CITY OF REDDING
777 Cypress Avenue, Redding, CA 96001
PO BOX 496071, Redding, CA 96049-6071
cityofredding.gov

MITIGATED NEGATIVE DECLARATION
Use Permit UP-2023-00550

State Clearinghouse No. _____

SUBJECT

Use Permit Application UP-2023-00550, by PACE Supply Corporation, is requesting approval to construct an additional 20,000 square feet of enclosed warehouse space and to improve two acres of undeveloped area for circulation and outdoor storage.

PROJECT DESCRIPTION

The project applicant, PACE Supply Corporation, is requesting approval of Use Permit Application UP-2023-00550, to construct an additional 20,000 square feet of enclosed warehouse space and to improve approximately two acres of undeveloped area for circulation and outdoor storage on a seven-acre property located at 3676 Old 44 Drive.

There is currently one 32,000 square foot commercial building on the seven-acre site. It is comprised of 25,000 square feet of warehouse space, 3,800 square feet of bulk retail space, and 3,200 square feet of office space. The rest of the site is used for a mixture of parking, landscaping, and outdoor storage save for approximately two acres of undeveloped area on the northern portion of the site. The project proposes to construct an additional 20,000 square feet of enclosed warehouse space with the majority of the undeveloped two acres to be improved with paving and gravel for vehicular circulation and additional outdoor storage.

The project proposes to be broken into two phases. Phase 1 would include the installation of gravel on a portion of the undeveloped land on the north side of the property along with additional site improvements. Phase 2 would add additional gravel and pavement to the undeveloped northern portion of the site as well as construction of the additional building area.

While the site is currently on septic, City sewer service to the project site will be provided by connecting to an eight-inch diameter sewer line in Old 44 Drive. The septic system will be demolished.

Water is supplied to the site from an existing eight-inch diameter water line in Old 44 Drive.

On-site storm drain facilities include a proposed drainage ditch around the perimeter of the proposed development and continuing along the west side of the site. Water leaves the site through an under-sidewalk drain and detention outlet at the southwest corner of the site.

No off-site improvements are proposed. All street, utility, and drainage improvements will connect to existing systems located adjacent to the project boundaries.

The project will continue to be operated as a warehouse and distribution center. As such, typical operation characteristics include employees, clients, and delivery vehicles traveling to and from the site. Relatively low levels of noise and lighting typical of commercial uses is expected.

ENVIRONMENTAL SETTING

The project site consists of approximately seven gross acres. It is primarily developed land with a minimal amount of landscaping and vegetation. The approximately two acres of undeveloped area proposed for development consist of annual grassland, blue oak woodland, and palustrine habitat. Topography of the site is relatively flat. The average elevation of the site is 99-104 feet above mean sea level and slopes to the east. Primary access to the site is provided from Old 44 Drive. Surrounding land uses include the following:

North: Commercial Excavation/Landscape Materials Business
South: Vehicle Storage, Commercial Recreation
East: Commercial Roofing Supply Business
West: Undeveloped Land

FINDINGS AND DETERMINATION

The City of Redding conducted an Initial Study (attached), which determined that the proposed project could have significant environmental effects. Subsequent revisions in the project proposal create the specific mitigation measures identified below. The project, as revised and as agreed to by the applicant, avoids or mitigates the potentially significant environmental effects identified, and the preparation of an environmental impact report will not be required. There is no substantial evidence, in light of the whole record before the City, that the project as revised may have a significant effect on the environment. If there are substantial changes that alter the character or impacts of the proposed project, another environmental impact determination will be necessary.

The project includes measures to mitigate potentially significant impacts associated with developing an area containing wetlands and potentially suitable habitat for various special status plant and animal species.

Prior to approval of the project, the lead agency may conclude, at a public hearing, that certain mitigation measures identified in the Mitigated Negative Declaration are infeasible or undesirable. In accordance with CEQA Section 15074.1, the lead agency may delete those mitigation measures and substitute other measures which it determines are equivalent or more effective. The lead agency would adopt written findings that the new measure is equivalent or more effective in mitigating or avoiding potential significant effects and that it, in itself, would not cause any potentially significant effect on the environment.

1. Based on the whole record (including the Initial Study and any supporting documentation) and the mitigation measures incorporated into the project, the City

of Redding has determined that a Mitigated Negative Declaration is appropriate. All potentially significant impacts would be reduced to less than significant.

2. The Mitigated Negative Declaration, with its supporting documentation, fully incorporated herein, reflects the independent judgment and analysis of the lead agency, which is the City of Redding.

DOCUMENTATION

The attached Initial Study documents the reasons to support the above determination.

MITIGATION MEASURES

MM-Bio-1 Prior to construction in aquatic environments, a qualified biologist shall conduct two (2) nighttime preconstruction surveys between January and March to detect western spadefoot toad adults, egg masses, and/or tadpoles. Preconstruction surveys shall occur immediately following separate precipitation events that produce enough volume of rain to develop ponding events. California Department of Fish and Wildlife (CDFW) shall be consulted prior to the initiation of project activities if any western spadefoots are observed.

MM-Bio-2 To the extent practicable, removal of large trees with cavities shall occur before bat maternity colonies form (i.e., prior to February 28) or after young are volant (i.e., after September 1). If construction (including the removal of large trees) occurs during the bat non-volant season (September 1 to February 28), a qualified professional shall conduct a pre-construction survey of the study area to locate maternity colonies and identify measures to protect colonies from disturbance. The preconstruction survey will be performed no more than seven days prior to the implementation of construction activities. If a maternity colony is located within the study area, or adjacent to the study area, a disturbance-free buffer shall be established by a qualified professional, in consultation with the California Department of Fish and Wildlife to ensure the colony is protected from project activities.

MM-Bio-3 If vegetation removal or construction activities will occur during the nesting season for migratory birds and raptors (February 1 through August 31), a qualified biologist shall conduct a pre-construction survey seven days before construction activities begin. If any candidate, sensitive, or special-status nesting birds are found, the California Department of Fish and Wildlife (CDFW) will be notified and consulted. An appropriate buffer, as determined by the CDFW and the qualified biologist, will be placed around the nest until the young have fledged. If construction activities cease for a period greater than seven days, additional preconstruction surveys will be required.

MM-Bio-4 Prior to issuance of a City grading permit that may impact or cause the permanent or temporary loss of jurisdictional waters or potential jurisdictional waters, as identified by the project, the developer shall secure all required permits and authorization from the U.S. Army Corps of Engineers, Regional Water Quality Control Board, and California Department of Fish and Wildlife. All terms and conditions of the required permits and authorizations shall be met.

MM-Bio-5 Prior to issuance of a grading permit, any permanent loss of waters of the U.S. or waters of the State, including wetlands, shall be offset by purchasing credits at a U.S. Army Corps of Engineers-approved mitigation bank, by payment of in-lieu fees to the U.S. Army Corps of Engineers-approved in-lieu fee program (according to current fee schedule), and/or as required by the State. The jurisdictional status of all on-site wetland features and documentation of resolution with the U.S. Army Corps of Engineers and/or the State regarding any required offsets shall be provided to the Planning Division.

MM-Bio-6 Prior to issuance of a grading permit or installation of any gravel for Phase 1, six-foot high, chain-link fencing or similar as approved by the development services director shall be in place and inspected by the Planning Division. This fencing shall be installed along the boundaries of Phase 1 in the northern undeveloped portion of the site.

PUBLIC REVIEW DISTRIBUTION

Draft copies or notice of this Mitigated Negative Declaration were distributed to:

- State Clearinghouse
- Shasta County Clerk
- U.S. Army Corp of Engineers, Redding
- California Department of Fish and Wildlife, Redding
- Central Valley Regional Water Quality Control Board, Redding
- Caltrans, District 2
- California Native Plant Society, Shasta Chapter
- Shasta Environmental Alliance
- Bella Vista Water District
- PACE Supply Corporation
- Sharrah Dunlap Sawyer Incorporated
- All property owners within 300 feet of the property boundary

PUBLIC REVIEW

(x) Draft document referred for comments on October 27, 2023.

( ) No comments were received during the public review period.

( ) Comments were received but did not address the draft Mitigated Negative Declaration findings or the accuracy/completeness of the Initial Study. No response is necessary. The letters are attached.

( ) Comments addressing the findings of the draft Mitigated Negative Declaration and/or accuracy or completeness of the Initial Study were received during the public review period. The letters and responses follow (see Response to Comments, attached).

The draft Mitigated Negative Declaration, Initial Study, Mitigated Monitoring Program, and other information concerning the project are available for public review Monday through Friday from 8:00 a.m. to 3:00 p.m. at the Planning Division of the Development Services Department, 777 Cypress Avenue, Redding, CA 96001, and online on the City Planning Projects page of the Development Services website at: www.cityofredding.gov. **If you have any questions or wish to submit comments, please contact Danny Castro, Assistant Planner, at dcastro@cityofredding.org, or by telephone at (530) 225-4471.**

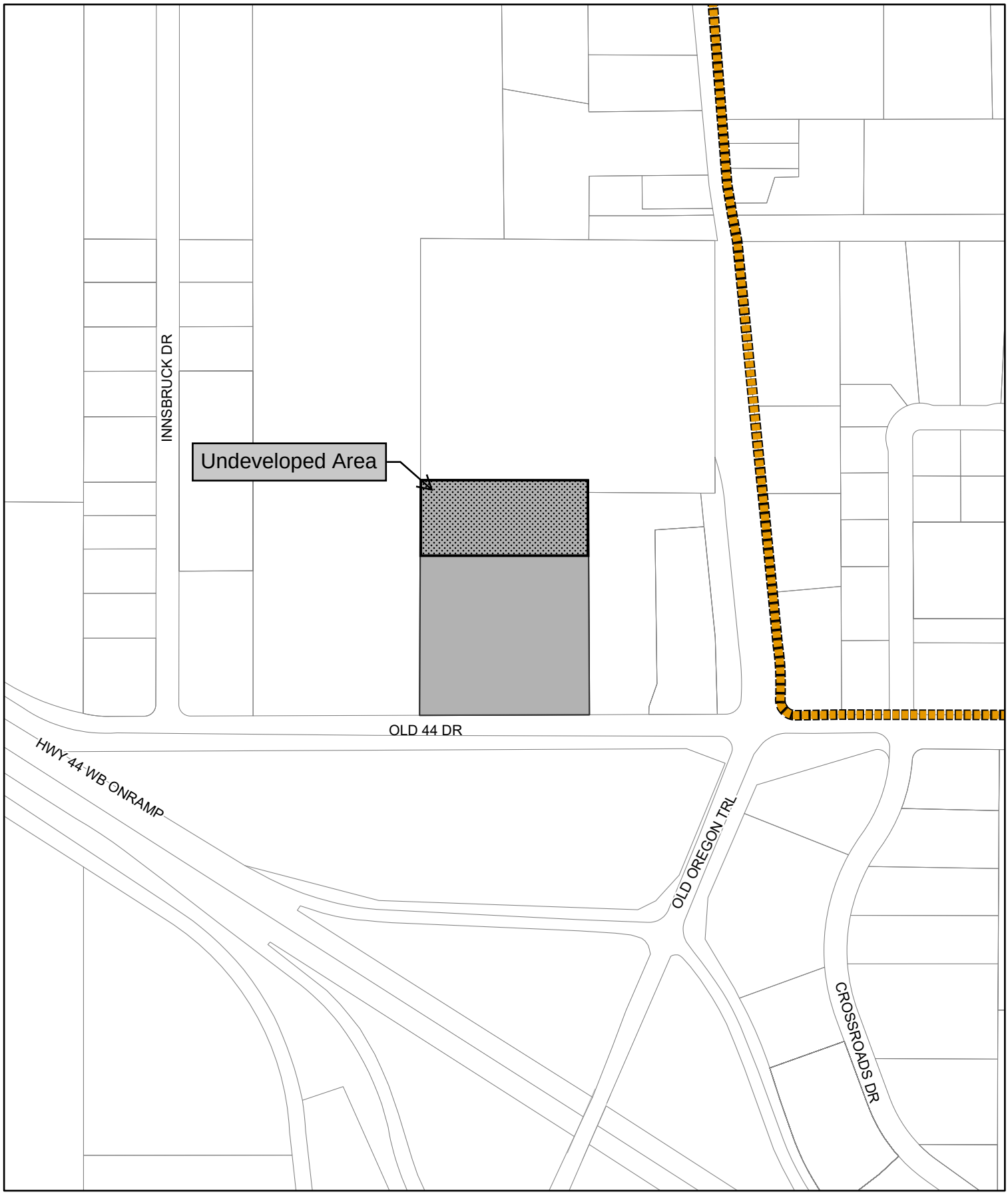
October 27, 2023
Date

Lily Toy, Planning Manager
Development Services

Date of Final Report

DC:jg

Attachments:
A. Location map
B. Initial Study
C. Mitigation Monitoring Program



N
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GIS DIVISION
INFORMATION TECHNOLOGY DEPARTMENT

DATE PRODUCED:
APRIL 11, 2023

0 200 400 Feet

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LOCATION MAP

UP-2023-00550
PACE SUPPLY CORPORATION
3676 OLD 44 DRIVE
AP# 109-010-037

MTG. DATE:

ITEM:

ATTACHMENT:

ENVIRONMENTAL INITIAL STUDY

INITIAL STUDY CHECKLIST
References and Documentation
PACE Supply Corporation Expansion
Use Permit UP-2023-00550

Prepared by:
CITY OF REDDING
Development Services Department
Planning Division
777 Cypress Avenue
Redding, California 96001

October 27, 2023

CITY OF REDDING
ENVIRONMENTAL CHECKLIST FORM

1. Project Title: PACE Supply Corporation Expansion

2. Lead agency name and address:

CITY OF REDDING
Development Services Department
Planning Division
777 Cypress Avenue
Redding, CA 96001

3. Contact Person and Phone Number: Danny Castro, (530) 225-4471

4. Project Location: 3676 Old 44 Drive

5. Applicant's Name and Address:
PACE Supply Corporation
4819 Fite Court
Stockton, CA 95215

Representative's Name and Address:
Sharrah Dunlap Sawyer Incorporated
320 Hartnell Avenue
Redding, CA 96002

6. General Plan Designation: Heavy Commercial

7. Zoning: "HC" Heavy Commercial

8. Description of Project:

The project applicant, PACE Supply Corporation, is requesting approval of Use Permit Application UP-2023-00550, to construct an additional 20,000 square feet of enclosed warehouse space and to improve approximately two acres of undeveloped area for circulation and outdoor storage on a seven-acre property located at 3676 Old 44 Drive.

There is an existing 32,000-square-foot commercial building on the seven-acre site. It is comprised of 25,000 square feet of warehouse space, 3,800 square feet of bulk retail space, and 3,200 square feet of office space. The rest of the site is used for a mixture of parking, landscaping, and outdoor storage save for approximately two acres of undeveloped area on the northern portion of the site. The project proposes to construct an additional 20,000 square feet of enclosed warehouse space with the majority of the undeveloped two acres to be improved with paving and gravel for vehicular circulation and additional outdoor storage.

The project proposes to be broken into two phases. Phase 1 would include the installation of gravel on a portion of the undeveloped land on the north side of the property along with additional site improvements. Phase 2 would add additional gravel and pavement to the undeveloped northern portion of the site as well as construction of the additional building area.

While the site is currently on septic, City sewer service to the project site will be provided by connecting to an eight-inch diameter sewer line in Old 44 Drive. The septic system will be demolished.

Water is supplied to the site from an existing eight-inch diameter water line in Old 44 Drive.

On-site storm drain facilities include a proposed drainage ditch around the perimeter of the proposed development and continuing along the west side of the site. Water leaves the site through an under-sidewalk drain & detention outlet at the southwest corner of the site.

No off-site improvements are proposed. All street, utility, and drainage improvements will connect to existing systems located

adjacent to the project boundaries.
The project will continue to be operated as a warehouse & distribution center. As such, typical operation characteristics include employees, clients, and delivery vehicles traveling to and from the site. Relatively low levels of noise and lighting typical of commercial uses is expected.

9. Surrounding Land Uses and Setting:

The project site consists of approximately seven gross acres. It is primarily developed land with a minimal amount of landscaping and vegetation. The approximately two acres of undeveloped area proposed for development consists of annual grassland, blue oak woodland, and palustrine habitat. Topography of the site is relatively flat. The average elevation of the site is 99-104 feet above mean sea level and slopes to the east. Primary access to the site is provided from Old 44 Drive. Surrounding land uses include the following:

North: Commercial Excavation/Landscape Materials Business
South: Vehicle Storage, Commercial Recreation
East: Commercial Roofing Supply Business
West: Undeveloped Land

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement):

- California Department of Fish and Wildlife
- U.S. Army Corps of Engineers
- Regional Water Quality Control Board

11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, is there a plan for consultation that includes, for example, the determination of significance of impacts to tribal cultural resources, procedures regarding confidentiality, etc.?

The Redding Rancheria, the Paskenta Band of Nomlaki Indians, and the Wintu Tribe of Northern California were noticed about this project and the preparation of its associated initial study. No California Native American tribes requested consultation pursuant to Public Resources Code section 21080.3.1.

Note: *Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21080.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.*

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "potentially significant impact or potentially significant unless mitigation incorporated" as indicated by the checklist on the following pages.

	Aesthetics		Agricultural and Forestry Resources		Air Quality
x	Biological Resources		Cultural Resources		Energy
	Geology / Soils		Greenhouse Gas Emissions		Hazards & Hazardous Materials
	Hydrology / Water Quality		Land Use / Planning		Mineral Resources

	Noise		Population / Housing		Public Services
	Recreation		Transportation		Tribal Cultural Resources
	Utilities / Service Systems		Wildfire		Mandatory Findings of Significance

DETERMINATION:

On the basis of the initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR of NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

The Initial Study, site plan, project description, draft Mitigated Negative Declaration, and other information concerning the project are available for public review from 8:00 a.m. to 3:00 p.m. weekdays at the Planning Division, Development Services Department, 777 Cypress Avenue, Redding, CA 96001, and online on the City Planning Projects page of the Development Services website at: www.cityofredding.gov. If you have any questions or to submit comments, please contact Danny Castro, Assistant Planner, at dcastro@cityofredding.org, or by telephone at (530) 225-4471.



Danny Castro, Assistant Planner
Development Services Department

October 27, 2023
Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

This section analyzes the potential environmental impacts associated with the proposed project. The issue areas evaluated in this Initial Study include:

- Aesthetics
- Agricultural and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Energy
- Geology/Soils
- Greenhouse Gas Emissions
- Hazards & Hazardous Materials
- Hydrology/Water Quality
- Land Use/Planning
- Mineral Resources
- Noise
- Population/Housing
- Public Services
- Recreation
- Transportation
- Tribal Cultural Resources
- Utilities/Service Systems
- Wildfire
- Mandatory Findings of Significance

The environmental analysis in this section is patterned after the Initial Study Checklist recommended by the State *CEQA Guidelines* and used by the City of Redding in its environmental review process. For the preliminary environmental assessment undertaken as part of this Initial Study's preparation, a determination that there is a potential for significant effects indicates the need to more fully analyze the development's impacts and to identify mitigation.

For the evaluation of potential impacts, the questions in the Initial Study Checklist are stated and an answer is provided according to the analysis undertaken as part of the Initial Study. The analysis considers the long-term, direct, indirect, and cumulative impacts of the development. To each question, there are four possible responses:

- **No Impact.** The development will not have any measurable environmental impact on the environment.

- **Less Than Significant Impact.** The development will have the potential for impacting the environment, although this impact will be below established thresholds that are considered to be significant.

- **Potentially Significant Impact Unless Mitigation Incorporated.** The development will have the potential to generate impacts which may be considered as a significant effect on the environment, although mitigation measures or changes to the development's physical or operational characteristics can reduce these impacts to levels that are less than significant.

- **Potentially Significant Impact**. The development will have impacts which are considered significant, and additional analysis is required to identify mitigation measures that could reduce these impacts to less than significant levels.

Where potential impacts are anticipated to be significant, mitigation measures will be required, so that impacts may be avoided or reduced to insignificant levels.

Prior environmental evaluations applicable to all or part of the project site:

- *City of Redding General Plan*, 2000
- *City of Redding General Plan Final Environmental Impact Report*, 2000, SCH #1998072103

List of attachments/references:

Attachment A – Figure 1 – Location Map
Figure 2 – Project Site Plan
Figure 3 – Elevation Drawings

Attachment B – *Biological Resource Assessment*, Gallaway Enterprises, March, 2022 (on file in the Development Services Department, Planning Division)

Attachment C – *Draft Delineation of Aquatic Resources*, Gallaway Enterprises, March, 2022 (on file in the Development Services Department, Planning Division)

Attachment D – *Spring Botanical Survey*, Gallaway Enterprises, April 2022 (on file in the Development Services Department, Planning Division)

Attachment E – *Response to CDFW Letter,* Gallaway Enterprises, September 13, 2023 (on file in the Development Services Department, Planning Division)

Attachment F – *Tree Inventory Memo*, Gallaway Enterprises, December 6, 2021 (on file in the Development Services Department, Planning Division)

Attachment G – *2021-2022 Wet Season Branchiopod Survey*, Gallaway Enterprises, March 2022 (on file in the Development Services Department, Planning Division)

Attachment H – *90 Day Report: Dry Season Surveys for Federally Listed Branchiopods*, Gallaway Enterprises, August 22, 2022 (on file in the Development Services Department, Planning Division)

Attachment I – *Cultural Resources Inventory Survey*, Genesis Society, February 8, 2022 (on file in the Development Services Department, Planning Division)

Attachment J – *Storm Drainage Analysis*, Sharrah Dunlap Sawyer Incorporated, July 19, 2023 (on file in the Development Services Department, Planning Division)

Attachment K – Letters sent to the Redding Rancheria, the Paskenta Band of Nomlaki Indians, and the Wintu Tribe of Northern California, August 17, 2023

SUMMARY OF MITIGATION MEASURES: See Section XXI, Mandatory Findings of Significance

I. AESTHETICS: *Except as provided in Public Resources Code Section 21099, would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?				X
c) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? *(Public views are those that area experienced from publicly accessible vantage point).* If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?				X
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?				X

Discussion:

a) The project must comply with the height standards of the City's Zoning Ordinance. The project would be consistent in height with buildings on adjacent properties and would not obstruct any documented scenic vistas. The proposed project would not represent a significant change to the overall scenic quality of the area.

b) The project site is not located adjacent to a state-designated scenic highway.

c) The project will be compatible with the existing visual character of the property and its surroundings.

d) The project would generate light that is customary for development and comply with the Zoning Ordinance light standards. There would not be an adverse effect on day or nighttime views in the area.

Documentation:
City of Redding General Plan, Natural Resources Element, 2000
City of Redding Zoning Ordinance, Chapter 18.40.090

Mitigation:
None necessary.

II. AGRICULTURE RESOURCES: *In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural, Land Evaluation and Site Assessment Mode (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				**X**
b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract?				**X**
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 5110(g))?				**X**
d Result in the loss of forest land or conversion of forest land to non-forest use?				**X**
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest land?				**X**

Discussion:

a-e) The project site does not contain designated farmland, forest land, or timberlands. The project site has not been historically used for agricultural purposes, nor does it possess soils that are prime for agricultural production. According to the California Department of Conservation Farmland Mapping and Monitoring Program the Project site is not mapped as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance and falls within the classification of Urban Built-up Land. The Project site is located within the "HC" Heavy Commercial zoning district and agricultural uses are not permitted in this district. There is no Williamson Act contract that affects the Project site. The project would not convert or rezone any farmland to non-agricultural use, or any forest land to non-forest use.

Documentation:
City of Redding General Plan, Natural Resources Element, 2000
City of Redding General Plan Background Report, Chapter 9.4: Agricultural Lands
California Department of Conservation's Farmland Mapping and Monitoring Program
United States Department of Agriculture, Soil Conservation Service and Forest Service, Soil Survey of Shasta County Area.

Mitigation:
None necessary.

III. AIR QUALITY: *Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Conflict with or obstruct implementation of the applicable air quality plan?				**X**
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard?			**X**	
c) Expose sensitive receptors to substantial pollutant concentrations?			**X**	
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?				**X**

Discussion:

a, b) Shasta County, including the far northern Sacramento Valley, currently exceeds the state's ambient standards for ozone (smog) and particulates (fine, airborne particles). Consequently, these pollutants are the focus of local air quality policy, especially when related to land use and transportation planning. Even with application of measures to reduce emissions for individual projects, cumulative impacts are unavoidable when ozone and/or particulate emissions are involved. For example, the primary source of emissions contributing to ozone is from vehicles. Any project that generates vehicle trips has the potential of contributing incrementally to the problem. The Environmental Impact Report for the *General Plan* acknowledged this dilemma; and as a result, Findings and a Statement of Overriding Considerations were adopted by the City Council for impacts to air quality resulting from growth supported under the *General Plan*.

The City Air Quality Element of the *General Plan* establishes emission-reduction goals of 20 to 25 percent, depending on the projected level of unmitigated emissions for a project. Mitigation thresholds are established for the important regional/local pollutants, including: Reactive Organic Gases (ROG) and Oxides of Nitrogen (NOx), which are ozone precursors, and Inhalable Particulate Matter, 10 Micron (PM_{10}). The mitigation thresholds for these pollutants are tiered at two levels as follows:

Level "A"	**Level "B"**
25 pounds per day of NOx	137 pounds per day of NOx
25 pounds per day of ROG	137 pounds per day of ROG
80 pounds per day of PM_{10}	137 pounds per day of PM_{10}

If a project has unmitigated emissions less than the Level "A" threshold, then it is viewed as a minor project (from an air quality perspective) and only application of Standard Mitigation Measures (SMMs) is required to try to achieve at least a 20 percent reduction in emissions, or the best reduction feasible otherwise. Land uses that generate unmitigated emissions above Level "A" require application of appropriate Best Available Mitigation Measures (BAMMs), in addition to the SMMs, in order to achieve a net emission reduction of 20 percent or more. If, after applying SMMs and BAMMs, a use still exceeds the Level "B" threshold, then a minimum of 25 percent of the unmitigated emissions exceeding 137 pounds per day must be offset by reducing emissions from existing sources of pollution; otherwise, an Environmental Impact Report is required.

Under policy of the Air Quality Element, a project has the potential to impact air quality primarily in two ways: (1) the project would generate vehicle trip emissions (with NOx, ROG, and PM_{10}) that contribute cumulatively to local and regional air quality conditions; and (2) fugitive dust (particulate/PM_{10}) emissions are possible during construction activities. As an industrial warehouse project with a very low numbers of employees, the project does not have the potential to generate significant emission concentrations of other pollutants subject to state and federal ambient air quality standards.

Application of Standard Mitigation Measures (SMMs) is required in order to strive toward the *General Plan* policy of a 20 percent reduction in emissions to address small-scale cumulative effects. SMMs applicable to this project address primarily short-term impacts related to construction and are standard development regulations promulgated in the City Grading Ordinance and California Building Code identified below. Application of the SMMs and the application of Best Available Mitigation Measures for NOx emissions as outlined below would reduce the project's potential air quality impacts to a level less than significant.

1. Nontoxic soil stabilizers shall be applied according to manufacturer's specification to all inactive construction areas

(previously graded areas inactive for ten days or more).

2. All grading operations shall be suspended when winds (as instantaneous gusts) exceed 20 miles per hour.

3. Temporary traffic control shall be provided as appropriate during all phases of construction to improve traffic flow (e.g., flag person).

4. Construction activities that could affect traffic flow shall be scheduled in off-peak hours.

5. Active construction areas, haul roads, etc., shall be watered at least twice daily or more as needed to limit dust.

6. Exposed stockpiles of soil and other backfill material shall either be covered, watered, or have soil binders added to inhibit dust and wind erosion.

7. All truck hauling solid and other loose material shall be covered or should maintain at least two feet of freeboard (i.e., minimum vertical distance between top of the load and the trailer) in accordance with the requirements of CVC Section 23114. This provision is enforced by local law enforcement agencies.

8. All public roadways used by the project contractor shall be maintained free from dust, dirt, and debris caused by construction activities. Streets shall be swept at the end of the day if visible soil materials are carried onto adjacent public paved roads. Wheel washers shall be used where vehicles enter and exit unpaved roads onto paved roads, or trucks and any equipment shall be washed off leaving the site with each trip.

9. Alternatives to open burning of cleared vegetative material on the project site shall be used unless otherwise deemed infeasible by the City Planning Division. Suitable alternatives include, but are not limited to, on-site chipping and mulching and/or hauling to a biomass fuel site.

c) Potential impacts to neighboring homes (sensitive receptors) from fugitive dust caused during construction are mitigated by application of the SMMs discussed above.

d) The project does not involve land use that could generate objectionable odors affecting a substantial number of people.

Documentation:
Shasta County APCD Air Quality Maintenance Plan and Implementing Measures
City of Redding General Plan, Air Quality Element, 2000
City of Redding General Plan Final Environmental Impact Report, 2000, SCH #1998072103, Chapter 8.6, Air Quality,
CEQA Findings of Fact and Statement of Overriding Considerations for the *City of Redding General Plan Final Environmental Impact Report*, as adopted by the Redding City Council on October 3, 2000, by Resolution 2000-166
City of Redding General Plan Background Report, Chapter 9.7, Natural Resources and Air Quality
California Air Resources Board. 2017. Area designations maps/state and national. http://www.arb.ca.gov/desig/adm/adm.htm

Mitigation:
None necessary.

IV. BIOLOGICAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) 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 California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		**X**		
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local of regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?				**X**

IV. **BIOLOGICAL RESOURCES:** *Would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
c) 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?		**X**		
d) 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?		**X**		
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?			**X**	
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community, Conservation Plan, or other approved local, regional, or State habitat conservation plan?				**X**

Discussion:

The information below is based on the survey results documented in the Draft Delineation of Aquatic Resources (January, 2022) and the Biological Resources Assessment (March, 2022) prepared by Gallaway Enterprises for the project.

a) Plants

The Biological Survey Area (BSA) for the project includes approximately two acres of vacant land located north of the existing building and developed area of the property and contains of disturbed annual grassland habitat throughout. The annual grassland that occurs within the BSA shows signs of earthwork disturbance and disturbance from vegetation management and vehicle access. Blue oak woodland occurs primarily in the eastern portion of the BSA with a few very small oak trees growing along the western edge of the BSA among the aquatic features that occur within the BSA. These wetland features are dependent upon seasonal rains and runoff from the adjacent composting facility to the north. There is no critical habitat nor sensitive natural communities within the BSA.

No federal or state listed plants were observed within the BSA or were determined to have potential to occur within the BSA, therefore, the project will have no effect on federal or state listed plant species or their habitats. However, during the habitat assessment it was determined that the BSA contains potentially suitable habitat for three (3) special-status plant species: Red Bluff dwarf rush (Juncus leiospermus var. leiospermus), Legenere (Legenere limosa), and Henderson's bent grass (Agrostis hendersonii). As their blooming periods did not overlap with the time of the site visits, a protocol-level survey for these species was performed at a later date in April 2022 by Gallaway Enterprises. It concluded that none of these species were present on the project site during the appropriate survey window of the target species.

Animals

The project may impact potentially suitable habitat for special-status wildlife, including the western spadefoot toad, pallid bat, western red bat, and various avian species protected under the Migratory Bird Act. Although no special-status animal species were observed on the project site during field surveys there is the potential that these species could occur and therefore, would be considered a potentially significant impact.

Implementation of Mitigation Measures Bio-1, Bio-2, and Bio-3 below would reduce or eliminate project-associated impacts to special-status wildlife species to less than significant.

b) The project site is not within close proximity to any nearby lakes, rivers, or streams and does not contain any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. Thus, no impact would occur and no mitigation is required.

c) The Draft Delineation of Aquatic Resources prepared for the project identified five wetland features consisting of .29 acres on the

site that are characterized as a seasonal swale and four seasonal wetlands that are dependent upon seasonal rains and runoff from the adjacent facility to the north. The seasonal features are dominated by perennial rye-grass, Mediterranean barley (Hordeum marinum ssp. gussoneanum), hawkbit, dallisgrass (Paspalum dilatatum), popcorn flower (Plagiobothrys sp.), water starwort (Callitriche sp.), and iris-leaved rush (Juncus xiphioides). The largest wetland feature located along the western boundary of the site is connected to a larger wetland that extends west through the adjacent undeveloped parcel. All of the remaining wetlands identified on the project site are highly isolated features that are completely contained within the project boundary. These isolated wetlands lack any direct surface hydrologic connection to jurisdictional features. Due to the isolated nature of these four wetlands, they meet the requirements for being considered potentially non-jurisdictional due to a lack of a significant nexus to an off-site jurisdictional feature. Further, the hydrology of the isolated wetland feature in the north east corner of the site is completely sourced from an offsite leaky tank.

The project proposes to be broken into two phases. Phase 1 would include the demolition of the on-site septic system and the installation of site sewer, a fire service water line and a storm drain along the already developed portion of the west side of the site. Phase 1 would also include the installation of gravel on a portion of the undeveloped land on the north side of the property. This gravelling would occur outside of the potentially jurisdictional waters but has the potential to impact the wetlands. Movement and storage of equipment and supplies could mistakenly encroach into the wetlands. For this reason, mitigation would be required to bring the level of impact from gravelling the undeveloped area delineated in Phase 1 down to less than significant. Mitigation measure Bio-6 below would reduce or eliminate Phase 1 associated impacts to State or federally protected wetlands to less than significant.

The City has not established its own mitigation standards for replacement of wetlands impacted by development and, instead, relies on criteria recognized by state and federal resource agencies. Federal and State policies promote a no net loss of wetland resources. This can be accomplished in a number of ways, but a common approach is the purchase by the developer of mitigation credits at an established wetland mitigation bank. Based on these factors, mitigation measures are established below to ensure that, prior to issuance of a City grading permit, the necessary wetland mitigation credits are secured, and sufficient mitigation is performed in accordance with the Army Corps of Engineers and CDFW permitting requirements.

Implementation of Mitigation Measure Bio-4 and Bio-5 below would reduce or eliminate project-associated impacts to State or federally protected wetlands to less than significant.

d) The project site is surrounded by existing development to the north, east, and south. Consequently, the site does not serve as a wildlife movement corridor as it does not link together areas of suitable habitat that are otherwise separated by rugged terrain, changes in vegetation, or human development. The site contains shrubs and trees that could be used for nesting migratory birds and bats. There is also the potential for the project site to be used as habitat for the western spadefoot toad. Although none of these species were observed on the project site during field surveys, the potential for the project to interfere with an established native resident, migratory wildlife, or native wildlife nursery site is considered a potentially significant impact. Mitigation measures Bio-1, Bio-2, and Bio-3 bring those impacts to less than significant.

e) The City has adopted a Tree Management Ordinance (Chapter 18.45 of the RMC) that promotes the conservation of mature, healthy trees in the design of new development. The ordinance also recognizes that the preservation of trees will sometimes conflict with necessary land-development requirements. The *City's General Plan EIR* further acknowledges that preservation of native trees will sometimes conflict with normal land development and that implementation of the *General Plan* will ultimately set aside over 7,000 acres of open space, much of which contains oak habitat. But efforts must still be made to retain existing trees if reasonably possible, and to sufficiently plant new trees in the context of the new development. A tree survey is required to identify natural trees and tree groups most suitable for preservation or "candidate trees/groups." Where all identified candidate trees/groups cannot be preserved, the set-aside of a natural area or areas within a project site that is particularly suitable for the planting, retention, and/or natural regeneration of trees is considered to be a desirable means of accomplishing the goals of the ordinance.

An arborist report (tree study) was prepared for the project by Gallaway Enterprises in November of 2021. The tree study identified 14 blue oaks, a Pacific willow, and a Fremont's cottonwood. The proposed grading/improvement plan retains a portion of a tree group on the eastern portion of the site. The preservation of this tree group provides the best tree management strategy for the project allowed under the current Tree Management Ordinance.

f) No habitat conservation plans or other similar plans have been adopted for the project site or project area. No impact would occur in this regard.

Documentation:
California Department of Fish and Wildlife: Natural Diversity Data Base
City of Redding General Plan, Natural Resources Element, 2000
City of Redding Municipal Code, Chapter 18.45, Tree Management Ordinance
City of Redding General Plan Environmental Impact Report, 2000, SCH #1998072103
Biological Resource Assessment, Gallaway Enterprises, March, 2022
Draft Delineation of Aquatic Resources, Gallaway Enterprises, March, 2022
2021-2022 Wet Season Branchiopod Survey, Gallaway Enterprises, March 2022
90 Day Report: Dry Season Surveys for Federally Listed Branchiopods, Gallaway Enterprises, August 22, 2022
Spring Botanical Survey, Gallaway Enterprises, April 2022
Response to CDFW Letter, Gallaway Enterprises, September 13, 2023

Mitigation:

MM-Bio-1 Prior to construction in aquatic environments, a qualified biologist shall conduct two (2) nighttime preconstruction surveys between January and March to detect western spadefoot adults, egg masses, and/or tadpoles. Preconstruction surveys shall occur immediately following separate precipitation events that produce enough volume of rain to develop ponding events. CDFW shall be consulted prior to the initiation of project activities if any western spadefoots are observed.

MM-Bio-2 To the extent practicable, removal of large trees with cavities shall occur before bat maternity colonies form (i.e., prior to February 28) or after young are volant (i.e., after September 1). If construction (including the removal of large trees) occurs during the bat non-volant season (September 1 to February 28), a qualified professional shall conduct a pre-construction survey of the study area to locate maternity colonies and identify measures to protect colonies from disturbance. The preconstruction survey will be performed no more than seven days prior to the implementation of construction activities. If a maternity colony is located within the study area, or adjacent to the study area, a disturbance-free buffer shall be established by a qualified professional, in consultation with the California Department of Fish and Wildlife, to ensure the colony is protected from project activities.

MM-Bio-3 If vegetation removal or construction activities will occur during the nesting season for migratory birds and raptors (February 1 through August 31), a qualified biologist shall conduct a pre-construction survey seven days before construction activities begin. If any candidate, sensitive, or special-status nesting birds are found, the California Department of Fish and Wildlife (CDFW) will be notified and consulted. An appropriate buffer, as determined by the CDFW and the qualified biologist, will be placed around the nest until the young have fledged. If construction activities cease for a period greater than seven days, additional preconstruction surveys will be required.

MM-Bio-4 Prior to issuance of a City grading permit that may impact or cause the permanent or temporary loss of jurisdictional waters or potential jurisdictional waters, as identified by the project, the developer shall secure all required permits and authorization from the U.S. Army Corps of Engineers, Regional Water Quality Control Board, and California Department of Fish and Wildlife. All terms and conditions of the required permits and authorizations shall be met.

MM-Bio-5 Prior to issuance of a grading permit, any permanent loss of waters of the U.S. or waters of the State, including wetlands, shall be offset by purchasing credits at a U.S. Army Corps of Engineers-approved mitigation bank, by payment of in-lieu fees to the U.S. Army Corps of Engineers-approved in-lieu fee program (according to current fee schedule), and/or as required by the State. The jurisdictional status of all on-site wetland features and documentation of resolution with the U.S. Army Corps of Engineers and/or the State regarding any required offsets shall be provided to the Planning Division.

MM-Bio-6 Prior to issuance of a grading permit or installation of any gravel for Phase 1, 6-foot high chain-link fencing or similar as approved by the Development Services Director shall be in place and inspected by the Planning Division. This fencing shall be installed along the boundaries of Phase 1 in the northern undeveloped portion of the site.

V. CULTURAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5?				**X**

V. CULTURAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?				**X**
c) Disturb any human remains, including those interred outside of dedicated cemeteries?				**X**

Discussion

a-c) A Cultural Resources Inventory Survey was prepared for the project site by Genesis Society for Gallaway Enterprises. According to the report, existing records at the Northeast Information Center (NEIC) indicated that no prehistoric or historic-era sites had been documented within the site. An intensive-level pedestrian survey was conducted and failed to identify any prehistoric or historic-era sites within the project site. Consultation was undertaken with the Native American Heritage Commission (NAHC) regarding sacred land listings for the property. An information request letter was delivered to the NAHC on January 20, 2022.

The report recommends cultural resources clearance for the project due to the absence of historic properties, the absence of significant historical resources, and the absence of unique archaeological resources within the project site. Based upon the Cultural Resources Inventory it has been determined that the project site is not in an area of archaeological or cultural sensitivity. No impacts in this area are anticipated.

Documentation:
City of Redding General Plan Background Report, 1998
City of Redding General Plan Final Environmental Impact Report, 2000, SCH #1998072103
Cultural Resources Inventory Survey, Gallaway Enterprises, Incorporated, February 8, 2022.

Mitigation:
None necessary.

VI. Energy: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?			**X**	
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?				**X**

Discussion

a) The project would not result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation. Direct energy use would involve the short-term use of energy for construction activities. Project construction would primarily consume diesel and gasoline through operation of construction equipment, material deliveries, and debris hauling. Construction is estimated to result in a short-term consumption of energy, representing a small demand on local and regional fuel supplies that would be easily accommodated and would be temporary. Long-term use of electricity for operations within the warehouses such a lighting, and heating and cooling in the office portions of the building is expected to be less than significant due to the scale of the project.

b) The project will not conflict with any State or local plans for renewable energy or energy efficiency.

Documentation:
City of Redding General Plan, Air Quality Element, 2000
California Long-Term Energy Efficiency Strategic Plan, 2011
Regional Transportation Plan for Shasta County, 2018

Mitigation:
None necessary.

VII. GEOLOGY AND SOILS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake, fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publications 42. ii) Strong seismic ground shaking? iii) Seismic-related ground failure, including liquefaction? iv) Landslides?				**X**
b) Result in substantial soil erosion or the loss of topsoil?			**X**	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?				**X**
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?				**X**
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of waste water?				**X**
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				**X**

Discussion:

a, c, d) There are no Alquist-Priolo earthquake faults designated in the Redding area of Shasta County. There are no other documented earthquake faults in the immediate vicinity that pose a significant risk, and the site is located in an area designated in the Health and Safety Element of the *General Plan* as having a low ground-shaking potential. The project is not located on or near any documented landslide hazard areas, and there is no evidence of ground slippage or subsidence occurring naturally on the site. The type of soils and underlying geology is identified as having no potential for liquefaction. No portion of the site falls within the 100-year floodplain of the Sacramento River or any creek.

b) The project site contains two primary soil classifications. The primary site soil is Redding-Red Bluff gravelly loams, 0 to 3 percent slopes. These soils have very slow permeability and very slow runoff. The hazard of erosion is none to slight. The second soil classification present on the site is Redding gravelly loam, 3 to 8 percent slopes. This soil is present in a small area in the northwest corner of the site. This soil has slow permeability and slow to medium runoff. The hazard of erosion for this soil is slight to moderate. Proposed grading consists of gentle slopes of approximately 1 percent further limiting any risk of sudden or dramatic erosion.

The project is subject to certain erosion-control requirements mandated by existing City and State regulations. These requirements include:

- *City of Redding Grading Ordinance.* This ordinance requires the application of "Best Management Practices" (BMPs) in accordance with the City Erosion and Sediment Control Standards Design Manual (Redding Municipal Code Section 16.12.060, Subsections C, D, E). In practice, specific erosion-control measures are determined upon review of the final project improvement plans and are tailored to project-specific grading impacts.

- *California Regional Water Quality Board "Construction Activity Storm Water Permit.*" This permit somewhat overlaps the City's Grading Ordinance provision by applying state standards for erosion-control measures during construction of the project.

- *California Regional Water Quality Control Board "Project Storm Water Pollution Prevention Plan (SWPPP).*" This plan emphasizes stormwater best-management practices and is required as part of the Construction Activity Storm Water Permit. The objectives of the SWPPP are to identify the sources of sediment and other pollutants that affect the quality of stormwater discharges and to describe and ensure the implementation of practices to reduce sediment and other pollutants in stormwater discharges.

- *U.S. Army Corps of Engineers Nationwide Permit.* A Nationwide Permit, if applicable, will be required from the U.S. Army Corps of Engineers to address impacts to jurisdictional waters.

Actions for compliance with these regulations are addressed under Standard Conditions of Approval, which are uniformly applied to all land development projects. Since the project is subject to uniformly-applied ordinances and policies and the overall risk of erosion is low, potential impacts related to soil erosion and sedimentation are less than significant.

e) The proposed project does not involve the use of septic tanks or alternative wastewater disposal. The existing site septic system is required to be destroyed and the site connected to City sewer as a part of the conditions of approval.

f) No unique geologic features, fossil-bearing strata, or paleontological sites are known to exist on the project site.

Documentation:
City of Redding Health and Safety Element, figures 4-1 (Ground Shaking Potential) and 4.2 (Liquefaction Potential)
City of Redding General Plan Final Environmental Impact Report
City of Redding General Plan Background Report, 1998
City of Redding Grading Ordinance, RMC Chapter 16.12
City of Redding Standard Specifications, Grading Practices
City of Redding Standard Development Conditions for Discretionary Approvals
Soil Survey of Shasta County Area, United States Department of Agriculture, Soil Conservation Service and Forest Service, August 1974
Division of Mines and Geology Special Publication 42
State Regional Water Quality Control Board, Central Valley Region, Regulations related to Construction Activity Storm Water Permits and Storm Water Pollution Prevention Plans

Mitigation:
None necessary.

VIII. GREENHOUSE GAS EMISSIONS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			**X**	
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?				**X**

Discussion:

a) In 2005, the Governor of California signed Executive Oder S-3-05, establishing that it is the State of California's goal to reduce statewide greenhouse gas (GHG) emission levels. Subsequently, in 2006, the California State Legislature adopted Assembly Bill AS 32, the California Global Warming Solutions Act. In part, AB 32 requires the California Air Resources Board to develop and adopt regulations to achieve a reduction in the State's GHG emissions to year 1990 levels by year 2020.

California Senate Bill SB97 established that an individual project's effect on GHG emission levels and global warming must be assessed under CEQA. SB97 further directed that the State Office of Planning and Research (OPR) develop guidelines for the assessment of a project's GHG emissions. Those guidelines for GHG emissions were subsequently included as amendments to the CEQA Guidelines. The guidelines did not establish thresholds of significance and there are currently no state, regional, county, or city guidelines or thresholds with which to direct project-level CEQA review. As a result, the City of Redding has utilized the best available information to develop a threshold until a specific quantitative threshold is adopted by the state or regional air district.

As the Lead Agency, the City has opted to utilize a quantitative non-zero project-specific threshold using a methodology recommended by the California Air Pollution Officers (CAPCOA) and accepted by the California Air Resources Board. According to CAPCOA's *Threshold 2.3, CARB Reporting Threshold,* 10,000 metric tons of carbon-dioxide equivalents per year (mtCO2eq/yr) is recommended as a quantitative non-zero threshold. According to the CAPCOA, this threshold would be equivalent to 550 dwelling units, 400,000 square feet of office use, 120,000 square feet of retail, or 70,000 square feet of supermarket use. This approach is estimated to capture over half the future residential and commercial development projects and is designed to support the goals of AB 32 and not hinder it.

The United States Environmental Protection Agency (EPA) identifies four primary constituents that are most representative of the GHG emissions. They are:

- **Carbon Dioxide (CO_2):** Emitted primarily through the burning of fossil fuels. Other sources include the burning of solid waste and wood and/or wood products and cement manufacturing.
- **Methane (CH_4):** Emissions occur during the production and transport of fuels, such as coal and natural gas. Additional emissions are generated by livestock and agricultural land uses, as well as the decomposition of solid waste.
- **Nitrous Oxide (N_2O):** The principal emitters include agricultural and industrial land uses and fossil fuel and waste combustion.
- **Fluorinated Gases:** These can be emitted during some industrial activities. Also, many of these gases are substitutes for ozone-depleting substances, such as CFCs, which have been used historically as refrigerants. Collectively, these gases are often referred to as "high global-warming potential" gases.

The primary generators of GHG emissions in the United States are electricity generation and transportation. The EPA estimates that nearly 85 percent of the nation's GHG emissions are comprised of carbon dioxide (CO_2). The majority of CO_2 is generated by petroleum consumption associated with transportation and coal consumption associated with electricity generation. The remaining emissions are predominately the result of natural-gas consumption associated with a variety of uses.

With regard to the project, the predominant associated GHG is CO_2 generated by motor-vehicle travel to and from the site. To a substantially lesser degree, the project will result in CH_4 emissions associated with use of electric power generated by the Redding Electric Utility (REU), though it should be noted that REU distributes power from a variety of sources, including hydroelectric, wind, and natural gas.

Given the scope and nature of the proposed project compared to that of similar projects, emissions from the project would be significantly below the thresholds put forth by CARB, as well as the City's air-quality thresholds. Therefore, the project would not contribute significantly to GHG emissions in the air basin. Additionally, the City and State's construction standards and BMPs, including Air Quality SSM 1 through 9 (listed in Section III, Air Quality, above), will be used during construction to further limit any potential contribution to negative impacts from GHG emissions. The project's direct or indirect impact on measurable GHGs in the Redding area would be less than significant.

On a larger scale, the City of Redding's General Plan acknowledges that land use decisions have an impact on climate and air quality. Land use decisions that result in low or very low density on the periphery of the community increase the amount of vehicle-miles traveled (VMT), which increases vehicle emissions. In response to this impact, the City's *General Plan* includes a number of goals and policies in the Community Development and Design Element, Transportation Element, and Housing Element that promote a compact urban form and encourage infill development, advocate higher housing density, and ensure connectivity to citywide

bikeways and pedestrian plans. The goal of these policies is to reduce VMT, which also reduces emissions and reduces a wide variety of air quality impacts. Since automobiles are considered a major source of GHG emission, each vehicle trip reduced also reduces GHG emissions.

b) The project would not conflict with any applicable plan, policies, or regulations adopted to reduce GHG emission. As noted, in "a" above, the project is in conformance with the City's air quality policies and thresholds, and with state guidelines and regulations, and Standard Mitigation Measures listed in Section III Air Quality, above. The proposed project would have no impact on any plans, policies, or regulations related to GHG emissions.

Documentation:
City of Redding General Plan, 2000
CPCOA website, July 19, 2010
California Office of the Attorney General, "The California Environmental Quality Act Addressing Global Warming Impacts at the Local Agency Level," updated January 6, 2010.

Mitigation:
None necessary.

IX. HAZARDS AND HAZARDOUS MATERIALS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				**X**
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				**X**
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				**X**
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				**X**
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?				**X**
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				**X**
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?			**X**	

Discussion:

a-d) The nature of the project as a plumbing supply warehouse and distribution center does not present a significant risk related to hazardous materials or emissions. There are no documented hazardous material sites located on or near the project.

e) The project is not located within an airport land use plan or within two miles of a public airport or public use airport and would not result in a safety hazard for people residing or working in the project area. There would be no impact on public safety.

f) The project does not involve a use or activity that could interfere with emergency-response or emergency-evacuation plans for the area.

g) The project site is located outside of the very high fire hazard severity zone and proposes to remove most vegetation associated with wildlands from the site. The majority of the site has been disturbed in the past and is surrounded on three sides by developed commercial lots. No residential development is proposed with this commercial project. Furthermore, the project will need to comply with all fire safety regulations included in the standard conditions of approval and in the City of Redding Municipal Code. The project is expected to have a less than significant wildland fire-hazard potential.

Documentation:
City of Redding General Plan, Health and Safety Element, 2000
Redding Municipal Airport Area Plan, 1990

Mitigation:
None necessary.

X. HYDROLOGY AND WATER QUALITY: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?			**X**	
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?				**X**
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
i) Result in substantial erosion or siltation on- or off-site?			**X**	
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?			**X**	
iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff? or			**X**	
iv) Impede or redirect flood flows?			**X**	
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?				**X**
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?				**X**

Discussion:

a) Since the project would be served by City sanitary sewer service, the project would not involve any permitted discharges of waste material into ground or surface waters. Construction and operation of the project would not violate any water quality standards established by the Central Valley Regional Water Quality Control Board (RWQCB) in its Basin Plan for the Sacramento River and San Joaquin River Basins. Water pollution best management practices are required and will be incorporated into the improvement plans for the project. The City's construction standards require that all projects prepare an erosion and sediment control plan (ESCP) prior to construction to address water pollution control. The ESCP will ensure that water quality standards are not substantially affected by the project during construction.

b) The project would utilize Bella Vista Water District (BVWD) water service for domestic uses and fire protection. The proposed project would have no significant impact on groundwater supplies or groundwater recharge.

c) The project is subject to standard requirements discussed under Section VII, *Geology and Soils*. The final improvement plans for the project must also incorporate specific design measures intended to limit pollutant discharges in stormwater from urban improvements as established under the State's National Pollutant Elimination System (NPDES) general permit, which the City is now obligated to follow in accordance with State Water Quality Control Order No. 2003-0005-DWQ. Feasible Best Management Practices (BMPs) would be incorporated in the final design of the project's storm-drain system, as approved by the City Engineer, based on the BMPs listed in the latest edition of the California Storm Water Quality Association Storm Water Best Management Practices Handbook.

City of Redding Policy 1806 requires that all development includes stormwater detention facilities designed to maintain existing predevelopment rates of runoff during a 10-, 25-, and 100-year storm event.. A Storm Drainage Analysis was prepared by Sharrah Dunlap Sawyer Inc. that shows that the Pace Supply Expansion project can manage the storm water runoff in a way that maintains or reduces pre-project runoff volumes in the post-project condition as required by the City of Redding. It concludes that the proposed storm drain design complies with City Council Policy 1806, and City of Redding Engineering Division requirements for protection of floodplains and downstream drainage concerns.

d) The project site is not located in a flood hazard, tsunami or seiche zone.

e) The project would not conflict with a water quality control plan or groundwater management plan.

Documentation:
City of Redding General Plan Background Report, Chapter 10, Health and Safety Element, 1998
Federal Emergency Management Agency Floodplain regulations, FIRM map number 06089C1560G, dated March 17, 2011
City of Redding Storm Drain Master Plan, Montgomery-Watson Engineers 1993
Storm Drainage Analysis, Sharrah Dunlap Sawyer Incorporated, July 19, 2023

Mitigation:
None necessary.

XI. LAND USE AND PLANNING: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Physically divide an established community?				**X**
b) Cause a significant environmental impact due to conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?				**X**

Discussion:

a) The project does not have the potential to physically divide an established community. The project involves an expansion to an existing commercial warehouse in an area zoned for heavy commercial uses and surrounded by other existing heavy commercial type uses.

b) The project is compatible with the applicable policies and regulations of the City General Plan and Zoning Ordinance and is not in conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

Documentation:
City of Redding General Plan, Community Development Element, 2000
City of Redding General Plan Environmental Impact Report, 2000, SCH #1998072103
City of Redding General Plan, Natural Resources Element, 2000

Mitigation:
None necessary.

XII. MINERAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?				**X**
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local General Plan, specific plan or other land use plan?				**X**

Discussion:

a, b) The project site is not identified in the General Plan as having any known mineral-resource value or as being located within any "Critical Mineral Resource Overlay" area.

Documentation:
City of Redding General Plan, Natural Resources Element, 2000

Mitigation:
None necessary.

XIII. NOISE: *Would the project result in:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			**X**	
b) Generation of excessive ground-borne vibration or ground-borne noise levels?				**X**
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				**X**

Discussion:

a, b) Due to the nature of the project as a warehouse and distribution center, it would not result in a permanent increase in ambient noise levels and would not result in generation of excessive ground-borne vibration or ground-borne noise levels.

During the construction of the proposed project, there will be a temporary increase in noise in the project vicinity above existing ambient noise levels. The most noticeable construction noise will be related to grading, utility excavation, and land-clearing activity. The City's Grading Ordinance (RMC Chapter 16.12.120.H) limits grading-permit-authorized activities to between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday. No operations are allowed on Sunday. Since heavy construction work associated with the project is limited in scope and by existing regulation, the anticipated noise impact to neighboring properties is considered less than significant.

c) The project is not located within the vicinity of a private airstrip or airport, is not in an airport land use plan, and is over two miles away from the nearest airport. The project is also outside of the 55-decibel noise contour of the nearest airport.

Documentation:
City of Redding General Plan, Noise Element, 2000
City of Redding Grading Ordinance Redding Municipal Code, Section 16.12.120
City of Redding General Plan, Transportation Element, 2000
City of Redding Zoning Ordinance Redding Municipal Code, Section 18.40.100
City of Redding Municipal Airport Area Plan

Mitigation:
None necessary.

XIV. POPULATION AND HOUSING: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Induce substantial unplanned population growth in an area, either directly *(for example, by proposing new homes and businesses)* or indirectly *(for example, through extension of roads or other infrastructure)*?				**X**
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?				**X**

Discussion:

a, b) The nature of the project as a commercial project in an "HC" Heavy Commercial zoning district precludes it from displacing people or housing, and therefore, would not necessitate construction of replacement housing. The site and the area surrounding the site were never developed with housing. No impacts to population and housing will result from the project.

Documentation:
City of Redding General Plan, Housing Element, 2000

Mitigation:
None necessary.

XV. PUBLIC SERVICES: *Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
Fire Protection?			**X**	
Police Protection?			**X**	
Schools?				**X**
Parks?				**X**
Other public facilities?				**X**

Discussion:

Fire and Police Protection:

The City would provide police and fire protection to the project from existing facilities and under existing service levels. The size of the project would not mandate the need for additional police or fire facilities.

The project is subject to Chapter 16.20 of the Redding Municipal Code, which requires new development to pay a citywide fire facilities impact fee calculated to mitigate a project's fair share of cumulative impacts to the City's fire-protection infrastructure based upon improvements necessary to accommodate new development under the City's *General Plan*.

Schools:

Because the project is not residential in nature, it will not contribute to a change in the total student enrollment in any school district.

Parks:

The project will not cause a physical deterioration of an existing park facility or cause an adverse physical impact associated with a new park facility.

Other public facilities:

See discussion under Item XIX (Utilities and Service Systems) below.

Documentation:
City of Redding General Plan, Public Facilities Element, 2000

Mitigation:
None necessary.

XVI. RECREATION:	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				**X**
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				**X**

Discussion:

a) The project is a commercial warehouse project and will not cause a physical deterioration of an existing recreation facility or cause an adverse physical impact associated with a new recreation facility. It is not near to any existing neighborhood, regional park or other recreational facility.

b) The project does not propose any recreational facilities or require construction or expansion of facilities. There would not be any potentially significant impacts to recreation associated with the project.

Documentation:
City of Redding General Plan, Natural Resources Element, 2000
City of Redding General Plan, Recreation Element, 2000
City of Redding General Plan, Public Facilities Element, 2000

Mitigation:
None necessary.

XVII. TRANSPORTATION: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?				**X**

XVII. **TRANSPORTATION:** *Would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
b) Conflict or be inconsistent with CEQA Guidelines Section 15064.3, Subdivision (b)?				**X**
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?			**X**	
d) Result in inadequate emergency access?				**X**

Discussion:

a) Access to the project will continue to be provided from the existing driveway as well as from an additional driveway taking access from the same frontage. The City's Traffic Engineer has determined that the number of average vehicle trips that would be generated with development of the project would not have the potential to cause a significant impact to the surrounding street system.

b) The potential for the project to conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b) was evaluated based the project's anticipated Vehicle Miles Traveled (VMT). Senate Bill (SB) 743 established VMT as the metric to be applied for determining transportation impacts associated with development projects. Like many other jurisdictions in California, the City of Redding has not yet adopted a policy or thresholds of significance regarding VMT so the project-related VMT impacts were assessed based on guidance provided by the California Governor's Office of Planning and Research (OPR) in the publication *Technical Advisory on Evaluating Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018. This document identifies several criteria that may be used by jurisdictions to identify certain types of projects that are unlikely to have a VMT impact and can be "screened" from further VMT analysis. Additionally, absent substantial evidence indicating that a project would generate a potentially significant level of VMT, or inconsistency with a Sustainable Communities Strategy (SCS) or general plan, projects that generate or attract fewer than 110 trips per day generally may be assumed to cause a less-than significant transportation impact. As stated above, the City's Traffic Engineer has determined that the number of average vehicle trips that would be generated with development of the project would not have the potential to cause a significant impact. The project would not conflict with any program, plan, ordinance, or policy addressing the circulation system. Therefore, the project will not conflict with CEQA guidelines section 15064.3(b).

c) No off-site improvements, including new streets with sharp curves or dangerous intersections, are proposed by or required from the project. The site is in an area zoned for heavy commercial use. The entering and exiting of large vehicles such as tractor-trailers is an existing condition that is expected for this area. No significant increase in transportation-related hazards is expected.

d) The project does not alter existing emergency access to the site or to the surrounding area. The Redding Fire Marshal finds that the proposed secondary driveway on Old 44 Road would result in better site access and circulation for emergency vehicles.

Documentation:
City of Redding General Plan, Transportation Element, 2000
City of Redding General Plan Environmental Impact Report, 2000, SCH #1998072103
City of Redding Parks, Trails, and Open Space Master Plan, 2018
City of Redding Traffic Impact Fee Program
City of Redding Active Transportation Plan, 2018
Redding Area Bus Authority System Map and Route Guide, October 2000

Mitigation:
None necessary.

XVIII. TRIBAL CULTURAL RESOURCES: *Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or				**X**
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, , the lead agency shall consider the significance of the resource to a California Native American tribe.				**X**

Discussion:

a, b) The California Register of Historical Resources and the official Shasta County archaeological records were consulted and evaluated as a part of a Cultural Resources Inventory Survey completed by Genesis Society for the project. The report concludes that no historic properties, significant historical resources, or unique archaeological resources are located within the project site and does not identify the project site as being listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources. There are no known sites, features, places, cultural landscapes, sacred places, or objects with cultural value to a California Native American tribe on the project site. The project was referred to the appropriate tribal entities and no request for consultation was received.

Documentation:
Letters sent to the Redding Rancheria, the Paskenta Band of Nomlaki Indians, and the Wintu Tribe of Northern California, August 17, 2023
Cultural Resources Inventory Survey, Genesis Society, February 8, 2022

Mitigation:
None necessary.

XIX. UTILITIES AND SERVICE SYSTEMS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Require or result in the relocation or construction of new or expanded water or wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?				**X**
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?				**X**
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				**X**

XIX. UTILITIES AND SERVICE SYSTEMS: *Would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
d) Generate solid waste in excess of State or local standards, or infrastructure, or otherwise impair the attainment of solid waste reduction goals?				X
e) Comply with Federal, State, and local management and reduction statutes and regulations related to solid waste?				X

Discussion:

a) The proposed development does not generate the need for relocation or construction of new or expanded water or wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities. The project proposes to add under-sidewalk stormwater drainage at the southwest corner of the site. This improvement simply allows existing drainage to flow under the sidewalk instead of over and is not a relocation, new, or expanded utility.

b) Potable water is available from the Bella Vista Water District (BVWD) to serve the project with adequate pressure and flows for fire suppression. The demands of the project can be accommodated within the BVWD existing water resources. Sufficient water supplies are available to serve the project and reasonably foreseeable future development during normal, dry, and multiple day years.

c) The project will utilize the City's sanitary sewer system to dispose of wastewater. Adequate sewer capacity and wastewater treatment is available in the City's existing system.

d) The project would not generate solid waste in excess of State or local standards, or infrastructure, or otherwise impair the attainment of solid waste reduction goals. The City provides solid waste disposal, which the project would utilize. Adequate capacity is available to serve the needs of the project without need of special accommodation.

e) The project will comply with Federal, State, and local management and reduction statutes and regulations related to solid waste.

Documentation:
City of Redding General Plan, Public Facilities Elements, 2000
City of Redding Water and Sewer Atlas

Mitigation:
None necessary.

XX. WILDFIRE: *If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?				X
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose projects occupants to pollutant concentrations from a wildfire or the uncontrolled spread of wildfire?				X
c) Require installation or maintenance of associated infrastructure (such as roads, fuel sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				X

XX. **WILDFIRE:** *If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result, post-fire slope instability, or drainage changes?				**X**

Discussion:

a) The project is not located within a mapped very high fire severity zone. The use of the project site for warehousing and distribution would not add any additional residential units. The scale of the project would not add a significant amount of vehicular traffic to the area. Considering these factors, the project would not impair an emergency response plan or emergency evacuation plan.

b) The project site is surrounded on three sides by existing development and is located in an area with relatively flat topography. It is outside of a high fire severity zone and is in an area of known wetlands. The project would not exacerbate wildfire risks or expose project occupants to pollutant concentrations from a wildfire.

c) The project would not require the installation or maintenance of any roads, fuel sources, power lines or other utilities that could exacerbate wildfire risks. The site is located in an area that is already adequately served by utilities and improvements.

d) The project is not in an area with slopes and would not result in post-fire slope instability. Proper site drainage to storm drain infrastructure is proposed and required with development. Therefore, the project would not expose people or structures to downstream flooding or landslides.

Documentation:
CalFire, Fire Hazard Severity Zone Maps, Shasta County, 2008

Mitigation:
None necessary.

XXI. **MANDATORY FINDINGS OF SIGNIFICANCE:**	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below the self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?			**X**	
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			**X**	
c) Does the project have potential environmental effects which may cause substantial adverse effects on human beings, either directly or indirectly?				**X**

Discussion:

Based on the analysis undertaken as part of this Initial Study, the following findings can be made:

a) As discussed under Item IV, *Biological Resources*, if unmitigated, the project has the potential to result in the loss of jurisdictional wetlands or Waters of the United States. Also, as discussed, the project has the potential to impact special-status animal species (western spadefoot toad, pallid bat, and western red bat) as well as species of migratory birds and raptors. Mitigation Measures listed below have been established to reduce potential impacts to less than significant.

b) As discussed in Section V, the project will contribute to regionwide cumulative air quality impacts. However, under policy of the *General Plan*, application of existing grading and construction standards will reduce potential impacts from this project to a level less than significant.

c) As discussed herein, the project does not have characteristics which could cause substantial adverse effects on human beings, either directly or indirectly.

Documentation:
See all Sections above.

Mitigation:

MM-Bio-1 Prior to construction in aquatic environments, a qualified biologist shall conduct two (2) nighttime preconstruction surveys between January and March to detect western spadefoot adults, egg masses, and/or tadpoles. Preconstruction surveys shall occur immediately following separate precipitation events that produce enough volume of rain to develop ponding events. CDFW shall be consulted prior to the initiation of project activities if any western spadefoots are observed.

MM-Bio-2 To the extent practicable, removal of large trees with cavities shall occur before bat maternity colonies form (i.e., prior to February 28) or after young are volant (i.e., after September 1). If construction (including the removal of large trees) occurs during the bat non-volant season (September 1 to February 28), a qualified professional shall conduct a pre-construction survey of the study area to locate maternity colonies and identify measures to protect colonies from disturbance. The preconstruction survey will be performed no more than seven days prior to the implementation of construction activities. If a maternity colony is located within the study area, or adjacent to the study area, a disturbance-free buffer shall be established by a qualified professional, in consultation with the California Department of Fish and Wildlife, to ensure the colony is protected from project activities.

MM-Bio-3 If vegetation removal or construction activities will occur during the nesting season for migratory birds and raptors (February 1 through August 31), a qualified biologist shall conduct a pre-construction survey seven days before construction activities begin. If any candidate, sensitive, or special-status nesting birds are found, the California Department of Fish and Wildlife (CDFW) will be notified and consulted. An appropriate buffer, as determined by the CDFW and the qualified biologist, will be placed around the nest until the young have fledged. If construction activities cease for a period greater than seven days, additional preconstruction surveys will be required.

MM-Bio-4 Prior to issuance of a City grading permit that may impact or cause the permanent or temporary loss of jurisdictional waters or potential jurisdictional waters, as identified by the project, the developer shall secure all required permits and authorization from the U.S. Army Corps of Engineers, Regional Water Quality Control Board, and California Department of Fish and Wildlife. All terms and conditions of the required permits and authorizations shall be met.

MM-Bio-5 Prior to issuance of a grading permit, any permanent loss of waters of the U.S. or waters of the State, including wetlands, shall be offset by purchasing credits at a U.S. Army Corps of Engineers-approved mitigation bank, by payment of in-lieu fees to the U.S. Army Corps of Engineers-approved in-lieu fee program (according to current fee schedule), and/or as required by the State. The jurisdictional status of all on-site wetland features and documentation of resolution with the U.S. Army Corps of Engineers and/or the State regarding any required offsets shall be provided to the Planning Division.

MM-Bio-6 Prior to issuance of a grading permit or installation of any gravel for Phase 1, 6-foot high chain-link fencing or similar as approved by the Development Services Director shall be in place and inspected by the Planning Division. This fencing shall be installed along the boundaries of Phase 1 in the northern undeveloped portion of the site.

List of Attachments

Attachment A
Figure 1 – Location Map
Figure 2 – Project Site Plan
Figure 3 – Building Elevations

Attachment B
Biological Resource Assessment

Attachment C
Draft Delineation of Aquatic Resources and supporting delineation map.

Attachment D
Spring Botanical Survey

Attachment E
Response to CDFW Letter

Attachment F
Tree Inventory Memo

Attachment G
2021-2022 Wet Season Branchiopod Survey

Attachment H
90 Day Report: Dry Season Surveys for Federally Listed Branchiopods

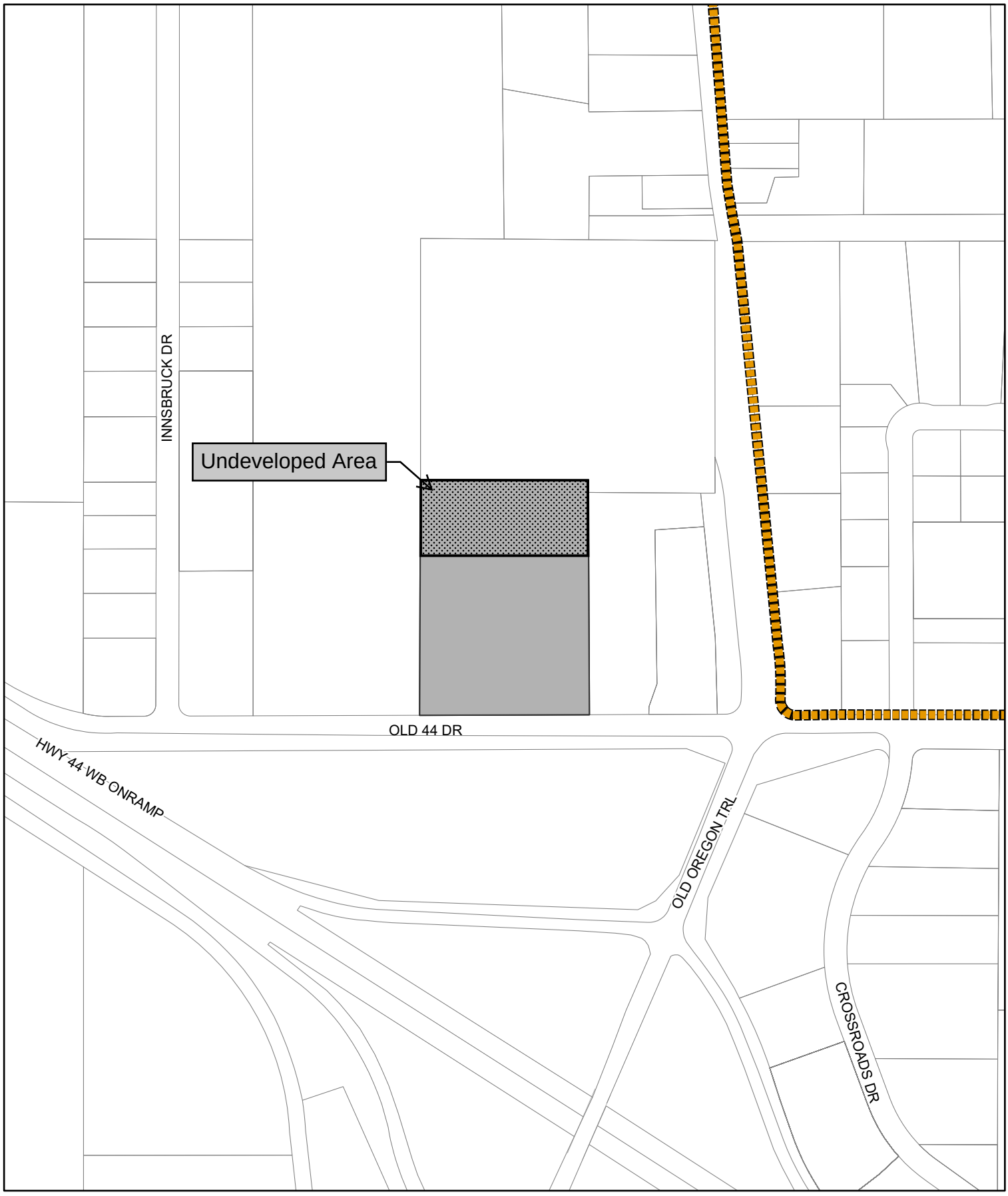
Attachment I
Cultural Resources Inventory Survey

Attachment J
Storm Drainage Analysis

Attachment K
Letters sent to the Redding Rancheria, the Paskenta Band of Nomlaki Indians, and the Wintu Tribe of Northern California.

Attachment A

Figure 1 – Location Map
Figure 2 – Project Site Plan
Figure 3 – Building Elevations



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GIS DIVISION
INFORMATION TECHNOLOGY DEPARTMENT

DATE PRODUCED:
APRIL 11, 2023

0 200 400 Feet

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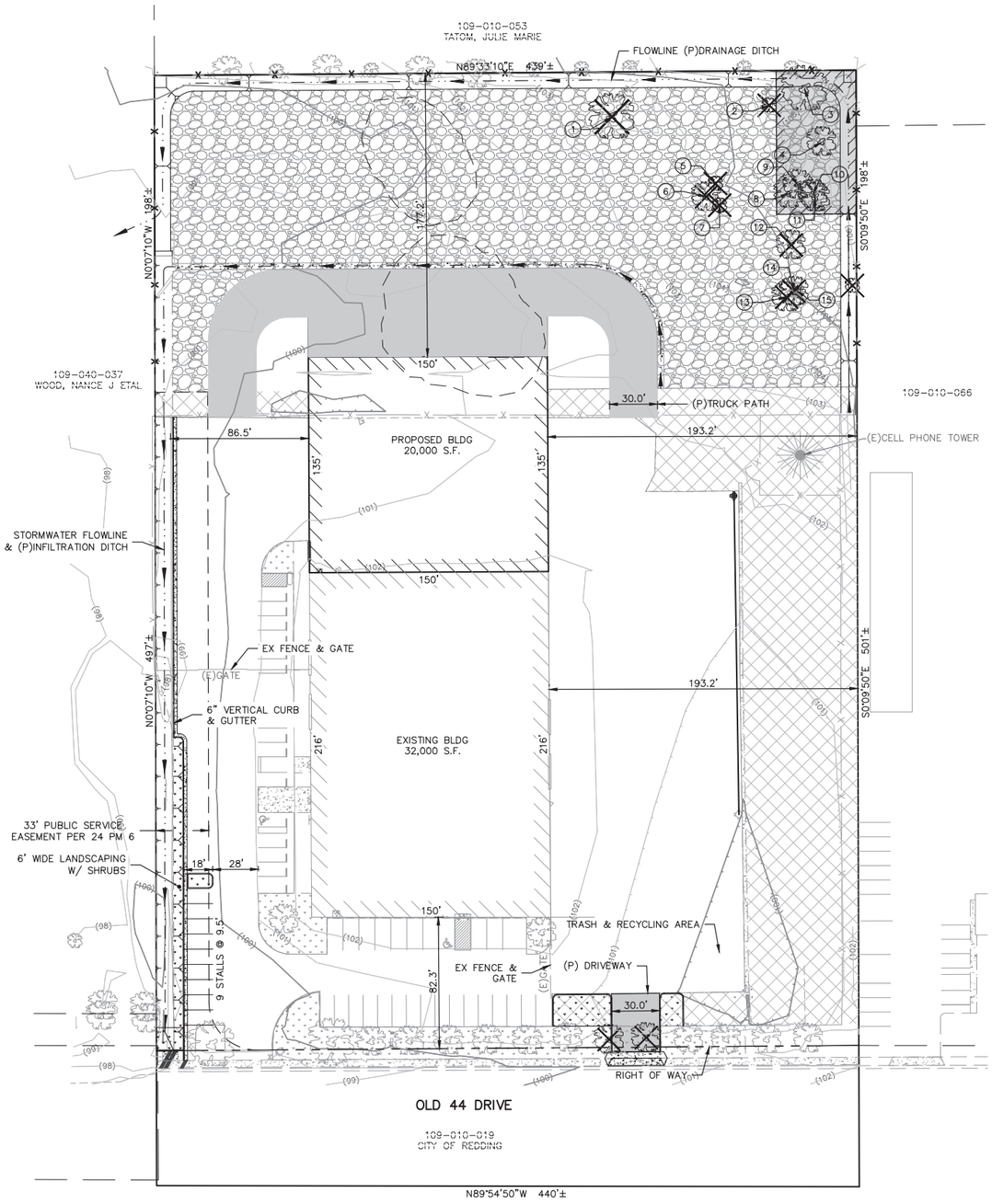
LOCATION MAP

UP-2023-00550
PACE SUPPLY CORPORATION
3676 OLD 44 DRIVE
AP# 109-010-037

MTG. DATE:

ITEM:

ATTACHMENT:



LEGEND

- EXISTING GRAVEL TO REMAIN
- NEW GRAVEL
- NEW AC PAVING
- TREE PRESERVATION AREA
- NEW LANDSCAPE AREA
- (P) PROPOSED
- STORMWATER FLOW PATH
- EXISTING FENCE
- PROPOSED FENCE
- TREES TO BE REMOVED
- TREES TO REMAIN

TREE TABLE

POINT #	DESCRIPTION
1	23" OAK
2	8" OAK
3	14"/30" COTTONWOOD
4	15" COTTONWOOD (SICK)
5	10" OAK
6	12"/16" OAK
7	7" OAK
8	15" OAK
9	14" OAK
10	15" OAK
11	12" OAK
12	14" OAK
13	15" OAK
14	18" OAK
15	7" OAK

PARKING DATA:

TYPICAL STANDARD SPACE SIZES: 9'X18' (MINIMUM)

TYPICAL ADA SPACE SIZE: 17'X18'

REQUIRED PARKING:

EX. WAREHOUSE:	20,000 S.F. @ 1/1,250 = 16*
	5,000 S.F. @ 1/2,000 = 3*
EX. BULK RETAIL (SHOWROOM & SALES)	3,800 S.F. @ 1/600 = 7
EX. OFFICE:	3,200 S.F. @ 1/350 = 10
PROPOSED WAREHOUSE:	15,000 S.F. @ 1/2,000 = 8*
	5,000 S.F. @ 1/4,000 = 2*
TOTAL REQUIRED PARKING:	46 SPACES

*WAREHOUSE PARKING CALCULATIONS PER SCHEDULE 18.41.040-A: PARKING SPACES REQUIRED WHICH STATES: 1 PARKING SPACE FOR EACH 1,250 SQUARE FEET OF GROSS FLOOR AREA FOR BUILDINGS BETWEEN 0 AND 20,000 SQUARE FEET IN AREA; 1 PARKING SPACE FOR EACH 2,000 SQUARE FEET OF GROSS FLOOR AREA FOR THE BUILDING AREA BETWEEN 20,000 AND 40,000 SQUARE FEET, AND 1 PARKING SPACE FOR EACH 4,000 SQUARE FEET OF GROSS FLOOR AREA FOR THE BUILDING AREA OVER 40,000 SQUARE FEET.

PROPOSED PARKING:

EX. STANDARD SPACES:	39
EX. ACCESSIBLE SPACES:	2
PROPOSED STANDARD SPACES:	9
TOTAL PROPOSED PARKING:	50

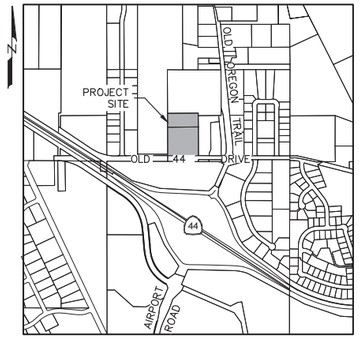
LANDSCAPE DATA:

REQUIRED LANDSCAPE:
PER BLDG AREA:

EX. GROSS BUILDING AREA:	32,000 S.F.
PROPOSED GROSS BUILDING AREA:	20,000 S.F
	52,000 S.F. * 5% = 2,600 S.F.
PER STALL COUNT 50 SPACES @ 60 S.F./SPACE = (46 REQUIRED)	3,000 S.F.
TOTAL REQUIRED	5,600 S.F.

TOTAL PROPOSED:

EX. LANDSCAPING	6,584 S.F.
PROPOSED	1,080 S.F.
TOTAL LANDSCAPING:	7,664 S.F.



VICINITY MAP
NOT TO SCALE

CLIENT:
PACE SUPPLY CORPORATION
425 MARKET STREET
OAKLAND, CA 94607

OWNER:
PACE SUPPLY CORPORATION
425 MARKET STREET
OAKLAND, CA 94607

ENGINEER:
SHARRAH DUNLAP SAWYER, INC.
320 HARTNELL AVENUE
REDDING, CA 96002

SITE DATA:

A.P.#:	109-010-037
GENERAL PLAN:	HC – HEAVY COMMERCIAL
ZONING:	HC – HEAVY COMMERCIAL
EXISTING USE:	COMMERCIAL
PROPOSED USE:	COMMERCIAL
GROSS SITE AREA:	7.0 ACRES
NET SITE AREA:	7.0 ACRES
ELECTRICITY:	REDDING ELECTRIC UTILITY
WATER:	BELLA VISTA WATER DISTRICT
SEWER:	CITY OF REDDING
TELEPHONE:	AT&T

BUILDING DATA:

EXISTING BUILDING AREA (SF):		32,000
WAREHOUSE	25,000	
BULK RETAIL	3,800	
OFFICE	3,200	
PROPOSED BUILDING AREA (SF):		20,000
WAREHOUSE	20,000	
TOTAL BUILDING AREA (SF):		52,000
FLOOR AREA RATIO:	0.15	

N

40 0 20 40
1 INCH = 40 FEET

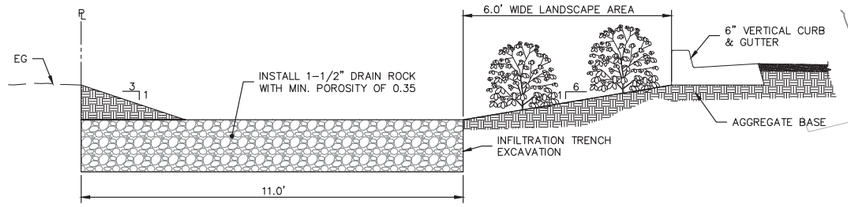
PACE SUPPLY
USE PERMIT
SITE PLAN

FOR

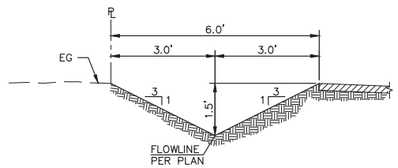
PACE SUPPLY

BY

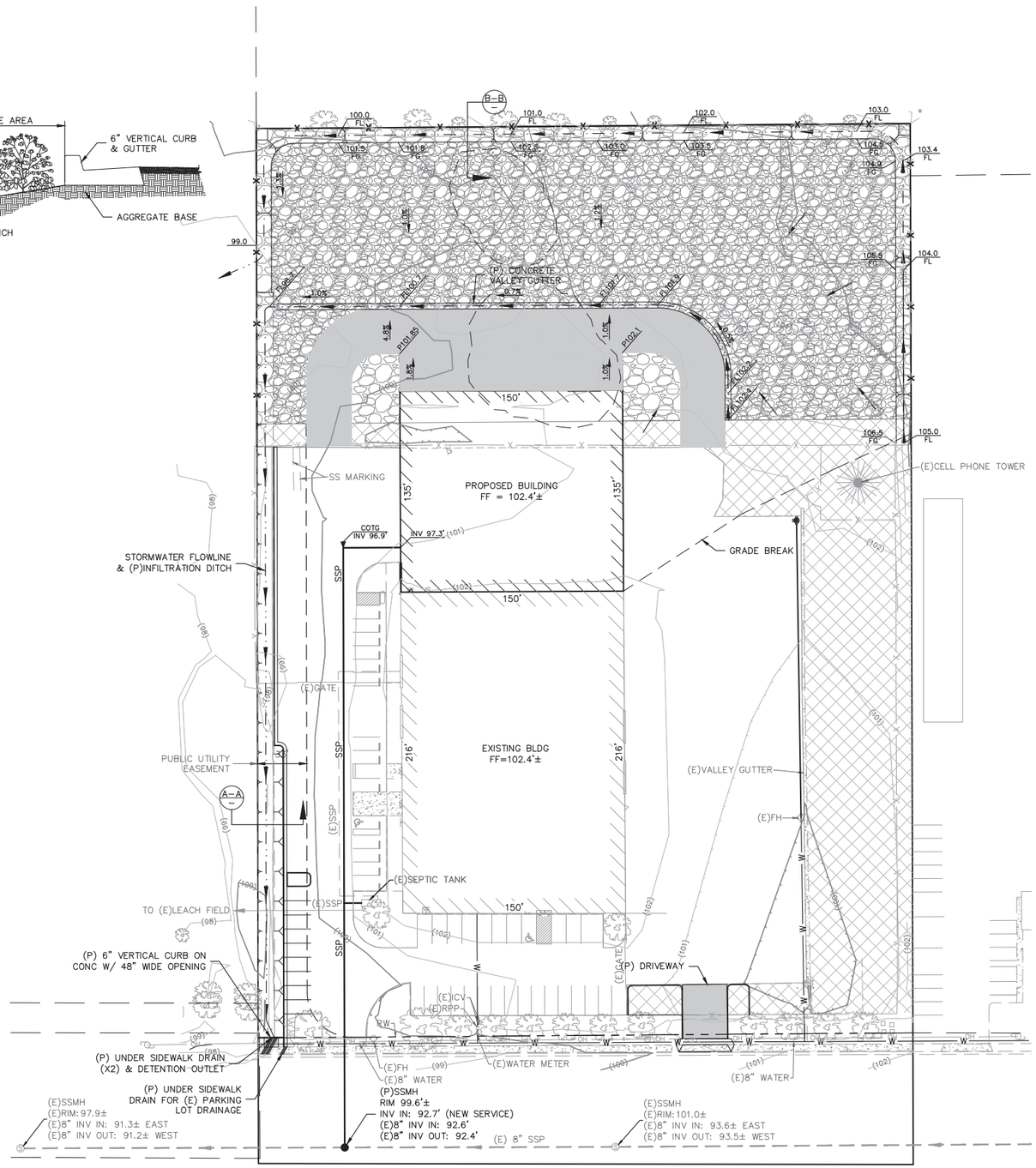
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Landscape Architecture • Presentation Graphics
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530.221.1792 voice • info@sdsengineering.com



ONSITE DETENTION
SECTION A–A
N.T.S.



DRAINAGE DITCH
SECTION B–B
N.T.S.



LEGEND

- INFILTRATION DITCH (SEE PLAN FOR WIDTH)
- EXISTING GRAVEL TO REMAIN
- NEW AC PAVING
- NEW GRAVEL
- (P) PROPOSED
- STORMWATER FLOW PATH
- X EXISTING FENCE
- X PROPOSED FENCE
- TREES TO REMAIN
- (E)SANITARY SEWER MANHOLE
- (P) SANITARY SEWER MANHOLE
- SSP PROPOSED SANITARY SEWER PIPE

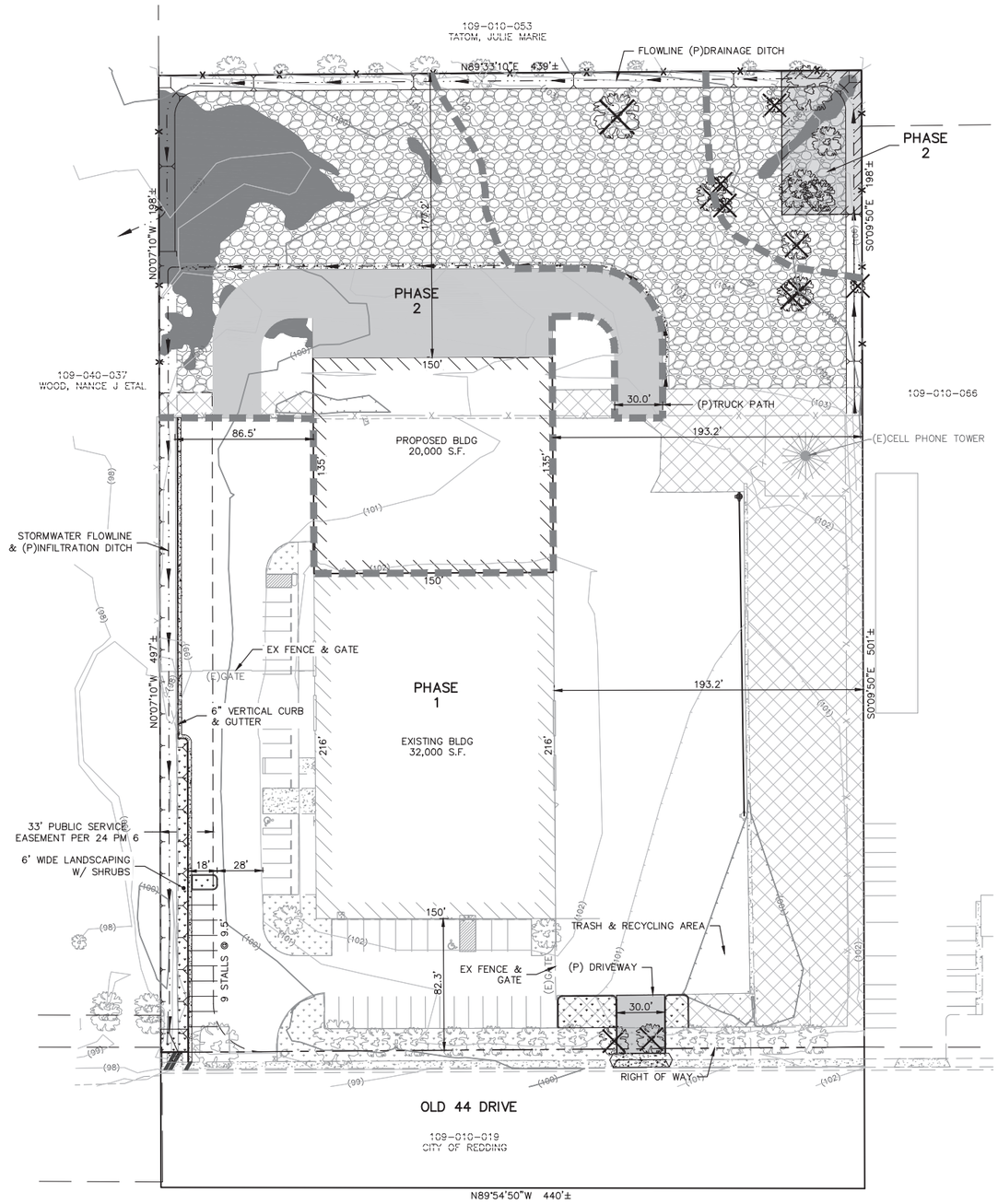
PACE SUPPLY
USE PERMIT
PRELIMINARY
GRADING, DRAINAGE
& UTILITY PLAN

FOR

PACE SUPPLY

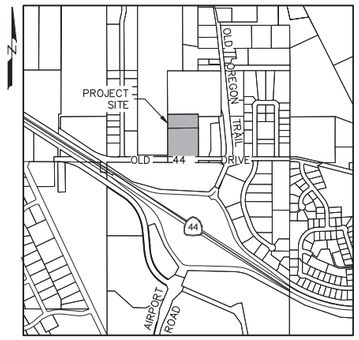
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LEGEND

- EXISTING GRAVEL TO REMAIN
- NEW GRAVEL
- NEW AC PAVING
- TREE PRESERVATION AREA
- NEW LANDSCAPE AREA
- (P) PROPOSED
- STORMWATER FLOW PATH
- EXISTING FENCE
- PROPOSED FENCE
- TREES TO BE REMOVED
- TREES TO REMAIN



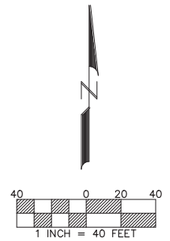
VICINITY MAP
NOT TO SCALE

PHASE 1 IMPROVEMENTS

- SANITARY SEWER IMPROVEMENTS ON THE WEST SIDE OF THE BUILDING AS NECESSARY TO ELIMINATE GROUND DISPOSAL SYSTEM
- SANITARY SYSTEM AS NECESSARY TO ENSURE A GRAVITY SEWER SERVICE TO THE MAIN IN OLD 44 DRIVE PER CITY STD.
- INSTALLATION OF A FIRE SERVICE WATER LINE AND BACKFLOW TO SERVE THE BUILDING EXPANSION
- INSTALLATION OF THE STORM DRAIN SYSTEM ALONG THE WEST BOUNDARY FROM THE DISCHARGE IN THE
- STREET TO THE EXISTING EDGE OF PAVEMENT ON THE NORTH.
- INSTALLATION OF THE NEW DRIVEWAY FROM OLD 44 ON THE EAST SIDE OF THE SITE.
- INSTALLATION OF NEW CURB GUTTER AND TIE IN PAVING ALONG THE WEST EDGE OF PAVEMENT
- INSTALLATION OF REQUIRED LANDSCAPING AND IRRIGATION ALONG THE WEST PROPERTY LINE AND AT NEW DRIVEWAY.
- GRADING AND PLACEMENT OF AGGREGATE BASE IN THE AREA NORTH OF THE EXISTING DEVELOPED SITE IN AREAS OUTSIDE OF THE DELINEATED WATERS OF THE US

PHASE 2 IMPROVEMENTS

- GRADING OF THE REMAINDER OF THE AREA NORTH OF THE EXISTING DEVELOPED SITE.
- COMPLETION OF THE STORM DRAIN IMPROVEMENTS NORTH OF THE EXISTING DEVELOPED SITE
- CONSTRUCTION OF THE PROPOSED BUILDING EXPANSION
- INSTALLATION OF THE NEW AC PAVING JUST NORTH WEST AND EAST OF THE BUILDING EXPANSION
- PLACEMENT OF AGGREGATE BASE ON THE REMAINING AREA NORTH OF THE DEVELOPED SITE AND THE NEW AC PAVEMENT.
- CONSTRUCTION OF NEW FENCING AROUND THE EXPANDED YARD



PACE SUPPLY
USE PERMIT
PHASING EXHIBIT

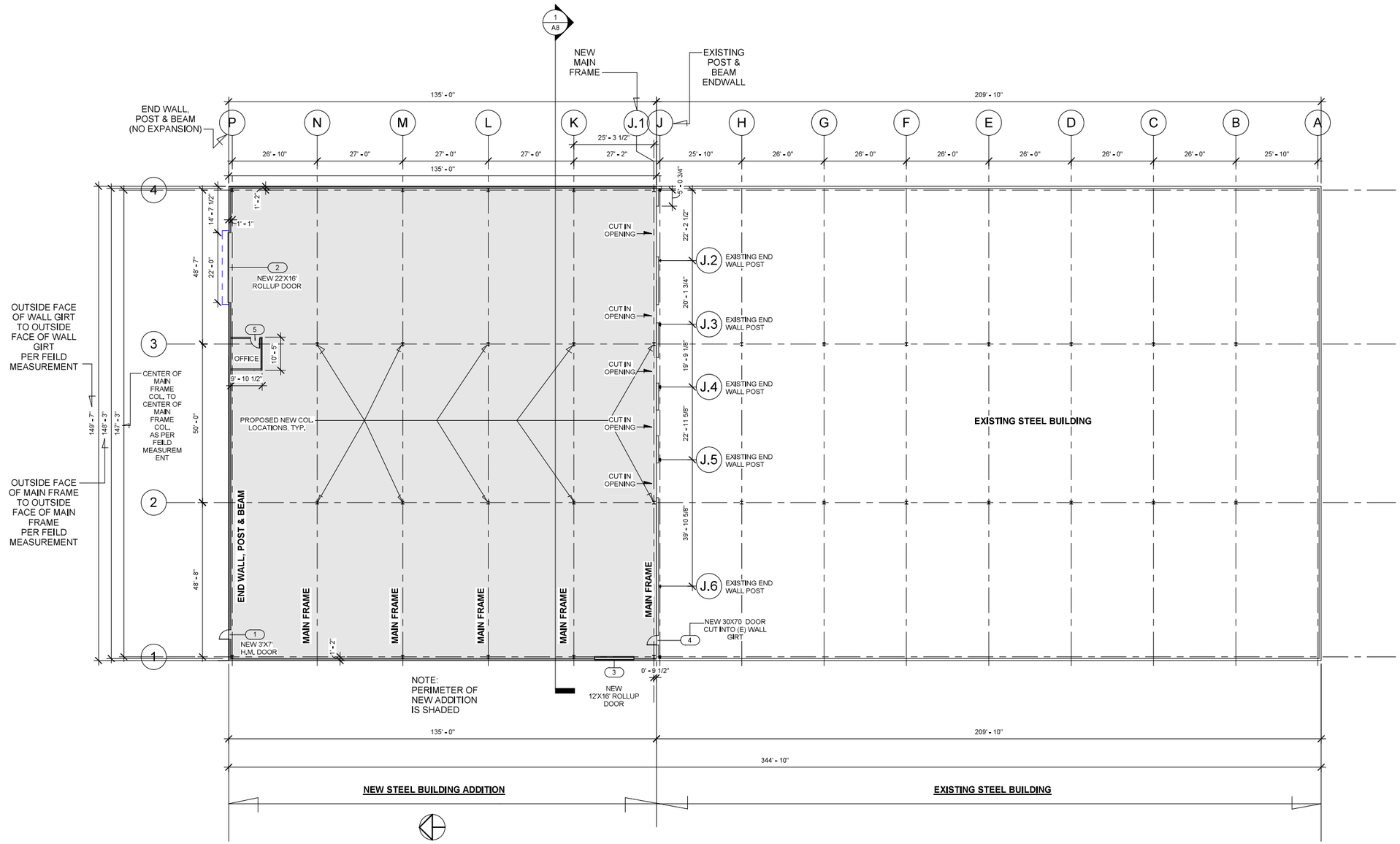
FOR

PACE SUPPLY

BY

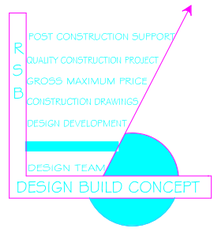
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DATE: SEPTEMBER, 2023 SCALE: 1"=40' SHEET 3 OF 3
CS p:\proj\p\22147\dwg\22147sdp.dwg 22147



1 FIRST FLOOR PLAN
1/16" = 1'-0"

PROJECT APPROACH



LICENSE STAMP

CONSULTANTS

Consultant
Address
Address
Address
Phone

PROJECT NAME

NEW STEEL BUILDING ADDITION FOR PACE SUPPLY

3676 OLD 44 DR.
REDDING, CA 96003

TITLE SHEET

FIRST FLOOR PLAN

INITIAL PLAN CHECK SUBMITTAL

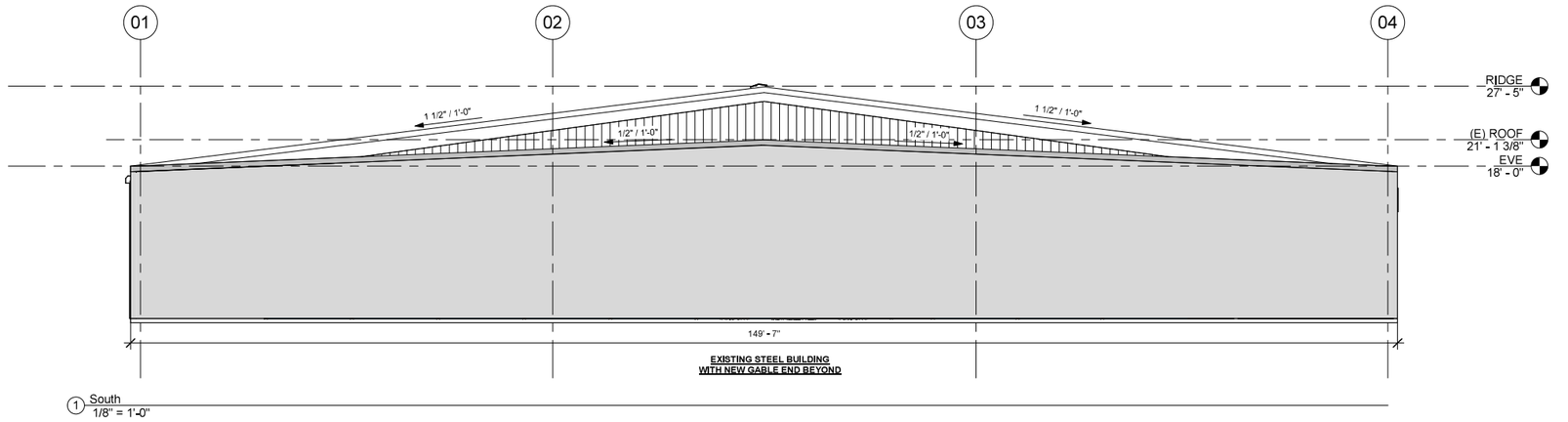
REVISIONS

SYMBOL	DESCRIPTION	BY	DATE

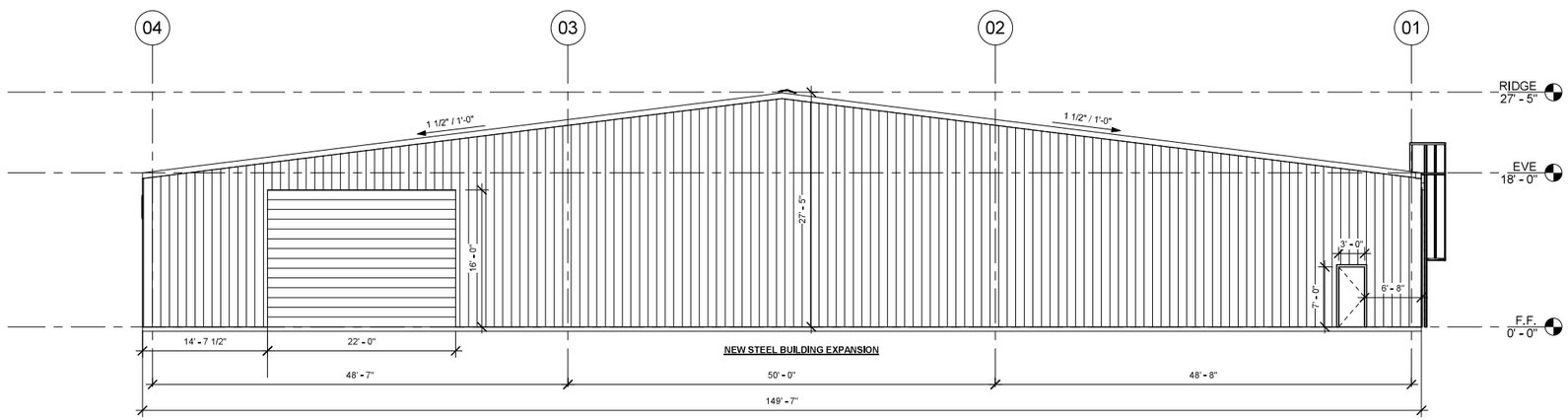
DRAWN BY
CHECKED BY
DATE DRAWN
SCALE 1/16" = 1'-0"

SHEET NUMBER

A1



1 South
1/8" = 1'-0"



2 North
1/8" = 1'-0"

PROJECT APPROACH

DESIGN BUILD CONCEPT
DESIGN TEAM
DESIGN DEVELOPMENT
CONSTRUCTION DRAWINGS
GROSS MAXIMUM PRICE
QUALITY CONSTRUCTION PROJECT
POST CONSTRUCTION SUPPORT

LICENSE STAMP

CONSULTANTS

Consultant
Address
Address
Address
Phone

PROJECT NAME

NEW STEEL BUILDING ADDITION FOR PACE SUPPLY

3676 OLD 44 DR.
REDDING, CA 96003

TITLE SHEET

Elevations

INITIAL PLAN CHECK SUBMITTAL

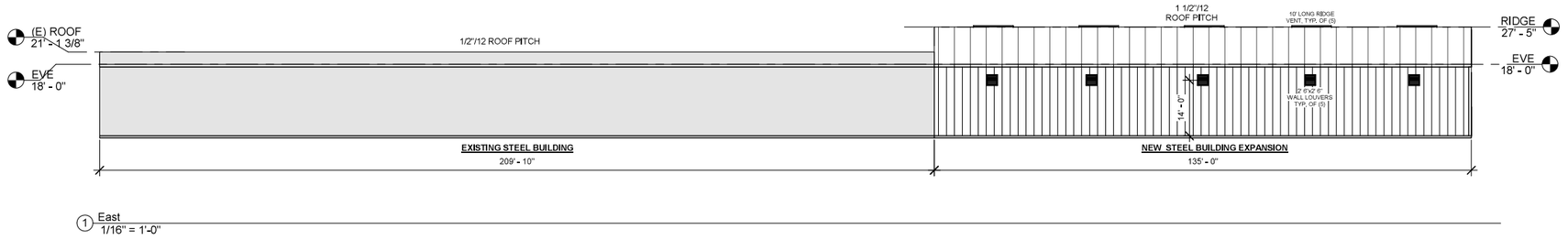
REVISIONS

SYMBOL	DESCRIPTION	BY	DATE

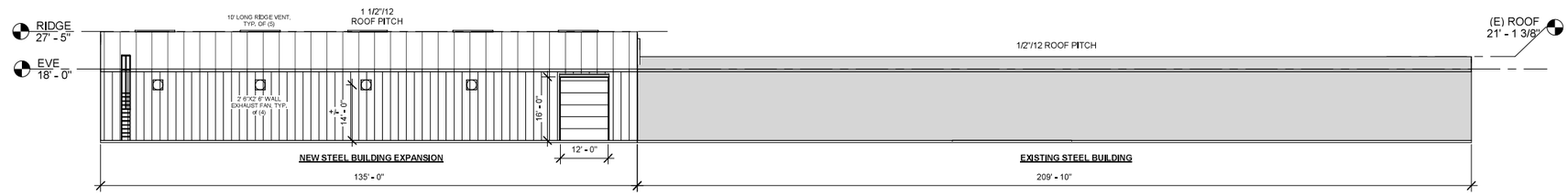
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DATE DRAWN
SCALE 1/8" = 1'-0"

SHEET NUMBER

A4

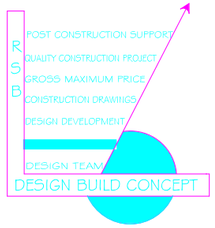


1 East
1/16" = 1'-0"



2 West
1/16" = 1'-0"

PROJECT APPROACH



LICENSE STAMP

CONSULTANTS

Consultant
Address
Address
Address
Phone

PROJECT NAME

NEW STEEL BUILDING ADDITION FOR PACE SUPPLY

3676 OLD 44 DR,
REDDING, CA 96003

TITLE SHEET

Elevations

INITIAL PLAN CHECK SUBMITTAL

REVISIONS

SYMBOL	DESCRIPTION	BY	DATE

DRAWN BY

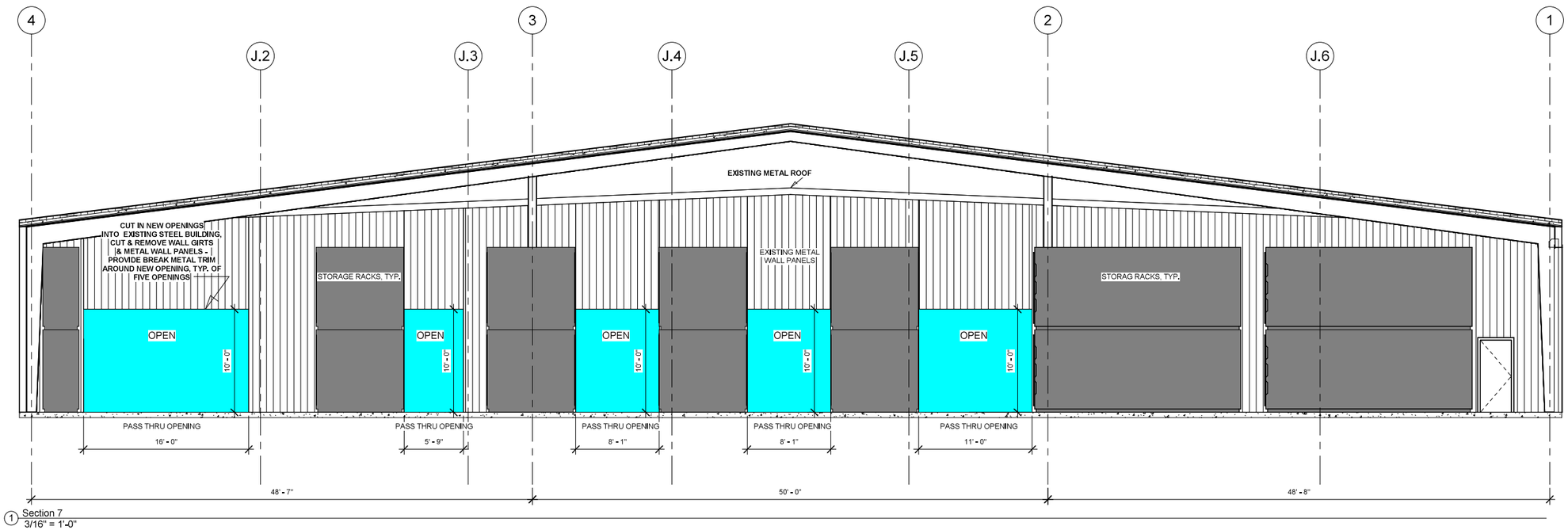
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DATE DRAWN

SCALE 1/16" = 1'-0"

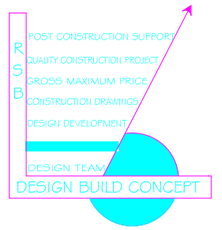
SHEET NUMBER

A5



1 Section 7
3/16" = 1'-0"

PROJECT APPROACH



LICENSE STAMP

CONSULTANTS

Consultant
Address
Address
Address
Phone

PROJECT NAME

NEW STEEL BUILDING ADDITION FOR PACE SUPPLY

TITLE SHEET

Wall Sections

INITIAL PLAN CHECK SUBMITTAL

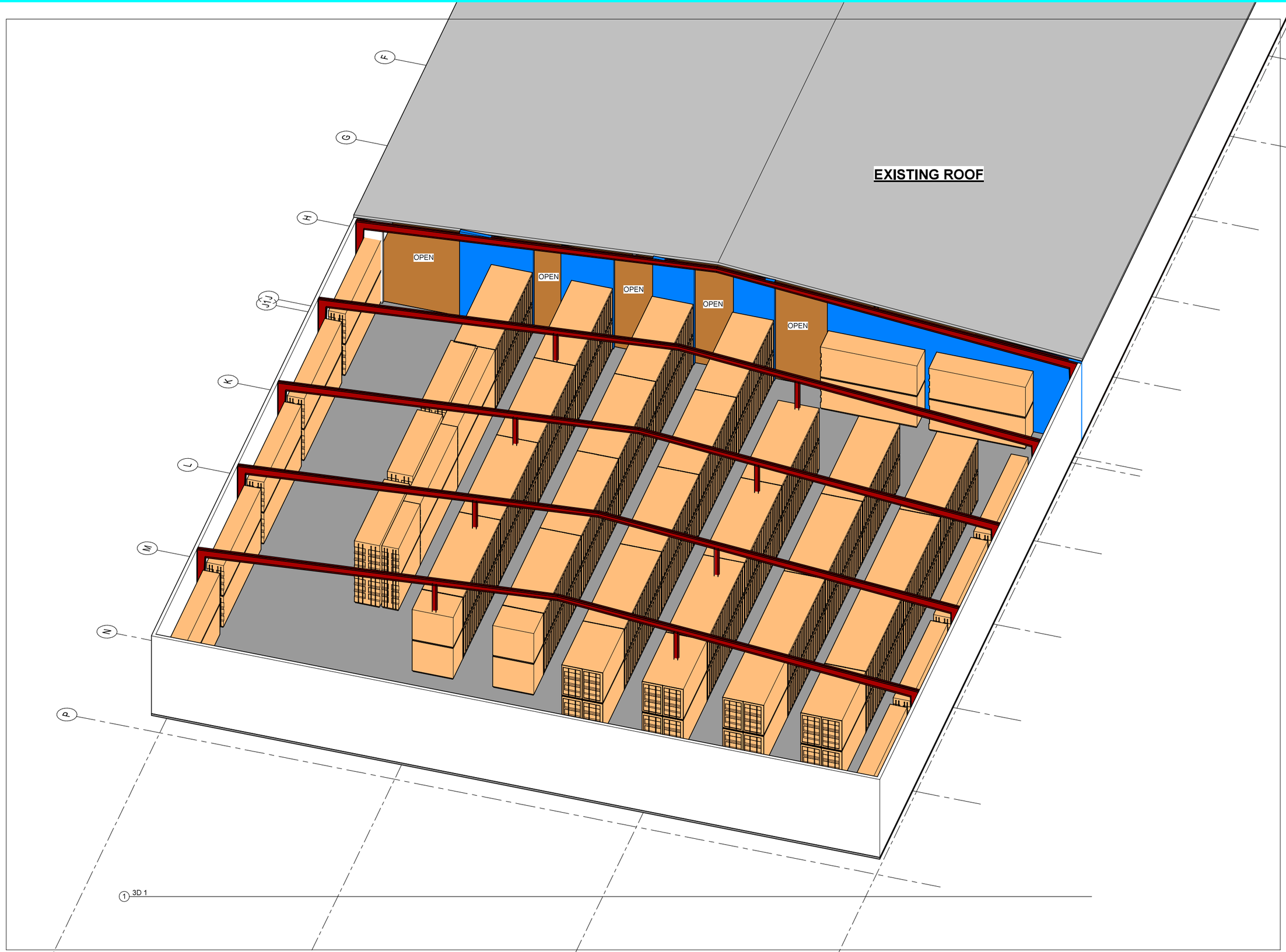
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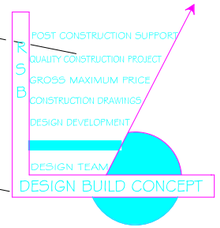
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CHECKED BY
DATE DRAWN
SCALE 3/16" = 1'-0"

SHEET NUMBER

A8



PROJECT APPROACH



LICENSE STAMP

CONSULTANTS

Consultant
Address
Address
Address
Phone

PROJECT NAME

NEW STEEL BUILDING ADDITION FOR PACE SUPPLY

TITLE SHEET

3D

INITIAL PLAN CHECK SUBMITTAL

REVISIONS

SYMBOL	DESCRIPTION	BY	DATE

DRAWN BY

CHECKED BY

DATE DRAWN

SCALE

SHEET NUMBER

A6

Attachment B
Biological Resource Assessment

gallaway
ENTERPRISES

117 Meyers Street, Suite 120, Chico CA 95928

BIOLOGICAL RESOURCE ASSESSMENT

Aquatic and Terrestrial Wildlife, and Botanical Resources

JW Wood Expansion Project

City of Redding, California

March 2022



Prepared for:
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425 Market Street
Oakland, CA 94607
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Appendix C.....Draft Delineation of Aquatic Resources Map

Appendix D.....2008 Dry-Season Invertebrate Survey Results

BIOLOGICAL RESOURCE ASSESSMENT

JW Wood Expansion Project

Project Location:
City of Redding, Shasta County, California
Section 3, Township 31N, Range 04W

INTRODUCTION

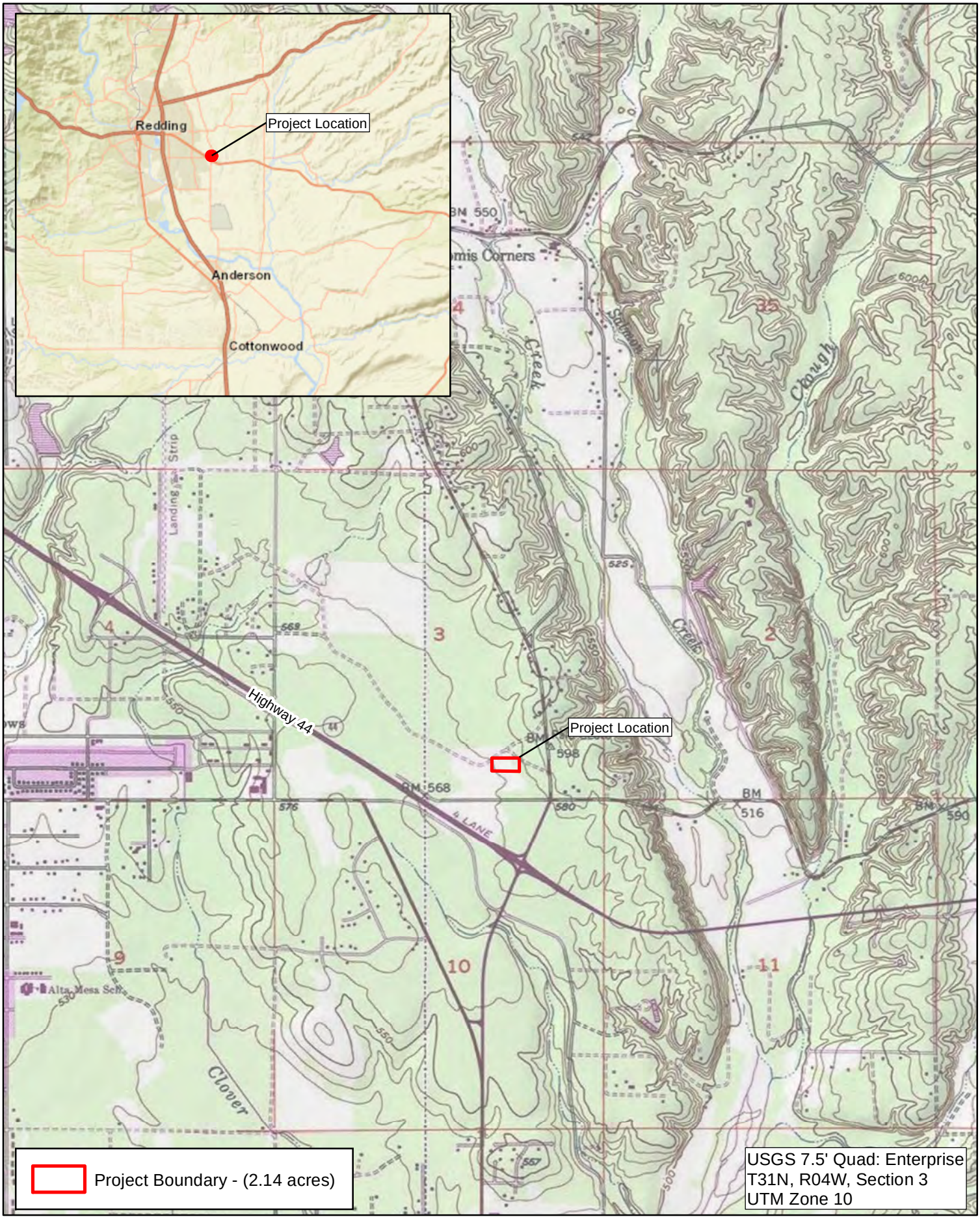
Purpose and Overview

The purpose of this biological resource assessment (BRA) is to document the endangered, threatened, sensitive, and rare species and their habitats that occur or may occur in the biological survey area (BSA) of the JW Wood Expansion Project (Project), located immediately north of the existing JW Wood facility at 3676 Old 44 Drive, Redding, California (**Figure 1**). The Project site falls within the Enterprise quadrangle, Section 3, Township 31N, Range 04W; latitude 40.565318, longitude -122.301439. The BSA is approximately 2.14 acres and is currently a vacant lot. Expansion of the existing JW Wood facility is proposed for the Project site.

The BSA is the area where biological surveys are conducted (**Figure 2**) and is limited to the Project boundary where Project activities will take place. Gallaway Enterprises conducted biological and botanical habitat assessments within the BSA to evaluate site conditions and potential for biological and botanical species to occur. Other primary references consulted include species lists and information gathered using the United States Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC), the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), the California Native Plant Society's (CNPS) inventory of rare and endangered plants, and literature review. The BRA results describe the findings of habitat assessments and surveys, and recommendations for avoidance and minimization measures.

Project Location and Environmental Setting

The BSA is located in the foothills north of the Sacramento Valley, approximately 4 miles east of the Sacramento River and 12 miles south of Shasta Lake, in the City of Redding. The BSA is the northern portion of a larger parcel (Assessor Parcel Number 109-040-037) that includes the existing JW Wood facility. The surrounding area consists of industrial facilities, commercial properties, and undeveloped lots. The BSA is dominated by disturbed annual grassland, with small patches of blue oaks (*Quercus douglasii*) present. Several seasonal wetland features occur within the BSA. In the northeast corner there is a swale feature that is sourced solely by runoff from the composting facility located north of the BSA. The overall topography of the BSA is relatively flat, aside from small depressions and mounds from historic excavation and disturbance. Soils within the BSA are gravelly loams, with a deep restrictive layer more than 80 inches in depth. The average annual precipitation for the area is 33.68 inches and the average temperature is 62.5° F (WRCC 2022).



1:24,000

0 0.25 0.5 Miles

NORTH

Data Sources: ESRI, USGS

JW Wood Expansion Project
Regional Location
Figure 1

gallaway ENTERPRISES

GE: #21-086 Map Date: 03/16/2022



1:1,200

0 50 100 Feet

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Biological Survey Area
Figure 2

gallaway ENTERPRISES

GE: #21-086 Map Date: 03/16/2022

Project Description

The proposed Project would involve the expansion of the existing JW Wood facility, including additional materials storage.

METHODS

References Consulted

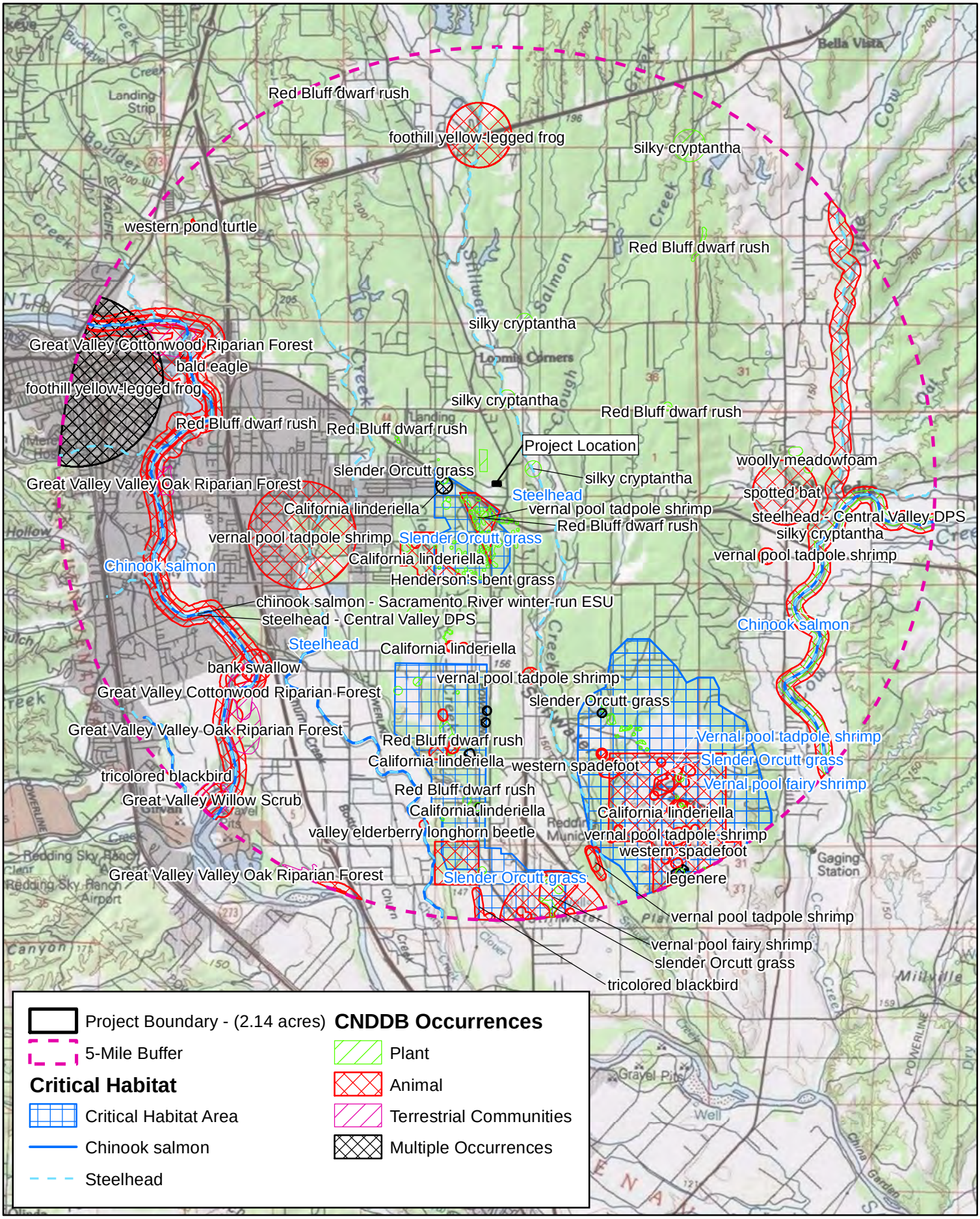
Gallaway Enterprises obtained lists of special-status species that occur in the vicinity of the BSA. The CNDDB, Rarefind 5, was also consulted and showed special-status species within a 5-mile radius of the BSA (**Figure 3**). Other primary sources of information regarding the occurrence of federally listed threatened, endangered, proposed, and candidate species and their habitats within the BSA used in the preparation of this BRA are:

- The USFWS IPaC Official Species List for the Project area, March 9, 2022, Project Code: 2022-0017777 (**Appendix A**);
- The results of a species record search of the CDFW CNDDB, RareFind 5, for the 7.5-minute United States Geological Survey (USGS) "Enterprise" (4012253), "Palo Cedro" (4012252), "Redding" (4012254), "Project City" (4012263), and "Cottonwood" (4012243) quadrangles (**Appendix A**);
- The review of the CNPS Inventory of Rare and Endangered Vascular Plants of California for the 7.5-minute USGS "Enterprise" (4012253), "Palo Cedro" (4012252), "Redding" (4012254), "Project City" (4012263), and "Cottonwood" (4012243) quadrangles (**Appendix A**);
- USFWS Critical Habitat Portal, December 10, 2021;
- Results from the habitat assessments conducted on November 11, 2021 and protocol-level botanical survey conducted on July 28, 2021 by Gallaway Enterprises staff (**Appendix B**);
- Results from the Draft Delineation of Aquatic Resources prepared by Gallaway Enterprises in January 2022 (**Appendix C**);
- Results from the wet-season invertebrate sampling conducted by Gallaway Enterprises during the winter of 2021/2022; and
- Results from the dry-season invertebrate sampling conducted by ENPLAN in 2008 (**Appendix D**).

Special-Status Species

Special-status species that have potential to occur in the BSA are those that fall into one of the following categories:

- Listed as threatened or endangered, or are proposed or candidates for listing under the California Endangered Species Act (CESA, 14 California Code of Regulations 670.5) or the Federal Endangered Species Act (ESA, 50 Code of Federal Regulations 17.12);
- Listed as a Species of Special Concern (SSC) by CDFW or protected under the California Fish and Game Code (CFGC) (i.e., Fully Protected species);
- Ranked by the CNPS as 1A, 1B, or 2;
- Protected under the Migratory Bird Treaty Act (MBTA);
- Protected under the Bald and Golden Eagle Protection Act; or


Red Bluff dwarf rush
foothill yellow-legged frog
silky cryptantha
western pond turtle
Red Bluff dwarf rush
silky cryptantha
Great Valley Cottonwood Riparian Forest
bald eagle
foothill yellow-legged frog
silky cryptantha
Red Bluff dwarf rush
Red Bluff dwarf rush
Project Location
slender Orcutt grass
silky cryptantha
Great Valley Valley Oak Riparian Forest
Steelhead
California linderiella
vernal pool tadpole shrimp
Red Bluff dwarf rush
vernal pool tadpole shrimp
Slender Orcutt grass
California linderiella
Chinook salmon
Henderson's bent grass
chinook salmon - Sacramento River winter-run ESU
steelhead - Central Valley DPS
Steelhead
California linderiella
bank swallow
vernal pool tadpole shrimp
Great Valley Cottonwood Riparian Forest
slender Orcutt grass
Great Valley Valley Oak Riparian Forest
Red Bluff dwarf rush
California linderiella
western spadefoot
tricolored blackbird
Red Bluff dwarf rush
Great Valley Willow Scrub
California linderiella
valley elderberry longhorn beetle
vernal pool tadpole shrimp
western spadefoot
Great Valley Valley Oak Riparian Forest
Slender Orcutt grass
legenere
vernal pool tadpole shrimp
vernal pool fairy shrimp
slender Orcutt grass
tricolored blackbird
woolly meadowfoam
spotted bat
steelhead - Central Valley DPS
silky cryptantha
vernal pool tadpole shrimp
Chinook salmon
Vernal pool tadpole shrimp
Slender Orcutt grass
Vernal pool fairy shrimp
Project Boundary - (2.14 acres)
5-Mile Buffer
Critical Habitat
Critical Habitat Area
Chinook salmon
Steelhead
CNDDB Occurrences
Plant
Animal
Terrestrial Communities
Multiple Occurrences
NORTH
1:91,000
0
1
2 Miles
Data Sources: ESRI, USGS, CNDDB, USFWS, NMFS
JW Wood Expansion Project
CNDDB Occurrences and Critical Habitat
Figure 3
gallaway ENTERPRISES
GE: #21-086
Map Date: 03/16/2022

- Species that are otherwise protected under policies or ordinances at the local or regional level as required by the California Environmental Quality Act (CEQA, §15380).

Critical Habitat

The ESA requires that critical habitat be designated for all species listed under the ESA. Critical habitat is designated for areas that provide essential habitat elements that enable a species' survival, and which are occupied by the species during the species' listing under the ESA. Areas outside of the species range of occupancy during the time of its listing can also be determined as critical habitat if the agency decides that the area is essential to the conservation of the species.

The USFWS Critical Habitat Portal was accessed on December 10, 2021 to determine if critical habitat occurs within the BSA. Appropriate Federal Registers were also used to confirm the presence or absence of critical habitat.

Sensitive Natural Communities

Sensitive Natural Communities (SNCs) are monitored by CDFW with the goal of preserving these areas of habitat that are rare or ecologically important. Many SNCs are designated as such because they represent a historical landscape and are typically preserved as valued components of California's diverse habitat assemblage.

Waters of the United States

A draft delineation of aquatic resources was conducted by Gallaway Enterprises in January 2022 (**Appendix C: Draft Delineation of Aquatic Resources Map**).

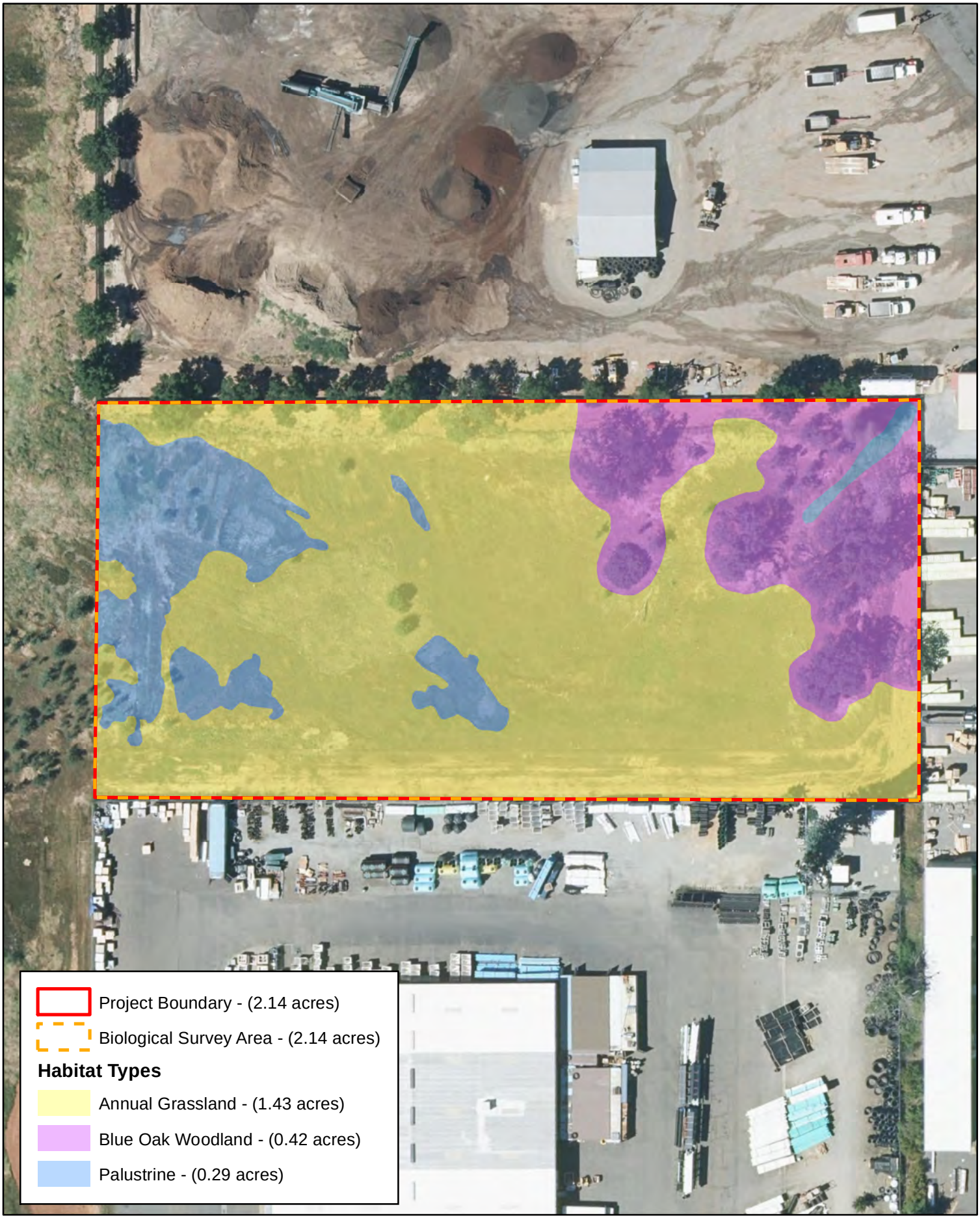
Biological and Botanical Surveys

A wet-season branchiopod survey was conducted by Gallaway Enterprises during the winter of 2021/2022 per USFWS survey guidelines. A dry-season branchiopod survey was conducted in 2008 by ENPLAN for a study area that included the BSA which resulted in negative findings of listed large branchiopods (**Appendix D**).

Gallaway Enterprises Senior Botanist Elena Gregg conducted a protocol-level survey for slender Orcutt grass (*Orcuttia tenuis*) on July 28, 2021. The protocol-level survey was conducted during the appropriate flowering window of the target species. The entire BSA was traversed on foot and all wetlands present on the site were surveyed for slender Orcutt grass. A Trimble Geo Explorer 6000 Series GPS Receiver was on hand to record any special-status plant occurrences observed. The survey was conducted in accordance with the March 2018 CDFW *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* and the September 1996 and January 2000 USFWS *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants*. A list of all plant species observed during the survey is provided as **Appendix B**.

Habitat Assessment

Habitat assessments were conducted by Gallaway Enterprises staff (**Figure 4**). A biological habitat assessment was conducted by Biologist Laurens Kuypers on November 11, 2021, and a botanical habitat



NORTH

1:800

0 50 100 Feet

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Habitat Types
Figure 4

gallaway ENTERPRISES

GE: #21-086 Map Date: 03/16/2022

assessment was conducted by Senior Botanist Elena Gregg on July 28 and November 11, 2021. The habitat assessment for botanical and wildlife species was conducted to determine the suitable habitat elements for special-status species within the BSA. The habitat assessment was conducted by walking the entire BSA, where accessible, and recording specific habitat types and elements. Potentially suitable habitat for special-status species present within the BSA was evaluated for quality based on vegetation composition and structure, physical features (e.g., soils, elevation), micro-climate, surrounding area, presence of predatory species and available resources (e.g., prey items, nesting substrates), and land use patterns.

RESULTS

Vegetation Communities

Annual Grassland

Disturbed annual grassland habitat occurs throughout BSA. The annual grassland that occurs within the BSA shows signs of earthwork disturbance and disturbance from vegetation management and vehicle access. Vegetation within this disturbed grassland community is primarily composed of annual ruderals and weeds such as medusahead (*Elymus caput-medusae*), soft chess (*Bromus hordeaceus*), Fitch's spikeweed (*Centromadia fitchii*), perennial rye-grass (*Festuca perennis*), hawkbit (*Leontodon saxatilis*), prickly lettuce (*Lactuca serriola*), and yellow star-thistle (*Centaurea solstitialis*). Wildlife species use grassland habitat for foraging but usually require some other habitat characteristic such as rocky outcroppings, cliffs, caves, or ponds to find shelter and cover for escapement. Common species that are found breeding in this habitat type include a variety of ground-nesting avian species and small mammals and reptiles (Mayer and Laudenslayer 1988).

Blue Oak Woodland

Blue oak woodland occurs primarily in the eastern end of the BSA with a few very small oaks growing along the western edge of the BSA among the aquatic features that occur within the BSA. All of the oaks growing within the BSA were small to mid-sized blue oak (*Quercus douglasii*) with sparse underbrush and a relatively spaced-out canopy. The sparse underbrush was composed primarily of foothill honeysuckle (*Lonicera interrupta*) and poison oak (*Toxicodendron diversilobum*). The Blue Oak Woodland habitat type provides foraging ground for a variety of wildlife species and breeding habitat for reptiles and mammals including bats and nesting birds.

Aquatic Habitat

Palustrine

Palustrine habitats are inland depressions containing either permanent or intermittent standing water that vary in size from small ponds to large wetland areas that may cover many acres. Palustrine habitats are characterized by shallow wetland depressions lacking wave-formed or bedrock features that may feature persistent wetland vegetation (trees, shrubs, persistent emergent plants, etc.) (Mayer and Laudenslayer 1988). The wetland features within the BSA are dependent upon seasonal rains and runoff from the adjacent composting facility to the north. Seasonal swales are depressional features that function as low drainage pathways and seasonal wetlands are depressional features that typically pond

water through late spring and are dominated by generalist wetland plant species. Within the BSA the seasonal features were dominated by perennial rye-grass, Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), hawkbit, dallisgrass (*Paspalum dilatatum*), popcorn flower (*Plagiobothrys* sp.), water starwort (*Callitriche* sp.), and iris-leaved rush (*Juncus xiphioides*). The wetland feature located along the eastern boundary of the BSA is connected to a larger wetland that extends east through the adjacent undeveloped parcel. Species that specialize in intermittent pools and wetland ecosystems include a variety of rare and common aquatic invertebrates, reptiles, and amphibians.

Critical Habitat

There is no critical habitat within or adjacent to the BSA.

Sensitive Natural Communities

No SNCs occur within the BSA.

Waters of the United States

A formal delineation of aquatic resources was conducted within the BSA by Gallaway Enterprises Senior Botanist Elena Gregg to determine the extent of aquatic resources onsite. The results of the delineation were prepared in a draft report dated January 2022. Based on this draft delineation, a total of 0.29 acre of wetland features occur within the BSA (**Appendix C**).

Special-Status Species

A summary of special-status species assessed for potential occurrence within the BSA based on the USFWS IPaC species list, CNDDB report, and the CNPS list of rare and endangered plants within the "Enterprise (4012253)", "Palo Cedro (4012252)", "Redding (4012254)", "Project City (4012263)," and "Cottonwood (4012243)" USGS 7.5-minute quadrangles and their potential to occur within the BSA are described in **Table 1**. Potential for occurrence was determined by reviewing database queries from federal and state agencies, performing field visits, and evaluating habitat characteristics.

Table 1. Special-status species and sensitive natural communities and their potential to occur in the BSA of the JW Wood Expansion Project, Shasta County, CA

Common Name *(Scientific Name)*	**Status** Fed/State/ CNPS	**Associated Habitats**	**Potential for Occurrence**
SENSITIVE NATURAL COMMUNITIES			
Great Valley Cottonwood Riparian Forest	_/SNC/_	Riparian forest.	None. There is no Great Valley Cottonwood Riparian Forest within the BSA.
Great Valley Valley Oak Riparian Forest	_/SNC/_	Riparian forest.	None. There is no Great Valley Valley Oak Riparian Forest within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/ CNPS	**Associated Habitats**	**Potential for Occurrence**
Great Valley Willow Scrub	_/SNC/_	Willow Scrub	None. There is no Great Valley Willow Scrub within the BSA.
PLANTS			
Ahart's paronychia (*Paronychia ahartii*)	_/_/1B.1	Vernally mesic areas that are nearly barren in clay soils. (Blooming Period [BP]: Feb – Jun)	None. There is no suitable habitat within the BSA.
Boggs Lake hedge-hyssop (*Gratiola heterosepala*)	_/SE/1B.2	Lake margins and vernal pools. (BP: Apr – Aug)	None. The wetlands present do not provide suitable habitat for this species.
Brazilian watermeal (*Wolffia brasiliensis*)	_/_/2B.3	Shallow freshwater marshes. (BP: Apr – Dec)	None. The wetlands present do not provide suitable habitat for this species.
Big-scale balsamroot (*Balsamorhiza macrolepis*)	_/_/1B.2	Chaparral, valley and foothill grassland and cismontane woodland. Microhabitat is serpentinite and cobbly soils. (BP: Mar – Jun)	None. There is no suitable soils or habitat within the BSA.
Henderson's bent grass (*Agrostis hendersonii*)	_/_/3.2	Moist places in grassland or vernal pool habitat. (BP: Apr – Jun)	**Moderate**. Two CNDDB occurrences (#11, #10) recorded approximately 200,000 plants in 1995 within a mile south of the BSA and within 3 miles northeast of the BSA.
Legenere (*Legenere limosa*)	_/_/1B.1	Vernal pools. (BP: Apr – Jun)	**Low**. Sub-optimal habitat for this species occurs in the BSA.
Maverick clover (*Trifolium piorkowskii*)	_/_/1B.2	Volcanic clay, openings, often streambanks. (BP: Apr – May)	None. There is no suitable soils or habitat within the BSA.
Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*)	_/_/1B.1	Vernal pools and vernally mesic sites. (BP: Mar – Jun)	**Moderate**. Numerous CNDDB occurrences within 1 mile of the BSA have been recorded in similar habitat that occurs within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/ CNPS	**Associated Habitats**	**Potential for Occurrence**
PLANTS			
Sanford's arrowhead (*Sagittaria sanfordii*)	_/_/1B.2	In standing or slow-moving freshwater ponds, marshes, and ditches. (BP: May – Oct [Nov])	None. The wetlands present do not provide suitable habitat for this species.
Shasta snow-wreath (*Neviusia cliftonii*)	_/SC/1B.2	In the mountains around Lake Shasta on shaded, north-facing, or sheltered canyons. Often found by streamsides; sometimes on limestone or volcanic soils. (BP: Apr – Jun)	None. There is no suitable habitat within the BSA.
Silky cryptantha (*Cryptantha crinita*)	_/_/1B.2	Gravelly streambeds and wetland swales. (BP: Apr – May)	None. There is no suitable habitat within the BSA.
Slender Orcutt grass (*Orcuttia tenuis*)	FT/SE/1B.1	Vernal pools. (BP: May – Sep [Oct])	None. Not detected during 2021 protocol-level botanical surveys.
Sulphur Creek brodiaea (*Brodiaea matsonii*)	_/_/1B.1	Streambanks. In cracks and crevices of metamorphic amphibolite schist. (BP: May – Jun)	None. There is no suitable habitat within the BSA.
INVERTEBRATES			
Conservancy fairy shrimp (*Branchinecta conservatio*)	FE/_/_	Deep, moderately turbid vernal pools.	None. Species not observed during the 2021/2022 wet-season sampling conducted and dry season sampling conducted in 2008 resulted in no detection of branchiopod cysts in the BSA (**Appendix D**).
Monarch butterfly (*Danaus plexippus*)	FC/_/_	Egg and larval stage dependent upon milkweed. Adults migrate seasonally, amassing in in dense tree canopy; e.g., eucalyptus.	None. There is no suitable habitat nor milkweed host plants present within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/ CNPS	**Associated Habitats**	**Potential for Occurrence**
INVERTEBRATES			
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT/_/_	Blue elderberry shrubs; usually associated with riparian areas.	None. There are no elderberry shrubs present within the BSA.
Vernal pool fairy shrimp *(Branchinecta lynchi)*	FT/_/_	Vernal pools and seasonally ponded areas.	None. Species not observed during the 2021/2022 wet-season sampling conducted and dry-season sampling conducted in 2008 resulted in no detection of branchiopod cysts in the BSA (**Appendix D**).
Vernal pool tadpole shrimp *(Lepidurus packardi)*	FE/_/_	Deep vernal pools.	None. Species not observed during the 2021/2022 wet-season sampling conducted and dry-season sampling conducted in 2008 resulted in no detection of *Lepidurus* cysts in the BSA (**Appendix D**).
FISH			
There is no potential within the BSA for any special-status fish species due to the lack of suitable aquatic habitat. There will be no effect to delta smelt (*Hypomesus transpacificus*), Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss irideus),* Pacific lamprey (*Entosphenus tridentatus*), or any other special-status fish species.			
HERPTILES			
California red-legged frog (*Rana draytonii*)	FT/SSC/_	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation.	None. Shasta County is outside of the current known range of California red-legged frog (USFWS 2002). There are no CNDDB occurrences within 40 miles of the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/ CNPS	**Associated Habitats**	**Potential for Occurrence**
HERPTILES			
Foothill yellow-legged frog Northwest/North Coast Clade (*Rana boylii*)	_/SSC/_	Perennial, shallow streams and riffles with rocky substrates and partial shade; commonly found in canyons and narrow streams.	None. There is no suitable habitat present within the BSA.
Shasta salamander (*Hydromantes shastae*)	_/ST/_	Occurs in rocky, limestone talus near Lake Shasta.	None. There is no suitable habitat present within the BSA.
Western spadefoot (*Spea hammondii*)	_/SSC/_	Occurs primarily in grassland habitats but can be found in valley-foothill hardwood woodlands. Open, intermittent pools are essential for breeding (January through May).	**Low**. Seasonal wetlands that occur within the BSA provide potentially suitable breeding habitat; however, pools did not contain sufficient water and spadefoots were not observed during a survey conducted in March 2022.
Western pond turtle (*Emys marmorata*)	_/SSC/_	Bodies of water with deep pools, emergent vegetation for foraging and cover, and locations for basking and nesting.	None. There is no suitable habitat present within the BSA.
BIRDS			
Bald eagle *(Haliaeetus leucocphealus)*	_/SE, FP/_	Coasts, large lakes, and river systems with open forests with large trees and snags near permanent water.	None**.** There is no suitable nesting habitat within the BSA.
Bank swallow (*Riparia riparia*)	_/ST/_	Requires vertical banks/cliffs with fine-textured or sandy soils near streams, rivers, lakes, or oceans to dig nesting hole.	None**.** There is no suitable nesting habitat within the BSA.
Northern spotted owl (*Strix occidentalis caurina*)	FT/ST/_	Forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops.	None. There is no suitable habitat within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/ CNPS	**Associated Habitats**	**Potential for Occurrence**
BIRDS			
Tricolored blackbird *(Agelaius tricolor)*	_/ST/_	Colonial nester in large freshwater marshes. Requires open, accessible water source and does most of its foraging in open habitats such as farm fields, pastures, large lawns.	None. There is no suitable nesting habitat within the BSA.
MAMMALS			
Fisher West Coast DPS (*Pekania pennanti*)	FC/SSC/_	Large areas of intermediate to large-tree stages/mature dense coniferous forests and deciduous-riparian areas with high percent canopy closure. Uses cavities, snags, logs and rocky areas for cover and denning.	None. There is no suitable habitat within the BS A.
Pallid bat (*Antrozous pallidus*)	_/SSC/_	Roosts within buildings, rock crevices, bridges, and occasionally tree hollows. Most common in open, dry habitats with rocky areas or trees with cavities or peeling bark for roosting.	**Low**. The BSA contains mature trees that could potentially provide roosting habitat. No evidence of roosting bats was observed during the habitat assessment.
Spotted bat (*Eduerma maculatum*)	_/SSC/_	Arid deserts and grasslands; mixed conifer forests. Needs rock crevices in cliffs or caves for roosting.	None. There is no suitable habitat within the BSA.
Townsend's big-eared bat (*Corynorhinus townsendii*)	_/SSC/_	Roost in caves and cave-like cavities, occasionally in bridges.	None. There is no suitable habitat within the BSA.
Western red bat (*Lasiurus blossevillii*)	_/SSC/_	Typically found in riparian areas dominated by walnuts, oaks, willows, cottonwoods, and sycamores where they roost in broad-leafed trees.	**Low**. The BSA contains mature trees that could potentially provide roosting habitat. No evidence of roosting bats was observed during the habitat assessment.

CODE DESIGNATIONS	
FE or FT = Federally listed as Endangered or Threatened **FC** = Federal Candidate Species **SE or ST=** State Listed as Endangered or Threatened **SC** = State Candidate Species **SSC** = State Species of Special Concern **FP** = State Fully Protected Species **SNC** = CDFW Sensitive Natural Community	**CNPS California Rare Plant Rank (CRPR):** **CRPR 1B** = Rare or Endangered in California or elsewhere **CRPR 2** = Rare or Endangered in California, more common elsewhere **CRPR 3** = More information is needed **CRPR 4** = Plants with limited distribution **0.1** = Seriously Threatened **0.2** = Fairly Threatened **0.3** = Not very Threatened
Potential for Occurrence: for plants it is considered the potential to occur during the survey period; for birds and bats it is considered the potential to breed, forage, roost, or over-winter in the BSA during migration. Any bird or bat species could fly over the BSA, but this is not considered a potential occurrence. The categories for the potential for occurrence include: **None:** The species or natural community is known not to occur and has no potential to occur in the BSA based on sufficient surveys, the lack suitable habitat, and/or the BSA is well outside of the known distribution of the species. **Low:** Potential habitat in the BSA is sub-marginal and/or the species is known to occur in the vicinity of the BSA. **Moderate:** Suitable habitat is present in the BSA and/or the species is known to occur in the vicinity of the BSA. Pre-construction surveys may be required. **High:** Habitat in the BSA is highly suitable for the species and there are reliable records close to the BSA, but the species was not observed. Pre-construction surveys required, with the exception of indicators for foraging habitat. **Known:** Species was detected in the BSA or a recent reliable record exists for the BSA.	

Endangered, Threatened, and Rare Plants

A botanical habitat assessment of the BSA was conducted on November 11, 2021 and a protocol-level botanical survey for slender Orcutt grass was conducted on July 28, 2021 by Gallaway Enterprises Senior Botanist Elena Gregg. Slender Orcutt grass was not observed within the BSA during the protocol-level survey conducted. No federal or state listed plants were observed within the BSA or were determined to have potential to occur within the BSA, therefore, the Project will have no effect on federal or state listed plant species or their habitats. During the habitat assessment it was determined that the BSA contains potentially suitable habitat for the three (3) special-status plant species: Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*), legenere (*Legenere limosa*), and Henderson's bent grass (*Agrostis hendersonii*). As their blooming periods did not overlap the time of the site visits, a protocol-level survey for these species within the BSA was not feasible. A list of all of the plant species observed during the 2021 protocol-level survey and habitat assessment is provided in **Appendix B**.

Henderson's bent grass

Henderson's bent grass is a CNPS Rank 3.2 plant. It is an annual grass native to northern California and Oregon. It usually occurs in vernal pool and swale habitats; however, it can also be found in moist areas in annual grasslands. It is associated with valley grasslands, vernal and seasonal wetlands, and swale and streambank plant communities. Current threats facing Henderson's bent grass is loss of habitat, changes in hydrology, and invasive species.

CNDDB Occurrences

There are three (3) CNDDB occurrences of this species within 5 miles of the BSA (#10, 11, 21). Occurrence #11 is located approximately 2 miles south of the BSA in an area with wetland and vernal swale hydrology. Occurrence #21 is located 2.5 miles to the north of the BSA and was found in a quarter-acre vernal pool.

Status of Henderson's bent grass occurring in the BSA

There is marginally suitable habitat present in and around the seasonal wetlands within the BSA. There is moderate potential for Henderson's bent grass to occur within the BSA.

Legenere

Legenere is a CNPS Rank 1B.1 plant. It is an annual wildflower of the bellflower family endemic to limited portions of Northern California. This species is the sole member of the genus Legenere. Legenere blooms in May and June and is found in vernal pools.

CNDDB Occurrences

There are five (5) CNDDB occurrences of this species within 5 miles of the BSA (#59, 64, 76, 85, 86). All are located south of the BSA, with the nearest occurrence (#59) being located 2.5 miles south of the BSA in vernal pool habitat in 2002.

Status of legenere occurring in the BSA

The wetland features within the BSA are dominated by generalist wetland plants and not vernal pool endemics, indicating these wetlands do not support the preferred hydrologic regime required for this species. There is low potential for legenere to occur within the BSA.

Red Bluff Dwarf Rush

Red Bluff dwarf rush is ranked by the CNPS as a 1B.1 plant species. It is an annual monocot that is endemic to California and blooms from March through May. Red Bluff dwarf rush is found in mesic annual grasslands and the edges of vernal pools.

CNDDB occurrences

There are 12 CNDDB occurrences of Red Bluff dwarf rush within 5 miles of the BSA, all located south of the BSA. The closest Red Bluff dwarf rush CNDDB occurrence is located approximately 1 mile south of the BSA.

Status of Red Bluff dwarf rush occurring in the BSA

The BSA contains a few seasonal wetlands that could provide suitable habitat for Red Bluff dwarf rush. Due to the presence of suitable habitat within the BSA and nearby CNDDB occurrences, there is **moderate** potential for Red Bluff dwarf rush to occur within the BSA.

Endangered, Threatened, and Special-status Wildlife

Gallaway Enterprises conducted protocol-level wet-season surveys for listed large branchiopods to determine the presence or the absence of vernal pool fairy shrimp (*Branchinecta lynchi*), vernal pool tadpole shrimp (*Lepidurus packardi*), and the conservancy fairy shrimp (*Branchinecta conservatio*) within the BSA. The wet-season surveys conducted during the winter of 2021/2022 by Section 10(a)1A permitted

biologist, Elena Gregg (TE-13632B-1) resulted in negative findings. Further, a 2008 dry-season survey conducted by ENPLAN within a large survey area that included the BSA resulted in no observance of listed large branchiopods. The lack of observance of listed large branchiopods indicating that listed large branchiopods do not occur within the BSA. However, due to the age of the 2008 dry-season survey, a current dry-season sampling survey is proposed to be conducted during the summer of 2022 by Gallaway Enterprises to complete the USFWS survey protocol and verify the absence of listed large branchiopods within the BSA. Due to the lack of evidence that listed large branchiopods occur within the BSA, the project will have no effect on vernal pool fairy shrimp, vernal pool tadpole shrimp, or conservancy fairy shrimp.

A wildlife habitat assessment was conducted within the BSA on November 11, 2021. Based on this habitat assessment, the BSA contains potentially suitable habitat for special-status wildlife, including western spadefoot, pallid bat, western red bat, and various avian species protected under the MBTA.

Western spadefoot

The western spadefoot is a SSC in California. It is an endemic species in California. The western spadefoot toad ranges from the northern point of the Central Valley south to the western corner of California. They are a stocky, small toad that varies in colors from gray, green and brown and typically have four irregular spots or stripes on their back. Their eyes are described as being golden with vertical pupils. The most distinguishing feature of the toad is a hardened, black spade on the hind foot. The spade is used for burrowing into moist soils. Suitable habitat consists of open grasslands with intermittent streams and vernal pools. Vernal pools and water sources that are ponded for a minimum of 30 days are essential for breeding and depositing eggs. Current threats facing the western spadefoot toad are loss of habitat, changes in hydrological regimes, and human disturbances.

CNDDB occurrences

Two western spadefoot toad CNDDB occurrences (#462 and #460) are recorded within 5 miles of the BSA. Occurrence #462 was recorded in 2006 approximately 3.5 miles southeast of the BSA and occurrence #462 was recorded in 2002 approximately 4.2 miles southeast of the BSA. Both CNDDB occurrences of western spadefoot within 5 miles of the BSA were recorded within the aquatic habitat of the Stillwater Plains Conservation Bank located directly east of the Redding Municipal Airport. These represent the northernmost occurrences of this species.

Status of western spadefoot toad occurring in the BSA

The BSA features seasonal wetlands that could support breeding habitat for western spadefoot when water is ponded for 30 days or longer, and adjacent grasslands could provide suitable aestivation habitat. Western spadefoot has never been found north of occurrence #462, which is 3.5 miles south of the BSA.

On March 14, 2022, Gallaway Enterprises Biologist Daviel Vazquez conducted a survey for western spadefoot during a nighttime precipitation event. During the survey it was observed that the wetland features were not ponding water. No western spadefoots were observed and no spadefoot vocalizations were heard.

Due to the lack of nearby occurrences, suboptimal habitat, and surrounding development, there is low potential for western spadefoot to occur within the BSA when water is present.

Pallid bat

Pallid bats are designated as a CDFW SSC. Pallid bats roost alone, in small groups (2 to 20 bats), or gregariously (hundreds of individuals). Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, trees (e.g., basal hollows of coast redwoods and giant sequoias, bole cavities of oaks, exfoliating Ponderosa pine and valley oak bark, deciduous trees in riparian areas, and fruit trees in orchards), and various human structures such as bridges (especially wooden and concrete girder designs), barns, porches, bat boxes, and human-occupied as well as vacant buildings. Roosts generally have unobstructed entrances/exits, are high above the ground, warm, and inaccessible to terrestrial predators. However, this species has also been found roosting on or near the ground under burlap sacks, stone piles, rags, and baseboards. Lewis 1996 found that pallid bats have low roost fidelity and both pregnant and lactating pallid bats changed roosts an average of once every 1.4 days throughout the summer. Overwintering roosts have relatively cool, stable temperatures and are located in protected structures beneath the forest canopy or on the ground, out of direct sunlight. In other parts of the species' range, males and females have been found hibernating alone or in small groups, wedged deeply into narrow fissures in mines, caves, and buildings. At low latitudes, outdoor winter activity has been reported at temperatures between –5 and 10 °C (Western Bat Working Group 2021).

CNDDB Occurrences

The nearest pallid bat CNDDB occurrence (#428) was recorded in 2016, approximately 5.5 miles east of the BSA, in the foothills east of Palo Cedro. There are no CNDDB occurrence of pallid bat recorded within 5 miles of the BSA.

Status of pallid bat occurring in the BSA

The mature blue oaks present and a large snag in the northeastern corner of the BSA provide potential tree-roosting habitat for pallid bat. No evidence of roosting bats was observed during the habitat assessment; therefore, there is low potential for occurrence of roosting pallid bat within the BSA.

Migratory birds and raptors

Nesting birds are protected under the MBTA (16 USC 703) and the CFGC (§3503). The MBTA (16 USC §703) prohibits the killing of migratory birds or the destruction of their occupied nests and eggs except in accordance with regulations prescribed by the USFWS. The bird species covered by the MBTA includes nearly all of those that breed in North America, excluding introduced (i.e. exotic) species (50 Code of Federal Regulations §10.13). Activities that involve the removal of vegetation including trees, shrubs, grasses, and forbs or ground disturbance has the potential to affect bird species protected by the MBTA.

The CFGC (§3503.5) states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks, eagles, and falcons) or Strigiformes (owls) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Take includes the disturbance of an active nest resulting in the abandonment or loss of young. The CFGC (§3503) also states that "it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto."

CNDDB Occurrences

The majority of migratory birds and raptors protected under the MBTA and CFGC are not recorded on the CNDDB because they are abundant and widespread.

Status of migratory birds and raptors occurring in the BSA

There is potentially suitable habitat for a variety of nesting avian species within the BSA.

REGULATORY FRAMEWORK

The following describes federal, state, and local environmental laws and policies that may be relevant if the BSA were to be developed or modified.

Federal

Waters of the United States, Clean Water Act, Section 404

The Corps and the U.S. Environmental Protection Agency (EPA) regulate the discharge of dredged or fill material into jurisdictional waters of the United States, under the Clean Water Act (§404). The term "waters of the United States" is an encompassing term that includes "wetlands" and "other waters." Wetlands have been defined for regulatory purposes as follows: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3, 40 CFR 230.3). Wetlands generally include swamps, marshes, bogs, and similar areas." Other waters of the United States are intermittent or perennial tributaries and impoundments including lakes, ponds, and other surface water features, that exhibit an ordinary high-water mark but lack positive indicators for one or more of the three wetland parameters (i.e., hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4).

The Corps may issue either individual permits on a case-by-case basis or general permits on a program level. General permits are pre-authorized and are issued to cover similar activities that are expected to cause only minimal adverse environmental effects. Nationwide permits are general permits issued to cover particular fill activities. All nationwide permits have general conditions that must be met for the permits to apply to a particular Project, as well as specific conditions that apply to each nationwide permit.

Clean Water Act, Section 401

The Clean Water Act (§401) requires water quality certification and authorization for placement of dredged or fill material in WOTUS. In accordance with the Clean Water Act (§401), criteria for allowable discharges into surface waters have been developed by the State Water Resources Control Board, Division of Water Quality. The resulting requirements are used as criteria in granting National Pollutant Discharge Elimination System (NPDES) permits or waivers, which are obtained through the Regional Water Quality Control Board (RWQCB) per the Clean Water Act (§402). Any activity or facility that will discharge waste (such as soils from construction) into surface waters, or from which waste may be discharged, must obtain an NPDES permit or waiver from the RWQCB. The RWQCB evaluates an NPDES permit application to determine whether the proposed discharge is consistent with the adopted water quality objectives of the basin plan.

Migratory Bird Treaty Act

The MBTA (16 USC §703) prohibits the killing of migratory birds or the destruction of their occupied nests and eggs except in accordance with regulations prescribed by the USFWS. The bird species covered by the MBTA includes nearly all of those that breed in North America, excluding introduced (i.e., exotic) species (50 Code of Federal Regulations §10.13).

Federal Endangered Species Act

The United States Congress passed the ESA in 1973 to protect species that are endangered or threatened with extinction. The ESA is intended to operate in conjunction with the National Environmental Policy Act (NEPA) to help protect the ecosystems upon which endangered and threatened species depend.

Under the ESA, species may be listed as either "endangered" or "threatened." Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. All species of plants and animals, except non-native species and pest insects, are eligible for listing as endangered or threatened. The USFWS also maintains a list of "candidate" species. Candidate species are species for which there is enough information to warrant proposing them for listing, but that have not yet been proposed. "Proposed" species are those that have been proposed for listing but have not yet been listed.

The ESA makes it unlawful to "take" a listed animal without a permit. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Through regulations, the term "harm" is defined as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."

State of California

California Endangered Species Act

The California Endangered Species Act (CESA) is similar to the ESA, yet it pertains to state-listed endangered and threatened species. The CESA requires state agencies to consult with the CDFW when preparing documents to comply with the CEQA. The purpose is to ensure that the actions of the lead agency do not jeopardize the continued existence of a listed species or result in the destruction, or adverse modification of habitat essential to the continued existence of those species. In addition to formal listing under the federal and state endangered species acts, "species of special concern" receive consideration by CDFW. Species of special concern are those whose numbers, reproductive success, or habitat may be threatened.

California Fish and Game Code (§3503.5)

The CFGC (§3503.5) states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks, eagles, and falcons) or Strigiformes (all owls except barn owls) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Take includes the disturbance of an active nest resulting in the abandonment

or loss of young. The CFGC (§3503) also states that "it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto."

California Migratory Bird Protection Act

The CMBPA amends the CFGC (§3513) to mirror the provisions of the MBTA and allow the State of California to enforce the prohibition of take or possession of any migratory nongame bird as designated in the federal MBTA, including incidental take.

Activities that involve the removal of vegetation including trees, shrubs, grasses, and forbs or ground disturbance have the potential to affect bird species protected by the MBTA and CFGC. Thus, vegetation removal and ground disturbance in areas with breeding birds should be conducted outside of the breeding season (approximately March 1 through August 31). If vegetation removal or ground-disturbing activities are conducted during the breeding season, then a qualified biologist must determine if there are any nests of bird species protected under the MBTA and CFGC present in the Project area prior to commencement of vegetation removal or ground-disturbing activities. If active nests are located or presumed present, then appropriate avoidance measures (e.g., spatial or temporal buffers) must be implemented.

California Environmental Quality Act Guidelines §15380

Although threatened and endangered species are protected by specific federal and state statutes, CEQA Guidelines §15380(d) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled based on the definition in the ESA and the section of the CFGC dealing with rare, threatened, and endangered plants and animals. The CEQA Guidelines (§15380) allows a public agency to undertake a review to determine if a significant effect on species that have not yet been listed by either the USFWS or CDFW (e.g., candidate species, species of concern) would occur. Thus, CEQA provides an agency with the ability to protect a species from a project's potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

Lake and Streambed Alteration Agreement, CFGC (§1602)

The CDFW is a trustee agency that has jurisdiction under the CFGC (§1600 et seq.). The CFGC (§1602), requires that a state or local government agency, public utility, or private entity must notify CDFW if a proposed Project will "substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated by the department, or use any material from the streambeds… except when the department has been notified pursuant to Section 1601." If an existing fish or wildlife resource may be substantially adversely affected by the activity, CDFW may propose reasonable measures that will allow protection of those resources. If these measures are agreeable to the parties involved, they may enter into an agreement with CDFW identifying the approved activities and associated mitigation measures.

Rare and Endangered Plants

The CNPS maintains a list of plant species native to California with low population numbers, limited distribution, or otherwise threatened with extinction. This information is published in the Inventory of

Rare and Endangered Vascular Plants of California. Potential impacts to populations of CNPS California Rare Plant Rank (CRPR) plants receive consideration under CEQA review. The CNPS CRPR categorizes plants as follows:

- Rank 1A: Plants presumed extinct in California;
- Rank 1B: Plants rare, threatened, or endangered in California or elsewhere;
- Rank 2A: Plants presumed extirpated or extinct in California, but not elsewhere;
- Rank 2B: Plants rare, threatened, or endangered in California, but more numerous elsewhere;
- Rank 3: Plants about which we need more information; and
- Rank 4: Plants of limited distribution.

The California Native Plant Protection Act (CFGC §1900-1913) prohibits the taking, possessing, or sale within the state of any plants with a state designation of rare, threatened, or endangered as defined by CDFW. An exception to this prohibition allows landowners, under specific circumstances, to take listed plant species, provided that the owners first notify CDFW and give the agency at least 10 days to retrieve (and presumably replant) the plants before they are destroyed. Fish and game Code §1913 exempts from the 'take' prohibition "the removal of endangered or rare native plants from a canal, lateral channel, building site, or road, or other right of way."

CONCLUSIONS AND RECOMMENDATIONS

Endangered, Threatened, and Rare Plants

Henderson's bent grass , legenere, and Red Bluff dwarf rush

If impacts to the wetland features present within the BSA are proposed, it is recommended that prior to any construction activities CDFW protocol-level surveys be conducted during the appropriate survey windows (i.e., blooming periods) for Henderson's bent grass, legenere, and Red Bluff dwarf rush by a qualified botanist to determine presence or absence within the BSA.

If special-status botanical species are observed within the BSA, then minimization and mitigation measures that are recognized by CDFW will be implemented based on the level of potential impacts. Measures recognized include:

1. The applicant shall design the Project to avoid or minimize impacts to areas where special-status botanical species occur and maintain protective elements such as, fencing, open space or conservation easements, and/or buffer zones around suitable habitat where special-status botanical species occur prior to construction activities and throughout construction activities and/or;

2. If the applicant cannot completely avoid impacts to special-status botanical species then consultation with the CDFW must be conducted and to discuss feasible mitigation measures. Mitigation measures could include collecting seed and/or transplanting the impacted plants.

Endangered, Threatened, and Special-status Wildlife

The following avoidance and minimization measures further reduce or eliminate Project-associated impacts to special-status wildlife species.

Western spadefoot

- Prior to construction, if water is ponded at the site, then two (2) nighttime pre-construction surveys shall be conducted by a qualified biologist during and/or immediately following separate precipitation events that occur between October and May.
- Should any life stages of western spadefoot be found within the Project boundary, CDFW shall be consulted prior to the initiation of Project activities.

Pallid bat and western red bat

- If mature trees are proposed for removal, they should be removed and/or fallen between September 16 – March 15 outside of the bat maternity season. Trees should be removed at dusk to minimize impacts to roosting bats.

Migratory birds and raptors

- Project activities including site grubbing and vegetation removal shall be initiated outside of the bird nesting season (February 1 – August 31).
- If Project activities cannot be initiated outside of the bird nesting season, then the following will occur:
  - A qualified biologist will conduct a pre-construction survey within 250 feet of the BSA, where accessible, within 7 days prior to the start of Project activities.
  - If an active nest (i.e., containing egg[s] or young) is observed within the BSA or in an area adjacent to the BSA where impacts could occur, then a species protection buffer will be established. The species protection buffer will be defined by a qualified biologist based on the species, nest type, and tolerance to disturbance. Construction activity shall be prohibited within the buffer zones until the young have fledged or the nest fails as determined by a qualified biologist. Nests shall be monitored by a qualified biologist once per week and a report submitted to the CEQA lead agency weekly.

Other Natural Resources

Waters of the United States

If activities occur within the ordinary high-water mark and/or result in fill or discharge to any waters of the U.S which include but are not limited to, intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, “wetlands,” sloughs, prairie potholes, wet meadows, playa lakes, vernal pools, or natural ponds, then the following will need to be obtained:

- Prior to any discharge or fill material into Waters of the U.S, authorization under a Nationwide Permit or Individual Permit shall be obtained from the Corps. For fill requiring a

Corps permit, a water quality certification from the Regional Water Quality Board (Clean Water Act §401) shall also be obtained prior to discharge of dredged or fill material.

- Prior to any activities that would obstruct the flow of or alter the bed, channel, or bank of any perennial, intermittent or ephemeral creeks, notification of streambed alteration shall be submitted to the CDFW, and, if required, a Lake and Streambed Alteration Agreement (§1602) shall be obtained.

Oak Woodlands and Tree Removal

Impacts to oaks within the BSA must be mitigated as required by the City of Redding. The City of Redding enacted a Tree Preservation Ordinance (Chapter 18.45 of the Municipal Code) and oak tree preservation guide.[1] Prior to Project entitlement a Tree Protection Plan, which includes a tree delineation, impacts assessment, tree health survey, and tree protection requirements will be required. The Tree Protection Plan will identify the type, location, and number of trees that will be preserved onsite.

[1] City of Redding. Trees & Construction, A Guide to Preservation. Document retrieved from: http://www.cityofredding.org/home/showdocument?id=3720

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LIST OF PREPARERS

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Elena Gregg. Senior Botanist. B.S. in Environmental Biology and Management, University California, Davis. Mrs. Gregg has over 16 years of experience conducting protocol-level botanical surveys, botanical habitat assessments, arborist surveys, and wetland delineations.

Anthony McLaughlin. GIS Analyst and Environmental Planning. B.A in Human Geography with certificates in Geographical Information Systems and Environmental and Land Use Planning. Anthony has more than 5 years conducting spatial analysis, drafting technical reports, and producing high quality cartographic outputs.

Appendix A

Species Lists

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To:
Project Code: 2022-0017777
Project Name: JW Wood Expansion Project

March 09, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Project Code: 2022-0017777
Event Code: None
Project Name: JW Wood Expansion Project
Project Type: New Constr - Above Ground
Project Description: development
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@40.56537445,-122.30134855728176,14z



Counties: Shasta County, California

Endangered Species Act Species

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina*	Threatened

There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/1123

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii*	Threatened

There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/2891

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus*	Threatened

There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/321

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/7850	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Slender Orcutt Grass *Orcuttia tenuis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1063	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC User Contact Information

Agency: Gallaway Enterprises
Name: Brittany Reaves
Address: 117 Meyers Street, Suite 120
City: Chico
State: CA
Zip: 95928
Email brittany@gallawayenterprises.com
Phone: 5303329909

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Project City (4012263) OR Redding (4012254) OR Enterprise (4012253) OR Palo Cedro (4012252) OR Cottonwood (4012243))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Ahart's paronychia *Paronychia ahartii*	PDCAR0L0V0	None	None	G3	S3	1B.1
bald eagle *Haliaeetus leucocephalus*	ABNKC10010	Delisted	Endangered	G5	S3	FP
bank swallow *Riparia riparia*	ABPAU08010	None	Threatened	G5	S2	
big-scale balsamroot *Balsamorhiza macrolepis*	PDAST11061	None	None	G2	S2	1B.2
Boggs Lake hedge-hyssop *Gratiola heterosepala*	PDSCR0R060	None	Endangered	G2	S2	1B.2
California linderiella *Linderiella occidentalis*	ICBRA06010	None	None	G2G3	S2S3	
chinook salmon - Central Valley spring-run ESU *Oncorhynchus tshawytscha pop. 11*	AFCHA0205L	Threatened	Threatened	G5T1T2Q	S2	
chinook salmon - Sacramento River winter-run ESU *Oncorhynchus tshawytscha pop. 7*	AFCHA0205B	Endangered	Endangered	G5T1Q	S1	
dubious pea *Lathyrus sulphureus var. argillaceus*	PDFAB25101	None	None	G5T1T2Q	S1S2	3
Fisher *Pekania pennanti*	AMAJF01020	None	None	G5	S2S3	SSC
foothill yellow-legged frog *Rana boylii*	AAABH01050	None	Endangered	G3	S3	SSC
great egret *Ardea alba*	ABNGA04040	None	None	G5	S4	
Great Valley Cottonwood Riparian Forest *Great Valley Cottonwood Riparian Forest*	CTT61410CA	None	None	G2	S2.1	
Great Valley Valley Oak Riparian Forest *Great Valley Valley Oak Riparian Forest*	CTT61430CA	None	None	G1	S1.1	
Great Valley Willow Scrub *Great Valley Willow Scrub*	CTT63410CA	None	None	G3	S3.2	
green sturgeon - southern DPS *Acipenser medirostris pop. 1*	AFCAA01031	Threatened	None	G3T1	S1	
Henderson's bent grass *Agrostis hendersonii*	PMPOA040K0	None	None	G2Q	S2	3.2
hoary bat *Lasiurus cinereus*	AMACC05030	None	None	G3G4	S4	
kneecap lanx *Lanx patelloides*	IMGASL7030	None	None	G2?	S2	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
legenere *Legenere limosa*	PDCAM0C010	None	None	G2	S2	1B.1
maverick clover *Trifolium piorkowskii*	PDFAB40410	None	None	G2	S2	1B.2
North American porcupine *Erethizon dorsatum*	AMAFJ01010	None	None	G5	S3	
northern clarkia *Clarkia borealis ssp. borealis*	PDONA05062	None	None	G4T4	S4	4.3
Oregon shoulderband *Helminthoglypta hertleini*	IMGASC2280	None	None	G3Q	S1S2	
osprey *Pandion haliaetus*	ABNKC01010	None	None	G5	S4	WL
Pacific lamprey *Entosphenus tridentatus*	AFBAA02100	None	None	G4	S3	SSC
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G4	S3	SSC
Red Bluff dwarf rush *Juncus leiospermus var. leiospermus*	PMJUN011L2	None	None	G2T2	S2	1B.1
Sanford's arrowhead *Sagittaria sanfordii*	PMALI040Q0	None	None	G3	S3	1B.2
Shasta chaparral *Trilobopsis roperi*	IMGASA2030	None	None	G2	S1	
Shasta hesperian *Vespericola shasta*	IMGASA4070	None	None	G1	S1	
Shasta salamander *Hydromantes shastae*	AAAAD09030	None	Threatened	G3	S3	
Shasta snow-wreath *Neviusia cliftonii*	PDROS14020	None	Candidate Endangered	G2	S2	1B.2
silky cryptantha *Cryptantha crinita*	PDBOR0A0Q0	None	None	G2	S2	1B.2
silver-haired bat *Lasionycteris noctivagans*	AMACC02010	None	None	G3G4	S3S4	
slender Orcutt grass *Orcuttia tenuis*	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
spotted bat *Euderma maculatum*	AMACC07010	None	None	G4	S3	SSC
steelhead - Central Valley DPS *Oncorhynchus mykiss irideus pop. 11*	AFCHA0209K	Threatened	None	G5T2Q	S2	
Sulphur Creek brodiaea *Brodiaea matsonii*	PMLIL0C0H0	None	None	G1	S1	1B.1
Townsend's big-eared bat *Corynorhinus townsendii*	AMACC08010	None	None	G4	S2	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
tricolored blackbird *Agelaius tricolor*	ABPBXB0020	None	Threatened	G1G2	S1S2	SSC
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	IICOL48011	Threatened	None	G3T2	S3	
vernal pool fairy shrimp *Branchinecta lynchi*	ICBRA03030	Threatened	None	G3	S3	
vernal pool tadpole shrimp *Lepidurus packardi*	ICBRA10010	Endangered	None	G4	S3S4	
western pearlshell *Margaritifera falcata*	IMBIV27020	None	None	G4G5	S1S2	
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western red bat *Lasiurus blossevillii*	AMACC05060	None	None	G4	S3	SSC
western spadefoot *Spea hammondii*	AAABF02020	None	None	G2G3	S3	SSC
Wintu sideband *Monadenia troglodytes wintu*	IMGASC7092	None	None	G1G2T1T2	S1S2	
woolly meadowfoam *Limnanthes floccosa ssp. floccosa*	PDLIM02043	None	None	G4T4	S3	4.2
Yuma myotis *Myotis yumanensis*	AMACC01020	None	None	G5	S4	

Record Count: 51

California Native Plant Society

Search Results

12 matches found. Click on scientific name for details

Search Criteria: CRPR is one of [**1A:1B:2A:2B**] , Quad is one of [**4012263:4012254:4012253:4012252:4012243**]

SCIENTIFIC NAME	▲ COMMON NAME	BLOOMING PERIOD	FED LIST	STATE LIST	CA RARE PLANT RANK	PHOTO
Paronychia ahartii	Ahart's paronychia	Feb-Jun	None	None	1B.1	 © 2004 Carol W. Witham
Balsamorhiza macrolepis	big-scale balsamroot	Mar-Jun	None	None	1B.2	 ©1998 Dean Wm. Taylor
Gratiola heterosepala	Boggs Lake hedge-hyssop	Apr-Aug	None	CE	1B.2	 ©2004 Carol W. Witham
Wolffia brasiliensis	Brazilian watermeal	Apr-Dec	None	None	2B.3	 © 2021 Scot Loring
Legenere limosa	legenere	Apr-Jun	None	None	1B.1	 ©2000 John Game
Trifolium piorkowskii	maverick clover	Apr-May	None	None	1B.2	 ©2018 Al Keuter
Juncus leiospermus var. *leiospermus*	Red Bluff dwarf rush	Mar-Jun	None	None	1B.1	 ©2016 Dylan Neubauer

Sagittaria sanfordii	Sanford's arrowhead	May-Oct(Nov)	None	None	1B.2	 ©2013 Debra L. Cook
Neviusia cliftonii	Shasta snow-wreath	Apr-Jun	None	CC	1B.2	 ©2008 Steve Matson
Cryptantha crinita	silky cryptantha	Apr-May	None	None	1B.2	 ©2009 Sierra Pacific Industries
Orcuttia tenuis	slender Orcutt grass	May-Sep(Oct)	FT	CE	1B.1	 © 2013 Justy Leppert
Brodiaea matsonii	Sulphur Creek brodiaea	May-Jun	None	None	1B.1	 ©2016 Len Lindstrand III

Showing 1 to 12 of 12 entries

Suggested Citation:

California Native Plant Society, Rare Plant Program. 2022. Rare Plant Inventory (online edition, v9-01 1.5). Website https://www.rareplants.cnps.org [accessed 9 March 2022].

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Appendix B

Observed Species List

Plant Species Observed within the JW Wood BSA on July 28, 2021 and November 11, 2021	
Scientific Name	**Common Name**
Acmispon americanus	Spanish lotus
Aristida oligantha	Oldfield 3-awn
Briza maxima	Greater quaking-grass
Briza minor	Lesser quaking-grass
Bromus hordeaceus	Soft chess
Centaurea solstitialis	Yellow star thistle
Centromadia fitchii	Fitch's spikeweed
Croton setiger	Turkey-mullein
Cynodon dactylon	Bermuda grass
Cynosurus echinatus	Hedgehog dogtail
Cyperus eragrostis	Tall nutsedge
Dactylis glomerata	Orchardgrass
Deschampsia danthonoides	Annual hairgrass
Eleocharis macrostachya	Pale spike-rush
Elymus caput-medusae	Medusahead
Epilobium brachycarpum	Tall willowherb
Eryngium castrense	Coyote thistle
Festuca bromoides	Six-weeks fescue
Festuca perennis	Rye-grass
Glyceria occidentalis	Western mannagrass
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley
Hypericum perforatum	Klamathweed
Juncus sp.	Rush
Lythrum hyssopifolia	Hyssop loosestrife
Navarretia intertexta ssp. intertexta	Needle-leaved navarretia
Navarretia leucocephala	White pin-cushion
Odontostomum hartwegii	Hartweg's odontostomum
Paspalum dilatatum	Dallisgrass
Plagiobothrys stipitatus var. *stipitatus*	Large-flowered popcornflower
Plantago erecta	Erect plantain
Pogogyne zizyphoroides	Sacramento Valley pogogyne
Polypogon monspeliensis	Rabbitsfoot grass
Populus fremontii	Fremont's cottonwood
Psilocarphus brevissimus	Wooly marbles
Rumex crispus	Curly dock
Sorghum halepense	Johnsongrass
Toxicodendron diversilobum	Poison oak
Trifolium hirtum	Rose clover

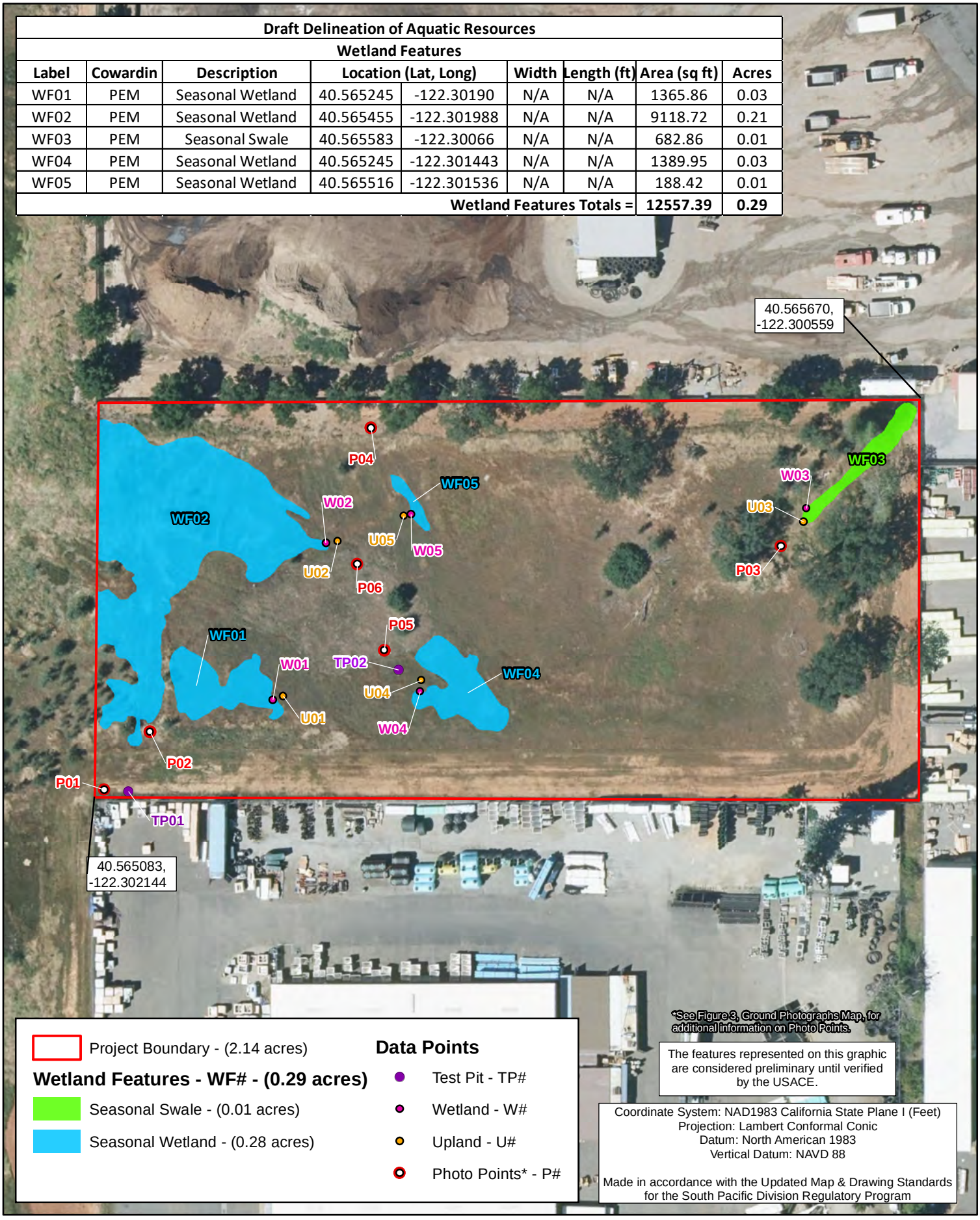
Scientific Name	**Common Name**
Triteleia hyacinthina	Wild hyacinth
Verbascum blattaria	Moth mullein
Veronica peregrina ssp. *xalapensis*	Purslane speedwell
Vicia villosa	Winter vetch

Wildlife Species Observed within the JW Wood BSA on November 11, 2021	
Birds	
Cathartes aura	Turkey vulture
Colaptes auratus	Northern flicker
Corvus brachyrhynchos	American crow
Malanerpes formicivorus	Acorn woodpecker
Zonotrichia leucophrys	White-crowned sparrow
Branta canadensis	Canada goose
Anas platyrhynchos	Mallard
Sayornis nigricans	Black phoebe
Aquatic Invertebrates	
Chaoboridae spp.	Phantom midge
Ostracodes spp.	Seed shrimp
Copepoda spp.	Copepods

Appendix C

Draft Delineation of Aquatic Resources Map

Draft Delineation of Aquatic Resources								
Wetland Features								
Label	**Cowardin**	**Description**	**Location (Lat, Long)**		**Width**	**Length (ft)**	**Area (sq ft)**	**Acres**
WF01	PEM	Seasonal Wetland	40.565245	-122.30190	N/A	N/A	1365.86	0.03
WF02	PEM	Seasonal Wetland	40.565455	-122.301988	N/A	N/A	9118.72	0.21
WF03	PEM	Seasonal Swale	40.565583	-122.30066	N/A	N/A	682.86	0.01
WF04	PEM	Seasonal Wetland	40.565245	-122.301443	N/A	N/A	1389.95	0.03
WF05	PEM	Seasonal Wetland	40.565516	-122.301536	N/A	N/A	188.42	0.01
				Wetland Features Totals =			**12557.39**	**0.29**



NORTH

1:800 1 inch = 67 feet

0 50 100 Feet

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Draft Delineation of Waters of the U.S
Figure 4

Delineated by: E. Gregg
Map by: A. McLaughlin

gallaway ENTERPRISES

GE: #21-086 Map Date: 01/18/2022

Appendix D

2008 Dry-Season Invertebrate Survey Results

EcoAnalysts, Inc.

1307 "L" Street
Davis, CA 95616 USA

530. 406.1178 telephone
530.383.4798 cell

10 November 2008

Darrin Doyle
ENPLAN
3179 Bechelli Lane
Suite 100
Redding, CA 96002

SUBJECT: Results of Analyses of Soil Samples Collected from the Proposed J. W. Wood Project Site, Redding, Shasta County, California.

Dear Mr. Doyle,

ENPLAN conducted a dry season survey of potential special-status shrimp habitats at the proposed J. W. Wood project site, located the City of Redding, in Shasta County, California. Soil samples were collected from forty previously identified habitats judged to be suitable for special-status shrimp species. No special-status shrimp eggs were collected from the soil samples analyzed.

EcoAnalysts, Inc. understands that ENPLAN will submit this report and all other pertinent materials and information to the U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (DFG), as required by the USFWS guidelines for a protocol-level survey.

Definitions

For the purpose of this report, special status shrimp are defined to include shrimp species listed as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11 for listed animals and various Federal Register notices for proposed species).

Species Accounts

One special-status tadpole shrimp (*Lepidurus packardi*) and one special-status fairy shrimp species (*Branchinecta lynchi*) have the potential to occur at the proposed project site. In addition, one non-listed fairy shrimp species (*Linderiella occidentalis*) is known from the proposed project vicinity.

Lepidurus packardi Simon, 1886, the Vernal Pool Tadpole Shrimp, is federally listed as an endangered species. This tadpole shrimp species is found in vernal pools throughout the Sacramento Valley, to the east side of San Francisco Bay (Rogers, 2001). Typically *Lepidurus packardi* is green in color, but may be mottled with brown in highly turbid water. *Lepidurus packardi* is omnivorous and generally forages on the bottoms of pools in dense vegetation. Tadpole shrimp tend to be slow growing and are usually collected after the vernal pool has been ponded for 30 days (Rogers, 2001).

Branchinecta lynchi Eng, Belk & Eriksen, 1990, the Vernal Pool Fairy Shrimp, is federally listed as a threatened species. This shrimp species is found in vernal pools throughout the Central Valley and western Riverside County in California, and near Medford, Oregon (Eriksen & Belk, 1999). This fairy shrimp species occurs in neutral to slightly alkaline vernal pools throughout the California Central Valley, and in rock outcrop pools along the Interior Coast Ranges, south of the Sacramento River Delta.

Methods

ENPLAN collected soil samples from forty potential special-status shrimp habitats at the proposed project site: five soil samples each were collected from features 4, 5, 8-10, 13-19, 24, 25, 28, 31, 34, 38-40, 43, 45, 47-49, 51, and 53; ten soil samples each were collected from features 1&3 (features lumped), 6, 7, 11, 12, 22&23 (features lumped), 26, 27, 29, 30&35&36&37 (features lumped), 41&42&44 (features lumped), 50, and 52. Each soil sample was placed in a plastic zip-lock bag, labeled with the locality number, and taken to the EcoAnalysts, Inc. California laboratory for analysis. All potential habitats sampled were identified according to the numbers assigned to them in the field, and recorded on a base map.

Laboratory Analysis

Soil samples were prepared for examination in the laboratory by dissolving the clumps of soil in water and sieving the material through 300- and 150- μm pore size screens. The small size of these screens ensures that the eggs from the shrimp species will be retained. The portion of each sample retained in the screens was dissolved in a brine solution to separate the organic material from the inorganic material. The organic fraction was then examined under a microscope.

Results

No special-status shrimp eggs were recovered from any of the soil samples. These surveys are insufficient by themselves to determine that special-status shrimp are present or absent from the habitats on this site. The results of this survey must be combined with

a protocol wet-season survey, and concurrence must be sought from the USFWS before any additional determinations can be made.

If you have any questions please call me.

Sincerely,



D. Christopher Rogers
Invertebrate Ecologist and Taxonomist
EcoAnalysts, Inc.
1307 "L" Street
Davis, CA 95616, USA

ENPLAN

Surveyor Certification Statement

I certify that the information in this survey report and attached exhibits fully and accurately represents my work.

Signature of Surveyor Dann D. Doyle Date 10-8-08

Recovery Permit No. TE 161512-0

U.S. Fish and Wildlife Service Vernal Pool Data Sheet
Dry Season Survey

Note: Please fill out the required information completely for each site visit.

This form is being submitted to serve as part of the 90-day report: _____ no ___√___ yes

Required color slides and/or photographs for the project site are included: _____ no ___√___ yes

Date: 10 / 2 / 08 Time: 1445 County: Shasta Quad: Enterprise, Calif.

Collector(s): Darrin Doyle Permit #: TE 161512-0

Site/Project Name: JW Wood Pool #: 50

Township: 31 N Range: 4 W Section: 15 40° 33' 55.84" N lat. 122° 18' 6.45" W long.

Habitat Condition: (circle where appropriate)

- undisturbed disturbed: tire tracks garbage discing/plowing

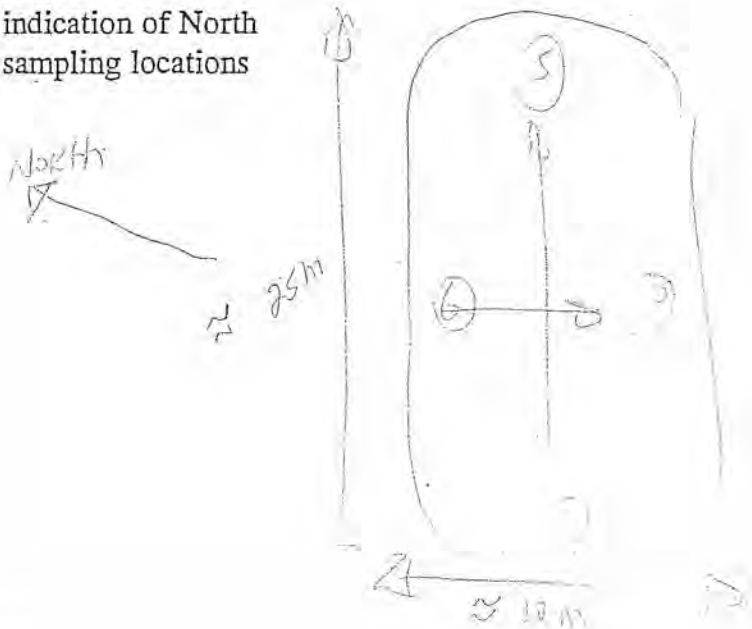
- ungrazed grazed: cattle horses sheep other_____
light moderate heavy

- land use of habitat: Undeveloped Blue oak woodland interspersed with annual grass

Pool Bottom Surface: (circle where appropriate)
hardpan claypan cobbly/rocky lava flow other silt

Pool Depth: 22 cm (estimated maximum) Surface Area: ≈250 m^2 (estimated maximum)

Sketch of pool and transects showing:
- scale
- indication of North
- sampling locations



U.S. Fish and Wildlife Service Vernal Pool Data Sheet
Dry Season Survey

Note: Please fill out the required information completely for each site visit.

This form is being submitted to serve as part of the 90-day report: _____ no ___√___ yes

Required color slides and/or photographs for the project site are included: _____ no ___√___ yes

Date: 10 / 2 / 08 Time: 1450 County: Shasta Quad: Enterprise, Calif.

Collector(s): Darrin Doyle Permit #: TE 161512-0

Site/Project Name: JW Wood Pool #: 51

Township: 31 N Range: 4 W Section: 15 40° 33' 54.91" N lat. 122° 18' 4.93" W long.

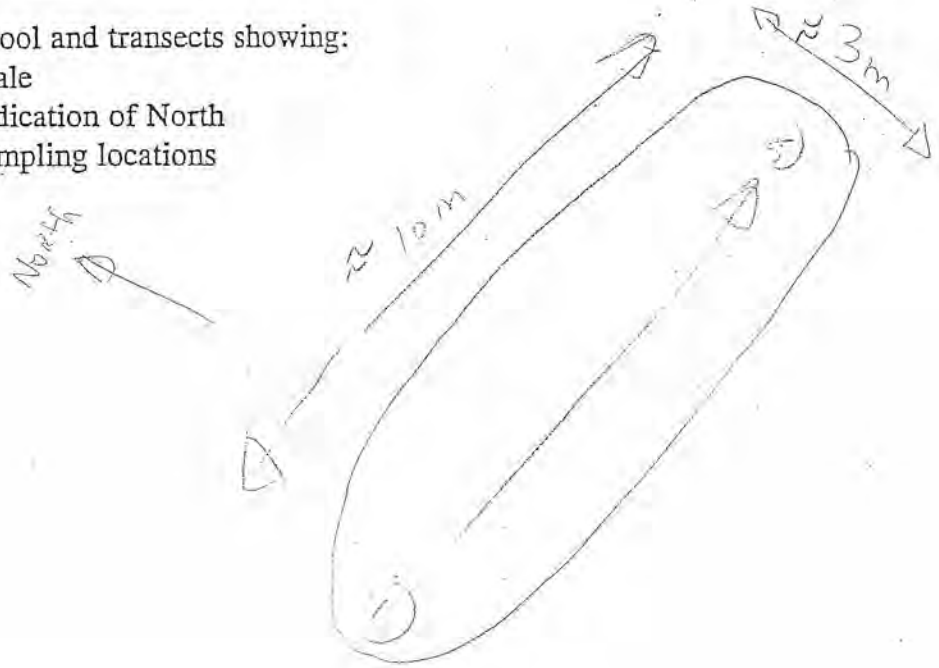
Habitat Condition: (circle where appropriate)

- undisturbed disturbed: tire tracks garbage discing/plowing
- ungrazed grazed: cattle horses sheep other_____
  light moderate heavy
- land use of habitat: Undeveloped Blue oak woodland interspersed with annual grassl

Pool Bottom Surface: (circle where appropriate)
hardpan claypan cobbly/rocky lava flow other Silt

Pool Depth: 50 cm (estimated maximum) Surface Area: ≈ 30 m² (estimated maximum)

Sketch of pool and transects showing:
- scale
- indication of North
- sampling locations



Attachment C

Draft Delineation of Aquatic Resources and supporting delineation map.

DRAFT DELINEATION OF AQUATIC RESOURCES

JW Wood Expansion Project

Redding, Shasta County, California

January 2022



Prepared for:
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425 Market St
Oakland, CA 94607
pheintz@pacesupply.com
Cell: (415) 265-6524

Prepared by:
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117 Meyers Street, Suite 120
Chico CA 95928
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www.gallawayenterprises.com

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Appendix B: NRCS Soil Map and Soil Series Descriptions

DRAFT DELINEATION OF AQUATIC RESOURCES,

JW Wood Expansion Project, Redding, Shasta County, California

Introduction and Project Location

Gallaway Enterprises conducted a delineation of aquatic resources including waters of the United States (WOTUS) and waters of the State (WOTS) for the JW Wood Expansion Project (Project) consisting of an approximately 2.4-acre survey area. The Project site is within the Redding city limits, north of the existing JW Wood facility located at 3676 Old 44 Drive **(Figures 1 and 2)**. The site falls within the Enterprise quadrangle, Section 3, Township 31N, Range 04W; latitude 40.565318, longitude -122.301439. The proposed Project involves the expansion of the existing JW Wood facility.

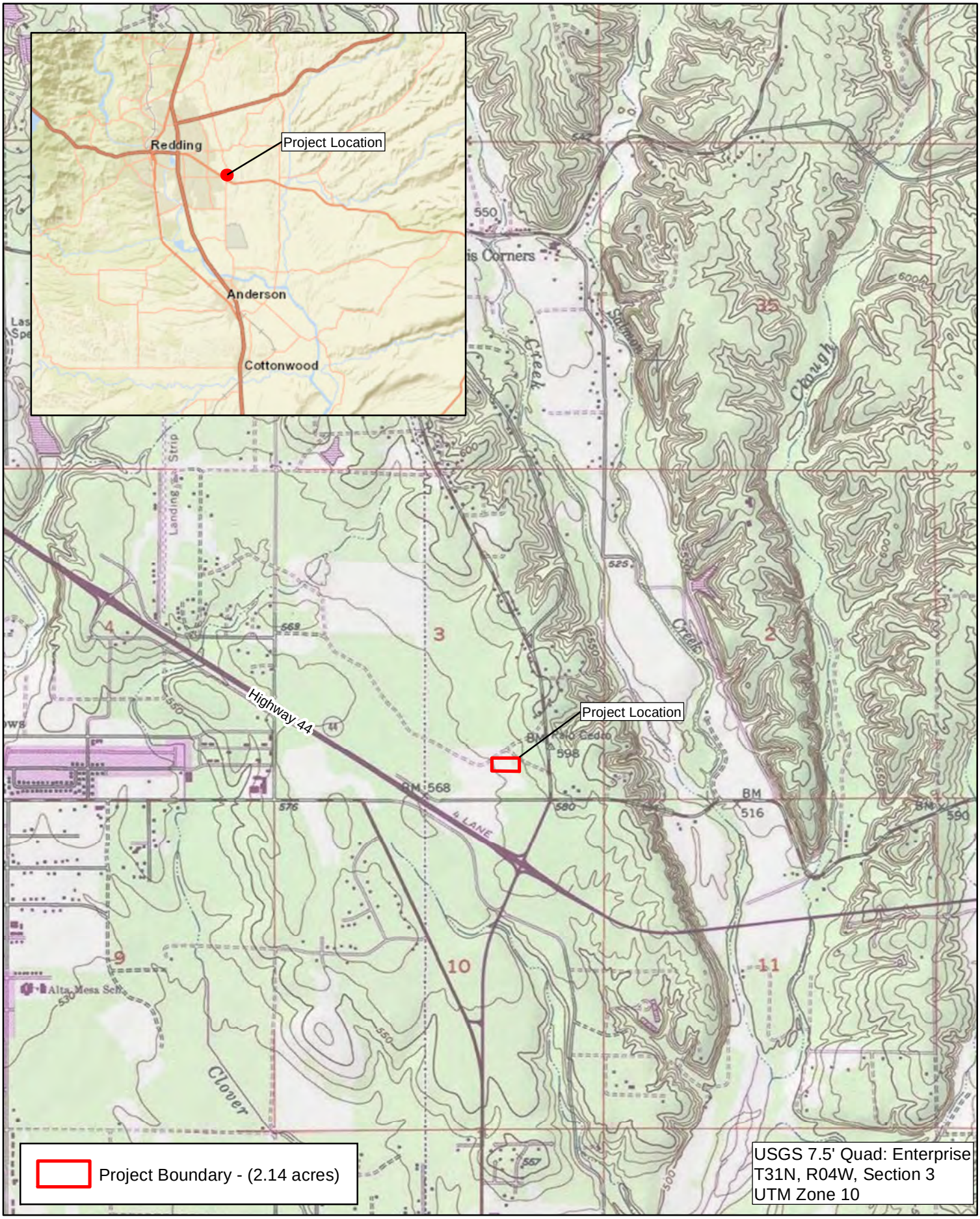
The Project site is accessible via Old 44 Drive in Shasta County, CA. To access the site from Interstate 5 North. Take exit 678 for California State Highway 44 East and continue to Exit 5 for Old Oregon Trail/Airport Road. Turn left onto Old Oregon Trail/Airport Road and continue 0.3 miles to Old 44 Drive. Turn left onto Old 44 Drive and continue 0.2 miles. Enter the JW Wood facility on the right side of the road. The Project site abuts the existing facility to the north.

The Project site was surveyed on November 11, 2021 by senior botanist Elena Gregg and biologist Laurens Kuypers and December 9, 2021 and January 6, 2022 by Ms. Gregg. Data regarding the location and extent of wetlands and other waters of the United States were collected using a Trimble Geo Explorer 6000 Series GPS Receiver. The survey involved an examination of botanical resources, soils, hydrological features, and determination of wetland characteristics based on the *United States Army Corps of Engineers Wetlands Delineation Manual* (1987) (1987 Delineation Manual); the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (2008) (Arid West Manual); the *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (2008); the *State of California 2016 Wetland Plant List* and the *2019 National Wetland Plant List updated information.* Gallaway Enterprises have prepared this report in compliance with the Minimum Standards for Acceptance of Aquatic Resources Delineation Reports (January 2016).

Environmental Setting and Site Conditions

The Project site is currently vacant and is dominated by disturbed annual grassland with small stands of oak trees. The Project site is primarily flat except for seasonal wetland depressions occurring throughout the site and one man-made mound. Human disturbance on the site consists of disking along the boundaries for fire safety, some historic excavation and spoil piles and vehicle tracks. Open land containing a large seasonal wetland occurs to the immediate west of the Project. A major composting facility occurs adjacent to the Project to the north, and commercial properties occur along the eastern and southern boundaries.

The average annual precipitation for the area is 33.68 inches and the average temperature is 62.45° F (Western Regional Climate Center 2022) in the region where the Project is located. The Project site averages 575 feet above sea level in elevation and is sloped between 0-3 percent. Soils within the survey area are gravelly loams with a restrictive layer ranging from 10 to 40 inches in depth.



1:24,000

0 0.25 0.5 Miles

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Regional Location
Figure 1

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GE: #21-086 Map Date: 01/20/2022



1:800

0 50 100 Feet

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Project Location
Figure 2

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GE: #21-086 Map Date: 01/20/2022

Survey Methodology

The entire Project was traversed on foot by Gallaway Enterprises staff on November 11 and December 9, 2021 and January 6, 2022 to identify any potentially jurisdictional features. The survey, mapping efforts, and report production were performed according to the current valid legal definitions of WOTUS in effect on September 10, 2021. The boundaries of non-tidal, non-wetland waters, when present, were delineated at the ordinary high water mark (OHWM) as defined in 33 Code of Federal Regulations (CFR) 328.3. The OHWM represents the limit of United States Army Corps of Engineers (Corps) jurisdiction over non-tidal waters (e.g., streams and ponds) in the absence of adjacent wetlands (33 CFR 328.04) (Curtis, et. al. 2011). Historic aerial photographs available on Google Earth and the previously verified delineation of WOTUS (SPK 2004-00404) were analyzed prior to conducting the field visit. Areas identified as having potential wetland or unusual signatures on historical aerial photos were assessed in the field to determine the current conditions.

Wetland perimeters based on the 1987 Delineation Manual and the Arid West Manual were recorded and defined according to their topographic and hydrologic orientation. Wetland determination field data were entered onto data sheets using the most current format (**Appendix A**). Sample points were established for each wetland and the corresponding upland zone. Test pit sampling was performed in areas displaying potential wetland signatures on past aerial photographs and problem areas. Test pit sampling points involved physical sampling of soils and vegetation, and investigation regarding hydrological connectivity. Only areas exhibiting the necessary wetland parameters according to the Arid West Manual on the date surveyed were mapped as wetlands. Photographs were taken to show wetland features, test pit areas, and/or areas identified as having potential wetland signatures. The locations of the photo points are depicted in **Figure 3** and the associated photographs are provided at the end of the report.

Many of the terms used throughout this report have specific meanings relating to the federal wetland delineation process. Term definitions are based on the Corps 1987 Delineation Manual; the Arid West Manual; *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States*, (Lichvar and McColley 2008) and the Corps *Jurisdictional Determination Form Instructional Guidebook* (2007). The terms defined below have specific meaning relating to the delineation of WOTUS as prescribed by §404 of the Clean Water Act (CWA) and described in 33 CFR Part 328 and 40 CFR Parts 110, 112, and 116, and 122.

Determination of Hydrophytic Vegetation

The presence of hydrophytic vegetation was determined using the methods outlined in the 1987 Delineation Manual and the Arid West Manual. Areas were considered to have positive indicators of hydrophytic vegetation if they pass the dominance test, meaning more than 50 percent of the dominant species are obligate wetland, facultative wetland and facultative plants. Plant species were identified to the lowest taxonomy possible. Plant indicator status was determined by reviewing the State of California 2016 Wetland Plant List for the Arid West Region and the National Wetland Plant List 2019 updated information. In situations where dominance can be misleading due to seasonality, the prevalence index will be used to determine hydrophytic status of the community surrounding sample sites.

Plant indicator status categories:

Obligate wetland plants (OBL) – plants that occur almost always (estimated probability 99%) in wetlands under normal conditions, but which may also occur rarely (estimated probability 1%) in non-wetlands.

Facultative wetland plants (FACW) - plants that usually occur (estimated probability 67% to 99%) in wetlands under normal conditions, but also occur (estimated probability 1% to 33%) in non-wetlands.

Ground Photographs Table				
Label	Direction	Latitude	Longitude	Comment
P01	E	40.565092	-122.302122	tp01
P02	N + NE	40.565117	-122.302065	wetland edge
P03	NE	40.565453	-122.300824	runoff wetland
P04	SE + E + SW	40.565624	-122.301612	wetlands overview
P05	SE	40.565298	-122.301585	wetlands overview
P06	NW	40.565424	-122.301638	wetlands overview



1:800

0 50 100 Feet

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Photo Points Map
Figure 3

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GE: #21-086 Map Date: 01/20/2022

Facultative plants (FAC) – Plants with a similar likelihood (estimated probability 33% to 67%) of occurring in both wetlands and non-wetlands.

Facultative upland plants (FACU) – Plants that occur sometimes (estimated probability1% to 33%) in wetlands, but occur more often (estimated probability 67% to 99%) in non-wetlands.

Obligate upland plants (UPL) – Plants that occur rarely (estimated probability 1%) in wetlands, but occur almost always (estimated probability 99%) in non-wetlands under natural conditions.

Determination of Hydric Soils

Soil survey information was reviewed for the current site condition. The evaluation of field samples included coloring the soil using the Munsell soil color chart (2009 Edition), hand texturing, and assessing soil features (e.g. oxidized root channels, evidence of hardpan, Mn and Fe concretions). Information regarding local soil and series descriptions is provided in **Appendix B.** A number of test pits (**Appendix A**) were dug within portions of the site that demonstrated wetland signatures in historic aerial photographs or depressional topography but did not meet the wetland test parameters upon investigation in the field. The current Natural Resources Conservation Service (NRCS) *Field Indicators of Hydric Soils in the United States, Version 8.2* (NRCS 2018) was used in conjunction with the Arid West Manual to determine the presence of hydric soil indicators.

Determination of Wetland Hydrology

Wetland hydrology was determined to be present if a site supported one or more of the following characteristics:

- Landscape position and surface topography (e.g. position of the site relative to an up-slope water source, location within a distinct wetland drainage pattern, and concave surface topography),
- Inundation or saturation for a long duration either inferred based on field indicators or observed during repeated site visits, and
- Residual evidence of ponding or flooding resulting in field indicators such as scour marks, sediment deposits, algal matting, surface soil cracks and drift lines.

The presence of water or saturated soil for approximately 12% or 14 consecutive days during the growing season typically creates anaerobic conditions in the soil, and these conditions affect the types of plants that can grow and the types of soils that develop (Wetland Training Institute 1995).

Historic aerial photographs were analyzed to look for primary and secondary wetland hydrology indicators of inundation or saturation. The historic aerial imagery reviewed was the public, readily available imagery provided on Google Earth (1998-2018). If aerial signatures demonstrated the presence of surface water on 1 or more of the historic aerial photographs viewed, inundation and a primary indicator of wetland hydrology was determined to be present. Saturation, a secondary indicator of wetland hydrology, was determined to be present if saturation, "darker patches within the field," were observed on 1 or more of the 9 historic aerial photographs viewed and the presence of hydric soils was confirmed in these areas during the field survey.

Determination of Ordinary High Water Mark

Gallaway utilized methods consistent with the Arid West Manual and *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States, (*Lichvar and McColley 2008*)* to determine the OHWM, when present. The lateral extents of non-tidal water bodies (e.g. intermittent and ephemeral streams) were based on the OHWM, which is "the line on the shore

established by the fluctuations of water" (Corps 2005). The OHWM was determined based on multiple observed physical characteristics of the area, which can include scour, multiple observed flow events (from current and historical aerial photos), shelving, and changes in the character of soil, presence of mature vegetation, deposition, and topography. Due to the wide extent of some floodplains, adjacent riparian scrub areas characterized by hydric soils, hydrophytic vegetation, and hydrology may be included within the OHWM of a non-tidal water body (Curtis, et. al. 2011). Inclusion of minor special aquatic areas is an acceptable practice as outlined in the Arid West Manual.

Determination of Wetland Boundaries in Difficult Wetland Situations

The difficult wetland situation procedures for determining hydrophytic vegetation were used when mapping the boundary of wetlands within the Project site due to the extreme drought conditions experienced in California in 2021 (NOAA 2022). To aid in the determination, spatial patterns, analysis of aerial photographs, topography, and landscape position were used in conjunction with vegetation data to determine the wetland boundary. Areas where wetland vegetation or wetland hydrology was lacking but where the landscape position was likely to concentrate water were closely inspected. Gallaway Enterprises mapped these areas as wetlands if hydric soil indicators were detected and at least one other hydric indicator was present (i.e. wetland hydrology or hydrophytic vegetation).

Aquatic Resource Boundary Determination and Acreage Calculation

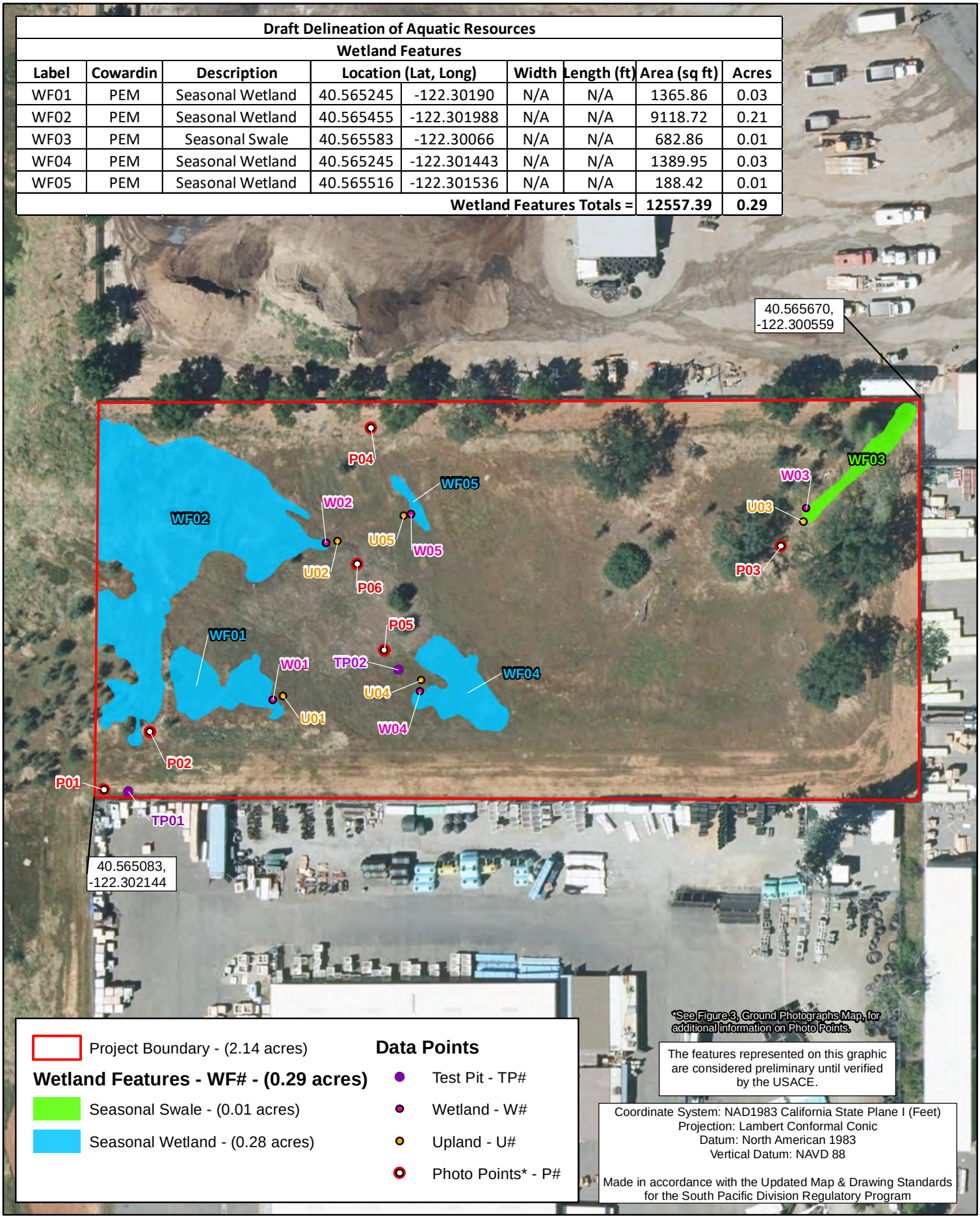
The wetland-upland boundary was determined based on the presence or inference of positive indicators of all mandatory criteria. Soil samples were taken within wetland and upland areas. The site was traversed to identify wetland features and boundaries. The spatial data obtained during the preparation of this aquatic resource delineation was collected using a Trimble Geo Explorer 6000 Series GPS Receiver. No readings were taken with fewer than 5 satellites. Point data locations were recorded for at least 25 seconds at a rate of 1 position per second. Area and line data were recorded at a rate of 1 position per second while walking at a slow pace. All GPS data were differentially corrected for maximum accuracy. In some cases, when visual errors and degrees of precision are identified due to environmental factors negatively influencing the precision of the GPS instrument (i.e. dense tree cover, steep topography, and other factors affecting satellite connection) mapping procedures utilized available topographic and aerial imagery datasets in order to improve accuracy in feature alignment and location.

Non-Wetland and Non-Jurisdictional Feature Determination

Areas were determined to be non-wetlands if they did not meet the necessary wetland test parameters (hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4) and were determined to be potentially non-jurisdictional if they were consistent with the description of non-jurisdictional features as presented in the *Corps Jurisdictional Determination Form Instructional Guidebook* (2007).

During the historic aerial photography review it was evident that a change in the hydrology patterns on the site occurred within the site following the development of a composting facility immediately north of the Project site. Water leaking from a water tank on the adjacent property is entering the Project site and has formed a wetland (WF03). It also appears, based on the aerial photography review that there may be an increase in water being contributed to WF02 due to runoff from the composting facility. There were additional areas within the Project site that exhibited potential wetland signatures and areas that, when ground-truthed, were determined to not meet the required wetland parameters. Test pits were taken within these areas (**Figure 4** and **Appendix A**). Photo points were taken at test pit locations and at other locations across the site to depict the site conditions (**Figure 3**).

Draft Delineation of Aquatic Resources								
Wetland Features								
Label	**Cowardin**	**Description**	**Location (Lat, Long)**		**Width**	**Length (ft)**	**Area (sq ft)**	**Acres**
WF01	PEM	Seasonal Wetland	40.565245	-122.30190	N/A	N/A	1365.86	0.03
WF02	PEM	Seasonal Wetland	40.565455	-122.301988	N/A	N/A	9118.72	0.21
WF03	PEM	Seasonal Swale	40.565583	-122.30066	N/A	N/A	682.86	0.01
WF04	PEM	Seasonal Wetland	40.565245	-122.301443	N/A	N/A	1389.95	0.03
WF05	PEM	Seasonal Wetland	40.565516	-122.301536	N/A	N/A	188.42	0.01
				Wetland Features Totals =			**12557.39**	**0.29**



NORTH

1:800 1 inch = 67 feet

0 50 100 Feet

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Draft Delineation of Waters of the U.S
Figure 4

Delineated by: E. Gregg
Map by: A. McLaughlin

gallaway ENTERPRISES

GE: #21-086 Map Date: 01/18/2022

There are four wetlands present within the Project site that are isolated, including the wetland sourced from the off-site leaky tank (WF01 and WF03-WF05). These isolated wetlands lack any direct surface or apparent subsurface hydrologic connection to jurisdictional features or to any features outside of the Project boundary. Due to the isolated nature of these wetlands, they meet the definition of an isolated, non-adjacent, non-jurisdictional feature; however, a significant nexus determination would need to be conducted by the Corps to verify the jurisdictional status of these features.

Results

A complete Draft Delineation of Aquatic Resources map, utilizing a 1" to 200' scale, is included as **Figure 4**. Photo points were taken at test pits, wetlands and other locations throughout the Project site to depict the current site conditions (**Figure 3**).

Waters of the United States: Other Waters

No features were identified as "other waters of the United States" (OW) within the Project site. No features observed within the Project site were found to have an OHWM.

Waters of the United States: Wetlands

The wetlands identified on the site are characterized as seasonal swales and seasonal wetlands (**Figure 4**). Seasonal swales are depressional features that function as low drainage pathways that typically connect to and help feed wetlands or other water features. Seasonal wetlands are depressional features that pond water for longer duration than vernal features and dry during the summer months. All wetland features identified within the Project site exhibited all three of the wetland parameters (**Appendix A**).

A total of five wetland features were identified within the Project site (**Table 1** and **Figure 4**). However, only one wetland within the site, WF02, continues off-site and may be potentially Corps jurisdictional. All of the remaining wetlands identified on the Project site (WF01, WF03, WF04, and WF05) are highly isolated features that are completely contained within the Project boundary. These isolated wetlands lack any direct surface hydrologic connection to jurisdictional features. Due to the isolated nature of these four wetlands, they meet the requirements for being considered potentially non-jurisdictional due to a lack of a significant nexus to an off-site jurisdictional feature. Further, the isolated wetland, WF03, also meets the definition of a non-jurisdictional feature since the hydrology is completely sourced from an off-site leaky tank.

Table 1. Draft Aquatic Resources Acreage Table for the JW Wood Expansion Project.

Wetland Features						
Label	**Cowardin**	**Description**	**Width (ft)**	**Length (ft)**	**Area (sq ft)**	**Acres**
WF01	PEM	Seasonal Wetland	N/A	N/A	1365.86	0.03
WF02	PEM	Seasonal Wetland	N/A	N/A	9118.72	0.21
WF03	PEM	Seasonal Wetland	N/A	N/A	682.86	0.01
WF04	PEM	Seasonal Wetland	N/A	N/A	1389.95	0.03
WF05	PEM	Seasonal Wetland	N/A	N/A	188.42	0.01
Wetland Features Totals =					**12557.39**	**0.29**

Soils

Field observations of soil characteristics within the Project site identified gravelly loams. The geographic

region in which the Project is found is often characterized as having a naturally occurring restrictive layer composed of an indurated duripan. Duripans restrict root growth, limit water infiltration, and cause perching of the water table in certain locations. Within the Project site, the duripan can range in depth from 10 to 40 inches.

Gallaway queried the National Cooperative Soil Survey database to further evaluate the current soil conditions. A total of two soil map units occur within the Project. The map units are listed below in **Table 2**. Based on Gallaway's review, of the two soil map units identified within the Project, one of the soil map units identified within the Project site contains minor amounts of hydric components (8 percent) which are typically found within depressions on fan remnants. A copy of the soil survey map and a description of mapped soil units for the Project are included as **Appendix B**.

Table 2. Soil Map Units, NRCS hydric soil designation, and approximate totals for the JW Wood Expansion Project.

Map Unit Symbol	Map Unit Name	% Hydric Component in Map Unit	Landform of Hydric Component	% Map Unit in Project Site
RdB	Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	0%	N/A	1.7%
ReA	Redding-Red Bluff gravelly loams, 0 to 3 percent slopes	8%	Fan remnants	98.3%

Vegetation

During the winter site visits, the most predominant identifiable vegetation within the uplands present included: *Bromus hordeaceus* (soft chess) (FACU), *Leontodon saxitilis* (hawkbit) (FACU), *Centaurea solstitialis* (yellow star thistle) (UPL), *Lactuca serriola* (prickly lettuce) (FACU), *Centromadia fitchii* (Fitch's spikeweed) (FACU), and *Elymus caput-medusae* (medusahead) (UPL). The wetlands present were dominated by *Festuca perennis* (rye grass) (FAC), *Hordeum marinum ssp. gussoneanum* (Mediterranean barley) (FAC), *Leontodon saxitilis*, *Paspalum dilatatum* (dallisgrass) (FACW), Callitriche sp. (water-starwort) (OBL), *Plagiobothrys* sp. (popcorn flower) (FACW), and *Juncus xiphioides* (iris-leaved rush) (OBL).

Hydrology

Direct precipitation, surface runoff from the adjacent land to the north and northeast, and outfall from an off-site leaky tank function as the main hydrological inputs for the aquatic resources located within the Project site. At the time of the winter site visits, each of the wetland features were ponded or saturated.

Of the five wetland features present within the Project site, four are completely isolated (WF01, WF03, WF04, and WF05) and are hydrologically restricted to the Project site. Further, one of these wetlands, WF03, is completely sourced from an off-site leaky tank and is not a natural wetland. As such, these four features are potentially Corps non-jurisdictional waters (**Figure 4**). The one remaining wetland, WF02, continues to the west and is connected to a large off-site seasonal wetland. This large off-site wetland appears to have a loose hydrologic connection to a system of man-made drainage ditches that flow under Highway 44 to the south and eventually flows into a series of unnamed tributaries of Stillwater Creek. As such, WF02 may be potentially Corps jurisdictional. To confirm the jurisdictional status of these wetlands, a significant nexus determination will have to be conducted by the Corps.

Site Photos Taken on November 11, 2021 and January 6, 2022



P01 – TP01 looking east



P03 – WF03 looking northeast



P02 – WF01 looking northeast



P04 – WF05 looking southeast



P02 – WF02 looking north



P04 – Upland looking east



P04 – End of WF02 looking southwest



P06 – WF02 looking northwest



P05 – WF04 looking southeast

Glossary

Abutting: When referring to wetlands that are adjacent to a tributary, abutting defines those wetlands that are not separated from the tributary by an upland feature, such as a berm or dike.

Adjacent: Adjacent as used in "Adjacent to traditional navigable water," is defined in Corps and EPA regulations as "bordering, contiguous, or neighboring." Wetlands separated from other waters of the U.S. by man-made dikes or barriers, natural river berms, beach dunes and the like are 'adjacent wetlands. A wetland "abuts" a tributary if it is not separated from the tributary by uplands, a berm, dike, or similar feature.

While all wetlands that meet the agencies' definitions are considered adjacent wetlands, only those adjacent wetlands that have a continuous surface connection because they directly abut the tributary (e.g., they are not separated by uplands, a berm, dike, or similar feature) are considered jurisdictional under the plurality standard. (CWA Jurisdiction Following Rapanos v US and Carabell v US 12-02-08).

The regulations define "adjacent" as follows: "[t]he term adjacent means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are 'adjacent wetlands.'" Under this definition, a wetland does not need to meet all criteria to be considered adjacent. The agencies consider wetlands to be bordering, contiguous, or neighboring, and therefore "adjacent" if at least one of following three criteria is satisfied:

(1) There is an unbroken surface or shallow sub-surface hydrologic connection between the wetland and jurisdictional waters; or

(2) The wetlands are physically separated from jurisdictional waters by "manmade dikes or barriers, natural river berms, beach dunes, and the like;" or,

(3) Where a wetland's physical proximity to a jurisdictional water is reasonably close, that wetland is "neighboring" and thus adjacent. For example, wetlands located within the riparian area or floodplain of a jurisdictional water will generally be considered neighboring, and thus adjacent. One test for whether a wetland is sufficiently proximate to be considered "neighboring" is whether there is a demonstrable ecological interconnection between the wetland and the jurisdictional waterbody. For example, if resident aquatic species (e.g., amphibians, reptiles, fish, mammals, or waterfowl) rely on both the wetland and the jurisdictional waterbody for all or part of their life cycles (e.g., nesting, rearing, feeding, etc.), that may demonstrate that the wetland is neighboring and thus adjacent. The agencies recognize that as the distance between the wetland and jurisdictional water increases, the potential ecological interconnection between the waters is likely to decrease.

The agencies will also continue to assert jurisdiction over wetlands "adjacent" to traditional navigable waters as defined in the agencies' regulations. Under EPA and Corps regulations and as used in this guidance, "adjacent" means "bordering, contiguous, or neighboring." Finding a continuous surface connection is not required to establish adjacency under this definition. The Rapanos decision does not affect the scope of jurisdiction over wetlands that are adjacent to traditional navigable waters. The agencies will assert jurisdiction over those adjacent wetlands that have a continuous surface connection with a relatively permanent, non-navigable tributary, without the legal obligation to make a significant nexus finding.

Atypical situation (significantly disturbed): In an atypical (significantly disturbed) situation, recent human activities or natural events have created conditions where positive indicators for hydrophytic vegetation, hydric soil, or wetland hydrology are not present or observable.

Channel. "An open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water" (Langbein and Iseri 1960:5).

Channel bank. The sloping land bordering a channel. The bank has steeper slope than the bottom of the channel and is usually steeper than the land surrounding the channel.

Cobbles. Rock fragments 7.6 cm (3 inches) to 25 .4 cm (10 inches) in diameter.

Debris flow. A moving mass of rock fragments, soil, and mud where more than 50% of the particles are larger than sand-sized.

Ditch. A constructed or excavated channel used to convey water.

Drift. Organic debris oriented to flow direction(s) (larger than small twigs).

Ephemeral stream. An ephemeral stream has flowing water only in direct response to precipitation events in a typical year. Ephemeral streambeds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Facultative wetland (FACW). Wetland indicator category; species usually occurs in wetlands (estimated probability 67–99%) but occasionally found in non-wetlands.

Flat. A level landform composed of unconsolidated sediments usually mud or sand. Flats may be irregularly shaped or elongate and continuous with the shore, whereas bars are generally elongate, parallel to the shore, and separated from the shore by water.

Gravel. A mixture composed primarily of rock fragments 2mm (0 .08 inch) to 7.6 cm (3 inches) in diameter. Usually contains much sand.

Growing season The frost-free period of the year (see U.S. Department of Interior, National Atlas 1970:110-111 for generalized regional delineation).

Herbaceous. With the characteristics of an herb; a plant with no persistent woody stem above ground.

Hydric soil. Soil is hydric that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic (oxygen-depleted) conditions in its upper part (i.e., within the shallow rooting zone of herbaceous plants).

Hydrophyte, **hydrophytic.** Any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

Intermittent stream. An intermittent stream has flowing water during certain times of the year and more than in direct response from precipitation, when elevated groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water.

Jurisdictional Waters. Features that meet the definition of waters of the Unites States provided below and that fall under Corps regulations pursuant to Section 404 of the CWA are considered jurisdictional features.

Litter. Organic debris oriented to flow direction(s) (small twigs and leaves).

Man-induced wetlands. A man-induced wetland is an area that has developed at least some characteristics of naturally occurring wetlands due to either intentional or incidental human activities.

Non-Relatively Permanent Water: A non-relatively permanent water (NRPW) is defined as a tributary that is not a TNW and that typically flows for periods for less than 3 months. NRPWs are jurisdictional

when they have a documented significant nexus to TNWs. All NRPWs must also contain appropriate morphology of bed, bank and scour and be clearly connected to a TNW.

Normal circumstances. This term refers to the soil and hydrologic conditions that are normally present, without regard to whether the vegetation has been removed.

Obligate hydrophytes. Species that are found only in wetlands e.g., cattail (*Typha latifolia*) as opposed to ubiquitous species that grow either in wetland or on upland-e .g., red maple (*Acer rubrum*).

Obligate wetland (OBL). Wetland indicator category; species occurs almost always (estimated probability 99%) under natural conditions in wetlands.

Other Waters of the United States. Other waters of the United States are seasonal or perennial water bodies, including lakes, stream channels, drainages, ponds, and other surface water features, that exhibit an ordinary high-water mark but lack positive indicators for one or more of the three wetland parameters (hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4).

Palustrine the Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 parts per thousand. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m (6.6 feet) at low water; and (4) salinity due to ocean-derived salts is less than 0.5 parts per thousand.

Perennial stream. A perennial stream has flowing water year-round during atypical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Ponded. Ponding is a condition in which free water covers the soil surface (e.g., in a closed depression) and is removed only by percolation, evaporation, or transpiration.

Problem area. Problem areas are those where one or more wetland parameters may be lacking because of normal seasonal or annual variations in environmental conditions that result from causes other than human activities or catastrophic natural events**.**

Relatively Permanent Waters of the U.S. Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months).

Scour. Soil and debris movement.

Sheetflow. Overland flow occurring in a continuous sheet; a relatively high-frequency, low-magnitude event.

Shrub. A woody plant which at maturity is usually less than 6 m(20 feet) tall and generally exhibits several erect, spreading, or prostrate stems and has a bushy appearance ; e.g., speckled alder (*Alnus rugosa*) or buttonbush (*Cephalanthus occidentalis*).

Succession. Changes in the composition or structure of an ecological community.

Traditional Navigable Waters (TNWs)."[a]ll waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide." These waters are referred to in this guidance as traditional navigable waters. The traditional navigable waters include all of the "navigable waters of the United States," as defined in 33 C.F.R. Part 329 and by numerous decisions of the federal courts, plus all other waters that are navigable-in-fact (for example, the Great Salt Lake, UT, and Lake Minnetonka, MN). Thus, the traditional

navigable waters include, but are not limited to, the "navigable waters of the United States" within the meaning of Section 10 of the Rivers and Harbors Act of 1899 (also known as "Section 10 waters").

Tree. A woody plant which at maturity is usually 6 m (20 feet) or more in height and generally has a single trunk, unbranched for 1 m or more above the ground, and a more or less definite crown; e.g., red maple (*Acer rubrum*), northern white cedar (*Thuja occidentalis*).

Typical Year. Defined by the EPA and Corps as meaning when precipitation and other climactic variables are within the normal periodic range for the geographic area based on a rolling thirty-year period.

Water table. The upper surface of a zone of saturation. No water table exists where that surface is formed by an impermeable body.

Waters of the United States (WOTUS). This is the encompassing term for areas under federal jurisdiction pursuant to Section 404 of the CWA. Waters of the United States are divided into "wetlands" and "other waters of the United States."

Watershed (drainage basin). An area of land that drains to a single outlet and is separated from other watersheds by a divide.

Wetland. Wetlands are defined as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3 [b], 40 CFR 230.3). To be considered under potential federal jurisdiction, a wetland must support positive indicators for hydrophytic vegetation, hydric soil, and wetland hydrology.

Woody plant. A seed plant (gymnosperm or angiosperm) that develops persistent, hard, fibrous tissues, basically xylem; e.g., trees and shrubs.

Xeric. Relating or adapted to an extremely dry habitat.

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Appendix A: Arid West Wetland Determination Data Sheets

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: TP01

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): none | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.56509 | Long: -122.302076 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loams, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ○	No ◉	

Remarks: Drought conditions present at time of survey. Data point is located in a vehicle access area along a fence that has a history of disturbance due to fire break disking.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hordeum marinum ssp. gussoneanum*	40	Yes	FAC
2. *Festuca perennis*	20	Yes	FAC
3. *Bromus hordeaceus*	20	Yes	FACU
4. *Elymus caput-medusae*	20	Yes	UPL
5.			
6.			
7.			
8.			
Total Cover:	100 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	60	x 3 =	180
FACU species	20	x 4 =	80
UPL species	20	x 5 =	100
Column Totals:	100 (A)		360 (B)

Prevalence Index = B/A = 3.60

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: TP01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	5YR 4/2	98	5YR 4/6	2	C	PL	sandy clay loam	
5-10	5YR 4/5	70	10YR 5/6	20	C	PL	sandy clay loam	
	5YR 4/2	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 12/09/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: TP02

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): slightly concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.565269 | Long: -122.301558 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loams, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is a minute depression located adjacent to WF04.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hordeum marinum ssp. gussoneanum*	30	Yes	FAC
2. *Leontodon saxatilis*	10	Yes	FACU
3. *Centromadia fitchii*	10	Yes	FACU
4. *Plagiobothrys stipitatus*	10	Yes	FACW
5. *Erodium botrys*	5	No	FACU
6. *Pogogyne zizyphoroides*	5	No	OBL
7.			
8.			
Total Cover:	70 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 30 % | % Cover of Biotic Crust 30 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	10	x 2 =	20
FAC species	30	x 3 =	90
FACU species	25	x 4 =	100
UPL species		x 5 =	0
Column Totals:	70 (A)		215 (B)

Prevalence Index = B/A = 3.07

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: TP02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	5YR 4/4	98	2.5YR 3/6	2	C	PL	gravelly loam	% gravel increased @ 3 in deep
	5YR 5/3	30						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ◉ No ○ Depth (inches): 0

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: W01

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.565225 | Long: -122.301800 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is a clear shallow depression.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Festuca perennis*	30	Yes	FAC
2. *Hordeum marinum ssp. gussoneanum*	25	Yes	FAC
3. *Centromadia fitchii*	10	No	FACU
4. *Plagiobothrys sp.*	5	No	FACW
5.			
6.			
7.			
8.			
Total Cover:	70 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 30 % | % Cover of Biotic Crust 35 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	5	x 2 =	10
FAC species	55	x 3 =	165
FACU species	10	x 4 =	40
UPL species		x 5 =	0
Column Totals:	70 (A)		215 (B)

Prevalence Index = B/A = 3.07

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: No soil pit taken due to the presence of ponding water and dominance of hydrophytic vegetation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches):	0-12
Water Table Present?	Yes ◉	No ○	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):	0

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: U01

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): slightly convex | Slope (%): 0.3

Subregion (LRR): C - Mediterranean California | Lat: 40.565231 | Long: -122.301779 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is minutely convex to almost flat.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Centaurea solstitialis*	25	Yes	Not Listed
2. *Leontodon saxitilis*	25	Yes	FACU
3. *Festuca perennis*	25	Yes	FAC
4. *Bromus hordeaceus*	15	No	FACU
5.			
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	25	x 3 =	75
FACU species	40	x 4 =	160
UPL species	25	x 5 =	125
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	5YR 4/4	60	2.5YR 3/6	30	C	PL	gravelly clay loam	Few Mn stains
	5YR 4/2	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Area is not a closed depression, therefore, no hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ◉	No ○	Depth (inches): -6
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches): -4

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project City/County: Shasta County Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. State: CA Sampling Point: W02

Investigator(s): Elena Gregg Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.565455 Long: -122.301698 Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is a clear depression.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hordeum marinum ssp. gussoneanum*	30	Yes	FAC
2. *Triteleia hyacintha*	15	Yes	FAC
3. *Festuca perennis*	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
Total Cover:	50 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 50 % % Cover of Biotic Crust 40 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	50	x 3 =	150
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	50 (A)		150 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks: "Bare ground" representative of open water.

SOIL

Sampling Point: W02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: No soil pit taken due to presence of surface water and dominance of hydrophytic vegetation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches):	0-5
Water Table Present?	Yes ◉	No ○	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):	0

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: U02

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): convex | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.565458 | Long: -122.301675 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is convex.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Elymus caput-medusae*	60	Yes	UPL
2. *Briza maxima*	20	Yes	UPL
3. *Festuca perennis*	15	No	FAC
4. *Epilobium brachycarpum*	5	No	FAC
5.			
6.			
7.			
8.			
Total Cover:	100 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	20	x 3 =	60
FACU species		x 4 =	0
UPL species	80	x 5 =	400
Column Totals:	100 (A)		460 (B)

Prevalence Index = B/A = 4.60

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-13	5YR 5/3	40	2.5YR 3/6	10	C	M	gravelly clay loam	
	5YR 4/4	50						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Area is not a closed depression, therefore, no hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ◉ No ○ Depth (inches): -6

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: W03

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.565508 | Long: -122.300775 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is a ditch-like depression formed due to runoff from an off-site leaky tank.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Cynodon dactylon*	50	Yes	FACU
2. *Paspalum dilatatum*	30	Yes	FACW
3. *Cyperus eragrostis*	20	Yes	FACW
4.			
5.			
6.			
7.			
8.			
Total Cover:	100 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	50	x 2 =	100
FAC species		x 3 =	0
FACU species	50	x 4 =	200
UPL species		x 5 =	0
Column Totals:	100 (A)		300 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: No soil pit taken due to presence of surface water and dominance of hydrophytic vegetation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches):	0-3
Water Table Present?	Yes ◉	No ○	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):	0

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project | City/County: Shasta County | Sampling Date: 11/11/21

Applicant/Owner: PACE Supply Corp. | State: CA | Sampling Point: U03

Investigator(s): Elena Gregg | Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): slightly convex | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.565488 | Long: -122.300781 | Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is slightly convex.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Cynodon dactylon*	85	Yes	FACU
2. *Festuca perennis*	10	No	FAC
3. *Cynosurus echinatus*	5	No	UPL
4.			
5.			
6.			
7.			
8.			
Total Cover:	100 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	10	x 3 =	30
FACU species	85	x 4 =	340
UPL species	5	x 5 =	25
Column Totals:	100 (A)		395 (B)

Prevalence Index = B/A = 3.95

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks: Cynodon dactylon forms a thick layer of thatch in area.

SOIL

Sampling Point: U03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5YR 2.5/2	97	5YR 4/4	3	C	PL	gravelly clay loam	
8-12	5YR 4/4	90					gravelly clay loam	
	7.5YR 2.5/2	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: No hydric soil criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ◉	No ○	Depth (inches): -7
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches): -5

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project City/County: Shasta County Sampling Date: 1/6/22

Applicant/Owner: PACE Supply Corp. State: CA Sampling Point: W04

Investigator(s): Elena Gregg Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.565238 Long: -122.301516 Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions considered present at time of survey. Area is a clear depression.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hordeum marinum ssp. gussoneanum*	20	Yes	FAC
2. *Callitriche sp.*	25	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	45 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 55 % % Cover of Biotic Crust 40 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x 1 =	25
FACW species		x 2 =	0
FAC species	20	x 3 =	60
FACU species		x 4 =	0
UPL species		x 5 =	0
Column Totals:	45 (A)		85 (B)

Prevalence Index = B/A = 1.89

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: No soil pit taken due to the presence of surface water and dominance of hydrophytic vegetation. Soil assumed hydric.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Shallow Aquitard (D3)
- ☒ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉ No ○	Depth (inches):	0-7
Water Table Present?	Yes ◉ No ○	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes ◉ No ○	Depth (inches):	0

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project City/County: Shasta County Sampling Date: 1/6/22

Applicant/Owner: PACE Supply Corp. State: CA Sampling Point: U04

Investigator(s): Elena Gregg Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.565254 Long: -122.301514 Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions still considered present at time of survey. Area is flat to very minutely convex.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Leontodon saxitilis*	50	Yes	FACU
2. *Hordeum marinum ssp. gussoneanum*	20	Yes	FAC
3. *Festuca perennis*	10	No	FAC
4. *Bromus hordeaceus*	8	No	FACU
5. *Centromadia fitchii*	5	No	FACU
6. *Lactuca serriola*	2	No	FACU
7.			
8.			
Total Cover:	95 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 5 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	30	x 3 =	90
FACU species	65	x 4 =	260
UPL species		x 5 =	0
Column Totals:	95 (A)		350 (B)

Prevalence Index = B/A = 3.68

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	5YR 4/4	97	2.5YR 3/6	3	C	PL	gravelly clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ◉ No ○ Depth (inches): -3

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project City/County: Shasta County Sampling Date: 1/6/22

Applicant/Owner: PACE Supply Corp. State: CA Sampling Point: W05

Investigator(s): Elena Gregg Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.565498 Long: -122.301535 Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions present at time of survey. Area is a depression located at the base of a low hill.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hordeum marinum ssp. gussoneanum*	60	Yes	FAC
2. *Callitriche sp.*	5	No	OBL
3. *Leontodon saxatilis*	5	No	FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	70 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 30 % % Cover of Biotic Crust 20 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species		x 2 =	0
FAC species	60	x 3 =	180
FACU species	5	x 4 =	20
UPL species		x 5 =	0
Column Totals:	70 (A)		205 (B)

Prevalence Index = B/A = 2.93

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☒ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: No soil pit taken due to the presence of surface water and dominance of hydrophytic vegetation. Soil assumed hydric.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☒ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches):	0-5
Water Table Present?	Yes ◉	No ○	Depth (inches):	0
Saturation Present? (includes capillary fringe)	Yes ◉	No ○	Depth (inches):	0

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: JW Wood Expansion Project City/County: Shasta County Sampling Date: 1/6/22

Applicant/Owner: PACE Supply Corp. State: CA Sampling Point: U05

Investigator(s): Elena Gregg Section, Township, Range: Section 3 Township 31N Range 04W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): slightly convex Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.565495 Long: -122.301548 Datum: NAD83

Soil Map Unit Name: Redding-Red Bluff gravelly loam, 0 to 3 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions still considered present at time of survey. Area is minutely convex.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Elymus caput-medusae*	45	Yes	UPL
2. *Leontodon saxitilis*	25	Yes	FACU
3. *Hordeum marinum ssp. gussoneanum*	25	Yes	FAC
4.			
5.			
6.			
7.			
8.			
Total Cover:	95 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 5 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	25	x 3 =	75
FACU species	25	x 4 =	100
UPL species	45	x 5 =	225
Column Totals:	95 (A)		400 (B)

Prevalence Index = B/A = 4.21

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	5YR 4/4	98	2.5YR 3/6	2	C	PL	gravelly clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ◉ No ○ Depth (inches): -3

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B: NRCS Soils Map and Soil Series Description

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Shasta County Area, California



December 14, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:736 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Shasta County Area, California
Survey Area Data: Version 16, Sep 6, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 8, 2019—Jun 21, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
RdB	Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	0.0	1.7%
ReA	Redding-Red Bluff gravelly loams, 0 to 3 percent slopes	2.1	98.3%
Totals for Area of Interest		**2.1**	**100.0%**

Map Unit Descriptions

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, 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 and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils 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. Other minor components, however, have properties and behavioral 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*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one 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.

Shasta County Area, California

RdB—Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17

Map Unit Setting

National map unit symbol: 2w8bn
Elevation: 430 to 1,100 feet
Mean annual precipitation: 28 to 48 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 310 to 335 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous, metamorphic and sedimentary rock over clayey alluvium derived from igneous, metamorphic and sedimentary rock over cemented alluvium derived from igneous, metamorphic and sedimentary rock over tehama formation

Typical profile

A1 - 0 to 5 inches: gravelly loam
A2 - 5 to 6 inches: loam
Bt - 6 to 13 inches: clay
Btqm - 13 to 28 inches: cemented very gravelly material
2C - 28 to 60 inches: stratified sand to loam to clay

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches; 10 to 30 inches to duripan
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 5 to 13 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R017XD089CA - ACID TERRACE
Hydric soil rating: No

Minor Components

Red bluff

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Clough

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Tread
Microfeatures of landform position: Swales
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Newtown

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

ReA—Redding-Red Bluff gravelly loams, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hfrz
Elevation: 100 to 1,500 feet
Mean annual precipitation: 14 to 30 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 200 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 45 percent
Red bluff and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Fan remnants

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: gravelly loam
H2 - 6 to 13 inches: clay
H3 - 13 to 28 inches: indurated

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches; 13 to 28 inches to duripan
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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 0.7 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: D
Ecological site: R017XD089CA - ACID TERRACE
Hydric soil rating: No

Description of Red Bluff

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: gravelly loam
H2 - 6 to 24 inches: gravelly clay loam
H3 - 24 to 30 inches: gravelly clay loam
H4 - 30 to 40 inches: indurated

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 30 to 40 inches to duripan
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R017XD089CA - ACID TERRACE
Hydric soil rating: No

Minor Components

Moda

Percent of map unit: 8 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Tread
Microfeatures of landform position: Vernal pools
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Igo

Percent of map unit: 7 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Tread
Microfeatures of landform position: Swales
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Hydric Soil List - All Components

This table lists the map unit components and their hydric status in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 2002).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the

upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes in the table (for example, 2). Definitions for the codes are as follows:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
    A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
    B. Show evidence that the soil meets the definition of a hydric soil;
3. Soils that are frequently ponded for long or very long duration during the growing season.
    A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
    B. Show evidence that the soil meets the definition of a hydric soil;
4. Map unit components that are frequently flooded for long duration or very long duration during the growing season that:
    A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or

B. Show evidence that the soil meets the definition of a hydric soil;

Hydric Condition: Food Security Act information regarding the ability to grow a commodity crop without removing woody vegetation or manipulating hydrology.

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

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Report—Hydric Soil List - All Components

Hydric Soil List - All Components–CA607-Shasta County Area, California					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
RdB: Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	Redding	85	Fan remnants	No	—
	Red Bluff	5	Fan remnants	No	—
	Clough	5	Fan remnants	No	—
	Newtown	5	Fan remnants	No	—
ReA: Redding-Red Bluff gravelly loams, 0 to 3 percent slopes	Redding	45	Fan remnants	No	—
	Red Bluff	40	Fan remnants	No	—
	Moda	8	Fan remnants	Yes	3
	Igo	7	Fan remnants	No	—

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Attachment D
Spring Botanical Survey

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117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

May 19, 2022

JW Wood Expansion Project
Attn.: Paul Heintz
425 Market St.
Oakland, CA 94607

Mr. Heintz;

As requested, Gallaway Enterprises conducted a focused protocol-level botanical survey for Red Bluff Dwarf Rush (*Juncus leiospermus var. leiospermus*), Legenere (*Legenere limosa*), and Henderson's bentgrass (*Agrostis hendersonii*) within the 2.14-acre survey area located within the city of Redding, CA. The survey was conducted on April 18, 2022. Red Bluff Dwarf Rush and Legenere are California Native Plant Society (CNPS) Rank 1B.1[1] species and Henderson's bentgrass is a CNPS Rank 3.2[2] species, therefore, the survey was conducted per CNPS and California Department of Fish and Wildlife (DFW) guidelines.

Location

The survey area is located in the city of Redding, CA, within the US Geological Survey (USGS) Enterprise quadrangle, Section 3, Township 31N, Range 04W. The JW Wood Expansion Project (Project) is approximately 2.14 acres. Expansion of the existing JW Wood facility is proposed for the Project site.

The Project site is located immediately north of the existing JW Wood facility at 3676 Old 44 Drive, Redding, California. The Project site is currently a vacant lot and contains seasonal wetlands. Documented occurrences of Red Bluff Dwarf Rush and Henderson's bent grass occur within 0.5 miles of the survey area.

Methodology

The survey for Red Bluff Dwarf Rush, Legenere, and Henderson's Bentgrass was conducted on April 18, 2022 during the appropriate survey window of the target species, by botanist Christopher Belko (see **Attachment A** for Botanist Qualifications). The entire survey area was traversed on foot using meandering transects. A total of 5 staff-hours was spent in the field conducting this survey. A Trimble Geo Explorer 6000 Series GPS Receiver was on hand to record any special-status plant occurrences observed. The survey was conducted in accordance with the March 2018 CDFW *Protocols for Surveying and Evaluating Impacts*

[1] According to the CNPS Inventory of Rare and Endangered Plants, 1B.1 plants are species that are rare, threatened, or endangered in California and elsewhere; and are seriously threatened in California (meaning over 80% of occurrences are threatened).
[2] According to the CNPS Inventory of Rare and Endangered Plants, 3.2 plants are species about which more information is needed, but are considered moderately threatened in California (meaning 20-80% of occurrences are threatened).

to Special Status Native Plant Populations and Sensitive Natural Communities and the June 2, 2001 revised *CNPS Botanical Survey Guidelines*. Rainfall and inundation was considered below average during the winter of 2021/2022 according to the National Oceanic and Atmospheric Administration (NOAA), however portions of the seasonal wetlands were inundated due to recent rains at the time of the survey.

Results

No occurrences of Red Bluff Dwarf Rush, Legenere, or Henderson's Bentgrass were observed within the survey area during the 2022 protocol-level survey conducted.

A list of all of the plant species observed during the survey is provided as **Attachment B**.

Should you have any questions, please contact Elena Gregg at (530) 332-9909 or via email at elena@gallawayenterprises.com.

Sincerely,



Christopher Belko, Botanist
Gallaway Enterprises

Attachments:

Attachment A – Surveyor Qualifications
Attachment B – Observed Plant List

Attachment A

Surveyor Qualifications

Christopher Belko

Botanist

Gallaway Enterprises

Education

B.S. Botany, Humboldt State University, 2020

Experience 2 Years

Gallaway Enterprises
Botanist
(February 2022 – Current)

ACRT Pacific
Vegetation Management Inspector
(October 2021 – February 2022)

Sierra Pacific Industries,
Botanist Aide
(April – September 2021)

HSU Fire Ecology Lab
Field Research Assistant
(May – September 2020)

Certifications/Permits

- CDFW Collection Permit for Listed Plant Species

Overview

Christopher has one year of professional experience conducting rare plant surveys. He has a working knowledge of CNPS, CDFW, and USFWS survey protocols. He is experienced in surveying a wide range of habitats including valley grassland, seasonal wetland, oak woodland, conifer forest, montane meadow, and riparian systems among other aquatic resources for state listed and CNPS ranked plants. He has conducted floristic surveys in Butte, Shasta, Trinity, Humboldt, Lassen, Tehama, and Modoc counties. Mr. Belko has one season of experience conducting protocol level surveys for Butte County Meadowfoam (*Limnanthes floccosa subsp. californica)*, a federally endangered plant.

Christopher is experienced in performing tree inventories. He has performed tree inspection and consultation for utility management in sensitive urban and forested environments. He established survey plots of the rare Baker's Cypress and a community of heritage hardwoods for future monitoring. He is also trained in urban horticulture, and forest management practices.

Christopher was a research assistant at Humboldt State University and gained experience conducting floristic fire effects surveys in Shasta County.

During his time with Gallaway Enterprises, Christopher has been trained in conducting wetland delineations and has a working knowledge of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region*. Christopher has prepared wetland delineation reports according to USACE guidelines.

Representative Project:

Sycamore Creek Conservation Bank (Butte County)

Christopher performed floristics monitoring for the Sycamore Creek Conservation Bank in 2022. This work included a protocol-level botanical survey for Butte County Meadowfoam. This survey required the identification of Butte County Meadowfoam in a desiccated condition, accurate mapping of its current extent, and correct identification of all other observed plants within the Bank.

Attachment B

Plant Species Observed

Plant Species Observed within the JW Wood Expansion Project on April 18, 2022	
Scientific Name	**Common Name**
Aira caryophyllea	Silver hairgrass
Allium amplectens	Clasping onion
Arctostaphylos viscida ssp. viscida	White-leaved manzanita
Avena fatua	Wild oats
Briza maxima	Greater quaking-grass
Briza minor	Lesser quaking-grass
Bromus diandrus	Rip-gut brome
Bromus hordeaceus	Soft chess
Bromus sterilis	Sterile brome
Carduus pycnocephalus	Italian thistle
Castilleja attenuata	Valley tassels
Centromadia fitchii	Fitch's spikeweed
Cerastium glomeratum	Mouse-eared chickweed
Cyperus eragrostis	Tall nutsedge
Deschampsia danthonioides	Annual hairgrass
Dichelostemma multiflorum	Round-toothed ookow
Eleocharis macrostachya	Pale spike-rush
Elymus caput-medusae	Medusahead
Epilobium brachycarpum	Tall willowherb
Eriophyllum lanatum var. grandiflorum	Large-flowered wooly sunflower
Erodium botrys	Long-beaked stork's-bill
Festuca bromoides	Six-weeks fescue
Festuca microstachys	Small fescue
Festuca perennis	Rye-grass
Galium aparine	Bedstraw
Geranium dissectum	Cut-leaved geranium
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley
Hordeum murinum	Wall hare barley
Hydrocotyle ranunculoides	Floating pennywort
Hypericum perforatum	Klamathweed
Juncus bufonius	Toadrush
Juncus effusus	Pacific rush
Juncus occidentalis	Western rush
Juncus xiphioides	Iris-leaved rush
Lactuca serriola	Prickly lettuce
Lasthenia fremontii	Goldfields
Layia fremontii	Tidy-tips
Logfia gallica	Narrowleaf cottonrose
Lonicera interrupta	Chaparral honeysuckle
Lupinus nanus	Sky lupine
Lythrum hyssopifolia	Hyssop loosestrife
Microseris acuminata	Sierra foothill silverpuff

Scientific Name	Common Name
Navarretia leucocephala	White pin-cushion
Odontostomum hartwegii	Hartweg's odontostomum
Paspalum dilatatum	Dallisgrass
Petrorhgia dubia	Grass-pink
Plagiobothrys austiniae	Austin's popcorn flower
Plagiobothrys greenei	Green's popcorn flower
Plantago elongata	Prairie plantain
Plantago erecta	Erect plantain
Pogogyne zizyphoroides	Sacramento Valley pogogyne
Populus fremontii	Fremont's cottonwood
Psilocarphus brevissimus	Wooly marbles
Quercus douglasii	Blue oak
Raphanus sativus	Radish
Rubus armeniacus	Himalayan blackberry
Rumex crispus	Curly dock
Salix sp.	Willow
Scleranthus annuus	German knotweed
Scribneria bolanderi	Scribern's grass
Sonchus asper	Sow thistle
Sorghum halepense	Johnsongrass
Thysanocarpus radians	Fringe pod
Torilis arvensis	Hedge parsley
Toxicodendron diversilobum	Poison oak
Trifolium depauperatum	Cowbag clover
Trifolium dubium	Shamrock clover
Trifolium glomeratum	Sessile-headed clover
Trifolium hirtum	Rose clover
Trifolium microcephalum	Maiden clover
Triphysaria eriantha	Johnnytuck
Typha latifolia	Cattails
Veronica peregrina ssp. *xalapensis*	Purslane speedwell
Vicia villosa	Winter vetch

Attachment E
Response to CDFW Letter

gallaway ENTERPRISES

117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

September 13, 2023

Danny Castro
Assistant Planner, Development Services
City of Redding Development Services Department
Planning Division
777 Cypress Avenue
Redding, CA 96001

RE: Response to CDFW Letter dated September 5, 2023 – Early Consultation Request for the JW Wood Expansion Project (Project), Shasta County

Mr. Castro,

On behalf of our client, Pace Supply, we are responding to the California Department of Fish and Wildlife (CDFW) comment letter dated September 5, 2023 regarding the content of the March 2022 JW Wood Expansion Biological Resource Assessment (BRA) and recommended avoidance and minimization measures (AMMs). The following content reviews and addresses each statement/consultation recommendation in the letter.

1. Preliminary and/or Supplementary Biological Studies

Special-Status Bumble Bees:

CDFW states that there is suitable habitat within the BSA for Crotch's bumble bee, and therefore recommends a focused survey for Crotch's bumble bee be conducted and an amended Biological Report submitted to CDFW.

The BRA species lists are created by utilizing CNDDB, IPaC, CNPS, and NMFS to identify special status species observations and habitat within the region. Crotch bumble bee was not/and is currently not included on the species lists within the "Cottonwood", "Enterprise", "Palo Cedro", "Project City", and "Redding" United States Geological Survey quadrangles. There nearest CNDDB occurrence (#4) is approximately 27 miles from the BSA in Tehama County and is from 1956. According to the IUCN Red List, Crotch bumble bee is thought to be possibly extinct from this region. Suitable bee habitat requires the availability of nectar and pollen from floral resources throughout the duration of the colony period (spring, summer, and fall) (Xerces Society 2018). No known food sources forces were observed within the BSA. Some floral resources are in bloom from February to October within the BSA; however, they are not sufficient to support Crotch bumble bee populations. There is no suitable habitat for Crotch's bumble bee within the BSA. The inclusion of additional analysis and focused surveys are not warranted in the BRA document.

Wetlands:

CDFW states that a supplemental wetlands impact assessment should be performed to include impacts to onsite and offsite wetlands and that mitigation for the loss of wetland habitat begin at 3:1 or greater.

Based on observations of the topography of the adjacent parcels and its interactions with the site being reviewed, it is our understanding that the site receives overflow water from the adjacent parcels and ponds. This observation is substantiated by surveyed topography. There is no apparent topography that allows flow from the site to the adjacent parcel; therefore, there will be no direct or indirect hydrological interruption as a result of the proposed project. In the past, CDFW has requested similar supplemental assessments for other projects and the conclusions of the professional hydrologist have not been considered based on CDFW's opinion of indirect impacts. These situations have resulted in significant costs and delays for those projects with no mechanism for resolution. There is no CDFW requirement to mitigate for the loss of "wetland habitat" at a ratio greater that 1:1 to meet the CDFW policy of "no net loss".

Western Spadefoot:

CDFW states that there is potential suitable breeding and upland habitat for western spadefoot within the BSA and recommends additional assessments are conducted.

We concur with CDFW that potential suitable breeding and terrestrial habitat is present within the BSA as is discussed in the results section of the BRA. The justification in the species table, "seasonal wetlands that occur within the BSA provide potentially suitable breeding habitat; however, pools did not contain sufficient water and spadefoots were not observed during a survey conducted in March 2022" is correct. At the time of the focused night-time western spadefoot survey, water was not ponding, and no western spadefoots were observed or heard vocalizing. This survey was separate from the site visits conducted for the wetland delineation on November 11 and December 9, 2021 and January 6, 2022 when ponded water was present. Western spadefoots were also not observed during these site visits. Suitable terrestrial habitat was observed during the habitat assessment on November 11, 2021. We are not aware of any terrestrial habitat survey techniques for western spadefoot and the species is extremely difficult to detect when burrowing.

A terrestrial western spadefoot survey is not warranted. A statement about the presence of western spadefoot terrestrial habitat is stated in the results section. Inclusion of additional information regarding terrestrial habitat is not warranted.

2. BRA's Conclusions and Recommendations Section

Western Spadefoot:

CDFW recommends performing supplemental spadefoot surveys because of the less than average precipitation in the winter of 2021/2022.

The night-time western spadefoot survey was conducted on March 14, 2022 during a precipitation event and during the typical breeding/egg laying period, late winter to the end of March. No western spadefoots were observed. We believe it is unreasonable to suggest surveys be repeated based of less than average precipitation. Climate change is causing increasingly unpredictable weather patterns and waiting for the optimal conditions to occur could delay a project for years if not indefinitely. Despite this, one additional western spadefoot nighttime preconstruction survey should be conducted between January and March as is it the typical protocol to conduct two nighttime western spadefoot surveys if ponding water is present, and it was observed that ponding water was present during the wetland delineation site visits previously.

Bats:

CDFW states that the BRA's recommendation is inadequate for potential impacts to bats and recommends integration of CDFW AMM's, including marking trees with suitable habitat, additional work time restrictions, and exclusion.

There are no CNDDB occurrences of special status bats within 5 miles of the BSA and no evidence of bats was observed during the habitat assessment. Potential for bat occurrence within the BSA is low. Pallid bat outdoor winter activity has been observed at temperatures as low as 23°. Western red bat is also known to arouse from hibernation on warmer winter days and has been observed at temperatures as low as 44°F. The lowest average monthly temperatures in Redding are 36.1° F to 55° F, so even in winter, pallid bats and western red bats could relocate safely as long as disturbance occurred at above 44°F.

We will adopt the CDFW recommended maternity season dates of March 1- August 31 and replace the hibernacula restrictions with a temperature requirement of 44°F for tree removal. Instead of marking all trees with suitable habitat, if trees cannot be removed at dusk, during the first day(s) of vegetation removal, trees and shrubs under 18-inch dbh will be removed. The following day(s), remaining trees larger than 18-inch dbh will be removed. A Contractor Supplied Biologist will be present if tree removal occurs during the day.

3. Other Applicable CDFW Comments and Recommendations

Blue Oak Woodlands:

CDFW recommends designing around and retaining large, mature oak trees identified within the Project area.

Per the JW Wood Expansion Project Tree Inventory Report, it is recommended that as many healthy native tree species (trees with a health rating of 3 or greater) as feasible be retained within the Project site due to their aesthetics and usefulness to wildlife. Pursuant to Chapter 18.45 of the Redding Zoning Ordinance, removal of any tree exceeding 6 inches in diameter at breast height (DBH) requires a tree removal permit. If any of the trees present within the Project site are proposed for preservation, care will be taken to implement the avoidance and minimization measures outlined in the City of Redding's Trees & Construction: A Guide to Preservation.

Lake and Streambed Alteration Agreement:

CDFW states that notification via Fish and Game Code Section 1600 may be applicable based on the hydrological connection of onsite wetlands to streams that fall under CDFW jurisdiction.

The off-site wetland that may have a hydrologic connection to Stillwater Creek will not be hydrologically modified as a result of the proposed project. Fish and Game Code (CFGC) §1602 does not specifically contain provisions regulating activities that would impact wetlands, isolated areas containing riparian vegetation, or wetland hydrology. None of the conditions identified in CFGC §1602 (an entity shall not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake…) will or could occur as a result of the proposed project. Debris, waste or other material from the proposed site would have to travel over 3,000 feet over a series of level parcels, through a series of at least 5 culverts, under multiple components of SR44 to then potentially enter Stillwater Creek; therefore, a §1602 agreement is not necessary.

Low Impact Development:

CDFW recommends the implementation of Low Impact Development (LID) strategies to ensure no-net-increase in stormwater runoff from newly developed areas.

As mentioned previously, there is no apparent topography that allows flow from the site to the adjacent parcel containing wetlands that connect to culverts. The proposed project includes stormwater management designs that ensure no-net increase in stormwater runoff from the newly developed areas. The contractor will use BMP's for erosion control and the site design takes LID strategies into consideration.

Native Vegetation in Landscaping:

CDFW recommends utilizing vegetation native to the local area in landscaping whenever possible. The project proponent will take this into consideration.

Thank you for the opportunity to review and comment on this project. If there are questions or concerns regarding the content of this letter, please don't hesitate to contact me at (530) 332-9909 or kevin@gallawayenterprises.com.

Sincerely,



Kevin Sevier
Vice President and Senior Planner
Gallaway Enterprises, Inc.

Attached: Copy of Letter from Erika Iacona to Danny Castro dated September 5, 2023

From:	Iacona, Erika@Wildlife
To:	Castro, Danny
Subject:	Early Consultation Comments for the JW Wood Expansion Project (Pace Supply)
Date:	Tuesday, September 5, 2023 2:46:03 PM
Attachments:	image001.png

CAUTION: This email originated from outside the City of Redding; please be careful with links or attachments.

Dear Danny Castro,

The California Department of Fish and Wildlife (CDFW) has reviewed the updated Biological Resource Assessment (BRA), Tree Survey Letter and Draft Delineation of Aquatic Resources (DDAR) for the JW Wood Expansion Project (Pace Supply), a proposal to expand the existing facility and include additional storage materials in the City of Redding (Project). CDFW offers the following comments and recommendations in our role as a trustee and responsible agency pursuant to the California Environmental Quality Act, California Public Resources Code section 21000 *et seq*. The following are informal comments intended to assist the Lead Agency and Project applicant in making informed decisions early in the review and approval process and are separated into three sections: 1) CDFW comments regarding the need for preliminary and/or supplemental biological studies, 2) CDFW comments regarding the conclusions and recommendations proposed in the BRA, and 3) other applicable CDFW comments and recommendations.

1) CDFW Comments regarding the need for preliminary and/or supplementary biological studies:

Special-Status Bumble Bees

On September 30, 2022, the candidacy of four California bumble bee species was reinstated under CESA. As such, Crotch's bumble bee (*Bombus crotchii*), whose range bisects the City, receives the same legal protection afforded to endangered or threatened species (Fish and Game Code, §§ 2074.2 and 2085). Additionally, Crotch's bumble bee is listed as an invertebrate of conservation priority under the California Terrestrial and Vernal Pool Invertebrates of Conservation Priority (CDFW 2017). Crotch's bumble bee has a state ranking of S1/S2, meaning the Crotch's bumble bee is considered critically imperiled or imperiled, and is extremely rare (often five or fewer populations). Accordingly, Crotch's bumble bee meets the CEQA definition of rare, threatened, or endangered species (CEQA Guidelines, § 15380). Therefore, take of Crotch's bumble bee could require a mandatory finding of significance (CEQA Guidelines, § 15065).

The BRA does not list special status bumble bees as species with potential to occur. Crotch's bumble bees are generalist foragers and have been reported visiting a wide variety of flowering plants (Biesmeijer et al. 2006). Suitable Crotch's bumble bee habitat includes areas of grasslands and woodlands that contain requisite habitat elements, such as small mammal burrows. Based on habitat and vegetation present within the Project area, suitable habitat for Crotch's bumble bee may be present. Focused surveys for Crotch's bumble bee were not conducted as part of the biological study, nor were any measures for avoidance, minimization, or mitigation offered. The Project may result in temporal and permanent loss of suitable nesting and foraging habitat for Crotch's bumble bee and therefore, should be evaluated. A qualified biologist should analyze the Project area for potentially suitable habitat for Crotch's Bumble Bee. Such analyses should be included in an amended Biological Report and submitted for CDFW, ideally prior to the release of the draft environmental document.

For bumble bee survey guidelines please visit: https://wildlife.ca.gov/Conservation/Survey-Protocols#377281281-invertebrates

Wetlands

As described in the DDAR, several wetlands occur on the parcel. Due to the severe declines of wetlands throughout California, CDFW considers impacts to wetlands to be potentially significant and has a "no net loss" policy regarding wetland habitat. CDFW strongly discourages disturbance and/or development in wetlands. The Use Permit Site Plan indicates that wetlands identified in the Project area are proposed to be filled.

The DDAR states "*The one remaining wetland, WF02, continues to the west and is connected to a large off-site seasonal wetland*". Due to the hydrological connection between WF02 and the large seasonal wetland west of the Project area, a supplemental wetlands impact assessment should be performed. The supplemental assessment should include a thorough impacts analysis of proposed direct and indirect impacts to wetlands occurring both onsite and offsite, adjacent to the Project area. Such assessment should be included in the environmental document and considered by the Lead Agency when formulating most applicable avoidance, minimization, and mitigation measures. Based on the proposed permanent removal of onsite wetlands and direct/indirect impacts to hydrologically connected wetlands, CDFW recommends that mitigation for the loss of wetland habitat begin at 3:1 or greater.

Western Spadefoot

The BRA states that the potential for western spadefoot to occur in the Project area was "*Low. Seasonal wetlands that occur within the BSA provide potentially suitable breeding habitat; however, pools did not contain sufficient water and spadefoots were not observed during a survey conducted in March 2022"* however, this justification appears to account for breeding habitat only. Western spadefoot are almost completely terrestrial, and spend most of the year in underground burrows (Stebbins 1972), which may be constructed themselves, or in the form of small mammal burrows. Additionally, this justification was contradicted by the DDAR, as it states, "*At the time of the winter site visits, each of the wetland features were ponded or saturated*". The BRA omits the fact that this region received less than average precipitation in the winter of 2021/2022, and that Western Spadefoot may burrow in terrestrial habitat for several years before emerging to breed when conditions are optimal. Potentially suitable breeding habitat is present within the Project area and therefore, potentially suitable terrestrial habitat is likely to also occur.

Based on the information above, an additional assessment for western spadefoot is warranted, with specific regard to potentially suitable terrestrial habitat and this species' potential to occur in the Project area. CDFW recommends amending the BRA to include this information, or the formulated of a supplemental report for western spadefoot to the existing BRA, which thoroughly discusses the suitability of potential habitat and additional spadefoot surveys, as they are recommended in the BRA.

2) CDFW Comments regarding the BRA's Conclusions and Recommendations Section:

Rare Plants

CDFW concurs with the BRA's recommended avoidance and minimization measures for rare plants.

Western Spadefoot

CDFW concurs with the BRA to perform pre-construction surveys for western spadefoot, however

because breeding and egg laying normally occur from late winter to the end of March, surveys should not occur before January. Surveys should not occur during/after low or below-average precipitation seasons due to the information detailed in section 1, above.

CDFW strongly recommends performing supplemental spadefoot surveys *before* the draft environmental document is released. This will allow the Lead Agency to disclose the results in the environmental document and if applicable, include avoidance and minimization and mitigation measures to reduce potential impacts to less than significant.

Bats

CDFW does not find the BRA's recommendation adequate for potential impacts to bats. CDFW recommends integrating the Avoidance and Minimization Measures as they are written below.

If the Project will impact trees with cavities, crevices and/or exfoliated bark, a thorough survey of such trees should be conducted by a qualified biologist familiar with bats to determine habitat suitability. Mature trees with cavities, crevices and/or exfoliated bark should be clearly marked, and the following should occur prior to their removal.

- Marked trees shall not be removed or disturbed during the bat maternity season, when young are non-volant (March 1 – Aug 31), or during the bat hibernacula (November 1 – March 1), when bats have limited ability to safely relocate roosts.
- Marked trees should be removed at dusk to minimize impacts to roosting bats, under the supervision of a qualified biologist.
- If trees cannot be removed at dusk, humane evictions should be conducted by or under the supervision of a biologist with specific experience conducting bat exclusions. Humane exclusions could consist of a two-day tree removal process whereby non-suitable bat habitat is removed and the remainder of the trees are removed on the second day. This two-step process changes the microhabitat of the area causing the bats to vacate the area under their own volition, therefore minimizing impacts to bats.

Migratory Birds and Raptors

CDFW concurs with the BRA's recommended avoidance and minimization measures for migratory birds and raptors.

3) Other Applicable CDFW Comments and Recommendations:

Blue Oak Woodlands

Blue Oak Woodlands throughout Shasta County continue to be removed with limited mitigation measures, resulting in a cumulative permanent loss of oak woodlands throughout the region. While the Project's proposed impacts to oak woodland habitat appears relatively small, proposed impacts include permanent removal. CDFW strongly recommends designing around and retaining large, mature oak trees identified within the Project area.

Lake and Streambed Alteration Agreement

The DDAR states "*This large off-site wetland appears to have a loose hydrologic connection to a system of man-made drainage ditches that flow under Highway 44 to the south and eventually flows*

into a series of unnamed tributaries of Stillwater Creek". Based on the potential for hydrological connection of onsite wetlands to streams that fall under CDFW jurisdiction, Notification via Fish and Game Code Section 1600 may be applicable. To obtain information about the 1600 Notification process, please access the Department's website at: https://www.wildlife.ca.gov/Conservation/LSA.

Low Impact Development

This Project occurs adjacent to wetlands therefore, CDFW recommends the implementation of Low Impact Development (LID) strategies to ensure no-net-increase in stormwater runoff from newly developed areas. LID strategies include permeable pavement, vegetated stormwater bio-swales and retention basins to treat, retain and infiltrate stormwater runoff on-site. These LID strategies are typically designed to prevent project generated stormwater runoff from exceeding that of a 2-year storm event and to protect water quality and manage stormwater as close to its source as possible, thus mitigating potential flooding and pollution problems. Ideally, post project stormwater run-off volume, rate and duration will match pre-project conditions and hydro modification would not occur as a result of the Project. CDFW supports the use of LID strategies because they minimize impacts to aquatic habitats by filtering out pollution, preventing increased peak flows and related erosion, and because LID strategies increase ground water recharge and therefore help maintain biologically important summer low flows in local waterways.

Native Vegetation in Landscaping

According to the Plant Schedule, approximately half of the 143 trees proposed for planting are species native to California. As previously stated, CDFW recommends utilizing vegetation native to the local area in landscaping whenever possible. Benefits of utilizing native vegetation in landscaping include providing resources for native wildlife such as hummingbirds and beneficial pollinators, conserving water, reducing pesticide use, and reducing landscaping maintenance. The CNPS website (https://www.cnps.org) includes a variety of useful information and tools to help determine which native species occur in a particular area, information on care and maintenance of native species, and contacts for purchasing native plants or seeds. The CNPS tool Calscape (https://calscape.org/) generates a list of native plants that grow in an area based on a specific address and can be used to develop a planting palate for landscaping plans. For more information regarding the importance of using native species in landscaping, please see the CNPS Guidelines for Landscaping to Protect Native Vegetation from Genetic Degradation at: https://www.cnps.org/wpcontent/uploads/2018/04/landscaping.pdf.

For all future early consultation requests, e-mail R1CEQARedding@wildlife.ca.gov and please allow 15 days or more for CDFW's review of early consultation requests.

Kind Regards,
Erika

References:

Biesmeijer, J. C., S. P. M Roberts, M. Reemer, R. Ohlemiller, M. Edwards, T. Peeters, A. P. Schaffers, S. G. Potts, R. Kleukers, C. D. Thomas, J. Settele, and W. E. Kunin. 2006. Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands. Science 313(5785): 351-354

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Erika Iacona
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R1 Interior Habitat Conservation Planning
(530) 806-1389
601 Locust Street
Redding, CA 96001
CALIFORNIA DEPARTMENT OF FISH and WILDLIFE

Attachment F
Tree Inventory Memo

gallaway ENTERPRISES

117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

December 6, 2021

Paul Heintz
425 Market St
Oakland, CA
(415) 265-6524
pheintz@pacesupply.com

Re: Tree Inventory for the JW Wood Expansion Project, Shasta County, CA

Mr. Heintz:

Gallaway Enterprises conducted a Tree Inventory for the JW Wood Expansion Project (Project) on November 17, 2021. A summary of the results of the inventory conducted is included herein.

Project Location and Environmental Setting

The Project site is within the Redding city limits, north of the existing JW Wood facility located at 3676 Old 44 Drive. The site falls within the Enterprise quadrangle, Section 3, Township 31N, Range 04W; latitude 40.565318, longitude -122.301439. The Project site is currently vacant land dominated by disturbed annual grassland habitat and a few small patches of oak trees. A few seasonal wetlands are also located within the Project site. The site is bounded to the east and south by industrial developed land, to the north by a large composting facility, and to the immediate west by open land.

Regulatory Framework

City of Redding

The Project site is located within the City of Redding and, therefore, requires compliance with the Redding Zoning Ordinance. Pursuant to Chapter 18.45 of the Redding Zoning Ordinance, removal of any tree exceeding 6 inches in diameter at breast height (DBH) requires a tree removal permit. The provisions for tree removal are described in Section 18.45.060 of the Zoning Ordinance.

Survey Method

The Tree Inventory was conducted on November 17, 2021 by ISA Certified Arborist Elena Gregg and assisted by botanist Laura Lampe. The Tree Inventory was conducted according to the guidelines outlined in the City of Redding's *Trees & Construction: A Guide to Preservation*. All trees present within the Project site with a DBH of 6 inches or greater were identified and their locations recorded using a Trimble Geo Explorer 6000 Series GPS Receiver. Gallaway Enterprises then conducted a health assessment for all of the trees identified. A level 2 basic visual assessment (per ISA's ANSI A300 Part 9 and companion BMP guidelines) of each tree was conducted from the ground by walking completely around the tree and

looking at the growing site, trunk, trunk collar, and branches. Standing dead trees were not mapped or assessed for DBH or condition.

Following this visual assessment, each inventoried tree was assigned a health rating of 1 to 5, with 1 being a tree with poor health and 5 being a tree in excellent health. The ratings were based on the following standards:

1: These trees have a major defect that could result in instability of the tree or a portion of the tree failing that could be considered a hazard. The defect is typically extensive dead and/or decay.

2: These are generally sound trees but often have prominent leans, trunk elongation from competition with other trees, or general branching defects. Other potential health detractors include excessive deadwood or decay in the branches or overgrowth by vines.

3: These are average trees; they are generally in good health and without prominent defects in their branching pattern and overall structure. These trees also have adequate growing room and are not overgrown with vines (e.g. mistletoe, ivy, grape, blackberry).

4: These trees are above average, with good branch form. The trees are not overcrowded or light-starved and have plenty of room to grow. These trees often look much like a "3" except they are larger, older, and better established in the tree stand.

5: These trees are considered excellent in all aspects: form, branching, and structure.

Results of the Survey

Native oaks within the Project site consisted of blue oaks (*Quercus douglasii*). A total of 14 blue oaks were surveyed within the Project site (**Attachment A**). The average DBH of native oak trees present on the Project site is 12.87 inches. The oak tree canopy present within the Project site has been estimated at approximately 0.10 acres[1], which constitutes approximately five percent of the Project site. Also, on the Project site were a Pacific willow (*Salix lasiandra*) and Fremont's cottonwood (*Populus fremontii*).

A table listing each tree surveyed within the Project site and its assessed health rating is provided in **Attachment A** along with the tree location map. Photos documenting the conditions of stands on the site are provided as **Attachment B**.

A level 2 basic visual assessment from ground level was conducted; however, visual signs of decline may not have been outwardly evident or evident from the ground surface. As such, the accuracy of the heath rating is limited by the visual appearance of the trees at the time of the survey. An Arborist's Disclaimer Statement is provided as **Attachment C**.

[1] Oak canopy was roughly estimated by assuming an average 20-foot diameter dripline for each oak tree with a six inch or greater DBH identified on the Project site.

Recommendations

It is recommended that as many healthy native tree species (trees with a health rating of 3 or greater, **Attachment A**) as feasible be retained within the Project site due to their aesthetics and usefulness to wildlife.

The removal of any City regulated trees (heritage trees and native oaks with a single trunk 6 inches or greater or multiple trunks 10 inches in aggregate or greater in DBH) on the Project site must be in compliance with the City's zoning ordinance. City regulated trees present within the Project site include 14 blue oak trees, one Fremont's cottonwood and one Pacific willow tree. If regulated trees are proposed to be removed on the site, a tree removal permit will be required to be obtained from the City. Mitigation for removal of trees will be determined through consultation with the City.

If any of the trees present within the Project site are proposed for preservation, care should be taken to implement the avoidance and minimization measures outlined in the City of Redding's *Trees & Construction: A Guide to Preservation*. If construction activities or soil compaction occur within the dripline of a tree proposed for preservation, these activities may harm the tree to the point of failure. Preserved trees in close proximity to structures or walkways should be regularly monitored by a qualified arborist following construction activities for signs of stress or failure and properly managed (e.g. pruning dead branches, ensuring appropriate water regime for the species).

Should you have any questions or need any additional information on managing trees during construction, please do not hesitate to contact me at (530) 332-9909 or elena@gallawayenterprises.com.

Sincerely,



Elena Gregg, ISA Certified Arborist (WE-8033A)
Gallaway Enterprises

Attachment A: Tree Location Map and Tree Data Table
Attachment B: Project Site Photos
Attachment C: Arborist's Disclaimer

Attachment A

Tree Location Map and Tree Data Table



1:600

0 25 50 Feet

NORTH

Data Sources: ESRI, Shasta County, Maxar 02/25/2020

JW Wood Permitting
Tree Location Map
Attachment A

gallaway ENTERPRISES

GE: # 21-086 Map Date: 11/29/2021

Attachment A								
JW Wood Tree Inventory								
Tree Tag #	Species	Health	Dripline	DBH_1	DBH_2	DBH_3	Total DBH	Comments
1	Blue Oak	3	7	7	0	0	7	measured @ 38in due to low crotch
2	Blue Oak	4	16	14	8	0	22	above average
3	Blue Oak	3	12	12	0	0	12	lots of poison oak
4	Blue Oak	2	9	13	0	0	13	suckering, cavities, erosion, thin crown
5	Blue Oak	2	9	14	0	0	14	decay up trunk, lots of dead
6	Blue Oak	2	9	13	0	0	13	poison oak, significant lean, crowded
7	Blue Oak	3	12	15	0	0	15	some suckering, slightly crowded
8	Blue Oak	2	14	16	0	0	16	some dead, poor crotch, some suckering
9	Blue Oak	3	13	14	0	0	14	slight lean, some dead
10	Fremont's Cottonwood	1	9	15	0	0	15	lots of dead
11	Pacific Willow	1	12	12	12	10	34	lots of dead, significant decay
12	Blue Oak	2	9	9	0	0	9	very poor form, some dead
13	Blue Oak	3	12	12	0	0	12	some dead, poison oak
14	Blue Oak	2	9	8	0	0	8	some suckering, dead, decay, slight lean
15	Blue Oak	3	13	18	0	0	18	some poor branching, poison oak
16	Blue Oak	4	18	20	0	0	20	some dead

Attachment B

Project Site Photos Taken November 17, 2021



Tree #16 looking west.



Oak tree stand overview including trees #13-15 in foreground and #2-4 in background



Tree #11 – note significant amount of dead present

Attachment C

Arborist's Disclaimer Statement

Arborists are tree specialists who use their education, knowledge, training, experience, and research to examine trees and woodlands. Arborists recommend measures to enhance the beauty and health of trees and forests, while attempting to reduce the risk of living near them. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms subject to attack by disease, insects, fungi and other forces of nature. There are some inherent risks with trees that cannot be predicted with any degree of certainty, even by a skilled and experienced arborist. Arborists cannot predict acts of nature including, without limitation, storms of sufficient strength, which can cause even a healthy tree to fail. Any entity who develops land and builds structures with a tree in the vicinity should be aware and inform future residents of the risks of living with trees and this arborists disclaimer.

Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise remedial treatments cannot be guaranteed 100%.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services, such as property boundaries, property ownership, disputes between neighbors and other issues. Consulting arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborist by the client. An arborist should then be expected to reasonably rely upon the completeness and accuracy of the information provided.

Neither this author nor Gallaway Enterprises has assumed any responsibility for liability associated with the trees on or adjacent to this project site, their future demise and/or any damage, which may result therefrom. To live near trees is to accept some degree of risk.

Elena Gregg
ISA Certified Arborist WE-8033A
Gallaway Enterprises

Attachment G

2021-2022 Wet Season Branchiopod Survey

2021-2022 Wet Season Branchiopod Survey

For the

JW Wood Expansion Project

90-Day Findings Report
USFWS Reference # 2022-TA-0307

March 2022



Prepared for:
U.S. Fish and Wildlife Service, Sacramento Office
2800 Cottage Way W-2605
Sacramento, CA 95825-1888

Prepared by:

Gallaway Enterprises
117 Meyers Street, Suite 120
Chico CA 95928
(530) 332-9909
www.gallawayenterprises.com

2021-2022 WET SEASON BRANCHIOPOD SURVEY

JW WOOD EXPANSION PROJECT

Prepared for:
U.S. Fish and Wildlife Service,
Sacramento Office
Attn: Sarah Markegard
2800 Cottage Way W-2605
Sacramento, CA 95825-1888

Prepared by:
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MARCH 2022

SUMMARY OF FINDINGS

Gallaway Enterprises performed a wet-season vernal pool branchiopod survey within the JE Wood Expansion Project (Project) in Redding, Shasta County, California, in accordance with the U.S. Fish and Wildlife Service's *Survey Guidelines for the Listed Large Branchiopods* dated November 13, 2017. Surveys were initiated on November 11, 2021 and continued until February 3, 2022 within wetland features that met the minimum requirements for vernal pool branchiopods. All wetland features, including vernal pools, vernal swales, and seasonal wetlands within the Property were observed to determine if they met the minimum requirements for vernal pool branchiopods. A total of four features or portions of features ponded water to a depth of 3 cm or greater and were able to be sampled in efforts to determine the presence/absence of federally listed vernal pool branchiopods. The surveys were conducted due to the high potential for occurrence of federally listed vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardi*) within the site and the presence of CNDDB records of these two species within 5 miles of the Property. During the 2021-2022 wet-season surveys no federally listed branchiopods were observed within the Property.

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Appendix A – USFWS Wet-Season Sampling Authorization
Appendix B – Sampling Table
Appendix C – USFWS Vernal Pool Data Sheets
Appendix D – Survey Location Photographs

Exhibit A – Wet Season Sampling Location Map

1.0 INTRODUCTION

The JW Wood Expansion Project (Project) is an approximately 2-acre parcel (APN 109-010-051) located within the U. S. Geological Survey (USGS) Enterprise Quadrangle, Section 3 of Township 31 N, Range 04 W. The Property is located on at 3676 Old 44 Drive in Redding, Shasta County, CA (**Figure 1**). The Property is composed of annual grassland and blue oak woodland with a few seasonal wetlands present. Commercial development and a small area of open land surround the Project.

1.1 Purpose of the Survey

A wet-season survey was conducted to establish feature by feature presence or absence of listed vernal pool branchiopods to confirm the presence of listed large branchiopods for potential conservation purposes. A complete protocol-level survey per U.S. Fish and Wildlife Service (USFWS) guidelines consists of one wet-season survey and one dry-season survey conducted in any order within a 3-year period. A dry-season survey was conducted by ENPLAN within a survey area that included this Project site in 2008 with negative results, but no current dry-season survey has been conducted.

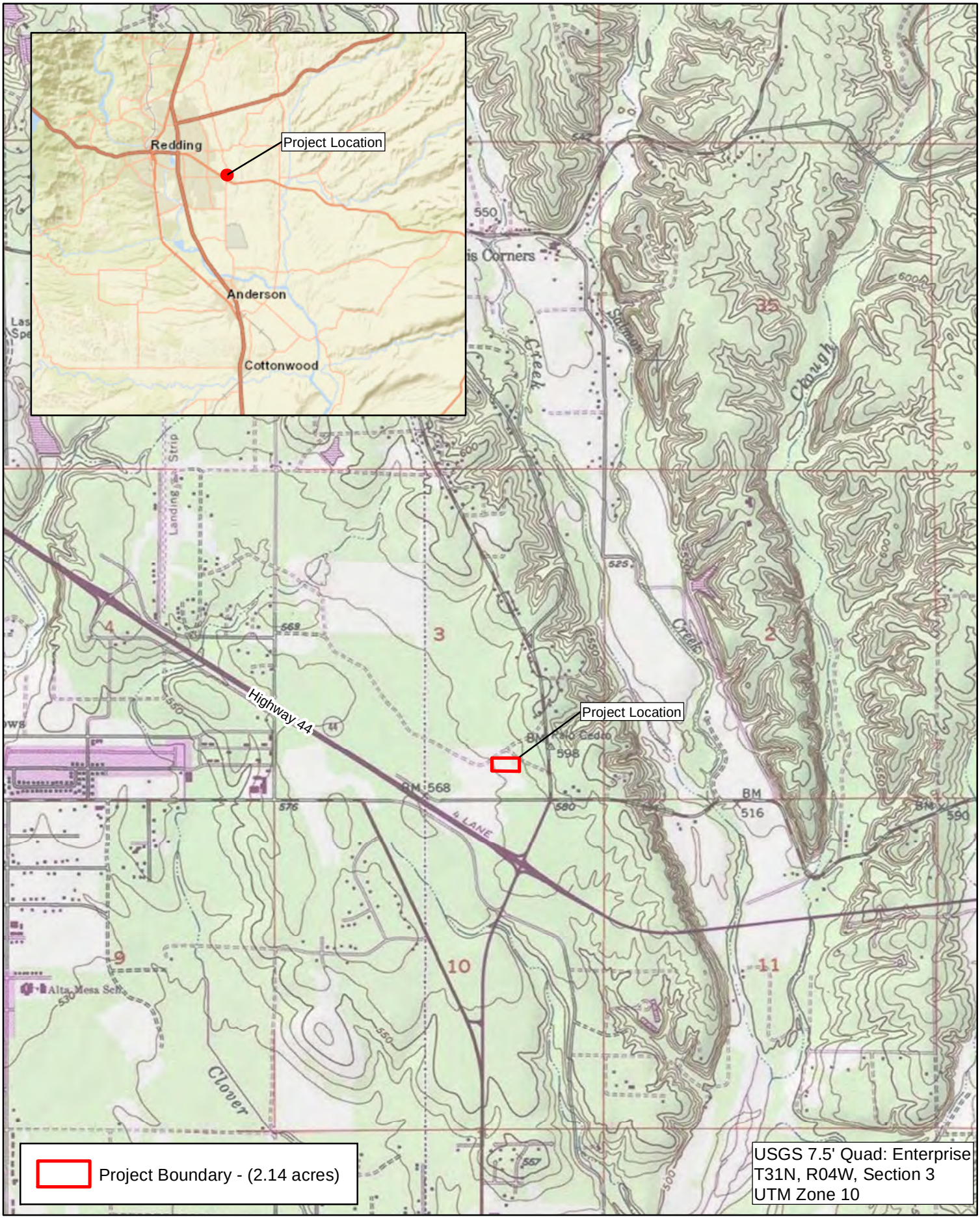
Written authorization from the USFWS to conduct the surveys for the JW Wood Expansion Project was received November 4, 2021 via e-mail from Dou-Shuan Yang (USFWS Reference No. 2022-TA-0307, **Appendix A**).

For the purpose of this report, the term branchiopod refers strictly to the two federally listed vernal pool invertebrate species that have the potential to occur within the site: vernal pool fairy shrimp (*Branchinecta lynchi*) and vernal pool tadpole shrimp (*Lepidurus packardi*).

The following wet-season report is being submitted in accordance with the conditions of the USFWS Permit TE-13632B-1. This document follows the reporting format outlined in the November 13, 2017 USFWS *Survey Guidelines for the Listed Large Branchiopods* (USFWS Guidelines).

2.0 PROJECT DESCRIPTION

The proposed Project includes the expansion of the existing JW Wood facility located to the immediate south of this Project survey area within the same parcel.



1:24,000

0 0.25 0.5 Miles

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Regional Location
Figure 1

gallaway ENTERPRISES

GE: #21-086 Map Date: 01/20/2022

3.0 METHODOLOGY

3.1 Survey Methodology

Surveys were conducted according to the USFWS Guidelines. Upon receipt of USFWS approval to survey the site (**Appendix A**), surveys were initiated after the first seasonal storm event to determine when pools/swales were inundated over 3 cm. The sampling period began November 11, 2021 after the first significant rain event, until February 3, 2022 when the features sampled had dried or remained ponded for over 90 consecutive days. Once inundated, pools and swales were sampled every two weeks. The Property contained varying sizes of wetland features, with only one feature remaining inundated for over 90 consecutive days (**Appendix B**). Pools were evaluated during each site visit and sampled if they contained greater than 3 cm of water. At each site visit, the survey area was traversed on foot. Sampling was done with a 0.5-mm mesh, long-handled D-net. A representative sample of each pool/swale's micro-habitats, including the bottom, edges and vertical water column was collected; and netted contents were examined either within the bag of the net, or transferred to a bucket and examined by portions in a white or clear sorting pan.

Botanist/biologist Elena Gregg (TE-13632B-1) performed the field surveys and was aided by biologist Laurens Kuypers.

4.0 HABITAT DESCRIPTION

4.1 Environmental Setting

The Project site is currently vacant and is dominated by disturbed annual grassland with small stands of oak trees. The Project site is primarily flat except for seasonal wetland depressions occurring throughout the site and one man-made mound. Human disturbance on the site consists of disking along the boundaries for fire safety, some historic excavation and spoil piles and vehicle tracks. Open land containing a large seasonal wetland occurs to the immediate west of the Project. A major composting facility occurs adjacent to the Project to the north, and commercial properties occur along the eastern and southern boundaries. Direct precipitation, surface runoff from the adjacent composting facility to the north, and outfall from an off-site leaky tank function as the main hydrological inputs for the seasonal wetlands located within the Project site.

The average annual precipitation for the area is 33.68 inches and the average temperature is 62.45° F (Western Regional Climate Center 2022) in the region where the Project is located. The Project site averages 575 feet above sea level in elevation and is sloped between 0-3 percent.

Soils within the survey area are gravelly loams with a restrictive layer ranging from 10 to 40 inches in depth.

Within the site the vegetation community is comprised of annual grassland and blue oak woodland. Aquatic palustrine habitat, including seasonal wetlands and swales, occurs embedded within the annual grassland habitat. During the winter field visits, vegetation within the uplands present included: soft chess (*Bromus hordeaceus*), hawkbit (*Leontodon saxitilis*), yellow star thistle (*Centaurea solstitialis*), prickly lettuce (*Lactuca serriola*), Fitch's spikeweed (*Centromadia fitchii*), and medusahead (*Elymus caput-medusae*). The wetlands present were dominated by perennial rye-grass (*Festuca perennis*), Mediterranean barley (*Hordeum marinum ssp. gussoneanum*), hawkbit, dallisgrass (*Paspalum dilatatum*), water-starwort (*Callitriche sp.*), popcorn flower (*Plagiobothrys sp.*), and iris-leaved rush (*Juncus xiphioides*).

4.2 Determination of Branchiopod Habitat

The wetland features within the Property were initially delineated in 2021. A map depicting the delineated wetland features and corresponding numbers was referenced during each site visit to determine the features that ponded water for sufficient amounts of time to support branchiopods (**Exhibit A**). All ponded features with the potential of supporting the life cycle of any of the listed vernal pool branchiopods were sampled and recorded on Data Sheets (**Appendix C**). Pictures of the survey area are provided in **Appendix D**.

4.3 Vernal Pools and Swales

Within the Property, all features were checked for ponded water 3cm deep or deeper. One of the five features mapped within the Project site, WF03, was determined to be not suitable habitat for large branchiopods and never ponded water during the 2021-2022 wet-season. All of the remaining four features present ponded water at the minimum depth for long enough duration to be sampled (**Exhibit A**). Of the four features sampled, one of them (WF02) remained ponded for 90 consecutive days. The three remaining features sampled were observed ponding water to a depth of 3 inches or greater for over 77 consecutive days.

5.0 SURVEY RESULTS

5.1 Results

Wet-season surveys conducted within the Property resulted in negative findings. Data sheets can be found in **Appendix C**.

5.1.1 Sampling Locations

All the wetland features or portions of features supporting the parameters to potentially sustain the life cycle of vernal pool branchiopods within the Property during the 2021-2022 wet-season survey are depicted in **Exhibit A**.

5.1.2 Species Identified and Population Size

General species encountered in pool communities on the site included large quantities of mosquito larvae (Diptera; Culicidae), seed shrimp (ostracods), and copepods, flatworms (platyhelminths), diving beetle (coleoptera) adults and larvae, water boatmen (corixids) and various midge fly larvae (Diptera; Chironomidae).

6.0 SUMMARY

Precipitation events during the 2021-2022 wet-season occurred primarily in the months of November and December. A total of five wetland features were identified within the Project site pursuant to the formal delineation of aquatic resources prepared by Gallaway Enterprises. Of the five features present, one feature, WF03, was determined to not be habitat for listed large branchiopods and never ponded water for long enough duration to be sampled during the entire wet-season. The remaining four seasonal wetlands were observed to be consistently ponding water throughout the wet-season and were sampled for listed large branchiopods.

Although the 2021-2022 wet-season was considered a drought year, all of the four seasonal wetlands containing suitable habitat for listed large branchiopods were observed ponding water for a minimum of 77 consecutive days. No federally listed branchiopods were observed within the Project site. During the sampling efforts, a variety of common freshwater invertebrates were observed in the features sampled.

11.0 REFERENCES CONSULTED

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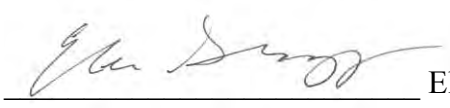
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Thorp, J.H. and A.P. Covich (eds). 2001. Ecology and classification of North American freshwater invertebrates (2nd ed.). Academic Press. San Diego, CA.

USFWS. 2017. Survey Guidelines for Listed Large Branchiopods. USFWS Pacific Southwest Region, Sacramento, CA. November 13, 2017.

12.0 STATEMENT OF SURVEYORS

"*I certify that the information in this survey report and attached exhibits fully and accurately represent my work*".



Elena Gregg (#TE-13632B-1)

APPENDIX A

USFWS Wet-Season Sampling Authorization

Elena Gregg

From: Yang, Dou-Shuan <dou-shuan_yang@fws.gov>
Sent: Friday, November 05, 2021 7:44 AM
To: Elena Gregg
Cc: Lantz, Samantha M; Havens, Michelle R
Subject: Survey request for vernal pool branchiopods at JW Wood Expansion Project in Palo Cedro, California

Ms. Gregg,

By this email message, you are authorized to conduct listed vernal pool branchiopod wet and dry season surveys, as specified in your November 3, 2021 email request, per the conditions of your recovery permit (TE-13632B-1). You propose to conduct surveys at the JW Wood Expansion Project site at Old 44 Drive in Palo Cedro, Shasta County, California.

You may conduct surveys within all suitable habitat on the site including both previously-identified and not previously-identified wetlands. Please remember to carry a copy of your permit while doing the work and to follow the terms and conditions of the permit, including the reporting requirements and decontamination procedures. In your report(s), please include which activities were authorized, the names of all persons involved in each activity, their recovery permit numbers, if applicable, and the date of this authorization, to help ensure that we correctly record the fulfillment of the reporting requirement under this authorization. Please let us know if the activities are not performed as authorized, or if they are done by a different permittee under a separate authorization. This authorization does not include access to the property which must be arranged with the landowner or manager. Please send electronic copies of the report(s) to Michelle Havens (cc'd here) and myself and use Service Reference #: 2022-TA-0307 in future correspondence regarding these surveys.

We ask that you use UTM coordinates for all spatial data. To ensure the accuracy and data integrity of your project, it is requested that you provide spatial information (boundaries, study areas, parcels, point locations, etc.) in the form of an ESRI shape file with projection, a GPS file with projection, or locations in an Excel spreadsheet with projection information. The preferred projection is UTM, Zone 10S, NAD83; the Sacramento Fish and Wildlife Office (SFWO) standard. FGDC compliant metadata must accompany each file. Please include any USFWS File Numbers associated with the data in your documentation. For additional information regarding metadata standards refer to http://www.fgdc.gov. For more information regarding spatial data please contact: Cheryl L. Hickam, GIS Branch Chief, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W-2605, Sacramento, CA 95825-1846, office: 916-414-6708, email: cheryl_hickam@fws.gov.

Please let me know if you have any questions.

Dou-Shuan Yang, PhD
Biologist
U.S. Fish & Wildlife Service
Listing and Recovery Division
Sacramento Fish and Wildlife Office
2800 Cottage Way
Sacramento, California 95825-1846

APPENDIX B

Sampling Table

	Sampling Day/Ponded Water Presence								
Feature #	1	2	3	4	5	6	7	Total Times Sampled	Approx. Days of Consecutive Ponding
WF 01	X	X	X	X	X	X		6	77
WF 02	X	X	X	X	X	X	X	7	90
WF 04	X	X	X	X	X	X		6	77
WF 05	X	X	X	X	X	X		6	77

APPENDIX C

USFWS Vernal Pool Data Sheets

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: JW Wood Expansion | **County:** Shasta | **Quad:** Enterprise | **Township:** 31N | **Range:** 4W | **Section:** 3

SURVEYOR / Permit Number: Elena Gregg / TE-13632B-1

Date: 11/11/21 | Time: 10 am | Weather Conditions: Sunny – rained w/in 2 days

Feature ID #	UTM (Northing, Easting, Datum) NAD83 Zone 10	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			Site has a history of physical disturbance but not terribly recent.
WF02	559096 E 4490743 N	23	14	12	25	37x22 + 30x10	↔			X	few X		X	X	many X			D/TT UG, AB	Snails, feature recieves runoff
WF01	559088 E 4490730 N	24	18	8	20	16x12	16x12			X			X	X	many X			NP/UD, UG, AB	Corixidae + Notonectidae
WF04	559112 E 4490732 N	26	18	7	15	18x11	18x11			X			X	X	many X	X		↓	
WF03		→	Not habitat - not deep enough to be sampled															—	
WF05	559106 E 4490744 N	26	18	3	6	10x3	10x3			X	X							NP/UD, UG, AB	

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli)*.
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: JW Wood Expansion | **County:** Shasta | **Quad:** Enterprise | **Township:** 31 N | **Range:** 4 W | **Section:** 3

SURVEYOR / Permit Number: E. Gregg / TE-13632 B-1

Date: 11/24/21 | Time: 10:40 am | Weather Conditions: Sunny + Breezy

Feature ID #	UTM (Northing, Easting, Datum)	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			Phantom midges found in all features. Lots of mosquito larvae in all features.
WF02		17	9	10		27x12 + 9x12				X	X		X	X	X	X	X	AB	
WF01		17	14	5		9x8				X	X		X	X	X	X		AB	
WF04		21	14	8		5x13				X	X		X	X	X	X		AB	
WF03	→			no water present / not habitat															
WF05		21	14	3	10	10 x 2				X	X		X		X	X	X	AB	

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli*).
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: JW Wood Expansion | **County:** Shasta | **Quad:** Enterprise | **Township:** 31 N | **Range:** 4 W | **Section:** 3

SURVEYOR / Permit Number: E. Gregg / TE-13632B-1

Date: 12/09/21 | Time: 11:15 am | Weather Conditions: Sunny + Breezy

Feature ID #	UTM (Northing, Easting, Datum)	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			
WF 02		15	12	10	25	15x7 37x15				X	X		X	X	X (few)	X	X	AB	Phantom midges
WF 01		15	13	5	15	7x10				X	X					X		AB	
WF 04		15	13	6	15	18x5				X	X		X		X (few)	X (many)		AB	Phantom midges
WF 05		15	13	5	10	10x2				X	X		X		X	X		AB	

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli*).
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: JW Wood Expansion	**County:** Shasta	**Quad:** Enterprise	**Township:** 31 N	**Range:** 4 W	**Section:** 3
SURVEYOR / Permit Number: E. Gregg / TE-13632B-1					
Date: 12-23-21	**Time:** 12:30 pm	**Weather Conditions:** Cloudy + Sprinkling			

Feature ID #	UTM (Northing, Easting, Datum)	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			
WF 02		8	9	10	25	↔				X (many)	X		X		X (few)	X		AB	
WF 01		8	9	13	17	↔				X	X		X	X		X		AB	
WF 04		8	9	9	15	↔				X	X		X		X (few)	X			
WF 05		8	9	3	10	↔				X	X		X			X		AB	

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli*).
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: JW Wood Expansion | **County:** Shasta | **Quad:** Enterprise | **Township:** 31 N | **Range:** 4 W | **Section:** 3

SURVEYOR / Permit Number: E. Gregg / TE-13632B-1

Date: 1/6/22 | Time: 10:30 am | Weather Conditions: Cloudy + foggy

Feature ID #	UTM (Northing, Easting, Datum)	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			
WF02		11	9	12	30	20x10 16x15				X	X		X		X	X	X	Turbid	snails PH 7.03 + 7.04
WF01		11	10	15	20	13 x 8				X	X		X		X	X	X		snails PH = 7.27
WF04		11	11	12	16	↔				X	X		X	X	X	X	X		phantom midges PH = 7.08
WF05		11	10	6	16	↔				X	X		X		X	X	X		springtails PH = 7.73 + 7.26

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli*).
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: SW Wood Expansion	**County:** Shasta	**Quad:** Enterprise	**Township:** 31 N	**Range:** 4 W	**Section:** 3

SURVEYOR / Permit Number: E. Gregg / TE-13632B-1

Date: 1-19-22 | Time: 10:30 am | Weather Conditions: Sunny, Breezy

Feature ID # (circuit #)	UTM (Northing, Easting, Datum)	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			
WF02		18	9	10	20	12x9 32x28				X	X		X	X	X many	X	X		phantom midge
WF01		18	11	5	10	12x12				X	X		X		X	X	X		phantom midge
WF04		18	9	8	13	18x18				X	X		X	X	X	X	X		phantom midge
WF05		18	8	5	13	10x3				X	X		X		X	X	X		phantom midge
WF03 → not habitat - dry																			

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli)*.
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

Appendix 1. U.S. Fish and Wildlife Service – Data Sheet for Wet Season Surveys For Listed Large Branchiopods

Site or Project Name: JW Wood Expansion | **County:** Shasta | **Quad:** Enterprise | **Township:** 31N | **Range:** 4W | **Section:** 3

SURVEYOR / Permit Number: E. Gregg / TE-13632B-1

Date: 2-3-22 | Time: 11:40 am | Weather Conditions: Sunny, breezy

Feature ID #	UTM (Northing, Easting, Datum)	Temp (°C)		Depth (cm)		Surface Area (m x m)		Crustaceans					Insects				Platyhelminths (flatworms)	Habitat Condition	Notes / Voucher information
		Air	Water	Average	Est. Max.	Present	Est. Max.	Anostracans	Notostracans	Copepods	Ostracods	Cladocera	Coleoptera	Hemiptera	Diptera Culicidae	Diptera Chironomida			
WF02		21	12	4	10	2x 5				X	X		X	X	X	X			Phantom midge
all other features dry – took pics of all																			

Notes: Fill in abbreviated names of Anostracans and Notostracans, for all others indicate presence with a check mark. Anostracan and Notostracan Abbreviations: Use first two letters of genus and species name (e.g., LIOC = *Linderiella occidentalis*, BRLI = *Branchinecta lindahli)*.
For habitat conditions use two letter abbreviation as follows: NP = Natural Pool, CP = Constructed Pool; UD = undisturbed, D = disturbed: with TT = tire tracks, T = trash, P = plowed; G = grazed, UG = ungrazed by: C = cattle, H = horses, S = sheep; AB = Algal blooms present.
(Estimate grazing regime by height of grasses and forbs and density of hoof prints) LG = light grazing, MG = moderate grazing, HG = heavy grazing.

APPENDIX D

Survey Location Photographs



WF01 taken 11/11/21



WF04 taken 1/6/22



WF03 taken 11/11/21



WF05 taken 1/6/22



WF02 taken 11/24/21

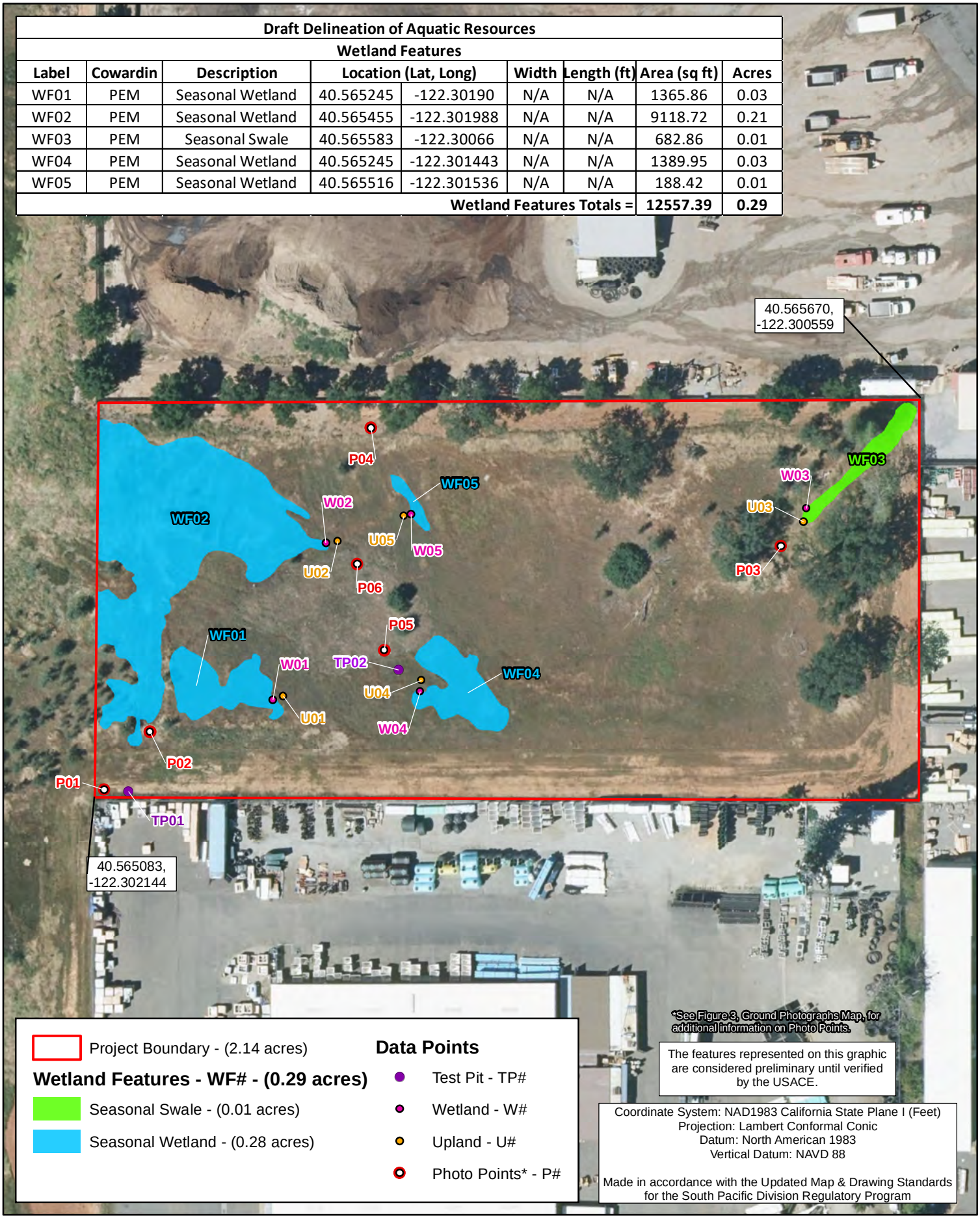


WF02 taken 2/3/22

EXHIBIT A

Wet Season Sampling Location Map

Draft Delineation of Aquatic Resources								
Wetland Features								
Label	Cowardin	Description	Location (Lat, Long)		Width	Length (ft)	Area (sq ft)	Acres
WF01	PEM	Seasonal Wetland	40.565245	-122.30190	N/A	N/A	1365.86	0.03
WF02	PEM	Seasonal Wetland	40.565455	-122.301988	N/A	N/A	9118.72	0.21
WF03	PEM	Seasonal Swale	40.565583	-122.30066	N/A	N/A	682.86	0.01
WF04	PEM	Seasonal Wetland	40.565245	-122.301443	N/A	N/A	1389.95	0.03
WF05	PEM	Seasonal Wetland	40.565516	-122.301536	N/A	N/A	188.42	0.01
						Wetland Features Totals =	12557.39	0.29



NORTH

1:800 1 inch = 67 feet

0 50 100 Feet

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Draft Delineation of Waters of the U.S
Exhibit A

Delineated by: E. Gregg
Map by: A. McLaughlin

gallaway ENTERPRISES

GE: #21-086 Map Date: 01/18/2022

Attachment H

90 Day Report: Dry Season Surveys for Federally Listed Branchiopods

gallaway ENTERPRISES

117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

90-Day Report:
Dry Season Surveys for Federally Listed Branchiopods within the JW Wood Expansion Project, Redding, Shasta County, California
USFWS Reference Number: 2022-TA-0307

August 22, 2022

A dry season survey for listed branchiopods was conducted in August 2022 within the JW Wood Expansion Project (Project) site. The Project is located at 3676 Old 44 Drive in Redding, Shasta County, CA (APN 109-010-051) (**Figure 1**). The approximately 2-acre site occurs within the U. S. Geological Survey (USGS) Enterprise Quadrangle, Section 3 of Township 31 N, Range 04 W. Based on a preliminary wetland assessment of the site, the Project site contains 0.29 acres of wetland features. However, based on the results of the 2021/2022 wet-season sampling conducted within the Project, some of these features did not pond water for a long enough duration to support large branchiopods.

A dry-season survey was conducted by ENPLAN within a survey area that included this Project site in 2008 with negative results. There are California Natural Diversity Database (CNDDB) occurrences of *Lepidurus packardi* and *Branchinecta lynchi* within five miles of the Project. Therefore, there is a potential for *Branchinecta lynchi* and *Lepidurus packardi* to occur within suitable habitat within the Project site.

Soil samples were collected from all wetlands within the Project site by Gallaway Enterprises under the U.S. Fish and Wildlife Service (USFWS) Recovery Permit Number TE-13632B-1. Official authorization to collect the soil samples was provided by the USFWS via email on November 4, 2021. The soil samples were collected by permittee Elena Gregg on August 9, 2022. The location of the 5 soil samples collected is depicted on the map included as **Figure 2** to this letter.

Soil Collection Methods:

The 5 soil samples were collected on August 9, 2022 by permittee Elena Gregg. In the weeks prior to collecting the sample, only a light drizzle with a nominal amount of precipitation occurred within the Project site followed by sunny and hot weather. As such, the soil within the Project site was still completely dry when the soil samples were collected with no visible or tactile indicators of moisture present. The soil was collected by using a hand spade to take soil from the top 1 to 3 centimeters of the pool sediment. Whenever possible, the soil was pried up in chunks to decrease the likelihood of damaging cysts. Within each sampled pool, soil was collected mainly from the lowest micro-topographic areas within the pools. The collected soil was deposited into clean, quart-sized re-sealable bags that were labeled with the collection location information. The map depicting the location of the 5 wetlands where soil samples were taken is provided as **Figure 2**. After collecting the soil samples, the re-sealable bags were left open until they were mailed to D. Christopher Rogers for analysis in the laboratory on

August 9, 2022. The methodology used and results of the laboratory analysis conducted by Christopher Rogers is provided as **Attachment B** to this letter.

Results:

Based on the results of D. Christopher Rogers' soil analysis, cysts of only the non-listed California fairy shrimp (*Linderiella occidentalis*) were observed in one of the soil samples collected. The cysts were found within WF02 (**Figure 2**). Based on personal communication with D. Christopher Rogers (email dated August 22, 2022) the cysts observed were old and many were broken. Further, the pool where the cysts were found has been influenced by runoff from the adjacent composting facility to the north and during the wet-season sampling it was observed to contain a significant amount of organic debris. Based on additional personal communication with D. Christopher Rogers (email dated July 27, 2022) regarding if the runoff from the compost facility could be impacting the suitability of the habitat present for listed large branchiopods, D. Christopher Rogers stated "as the organic debris decomposes in the water it strips oxygen from the water column and pumps more CO^2 into it. This suffocates everything that has gills like crustaceans…. runoff from the composting plant has effectively made the pools it has reached unsuitable for most crustaceans including the listed branchiopods." This explains why cysts of California fairy shrimp were observed within WF02, but hatched adults were not observed during the wet-season sampling. This further indicates that the habitat present within the Project is currently not suitable for the presence or persistence of listed large branchiopods.

Based on the combined results of this dry-season sampling and the wet-season sampling conducted within the Project, no listed large branchiopods occur within the Project site.

Included as attachments are the following:
Figure 1: Location Map
Figure 2: Delineation of Aquatic Resources Map
Attachment A: Christopher Rogers Dry Season Crustacean Soil Analysis Report

I certify that the field work conducted by Gallaway Enterprises as described in this report and the associated attached map fully and accurately represent my work.

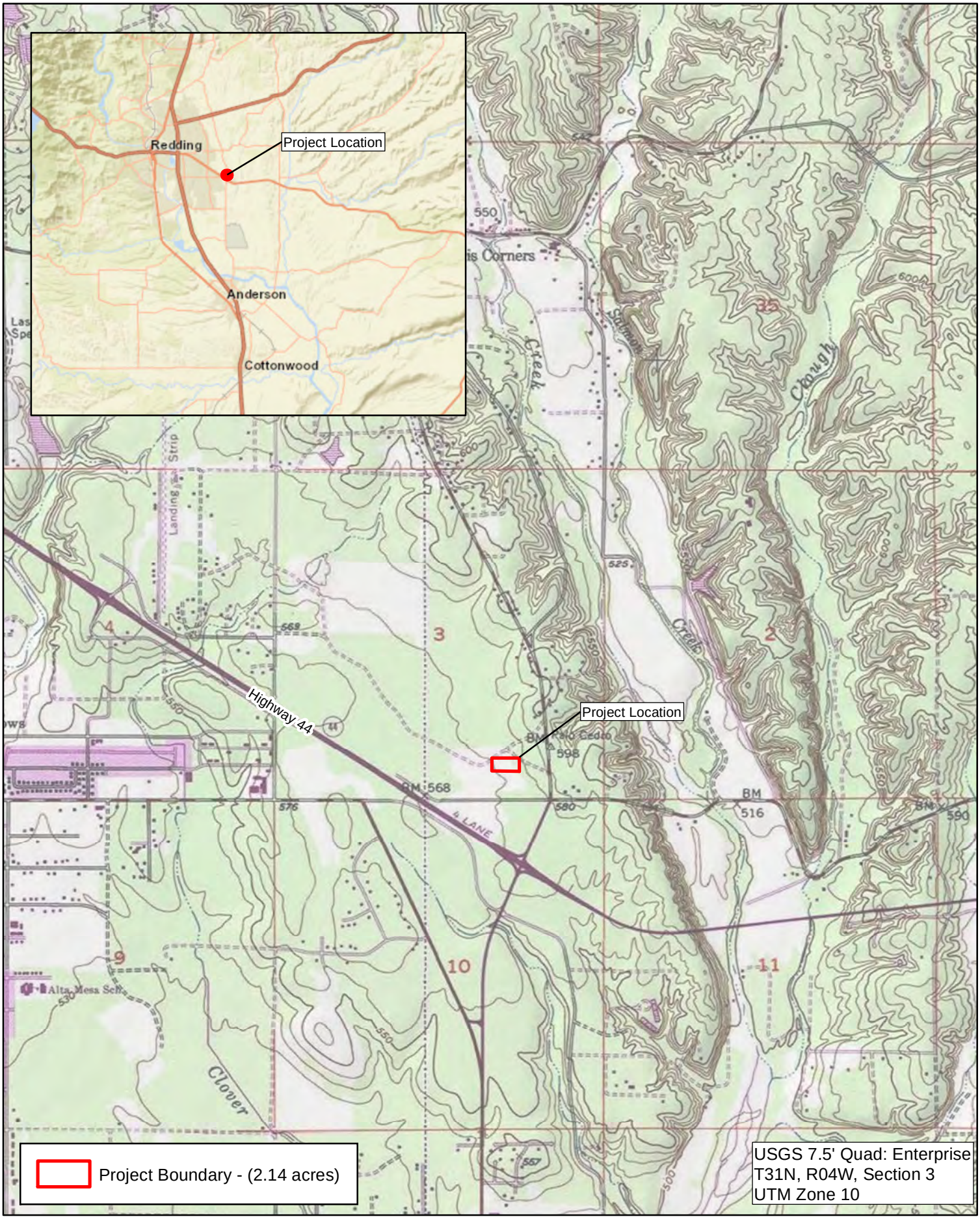
Prepared by,



Elena Gregg, Senior Botanist
Gallaway Enterprises

Figure 1

Location Map



1:24,000

0 0.25 0.5 Miles

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Regional Location
Figure 1

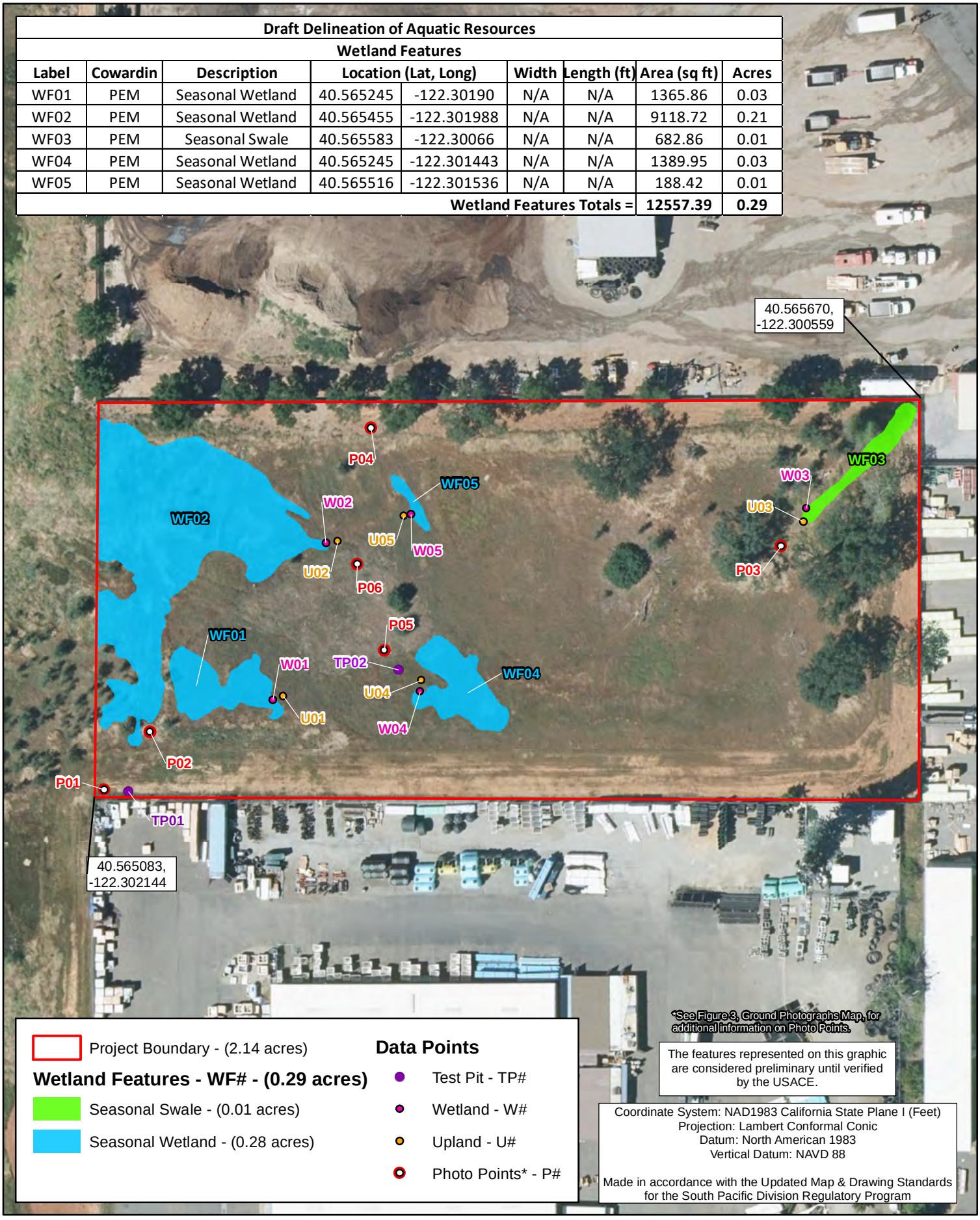
gallaway ENTERPRISES

GE: #21-086 Map Date: 01/20/2022

Figure 2

Delineation of Aquatic Resources Map (Sampling Locations)

Draft Delineation of Aquatic Resources								
Wetland Features								
Label	**Cowardin**	**Description**	**Location (Lat, Long)**		**Width**	**Length (ft)**	**Area (sq ft)**	**Acres**
WF01	PEM	Seasonal Wetland	40.565245	-122.30190	N/A	N/A	1365.86	0.03
WF02	PEM	Seasonal Wetland	40.565455	-122.301988	N/A	N/A	9118.72	0.21
WF03	PEM	Seasonal Swale	40.565583	-122.30066	N/A	N/A	682.86	0.01
WF04	PEM	Seasonal Wetland	40.565245	-122.301443	N/A	N/A	1389.95	0.03
WF05	PEM	Seasonal Wetland	40.565516	-122.301536	N/A	N/A	188.42	0.01
						Wetland Features Totals =	**12557.39**	**0.29**



NORTH

1:800 1 inch = 67 feet

0 50 100 Feet

Data Sources: ESRI, City of Redding 05/27/2020

JW Wood Expansion Project
Draft Delineation of Waters of the U.S
Figure 2

Delineated by: E. Gregg
Map by: A. McLaughlin

gallaway ENTERPRISES

GE: #21-086 Map Date: 01/18/2022

Attachment A

Christopher Rogers Dry Season Crustacean Soil Analysis Report

The University of Kansas

Kansas Biological Survey

21 August 2022

Elena Gregg
Gallaway Enterprises
530.332.9909
117 Meyers St
Chico, CA 95928

SUBJECT: Special Status Shrimp Habitat Surveys at the Proposed JW Wood Expansion Project, City of Redding, Shasta County, CA (USFWS 2022-TA-0307).

Dear Ms. Gregg:

Gallaway Enterprises conducted a dry season survey of potential special status shrimp habitats at the proposed JW Wood Expansion Project, City of Redding, Shasta County, CA (USFWS 2022-TA-0307). Soil samples were collected from five previously identified habitats that had previously been determined as potential special status shrimp species habitat. No eggs of any listed vernal pool crustaceans were recovered from the samples provided by Gallaway Enterprises.

It is my understanding that Gallaway Enterprises will submit this report and all other pertinent materials and information to the US Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (DFW), as required by the USFWS guidelines for a protocol level survey.

Definitions

For the purpose of this report, special status shrimp are defined to include shrimp species listed as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11 for listed animals and various Federal Register notices for proposed species). Two special status vernal pool crustacean species (*Branchinecta lynchi* Eng, Belk, & Eriksen, 1990 and *Lepidurus packardi* Simon, 1886) have the potential to occur at the proposed project site. In addition, one nonlisted fairy shrimp species (*Linderiella occidentalis*) is known from the proposed project vicinity.

Methods

Gallaway Enterprises staff collected soil samples from five potential special status shrimp habitats at the proposed project site. Each soil sample was placed in bags, labelled with the locality number, and taken to the Kansas Biological Survey laboratory for analysis. These analyses were conducted under Federal 10(A)1(a) Recovery Permit TE796284-7. All potential habitats sampled were identified according to the numbers assigned to them by Gallaway Enterprises.

Laboratory Analysis

Soil samples were prepared for examination in the laboratory by dissolving the clumps of soil in water and sieving the material through 300- and 150- µm pore size screens. The small size of these screens ensures that the eggs from the shrimp species will be retained. The portion of each sample retained in the screens was dissolved in a brine solution to separate the organic material from the inorganic material. The organic fraction was then examined under a microscope.

Results

No evidence or artefacts of any listed vernal pool crustaceans were found in any of the pool samples. Eggs belonging to the nonlisted fairy shrimp *Linderiella occidentalis* were recovered from pool 2. These analyses are insufficient by themselves to determine that federally endangered vernal pool crustaceans are present or absent from any pools on this site. The results of this survey must be combined with a protocol wet season survey, and concurrence must be sought from the USFWS before any additional determinations can be made. I certify that the information in this survey report and attached exhibits fully and accurately represents my work.

If you have any questions, please call me.

Sincerely,



D. Christopher Rogers
785.864.1714
Crustacean Taxonomist and Ecologist
Research Assistant Professor
Kansas Biological Survey
Kansas University, Higuchi Hall
2101 Constant Avenue, Lawrence, KS 66047-3759 USA

Attachment I

Cultural Resources Inventory Report

NOTE TO REVIEWER: Information contained in the *Cultural Resources Inventory Survey* (Genesis Society, 2022) for the project related to the specific location of prehistoric and historic sites is confidential and exempt from the Freedom of Information Act (FOIA) and the California Public Records Act (CPRA); therefore, site specific cultural resource investigations are not appended to this Initial Study. Professionally qualified individuals, as determined by the California Office of Historic Preservation, may contact the City of Redding Development Services Department, Planning Division directly in order to inquire about its availability.

Attachment I

Cultural Resources Inventory Report

NOTE TO REVIEWER: Information contained in the *Cultural Resources Inventory Survey* (Genesis Society, 2022) for the project related to the specific location of prehistoric and historic sites is confidential and exempt from the Freedom of Information Act (FOIA) and the California Public Records Act (CPRA); therefore, site specific cultural resource investigations are not appended to this Initial Study. Professionally qualified individuals, as determined by the California Office of Historic Preservation, may contact the City of Redding Development Services Department, Planning Division directly in order to inquire about its availability.

Attachment J
Storm Drainage Analysis

PACE SUPPLY EXPANSION

APN 109-010-037/109-040-0337
REDDING, CA

STORM DRAINAGE ANALYSIS

Prepared by

SHARRAH DUNLAP SAWYER, INC.
320 HARTNELL AVE.
REDDING CA, 96002
PHONE: 530-221-1792
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WWW.SDSENGINEERING.COM

This report was written by or under the direct supervision of:

Ian T. Stripling, P.E.
Civil Engineer

7/19/23
Date

REGISTERED PROFESSIONAL ENGINEER
IAN T. STRIPLING
No. 70840
EXP. 6/30/23
CIVIL
STATE OF CALIFORNIA

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Rainfall Data

Appendix B **Pre-Project Condition**
Pre-development Basin Map
Basin Runoff Calculations

Appendix C **Post-Project Condition**
Post-development Basin Map
Basin Runoff Calculations

Appendix D **South Detention Calculations**
Stage Storage Calculations
Stage Discharge Calculations
Detention Summary
Detention Equations
Modified Rational Method Calculations

Appendix E **Reference Materials**
Friction Coefficient Tables
Table 819.2A *Highway Design Manual*
Table 819.2B *Highway Design Manual*

EXECUTIVE SUMMARY

The Pace Supply Expansion project is a proposed building and pavement expansion to the existing Pace Supply site. The site is made up of two Parcels (APN 019-010-037/109-040-0337), and is located north of Old 44 Drive, east of Innsbruck Drive and west of Old Oregon Trail. The following report provides a preliminary analysis to show that the Pace Supply Expansion project can manage the storm water runoff in a way that maintains or reduces pre-project runoff volumes in the post-project condition as required by the City of Redding.



VICINITY MAP

DESIGN CRITERIA

To meet City Council Policy 1806, and City of Redding Engineering Division requirements for protection of floodplains and downstream drainage concerns, the design is required to maintain or reduce pre-project peak flows for the 10-, 25-, and 100-year design storm events. This report compares the pre-project condition against the post-project condition when construction is complete. To meet these requirements, the post-project peak runoff flows must be equal to, or less than, the pre-project peak runoff flows.

The project consists of three drainage basins, the largest of which is less than 10 acres. Per the City of Redding Construction Standards (CORCS) 200.00, the rational method shall be used to calculate, route, and compare the runoff for the project.

Per the CORCS, a 100-year design storm shall be used to size the detention basin to ensure that the project complies with City Council Policy 1806 and the City of Redding Engineering Division requirements.

Per CORCS 200.00, a 10-year design storm is used for sizing criteria when tributary areas are less than 40 acres. The Intensity-Depth-Frequency curve used for this location was generated within the City of Redding FLOW program. See the *City of Redding HEC-1 Processor Documentation (January 16, 2006)* for details. The hydrologic soil groups

used in this report were taken from the *USDA NRCS Web Soil Survey of the Shasta County Area.* See Appendix A for site specific details.

PRE-PROJECT CONDITION

The project is located north of Old 44 Drive, east of Innsbruck Drive and west of Old Oregon Trail. The pre-project site condition consists of an existing commercial lot and a vacant field with natural grass vegetated ground cover with oak trees scattered throughout. The site receives run-on from the commercial lots to the east.

In the pre-project condition, the site includes three drainage basins as shown in the Pre-Project Basin Map in Appendix 'B'. Basin PRE1 is 2.2 acres and consists of the northern undeveloped western portion of the site. Basin PRE2 is 1.6 acres and includes the existing developed area. Basin PRE3 is 1.6 acres in size and includes the run on from the east.

Pre-project 'C' values have been derived from Table 819.2A from the Caltrans Highway Design Manual (HDM). See Appendix 'B' for the Pre-Project Basin Map, pre-project basin data and the pre-project calculations.

POST-PROJECT CONDITION

In the post-project condition, the site includes three drainage basins as shown in the Post-Project Basin Map in Appendix 'C'. Basin POST1 is 2.6 acres and includes the area tributary to the on-site detention basin, including the building and pavement expansion. The undeveloped land will be graded and covered with gravel in the post-project condition. Basin POST2 is 1.0 acres and includes the western portion of the existing development. Basin POST3 is 1.8 acres and includes the eastern run-on. The run-on will be routed west around the site. This ditch has been preliminarily sized to handle the 100-year event.

Post-project 'C' values have been derived from Table 819.2B from the Caltrans Highway Design Manual (HDM). See Appendix 'C' for the Post-Project Basin Map, post-project basin data and the post-project calculations.

Detention Basin

The proposed detention basin is an above ground detention basin located along the western property line. It will be a 17' wide trapezoidal ditch with an 11' wide bottom and 3:1 slopes approximately 500' in length. The outlet structure of the detention basin will be located at the southwest corner of the project site and discharge into the north gutter of Old 44 Drive. The outlet structure will utilize two 3" tall x 24" wide City of Redding Standard Under Sidewalk Drains along with a 48" wide curb opening in the vertical curb to be placed at the right-of-way along Old 44 Drive to meter the flow discharging from the detention basin. The Under Sidewalk Drains will act as an orifice and the curb opening will act as a weir to limit peak post-project flows in the 2-, 10-, 25-, and 100-year events. See the table below containing the detention details as well as the pre-project, and post-project flows for the site and the proposed detention basin.

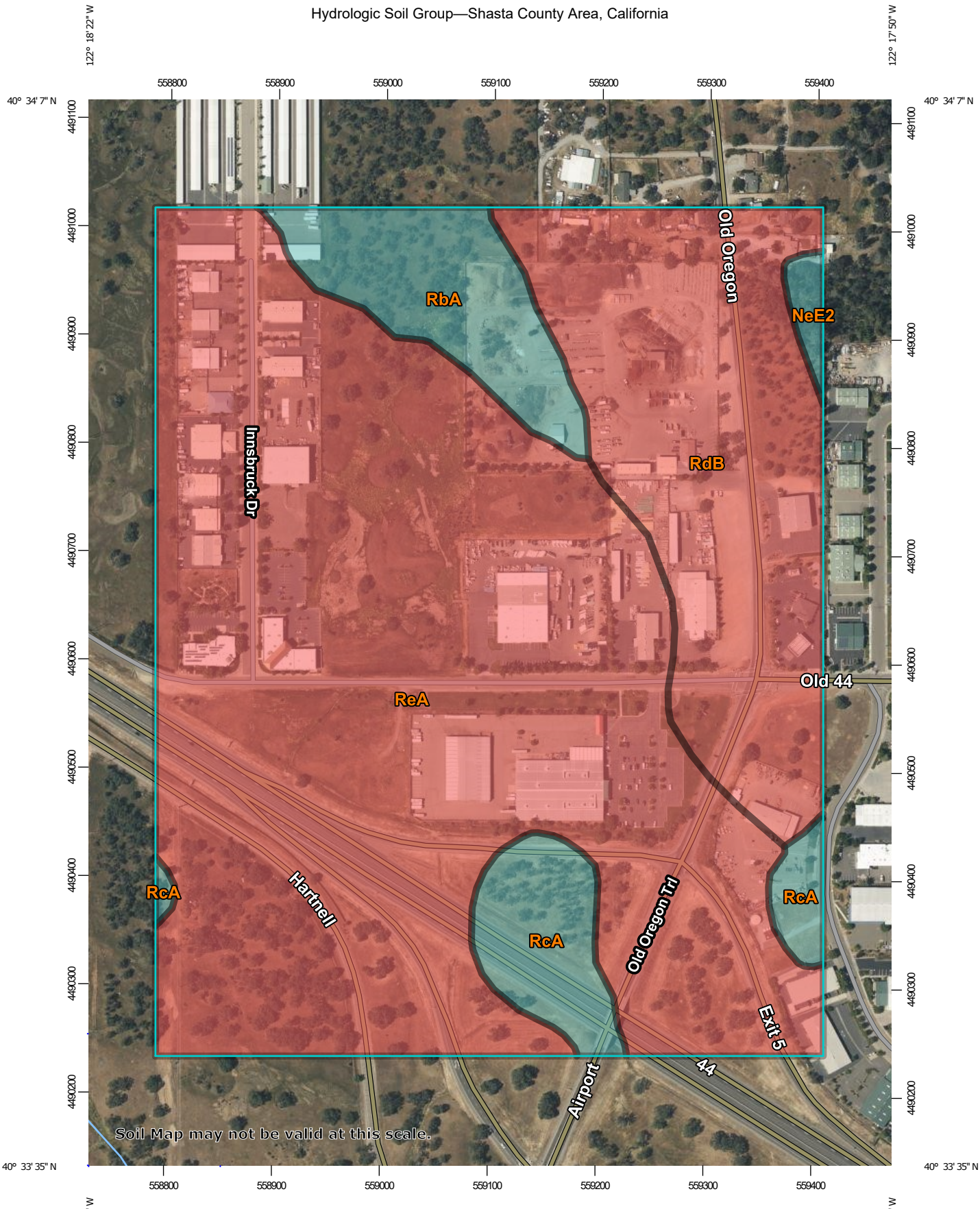
Per the City of Redding's MS4 requirements, the 2-year peak flow rate must not exceed pre-project flow rates in the post-project condition. The Drainage Summary Table below shows that the peak flow rate in the 2-year storm has not increased.

Pace Supply Detention Basin: Drainage Summary				
Top elevation: 99.00 Bottom elevation: 98.00 100-year WSE: 98.97		Bottom Opening: 24"x3" Sidewalk Drain (x2) Invert: 98.00		Top Opening: 48" Curb Opening Invert: 98.50
	Pre-Project (Q_{PRE2})	Future-Undetained (Q_{UNDET})	Post-Detained (Q_{OUT})	Post-Project (Q_{OUT} + Q_{UNDET})
2-year	**11.5**	8.0	2.8 cfs	**10.8**
10-year	**15.5**	10.6	4.2 cfs	**14.8**
25-year	**19.7**	13.3	5.7 cfs	**19.0**
100-year	**26.7**	18.1	8.1 cfs	**26.2**

CONCLUSION

As described above, the project's storm drain system manages the storm water runoff in a way that maintains or reduces pre-project runoff volumes in the post-project condition. The proposed storm drain design complies with City Council Policy 1806, and City of Redding Engineering Division requirements for protection of floodplains and downstream drainage concerns.

APPENDIX A
SITE DETAILS



Map Scale: 1:4,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Shasta County Area, California
Survey Area Data: Version 18, Sep 2, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 8, 2019—Jun 21, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NeE2	Newtown gravelly loam, 30 to 50 percent slopes, eroded	C	0.8	0.6%
RbA	Red Bluff loam, 0 to 3 percent slopes, MLRA 17, moist	C	7.7	6.4%
RcA	Red Bluff gravelly loam, moderately deep, 0 to 3 percent slopes	C	6.2	5.2%
RdB	Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	D	26.1	21.7%
ReA	Redding-Red Bluff gravelly loams, 0 to 3 percent slopes	D	79.5	66.1%
Totals for Area of Interest			**120.4**	**100.0%**

Rainfall Intensity Equations For the Redding Area

Depth-Duration-Frequency Data (in inches)
Per The City of Redding HEC-1 Processor Documentation (January 16, 2006)

Duration Days	Duration Minutes	Duration Hours	Table 1a Redding 5 SSE 510 ft 2 YR	5 YR	10 YR	25 YR	100 YR	Table 1b Shasta Dam 1075 ft 2 YR	5 YR	10 YR	25 YR	100 YR
-	5	0.08	0.31	0.36	0.40	0.46	0.58	0.46	0.54	0.60	0.70	0.89
-	10	0.17	0.41	0.48	0.54	0.61	0.76	0.63	0.74	0.82	0.96	1.21
-	15	0.25	0.49	0.56	0.63	0.72	0.90	0.76	0.89	0.98	1.15	1.46
-	30	0.5	0.64	0.74	0.84	0.95	1.19	1.03	1.21	1.34	1.58	1.99
-	60	1	0.85	0.98	1.11	1.26	1.57	1.41	1.66	1.84	2.15	2.73
-	120	2	1.13	1.3	1.47	1.67	2.09	1.93	2.27	2.51	2.95	3.73
-	180	3	1.33	1.53	1.73	1.97	2.46	2.32	2.73	3.02	3.54	4.47
-	360	6	1.76	2.03	2.29	2.60	3.25	3.17	3.73	4.12	4.83	6.11
-	720	12	2.33	2.69	3.03	3.45	4.31	4.33	5.09	5.64	6.61	8.36
1	1440	24	3.08	3.56	4.01	4.56	5.71	5.93	6.96	7.71	9.03	11.43

Calculated Intensity-Duration-Frequency Data

Elev	580 ft					
Duration Days	Duration Minutes	Duration Hours	2 YR in/hr	10 YR in/hr	25 YR in/hr	100 YR in/hr
-	5	0.08	3.94	5.10	5.88	7.42
-	10	0.17	2.62	3.45	3.92	4.89
-	15	0.25	2.09	2.69	3.09	3.88
-	30	0.5	1.38	1.80	2.06	2.58
-	60	1	0.92	1.20	1.37	1.71
-	120	2	0.61	0.80	0.91	1.15
-	180	3	0.48	0.63	0.72	0.90
0.25	360	6	0.32	0.42	0.48	0.60
0.5	720	12	0.21	0.28	0.32	0.40
1	1440	24	0.14	0.19	0.21	0.27

Intensity (in/hr)=IF(C26<=1075,IF(C26>=425,((C26-425)/(1075-425))*((G8/C8)-(D8/C8))+(D8/C8),"ERROR"),"ERROR")			
C26=Input Elevation	C8=Duration in Hours	D8=Inches at Redding 5 SSE	G8=inches at Shasta Dam

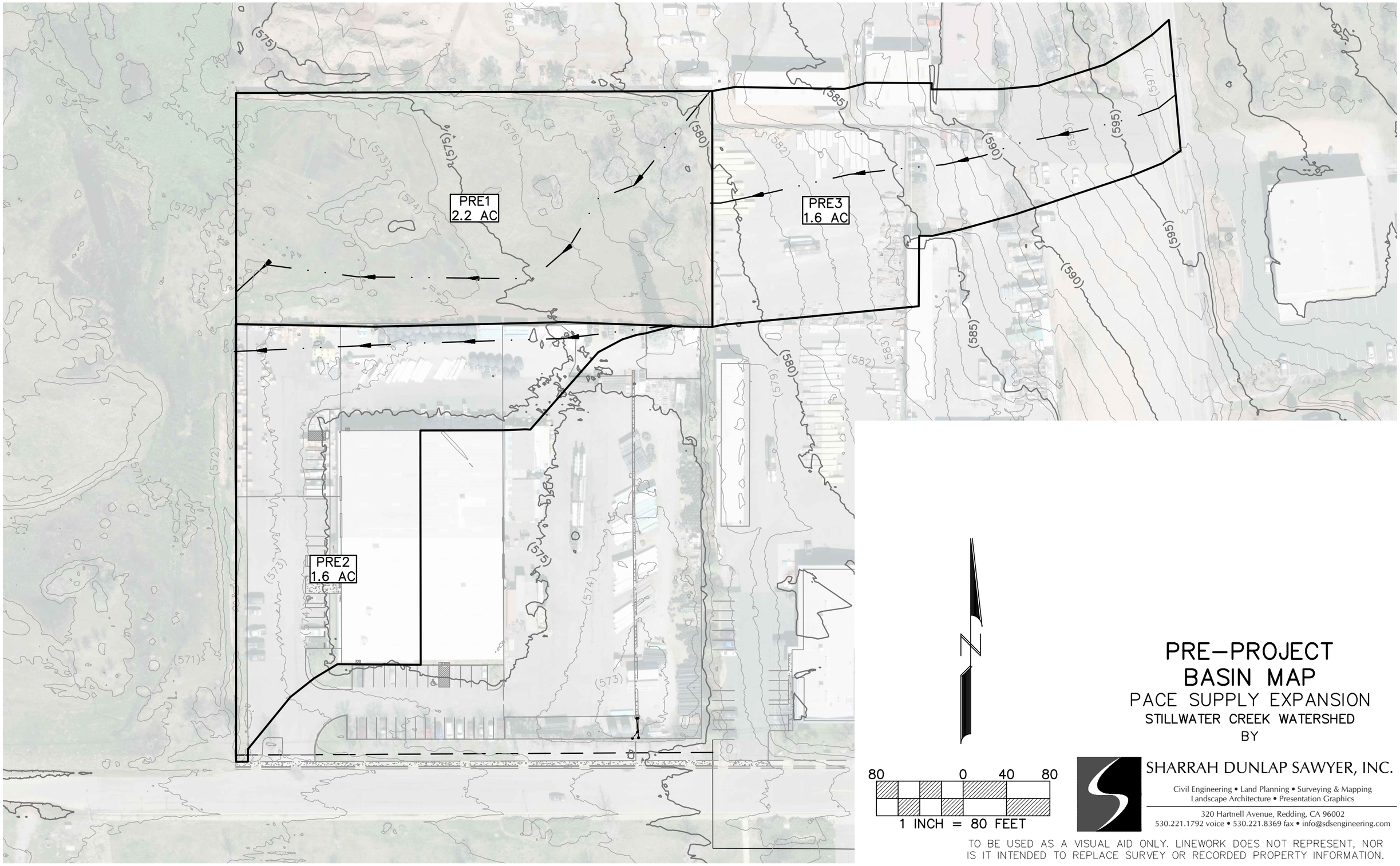
Intensity Equations

Intensity Equation: $i=FCT*t^{PWR}$
t=Time in **Minutes**

	FCT Value	PWR Value
2 YR	10.14	-0.59
10 YR	13.18	-0.59
25 YR	15.10	-0.59
100 YR	18.95	-0.59

FCT=ROUND(EXP(INDEX(LINEST(LN(<Intensity (y) Values>),LN(<Duration (x) Values>)),1,2)),2
PWR=ROUND(INDEX(LINEST(LN(<Intensity (y) Values>),LN(<IDuration (x) Values>)),1),2)

APPENDIX B
PRE-PROJECT CONDITION



N

80 0 40 80

1 INCH = 80 FEET

PRE-PROJECT BASIN MAP

PACE SUPPLY EXPANSION

STILLWATER CREEK WATERSHED

BY

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DATE: MARCH, 2023 SCALE: 1"=80' SHEET 1 OF 1

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Stormwater Runoff Coefficient for Areas

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

Undeveloped Areas

C-values obtained from Table 819.2A (Caltrans Highway Design Manual)		"C" values		
Surface Type		10-yr	25-yr	100-yr
Relief	3% Average	0.12		
Soil Infiltration	Gravelly Loam: Soil Type 'D' slow to take up water	0.10		
Vegetal Cover	Good Grassland with Few Trees	0.06		
Surface Storage	Shallow, defined drainage channels	0.08	10-yr x 1.1	10-yr x 1.25
		0.36	0.40	0.45

Eastern Run-On Developed Area

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type	Areas	%	10-yr	25-yr	100-yr
Pavement	1.0 ac	63.3%	0.90	0.99	1.00
Gravel	0.4 ac	25.3%	0.50	0.55	0.63
Landscaping	0.1 ac	5.7%	0.17	0.19	0.21
Roof	0.1 ac	5.7%	0.95	1.00	1.00
	1.6 ac	100.0%	0.76	0.84	0.95

Stormwater Runoff Calculation

Basin: PRE1

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type		%	10-yr	25-yr	100-yr
Eastern Area		0.0%	0.76	0.84	0.95
Undeveloped Area		100.0%	0.36	0.40	0.45
Gravel Area		0.0%	0.50	0.55	0.63
Asphault Area		0.0%	0.90	0.99	1.00
Roof Area		0.0%	0.95	1.00	1.00
	Total Basin Area = 2.2 ac	100.0%	0.36	0.40	0.45

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $T_{co} = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14	Estimated	Calculated		
Tco_2 = 14.8 min	i_2 = 2.07 in/hr	2.07 in/hr	L = 200 ft	Length of Flowpath
Tco_{10} = 13.0 min	i_{10} = 2.90 in/hr	2.90 in/hr	S = 0.020 ft/ft	Average Slope of Flowpath
Tco_{25} = 12.2 min	i_{25} = 3.45 in/hr	3.45 in/hr	n = 0.40	natural grassland, Table C-9
Tco_{100} = 10.9 min	i_{100} = 4.63 in/hr	4.63 in/hr	Elev = 580 ft	Site Elevation
			Tco_{min} = 5.0 min	

Time of Concentration (Shallow Concentrated Flow) Tcg = (L / V)

Hydraulic Design Series No. 2 pg. 2-24			
$V_{shallow} = \alpha\kappa S^{0.5}$	L = 325 ft	Length of Flowpath	
$V_{shallow}$ = 1.6 ft/s	S_{ave} = 0.010 ft/ft	Average Longitudinal Slope	
$Tc_{Shallow}$ = L / (60 V) = 3.4 min	κ = 0.491	Unpaved	
	α = 33	Unit Conversion (33)	

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 18.2 min	ΣTc_{10} = 16.4 min	ΣTc_{25} = 15.6 min	ΣTc_{100} = 14.3 min
FCT = 10.14	FCT = 13.18	FCT = 15.10	FCT = 18.95
PWR = -0.59	PWR = -0.59	PWR = -0.59	PWR = -0.59
i_2 = 1.83 in/hr	i_{10} = 2.53 in/hr	i_{25} = 2.99 in/hr	i_{100} = 3.94 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.36	i_2= 1.83 in/hr	A_2= 2.2 ac	**Q_2 = 1.4 cfs**
10-year	C_{10}= 0.36	i_{10}= 2.53 in/hr	A_{10}= 2.2 ac	**Q_{10} = 2.0 cfs**
25-year	C_{25}= 0.40	i_{25}= 2.99 in/hr	A_{25}= 2.2 ac	**Q_{25} = 2.6 cfs**
100-year	C_{100}= 0.45	i_{100}= 3.94 in/hr	A_{100}= 2.2 ac	**Q_{100} = 3.9 cfs**

Stormwater Runoff Calculation

Basin: PRE2

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type		%	10-yr	25-yr	100-yr
Eastern Area		0.0%	0.76	0.84	0.95
Undeveloped Area		0.0%	0.36	0.40	0.45
Gravel Area		0.0%	0.50	0.55	0.63
Asphault Area		78.0%	0.90	0.99	1.00
Roof Area		22.0%	0.95	1.00	1.00
	Total Basin Area = 1.6 ac	100.0%	0.91	0.99	1.00

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $T_{co} = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14	Estimated	Calculated		
T_{co_2} = 3.1 min	i_2 = 5.20 in/hr	5.20 in/hr	L = 100 ft	Length of Flowpath
$T_{co_{10}}$ = 2.7 min	i_{10} = 7.34 in/hr	7.34 in/hr	S = 0.010 ft/ft	Average Slope of Flowpath
$T_{co_{25}}$ = 2.5 min	i_{25} = 8.79 in/hr	8.79 in/hr	n = 0.05	Pavement - rough, Table C-9
$T_{co_{100}}$ = 2.3 min	i_{100} = 11.59 in/hr	11.59 in/hr	Elev = 580 ft	Site Elevation
			$T_{co_{min}}$ = 5.0 min	

Time of Concentration (Shallow Concentrated Flow) Tcg = (L / V)

Hydraulic Design Series No. 2 pg. 2-24	L = 300 ft	Length of Flowpath
$V_{shallow} = \alpha\kappa S^{0.5}$	S_{ave} = 0.010 ft/ft	Average Longitudinal Slope
$V_{shallow}$ = 2.0 ft/s	κ = 0.619	Paved
$T_{c_{Shallow}}$ = L / (60 V) = 2.5 min	α = 33	Unit Conversion (33)

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣT_{c_2} = 5.6 min	$\Sigma T_{c_{10}}$ = 5.2 min	$\Sigma T_{c_{25}}$ = 5.0 min	$\Sigma T_{c_{100}}$ = 5.0 min
FCT = 10.14	FCT = 13.18	FCT = 15.10	FCT = 18.95
PWR = -0.59	PWR = -0.59	PWR = -0.59	PWR = -0.59
i_2 = 3.67 in/hr	i_{10} = 4.98 in/hr	i_{25} = 5.84 in/hr	i_{100} = 7.33 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.91	i_2= 3.67 in/hr	A_2= 1.6 ac	**Q_2 = 5.3 cfs**
10-year	C_{10}= 0.91	i_{10}= 4.98 in/hr	A_{10}= 1.6 ac	**Q_{10} = 7.3 cfs**
25-year	C_{25}= 0.99	i_{25}= 5.84 in/hr	A_{25}= 1.6 ac	**Q_{25} = 9.3 cfs**
100-year	C_{100}= 1.00	i_{100}= 7.33 in/hr	A_{100}= 1.6 ac	**Q_{100} = 11.7 cfs**

Stormwater Runoff Calculation

Basin: PRE3

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type		%	10-yr	25-yr	100-yr
Eastern Area		100.0%	0.76	0.84	0.95
Undeveloped Area		0.0%	0.36	0.40	0.45
Gravel Area		0.0%	0.50	0.55	0.63
Asphault Area		0.0%	0.90	0.99	1.00
Roof Area		0.0%	0.95	1.00	1.00
Total Basin Area =	1.6 ac	100.0%	0.76	0.84	0.95

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $T_{co} = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14	Estimated	Calculated		
Tco_2 = 1.7 min	i_2 = 7.41 in/hr	7.41 in/hr	L = 100 ft	Length of Flowpath
Tco_{10} = 1.5 min	i_{10} = 10.38 in/hr	10.38 in/hr	S = 0.046 ft/ft	Average Slope of Flowpath
Tco_{25} = 1.4 min	i_{25} = 12.38 in/hr	12.38 in/hr	n = 0.05	Pavement - rough, Table C-9
Tco_{100} = 1.3 min	i_{100} = 16.23 in/hr	16.23 in/hr	Elev = 580 ft	Site Elevation
			Tco_{min} = 5.0 min	

Time of Concentration (Shallow Concentrated Flow) Tcg = (L / V)

Hydraulic Design Series No. 2 pg. 2-24		
$V_{shallow} = \alpha\kappa S^{0.5}$	S_{ave} = 0.040 ft/ft	Average Longitudinal Slope
$V_{shallow}$ = 4.1 ft/s	κ = 0.619	Paved
$Tc_{Shallow}$ = L / (60 V) = 1.4 min	α = 33	Unit Conversion (33)

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

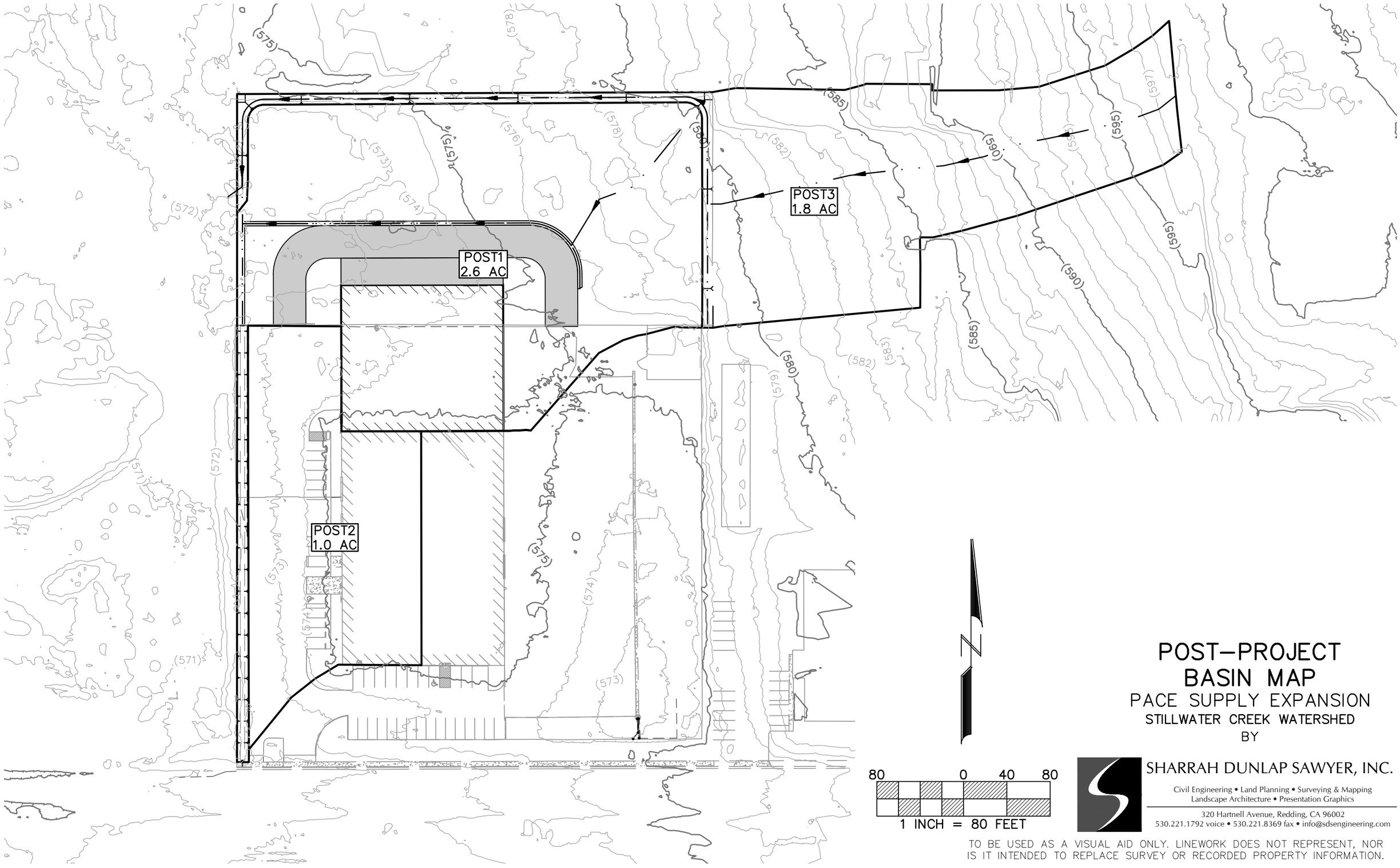
Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 5.0 min	ΣTc_{10} = 5.0 min	ΣTc_{25} = 5.0 min	ΣTc_{100} = 5.0 min
FCT = 10.14	FCT = 13.18	FCT = 15.10	FCT = 18.95
PWR = -0.59	PWR = -0.59	PWR = -0.59	PWR = -0.59
i_2 = 3.92 in/hr	i_{10} = 5.10 in/hr	i_{25} = 5.84 in/hr	i_{100} = 7.33 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.76	i_2= 3.92 in/hr	A_2= 1.6 ac	**Q_2 = 4.8 cfs**
10-year	C_{10}= 0.76	i_{10}= 5.10 in/hr	A_{10}= 1.6 ac	**Q_{10} = 6.2 cfs**
25-year	C_{25}= 0.84	i_{25}= 5.84 in/hr	A_{25}= 1.6 ac	**Q_{25} = 7.8 cfs**
100-year	C_{100}= 0.95	i_{100}= 7.33 in/hr	A_{100}= 1.6 ac	**Q_{100} = 11.1 cfs**

APPENDIX C
POST-PROJECT CONDITION



80 0 40 80

1 INCH = 80 FEET

POST–PROJECT BASIN MAP

PACE SUPPLY EXPANSION

STILLWATER CREEK WATERSHED

BY

SHARRAH DUNLAP SAWYER, INC.

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Landscape Architecture • Presentation Graphics

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DATE: MARCH, 2023 SCALE: 1"=80' SHEET 1 OF 1

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Stormwater Runoff Calculation

Basin: POST1

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type		%	10-yr	25-yr	100-yr
Eastern Area		0.0%	0.76	0.84	0.95
Undeveloped Area		0.0%	0.36	0.40	0.45
Gravel Area		62.0%	0.50	0.55	0.63
Asphault Area		20.0%	0.90	0.99	1.00
Roof Area		18.0%	0.95	1.00	1.00
Total Basin Area =	2.6 ac	100.0%	0.66	0.72	0.77

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR Tco = (0.66 $L^{0.5}$ $n^{0.52}$) / ($S^{0.31}$ $i^{0.38}$)

COR Hydro Manual pg. C-14	Estimated	Calculated		
Tco_2 = 5.7 min	i_2 = 3.71 in/hr	3.63 in/hr	L = 194 ft	Length of Flowpath
Tco_{10} = 5.0 min	i_{10} = 5.22 in/hr	5.10 in/hr	S = 0.020 ft/ft	Average Slope of Flowpath
Tco_{25} = 4.7 min	i_{25} = 6.22 in/hr	6.06 in/hr	n = 0.10	re soil/newly graded, Table C-9
Tco_{100} = 4.2 min	i_{100} = 8.36 in/hr	8.13 in/hr	Elev = 580 ft	Site Elevation
			Tco_{min} = 5.0 min	

Time of Concentration (Pipes/Channels) Tcs = (L / V)

COR Hydro Manual pg. C-15			
V_{mann} = (1.49/n) $R^{0.67}$ $S^{0.5}$	L = 310 ft	Length of Flowpath	
R= A / P = 0.15 ft	S_{ave} = 0.012 ft/ft	Average Longitudinal Slope	
V_{mann} = 1.6 ft/s	n = 0.029	Concrete and gravel	
Tc_{mann} = L / (60 V)= 3.2 min	A = 4.0 sf	Area of Flow	
	P = 27 ft	Wetted Perimeter	

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 8.9 min	ΣTc_{10} = 8.2 min	ΣTc_{25} = 7.9 min	ΣTc_{100} = 7.4 min
FCT = 10.14	FCT = 13.18	FCT = 15.10	FCT = 18.95
PWR = -0.59	PWR = -0.59	PWR = -0.59	PWR = -0.59
i_2 = 2.79 in/hr	i_{10} = 3.81 in/hr	i_{25} = 4.46 in/hr	i_{100} = 5.82 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.66	i_2= 2.79 in/hr	A_2= 2.6 ac	**Q_2 = 4.8 cfs**
10-year	C_{10}= 0.66	i_{10}= 3.81 in/hr	A_{10}= 2.6 ac	**Q_{10} = 6.5 cfs**
25-year	C_{25}= 0.72	i_{25}= 4.46 in/hr	A_{25}= 2.6 ac	**Q_{25} = 8.3 cfs**
100-year	C_{100}= 0.77	i_{100}= 5.82 in/hr	A_{100}= 2.6 ac	**Q_{100} = 11.7 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Mar 7 2023

Post1 Channel

User-defined

Invert Elev (ft)	= 98.81
Slope (%)	= 1.20
N-Value	= 0.027

Calculations

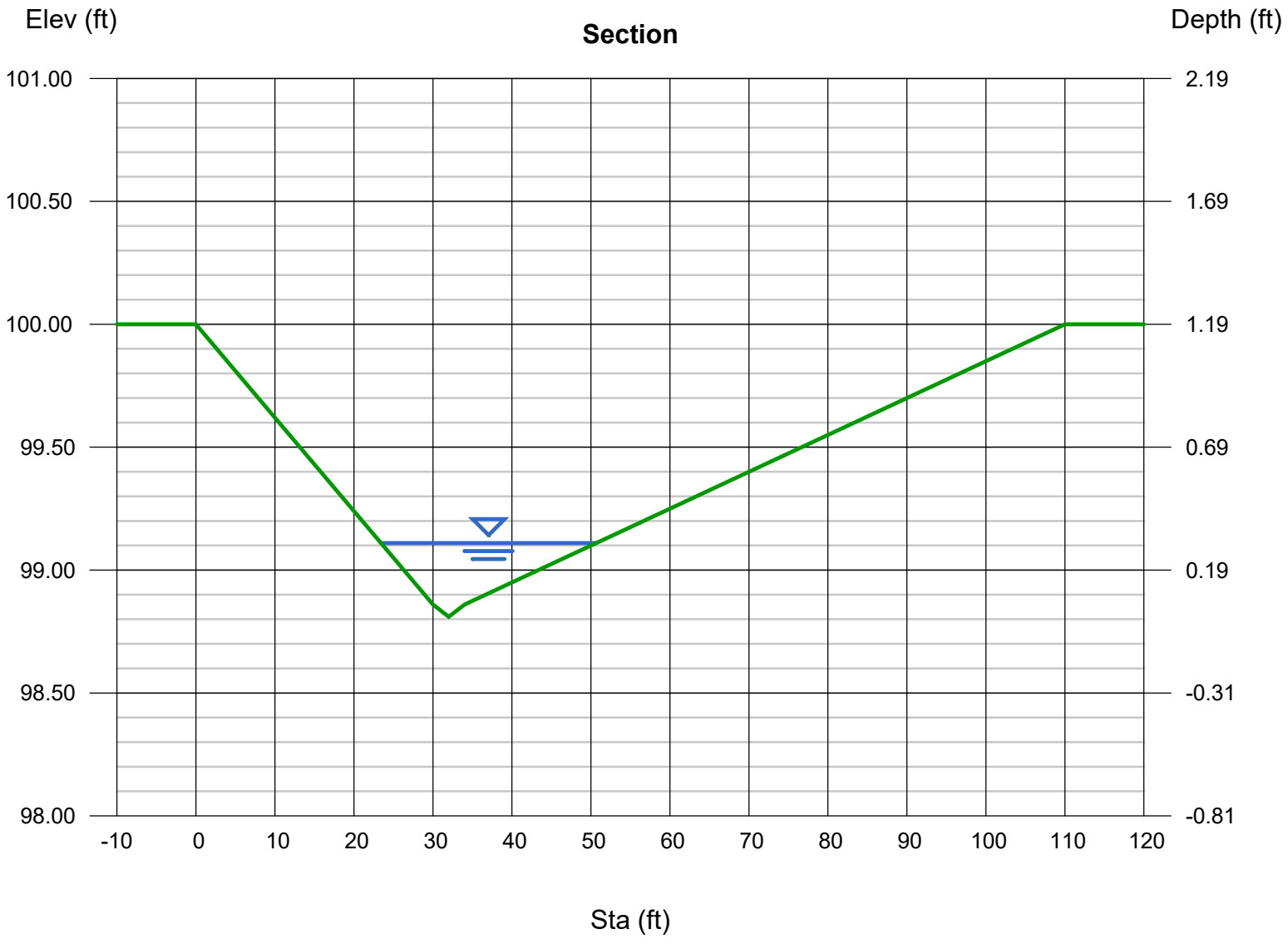
Compute by:	Known Q
Known Q (cfs)	= 6.40

Highlighted

Depth (ft)	= 0.30
Q (cfs)	= 6.400
Area (sqft)	= 4.01
Velocity (ft/s)	= 1.60
Wetted Perim (ft)	= 27.25
Crit Depth, Yc (ft)	= 0.27
Top Width (ft)	= 27.25
EGL (ft)	= 0.34

(Sta, El, n)-(Sta, El, n)...

(0.00, 100.00)-(30.00, 98.86, 0.015)-(32.00, 98.81, 0.015)-(34.00, 98.86, 0.015)-(110.00, 100.00, 0.033)



Stormwater Runoff Calculation

Basin: POST2

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type		%	10-yr	25-yr	100-yr
Eastern Area		0.0%	0.76	0.84	0.95
Undeveloped Area		0.0%	0.36	0.40	0.45
Gravel Area		0.0%	0.50	0.55	0.63
Asphault Area		65.0%	0.90	0.99	1.00
Roof Area		35.0%	0.95	1.00	1.00
Total Basin Area =	1.0 ac	100.0%	0.92	0.99	1.00

Total Rainfall Intensity $i = FCT * (Tc)^{PWR}$

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 5.0 min	ΣTc_{10} = 5.0 min	ΣTc_{25} = 5.0 min	ΣTc_{100} = 5.0 min
FCT = 10.14	FCT = 13.18	FCT = 15.10	FCT = 18.95
PWR = -0.59	PWR = -0.59	PWR = -0.59	PWR = -0.59
i_2 = 3.92 in/hr	i_{10} = 5.10 in/hr	i_{25} = 5.84 in/hr	i_{100} = 7.33 in/hr

Basin Runoff Flow $Q = C * i * A$

2-year	C_2= 0.92	i_2= 3.92 in/hr	A_2= 1.0 ac	**Q_2 = 3.6 cfs**
10-year	C_{10}= 0.92	i_{10}= 5.10 in/hr	A_{10}= 1.0 ac	**Q_{10} = 4.7 cfs**
25-year	C_{25}= 0.99	i_{25}= 5.84 in/hr	A_{25}= 1.0 ac	**Q_{25} = 5.8 cfs**
100-year	C_{100}= 1.00	i_{100}= 7.33 in/hr	A_{100}= 1.0 ac	**Q_{100} = 7.3 cfs**

Stormwater Runoff Calculation

Basin: POST3

Calculate composite runoff coefficient using the formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)			"C" values		
Surface Type		%	10-yr	25-yr	100-yr
Eastern Area		90.0%	0.76	0.84	0.95
Undeveloped Area		10.0%	0.36	0.40	0.45
Gravel Area		0.0%	0.50	0.55	0.63
Asphault Area		0.0%	0.90	0.99	1.00
Roof Area		0.0%	0.95	1.00	1.00
Total Basin Area =	1.8 ac	100.0%	0.72	0.79	0.90

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $Tco = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14

	Estimated	Calculated		
Tco_2 = 1.7 min	i_2 = 7.41 in/hr	7.41 in/hr	L = 100 ft	Length of Flowpath
Tco_{10} = 1.5 min	i_{10} = 10.38 in/hr	10.38 in/hr	S = 0.046 ft/ft	Average Slope of Flowpath
Tco_{25} = 1.4 min	i_{25} = 12.38 in/hr	12.38 in/hr	n = 0.05	Pavement - rough, Table C-9
Tco_{100} = 1.3 min	i_{100} = 16.23 in/hr	16.23 in/hr	Elev = 580 ft	Site Elevation
			Tco_{min} = 5.0 min	

Time of Concentration (Shallow Concentrated Flow) Tcg = (L / V)

Hydraulic Design Series No. 2 pg. 2-24

$V_{shallow} = \alpha\kappa S^{0.5}$	L = 340 ft	Length of Flowpath
$V_{shallow}$ = 4.1 ft/s	S_{ave} = 0.040 ft/ft	Average Longitudinal Slope
$Tc_{Shallow}$ = L / (60 V) = 1.4 min	κ = 0.619	Paved
	α = 33	Unit Conversion (33)

Time of Concentration (Gutter Flow) **N/A** Tcg = (L / V)

L = Length of Flowpath

Time of Concentration (Pipes/Channels) Tcs = (L / V)

COR Hydro Manual pg. C-15

$V_{mann} = (1.49/n)\ R^{0.67}\ S^{0.5}$	L = 590 ft	Length of Flowpath
R= A / P = 0.50 ft	S_{ave} = 0.010 ft/ft	Average Longitudinal Slope
V_{mann} = 3.1 ft/s	n = 0.030	Vegetal lining
Tc_{mann} = L / (60 V)= 3.2 min	A = 3.5 sf	Area of Flow
	P = 7 ft	Wetted Perimeter

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 6.3 min	ΣTc_{10} = 6.1 min	ΣTc_{25} = 6.0 min	ΣTc_{100} = 5.9 min
FCT = 10.14	FCT = 13.18	FCT = 15.10	FCT = 18.95
PWR = -0.59	PWR = -0.59	PWR = -0.59	PWR = -0.59
i_2 = 3.42 in/hr	i_{10} = 4.53 in/hr	i_{25} = 5.25 in/hr	i_{100} = 6.65 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.72	i_2= 3.42 in/hr	A_2= 1.8 ac	**Q_2 = 4.4 cfs**
10-year	C_{10}= 0.72	i_{10}= 4.53 in/hr	A_{10}= 1.8 ac	**Q_{10} = 5.9 cfs**
25-year	C_{25}= 0.79	i_{25}= 5.25 in/hr	A_{25}= 1.8 ac	**Q_{25} = 7.5 cfs**
100-year	C_{100}= 0.90	i_{100}= 6.65 in/hr	A_{100}= 1.8 ac	**Q_{100} = 10.8 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Mar 7 2023

POST3 Channel-100 Year

Triangular

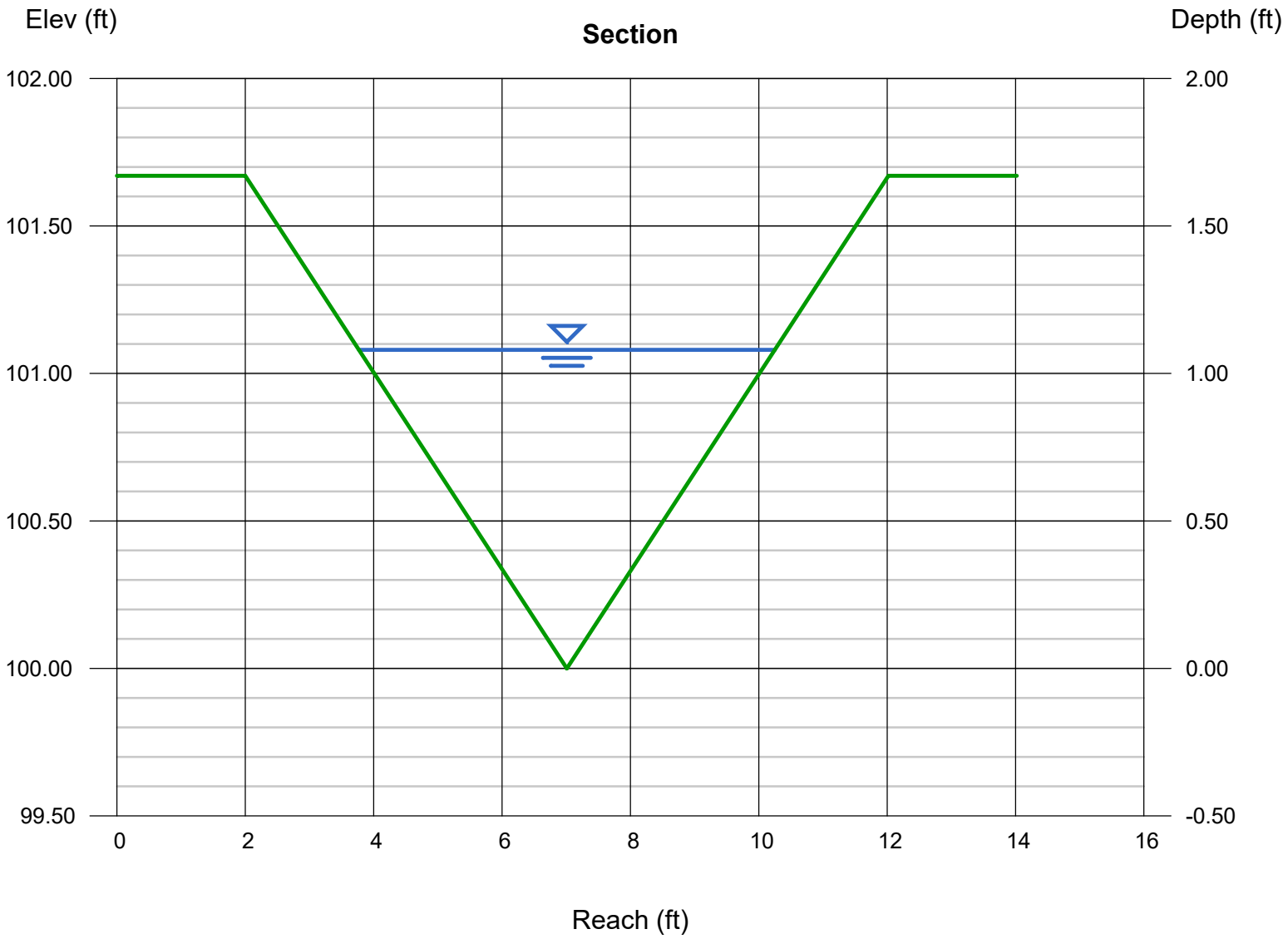
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.67
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.00

Highlighted

Depth (ft)	= 1.08
Q (cfs)	= 11.00
Area (sqft)	= 3.50
Velocity (ft/s)	= 3.14
Wetted Perim (ft)	= 6.83
Crit Depth, Yc (ft)	= 0.97
Top Width (ft)	= 6.48
EGL (ft)	= 1.23



APPENDIX D
DETENTION CALCULATIONS

Stage-Storage

Pace Supply Detention Basin

DETENTION BASIN - STAGE STORAGE TABLE					
ELEV	AREA (sq. ft.)	DEPTH (ft)	AVG END INC. VOL. (cu. ft.)	AVG END TOTAL VOL. (cu. ft.)	
98.00	5,490.00	0.00	0	0	
98.50	7,012.50	0.50	3,126	3,126	
99.00	8,535.00	0.50	3,887	7,013	

Detention Stage-Storage-Discharge Calculation

Pace Supply Detention Basin

Top Orifice						
48" Curb Opening	w =	48.00 in	h =	0.50 in	A =	0.167 sf
	cl elev =	98.52 ft	inv elev =	98.50 ft	L =	4.00 ft

1st Opening						
24"x3" Sidewalk Drain (x2)	w =	48.0 in	h =	3.0 in	A =	1.000 sf
	cl elev =	98.13 ft	inv elev =	98.00 ft	L =	4.00 ft

Orifice equation = C*A*(2g*deltaH)^0.5
C = 0.6
2g = 64.4

Weir equation = C*L*H^1.5
C = 3.2

			1st Opening				Top Opening				
			wier depth	wier outflow	cl depth	orifice outflow	weir depth	weir outflow	cl depth	orifice outflow	Detention Discharge
Elev			ft	cfs	ft	cfs	ft	cfs	ft	cfs	cfs
98.00											
98.50			0.50	4.5	0.38	2.9					2.9
99.00			1.00	12.8	0.88	4.5	0.5	4.50	0.48		9.0

** Note: Per Urban Drainage Design Manual Publication No. FHWA-NHI-01-021 August 2001 "*The Flow Condition, orifice or weir, producing the lowest discharge for a given stage defines the controlling relationship."*

Detention Stage-Storage-Discharge Summary

Pace Supply Detention Basin

Stage (ft)	Vol_{Total} (ft^3)	Q_{out} (cfs)
98.00	0	0.0
98.50	3,126	2.9
99.00	7,013	9.0

Underground Detention?	No

Pre-project Flow = PRE1+PRE2+PRE3
Undetained Flow = POST2+POST3

2-Year

Pre-project Flow =	11.5 cfs
Undetained Flow =	8.0 cfs
Detained Flow=	2.8 cfs
Post Peak Flow =	10.8 cfs
Time of Peak Flow =	12.08 hrs
Max Stage =	98.50 ft

10-Year

Pre-project Flow =	15.5 cfs
Undetained Flow=	10.6 cfs
Detained Flow=	4.2 cfs
Post Peak Flow =	14.8 cfs
Time of Peak Flow =	12.08 hrs
Max Stage =	98.62 ft

25-Year

Pre-project Flow =	19.7 cfs
Undetained Flow=	13.3 cfs
Detained Flow=	5.7 cfs
Post Peak Flow =	19.0 cfs
Time of Peak Flow =	12.08 hrs
Max Stage =	98.75 ft

100-Year

Pre-project Flow =	26.7 cfs
Undetained Flow=	18.1 cfs
Detained Flow=	8.1 cfs
Post Peak Flow =	26.2 cfs
Time of Peak Flow =	12.08 hrs
Max Stage =	98.97 ft

Detention Equations and Methodology

PI values are derived from the PI record from HEC-1. PI record values from HEC-1 are in 5-minute increments. Further information on how the PI record is calculated can be found the HEC-1 Flood Hydrograph Package User's Manual.

$i =$ PI ÷ 5 min

$Qin =$ CiA

$Vol_{in} = Q_{in}$ * time (5 min)

$Vol_{out} = Q_{out}$ (from the previous time increment) * time (5 min)

$\Delta Vol = Vol_{in} - Vol_{out}$

$Vol_{Total} = Vol_{Total}$ (from the previous time increment) + ΔVol

Peak Stage is calculated by using the total volume from the current time increment to linearly interpolate an elevation from the Stage-Storage table.

Avg Stage = Peak stage (from the previous time increment) + Peak stage (from the current time increment)

Q_{out} is calculated by using the average stage from the current time increment to interpolate a peak flow from the Stage-Storage table.

Detention Stage-Storage-Discharge Calculation

Pace Supply Detention Basin

2-year

Detention and Basin Parameters

Area = 2.6 ac
Total 24-hr rainfall= 3.43 in C = 0.66
Elev = 580

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
0	0.00	0.005	0.06	0.10	30.9	0.0	0.0	0.0	98.00	0	0.00
5	0.08	0.005	0.06	0.10	30.9	0.0	30.9	30.9	98.00	98.002	0.01
10	0.17	0.005	0.06	0.10	30.9	4.3	26.6	57.5	98.01	98.007	0.04
15	0.25	0.005	0.06	0.10	30.9	12.3	18.6	76.1	98.01	98.011	0.06
20	0.33	0.005	0.06	0.10	30.9	18.6	12.3	88.4	98.01	98.013	0.08
25	0.42	0.005	0.06	0.10	30.9	22.9	8.0	96.4	98.02	98.015	0.09
30	0.50	0.005	0.06	0.10	30.9	25.7	5.2	101.5	98.02	98.016	0.09
35	0.58	0.005	0.06	0.10	30.9	27.5	3.3	104.9	98.02	98.017	0.10
40	0.67	0.005	0.06	0.10	30.9	28.7	2.2	107.0	98.02	98.017	0.10
45	0.75	0.005	0.06	0.10	30.9	29.5	1.4	108.4	98.02	98.017	0.10
50	0.83	0.005	0.06	0.10	30.9	30.0	0.9	109.3	98.02	98.017	0.10
55	0.92	0.005	0.06	0.10	30.9	30.3	0.6	109.9	98.02	98.018	0.10
60	1.00	0.005	0.06	0.10	30.9	30.5	0.4	110.3	98.02	98.018	0.10
65	1.08	0.005	0.06	0.10	30.9	30.6	0.2	110.5	98.02	98.018	0.10
70	1.17	0.005	0.06	0.10	30.9	30.7	0.2	110.7	98.02	98.018	0.10
75	1.25	0.005	0.06	0.10	30.9	30.8	0.1	110.8	98.02	98.018	0.10
80	1.33	0.005	0.06	0.10	30.9	30.8	0.1	110.9	98.02	98.018	0.10
85	1.42	0.005	0.06	0.10	30.9	30.8	0.0	110.9	98.02	98.018	0.10
90	1.50	0.005	0.06	0.10	30.9	30.9	0.0	110.9	98.02	98.018	0.10
95	1.58	0.005	0.06	0.10	30.9	30.9	0.0	110.9	98.02	98.018	0.10
100	1.67	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
105	1.75	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
110	1.83	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
115	1.92	0.006	0.07	0.12	37.1	30.9	6.2	117.1	98.02	98.018	0.11
120	2.00	0.006	0.07	0.12	37.1	31.7	5.3	122.5	98.02	98.019	0.11
125	2.08	0.006	0.07	0.12	37.1	33.3	3.7	126.2	98.02	98.02	0.12
130	2.17	0.006	0.07	0.12	37.1	34.6	2.5	128.6	98.02	98.02	0.12
135	2.25	0.006	0.07	0.12	37.1	35.5	1.6	130.2	98.02	98.021	0.12
140	2.33	0.006	0.07	0.12	37.1	36.0	1.0	131.3	98.02	98.021	0.12
145	2.42	0.006	0.07	0.12	37.1	36.4	0.7	131.9	98.02	98.021	0.12
150	2.50	0.006	0.07	0.12	37.1	36.6	0.4	132.4	98.02	98.021	0.12
155	2.58	0.006	0.07	0.12	37.1	36.8	0.3	132.7	98.02	98.021	0.12
160	2.67	0.006	0.07	0.12	37.1	36.9	0.2	132.8	98.02	98.021	0.12
165	2.75	0.006	0.07	0.12	37.1	36.9	0.1	133.0	98.02	98.021	0.12
170	2.83	0.006	0.07	0.12	37.1	37.0	0.1	133.0	98.02	98.021	0.12
175	2.92	0.006	0.07	0.12	37.1	37.0	0.0	133.1	98.02	98.021	0.12
180	3.00	0.006	0.07	0.12	37.1	37.0	0.0	133.1	98.02	98.021	0.12
185	3.08	0.006	0.07	0.12	37.1	37.0	0.0	133.1	98.02	98.021	0.12
190	3.17	0.006	0.07	0.12	37.1	37.1	0.0	133.1	98.02	98.021	0.12
195	3.25	0.006	0.07	0.12	37.1	37.1	0.0	133.1	98.02	98.021	0.12
200	3.33	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
205	3.42	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
210	3.50	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
215	3.58	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
220	3.67	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
225	3.75	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
230	3.83	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
235	3.92	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
240	4.00	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
245	4.08	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
250	4.17	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
255	4.25	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
260	4.33	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
265	4.42	0.007	0.08	0.14	43.2	37.1	6.2	139.3	98.02	98.022	0.13
270	4.50	0.007	0.08	0.14	43.2	37.9	5.3	144.7	98.02	98.023	0.13
275	4.58	0.007	0.08	0.14	43.2	39.5	3.7	148.4	98.02	98.023	0.14
280	4.67	0.007	0.08	0.14	43.2	40.8	2.5	150.8	98.02	98.024	0.14
285	4.75	0.007	0.08	0.14	43.2	41.6	1.6	152.4	98.02	98.024	0.14
290	4.83	0.007	0.08	0.14	43.2	42.2	1.0	153.5	98.02	98.024	0.14
295	4.92	0.007	0.08	0.14	43.2	42.6	0.7	154.1	98.02	98.025	0.14
300	5.00	0.007	0.08	0.14	43.2	42.8	0.4	154.6	98.02	98.025	0.14
305	5.08	0.007	0.08	0.14	43.2	43.0	0.3	154.9	98.02	98.025	0.14
310	5.17	0.007	0.08	0.14	43.2	43.1	0.2	155.0	98.02	98.025	0.14
315	5.25	0.007	0.08	0.14	43.2	43.1	0.1	155.1	98.02	98.025	0.14
320	5.33	0.007	0.08	0.14	43.2	43.2	0.1	155.2	98.02	98.025	0.14
325	5.42	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
330	5.50	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
335	5.58	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
340	5.67	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
345	5.75	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
350	5.83	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
355	5.92	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
360	6.00	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
365	6.08	0.008	0.10	0.16	49.4	43.2	6.2	161.5	98.03	98.025	0.15
370	6.17	0.008	0.10	0.16	49.4	44.1	5.3	166.9	98.03	98.026	0.15
375	6.25	0.008	0.10	0.16	49.4	45.7	3.7	170.6	98.03	98.027	0.16
380	6.33	0.008	0.10	0.16	49.4	47.0	2.5	173.0	98.03	98.027	0.16
385	6.42	0.008	0.10	0.16	49.4	47.8	1.6	174.6	98.03	98.028	0.16
390	6.50	0.008	0.10	0.16	49.4	48.4	1.0	175.7	98.03	98.028	0.16
395	6.58	0.008	0.10	0.16	49.4	48.8	0.7	176.3	98.03	98.028	0.16
400	6.67	0.008	0.10	0.16	49.4	49.0	0.4	176.8	98.03	98.028	0.16
405	6.75	0.008	0.10	0.16	49.4	49.1	0.3	177.0	98.03	98.028	0.16
410	6.83	0.008	0.10	0.16	49.4	49.2	0.2	177.2	98.03	98.028	0.16
415	6.92	0.008	0.10	0.16	49.4	49.3	0.1	177.3	98.03	98.028	0.16
420	7.00	0.008	0.10	0.16	49.4	49.3	0.1	177.4	98.03	98.028	0.16
425	7.08	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
430	7.17	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
435	7.25	0.009	0.11	0.19	55.6	49.4	6.2	183.7	98.03	98.029	0.17
440	7.33	0.009	0.11	0.19	55.6	50.3	5.3	189.0	98.03	98.03	0.17
445	7.42	0.009	0.11	0.19	55.6	51.9	3.7	192.8	98.03	98.031	0.18
450	7.50	0.009	0.11	0.19	55.6	53.1	2.5	195.2	98.03	98.031	0.18
455	7.58	0.009	0.11	0.19	55.6	54.0	1.6	196.8	98.03	98.031	0.18
460	7.67	0.009	0.11	0.19	55.6	54.6	1.0	197.9	98.03	98.032	0.18
465	7.75	0.009	0.11	0.19	55.6	54.9	0.7	198.5	98.03	98.032	0.18
470	7.83	0.009	0.11	0.19	55.6	55.2	0.4	199.0	98.03	98.032	0.18
475	7.92	0.009	0.11	0.19	55.6	55.3	0.3	199.2	98.03	98.032	0.18
480	8.00	0.009	0.11	0.19	55.6	55.4	0.2	199.4	98.03	98.032	0.18

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
485	8.08	0.010	0.12	0.21	61.8	55.5	6.3	205.7	98.03	98.032	0.19
490	8.17	0.010	0.12	0.21	61.8	56.4	5.4	211.1	98.03	98.033	0.19
495	8.25	0.010	0.12	0.21	61.8	58.0	3.8	214.9	98.03	98.034	0.20
500	8.33	0.010	0.12	0.21	61.8	59.3	2.5	217.4	98.03	98.035	0.20
505	8.42	0.010	0.12	0.21	61.8	60.2	1.6	219.0	98.04	98.035	0.20
510	8.50	0.010	0.12	0.21	61.8	60.7	1.0	220.0	98.04	98.035	0.20
515	8.58	0.010	0.12	0.21	61.8	61.1	0.7	220.7	98.04	98.035	0.20
520	8.67	0.011	0.13	0.23	68.0	61.3	6.6	227.3	98.04	98.036	0.21
525	8.75	0.011	0.13	0.23	68.0	62.4	5.6	232.9	98.04	98.037	0.21
530	8.83	0.011	0.13	0.23	68.0	64.1	3.9	236.8	98.04	98.038	0.22
535	8.92	0.011	0.13	0.23	68.0	65.4	2.6	239.4	98.04	98.038	0.22
540	9.00	0.011	0.13	0.23	68.0	66.3	1.7	241.1	98.04	98.038	0.22
545	9.08	0.011	0.13	0.23	68.0	66.9	1.1	242.2	98.04	98.039	0.22
550	9.17	0.012	0.14	0.25	74.1	67.3	6.9	249.0	98.04	98.039	0.23
555	9.25	0.012	0.14	0.25	74.1	68.4	5.8	254.8	98.04	98.04	0.23
560	9.33	0.012	0.14	0.25	74.1	70.1	4.0	258.8	98.04	98.041	0.24
565	9.42	0.012	0.14	0.25	74.1	71.5	2.6	261.5	98.04	98.042	0.24
570	9.50	0.012	0.14	0.25	74.1	72.4	1.7	263.2	98.04	98.042	0.24
575	9.58	0.013	0.16	0.27	80.3	73.0	7.3	270.5	98.04	98.043	0.25
580	9.67	0.013	0.16	0.27	80.3	74.3	6.0	276.5	98.04	98.044	0.25
585	9.75	0.013	0.16	0.27	80.3	76.1	4.2	280.7	98.04	98.045	0.26
590	9.83	0.014	0.17	0.29	86.5	77.5	8.9	289.6	98.05	98.046	0.26
595	9.92	0.014	0.17	0.29	86.5	79.4	7.1	296.7	98.05	98.047	0.27
600	10.00	0.014	0.17	0.29	86.5	81.6	4.9	301.6	98.05	98.048	0.28
605	10.08	0.015	0.18	0.31	92.7	83.3	9.4	311.0	98.05	98.049	0.28
610	10.17	0.015	0.18	0.31	92.7	85.3	7.4	318.4	98.05	98.05	0.29
615	10.25	0.015	0.18	0.31	92.7	87.6	5.1	323.5	98.05	98.051	0.30
620	10.33	0.016	0.19	0.33	98.8	89.3	9.5	333.0	98.05	98.053	0.30
625	10.42	0.016	0.19	0.33	98.8	91.4	7.5	340.5	98.05	98.054	0.31
630	10.50	0.017	0.20	0.35	105.0	93.7	11.3	351.8	98.06	98.055	0.32
635	10.58	0.017	0.20	0.35	105.0	96.3	8.7	360.4	98.06	98.057	0.33
640	10.67	0.018	0.22	0.37	111.2	99.1	12.1	372.5	98.06	98.059	0.34
645	10.75	0.019	0.23	0.39	117.4	102.0	15.4	387.9	98.06	98.061	0.35
650	10.83	0.020	0.24	0.41	123.6	105.8	17.7	405.6	98.06	98.063	0.37
655	10.92	0.020	0.24	0.41	123.6	110.4	13.1	418.7	98.07	98.066	0.38
660	11.00	0.021	0.25	0.43	129.7	114.7	15.0	433.7	98.07	98.068	0.40
665	11.08	0.023	0.28	0.47	142.1	118.6	23.4	457.2	98.07	98.071	0.41
670	11.17	0.024	0.29	0.49	148.3	124.0	24.3	481.5	98.08	98.075	0.44
675	11.25	0.025	0.30	0.51	154.4	130.6	23.8	505.3	98.08	98.079	0.46
680	11.33	0.027	0.32	0.56	166.8	137.3	29.5	534.7	98.09	98.083	0.48
685	11.42	0.030	0.36	0.62	185.3	144.7	40.6	575.3	98.09	98.089	0.51
690	11.50	0.032	0.38	0.66	197.7	154.5	43.2	618.5	98.10	98.095	0.55
695	11.58	0.036	0.43	0.74	222.4	166.1	56.2	674.8	98.11	98.103	0.60
700	11.67	0.042	0.50	0.86	259.5	180.0	79.5	754.2	98.12	98.114	0.66
705	11.75	0.050	0.60	1.03	308.9	198.9	110.0	864.2	98.14	98.129	0.75
710	11.83	0.065	0.78	1.34	401.5	225.2	176.3	1040.5	98.17	98.152	0.88
715	11.92	0.109	1.31	2.24	673.4	265.1	408.3	1448.8	98.23	98.199	1.15
720	12.00	0.327	3.92	6.73	2020.1	346.4	1673.6	3122.4	98.50	98.366	2.12
725	12.08	0.080	0.96	1.65	494.2	636.2	-142.0	2980.5	98.48	98.488	2.83
730	12.17	0.056	0.67	1.15	345.9	849.4	-503.4	2477.0	98.40	98.437	2.53
735	12.25	0.045	0.54	0.93	278.0	759.5	-481.5	1995.5	98.32	98.358	2.07
740	12.33	0.039	0.47	0.80	240.9	622.5	-381.5	1614.0	98.26	98.289	1.67
745	12.42	0.034	0.41	0.70	210.0	502.3	-292.3	1321.7	98.21	98.235	1.36

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
750	12.50	0.031	0.37	0.64	191.5	408.6	-217.1	1104.6	98.18	98.194	1.13
755	12.58	0.028	0.34	0.58	173.0	337.7	-164.7	939.9	98.15	98.164	0.95
760	12.67	0.026	0.31	0.54	160.6	284.5	-123.9	816.0	98.13	98.14	0.81
765	12.75	0.025	0.30	0.51	154.4	244.4	-89.9	726.1	98.12	98.123	0.72
770	12.83	0.023	0.28	0.47	142.1	214.6	-72.5	653.5	98.10	98.11	0.64
775	12.92	0.022	0.26	0.45	135.9	192.0	-56.1	597.4	98.10	98.1	0.58
780	13.00	0.021	0.25	0.43	129.7	174.1	-44.4	553.1	98.09	98.092	0.53
785	13.08	0.020	0.24	0.41	123.6	160.1	-36.6	516.5	98.08	98.086	0.50
790	13.17	0.019	0.23	0.39	117.4	148.9	-31.5	485.0	98.08	98.08	0.46
795	13.25	0.018	0.22	0.37	111.2	139.4	-28.2	456.8	98.07	98.075	0.44
800	13.33	0.018	0.22	0.37	111.2	131.1	-19.9	437.0	98.07	98.071	0.41
805	13.42	0.017	0.20	0.35	105.0	124.4	-19.4	417.6	98.07	98.068	0.40
810	13.50	0.017	0.20	0.35	105.0	118.9	-13.9	403.7	98.06	98.066	0.38
815	13.58	0.016	0.19	0.33	98.8	114.3	-15.5	388.2	98.06	98.063	0.37
820	13.67	0.016	0.19	0.33	98.8	110.2	-11.4	376.9	98.06	98.061	0.35
825	13.75	0.015	0.18	0.31	92.7	106.5	-13.8	363.0	98.06	98.059	0.34
830	13.83	0.015	0.18	0.31	92.7	103.0	-10.3	352.7	98.06	98.057	0.33
835	13.92	0.014	0.17	0.29	86.5	99.6	-13.1	339.6	98.05	98.055	0.32
840	14.00	0.014	0.17	0.29	86.5	96.4	-9.9	329.7	98.05	98.054	0.31
845	14.08	0.014	0.17	0.29	86.5	93.2	-6.7	323.1	98.05	98.052	0.30
850	14.17	0.013	0.16	0.27	80.3	90.9	-10.5	312.5	98.05	98.051	0.29
855	14.25	0.013	0.16	0.27	80.3	88.5	-8.1	304.4	98.05	98.049	0.29
860	14.33	0.013	0.16	0.27	80.3	85.9	-5.5	298.8	98.05	98.048	0.28
865	14.42	0.013	0.16	0.27	80.3	83.9	-3.6	295.2	98.05	98.048	0.28
870	14.50	0.012	0.14	0.25	74.1	82.7	-8.5	286.6	98.05	98.047	0.27
875	14.58	0.012	0.14	0.25	74.1	81.0	-6.8	279.8	98.04	98.045	0.26
880	14.67	0.012	0.14	0.25	74.1	78.8	-4.7	275.1	98.04	98.044	0.26
885	14.75	0.012	0.14	0.25	74.1	77.2	-3.1	272.0	98.04	98.044	0.25
890	14.83	0.011	0.13	0.23	68.0	76.1	-8.2	263.8	98.04	98.043	0.25
895	14.92	0.011	0.13	0.23	68.0	74.6	-6.6	257.2	98.04	98.042	0.24
900	15.00	0.011	0.13	0.23	68.0	72.5	-4.6	252.6	98.04	98.041	0.24
905	15.08	0.011	0.13	0.23	68.0	71.0	-3.0	249.6	98.04	98.04	0.23
910	15.17	0.011	0.13	0.23	68.0	69.9	-1.9	247.7	98.04	98.04	0.23
915	15.25	0.011	0.13	0.23	68.0	69.2	-1.3	246.4	98.04	98.04	0.23
920	15.33	0.010	0.12	0.21	61.8	68.8	-7.0	239.4	98.04	98.039	0.23
925	15.42	0.010	0.12	0.21	61.8	67.6	-5.8	233.6	98.04	98.038	0.22
930	15.50	0.010	0.12	0.21	61.8	65.8	-4.1	229.5	98.04	98.037	0.21
935	15.58	0.010	0.12	0.21	61.8	64.5	-2.7	226.9	98.04	98.037	0.21
940	15.67	0.010	0.12	0.21	61.8	63.5	-1.7	225.1	98.04	98.036	0.21
945	15.75	0.010	0.12	0.21	61.8	62.9	-1.1	224.0	98.04	98.036	0.21
950	15.83	0.010	0.12	0.21	61.8	62.5	-0.7	223.3	98.04	98.036	0.21
955	15.92	0.010	0.12	0.21	61.8	62.2	-0.5	222.8	98.04	98.036	0.21
960	16.00	0.009	0.11	0.19	55.6	62.1	-6.5	216.3	98.03	98.035	0.20
965	16.08	0.009	0.11	0.19	55.6	61.1	-5.5	210.8	98.03	98.034	0.20
970	16.17	0.009	0.11	0.19	55.6	59.4	-3.8	207.0	98.03	98.033	0.19
975	16.25	0.009	0.11	0.19	55.6	58.1	-2.5	204.4	98.03	98.033	0.19
980	16.33	0.009	0.11	0.19	55.6	57.3	-1.7	202.8	98.03	98.033	0.19
985	16.42	0.009	0.11	0.19	55.6	56.7	-1.1	201.7	98.03	98.032	0.19
990	16.50	0.009	0.11	0.19	55.6	56.3	-0.7	201.0	98.03	98.032	0.19
995	16.58	0.009	0.11	0.19	55.6	56.0	-0.4	200.6	98.03	98.032	0.19
1000	16.67	0.009	0.11	0.19	55.6	55.9	-0.3	200.3	98.03	98.032	0.19
1005	16.75	0.009	0.11	0.19	55.6	55.8	-0.2	200.1	98.03	98.032	0.19
1010	16.83	0.008	0.10	0.16	49.4	55.7	-6.3	193.8	98.03	98.032	0.18

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1015	16.92	0.008	0.10	0.16	49.4	54.8	-5.4	188.4	98.03	98.031	0.18
1020	17.00	0.008	0.10	0.16	49.4	53.2	-3.8	184.6	98.03	98.03	0.17
1025	17.08	0.008	0.10	0.16	49.4	51.9	-2.5	182.1	98.03	98.029	0.17
1030	17.17	0.008	0.10	0.16	49.4	51.0	-1.6	180.5	98.03	98.029	0.17
1035	17.25	0.008	0.10	0.16	49.4	50.5	-1.0	179.5	98.03	98.029	0.17
1040	17.33	0.008	0.10	0.16	49.4	50.1	-0.7	178.8	98.03	98.029	0.17
1045	17.42	0.008	0.10	0.16	49.4	49.9	-0.4	178.3	98.03	98.029	0.17
1050	17.50	0.008	0.10	0.16	49.4	49.7	-0.3	178.1	98.03	98.029	0.17
1055	17.58	0.008	0.10	0.16	49.4	49.6	-0.2	177.9	98.03	98.028	0.17
1060	17.67	0.008	0.10	0.16	49.4	49.5	-0.1	177.8	98.03	98.028	0.16
1065	17.75	0.008	0.10	0.16	49.4	49.5	-0.1	177.7	98.03	98.028	0.16
1070	17.83	0.008	0.10	0.16	49.4	49.5	0.0	177.6	98.03	98.028	0.16
1075	17.92	0.007	0.08	0.14	43.2	49.5	-6.2	171.4	98.03	98.028	0.16
1080	18.00	0.007	0.08	0.14	43.2	48.6	-5.3	166.1	98.03	98.027	0.16
1085	18.08	0.007	0.08	0.14	43.2	47.0	-3.7	162.4	98.03	98.026	0.15
1090	18.17	0.007	0.08	0.14	43.2	45.7	-2.5	159.9	98.03	98.026	0.15
1095	18.25	0.007	0.08	0.14	43.2	44.8	-1.6	158.3	98.03	98.025	0.15
1100	18.33	0.007	0.08	0.14	43.2	44.3	-1.0	157.2	98.03	98.025	0.15
1105	18.42	0.007	0.08	0.14	43.2	43.9	-0.7	156.6	98.03	98.025	0.15
1110	18.50	0.007	0.08	0.14	43.2	43.7	-0.4	156.1	98.02	98.025	0.15
1115	18.58	0.007	0.08	0.14	43.2	43.5	-0.3	155.9	98.02	98.025	0.14
1120	18.67	0.007	0.08	0.14	43.2	43.4	-0.2	155.7	98.02	98.025	0.14
1125	18.75	0.007	0.08	0.14	43.2	43.4	-0.1	155.6	98.02	98.025	0.14
1130	18.83	0.007	0.08	0.14	43.2	43.3	-0.1	155.5	98.02	98.025	0.14
1135	18.92	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1140	19.00	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1145	19.08	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1150	19.17	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1155	19.25	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1160	19.33	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1165	19.42	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1170	19.50	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1175	19.58	0.006	0.07	0.12	37.1	43.2	-6.2	149.2	98.02	98.024	0.14
1180	19.67	0.006	0.07	0.12	37.1	42.4	-5.3	143.9	98.02	98.023	0.14
1185	19.75	0.006	0.07	0.12	37.1	40.8	-3.7	140.1	98.02	98.023	0.13
1190	19.83	0.006	0.07	0.12	37.1	39.5	-2.5	137.7	98.02	98.022	0.13
1195	19.92	0.006	0.07	0.12	37.1	38.7	-1.6	136.1	98.02	98.022	0.13
1200	20.00	0.006	0.07	0.12	37.1	38.1	-1.0	135.0	98.02	98.022	0.13
1205	20.08	0.006	0.07	0.12	37.1	37.7	-0.7	134.4	98.02	98.022	0.12
1210	20.17	0.006	0.07	0.12	37.1	37.5	-0.4	133.9	98.02	98.021	0.12
1215	20.25	0.006	0.07	0.12	37.1	37.3	-0.3	133.7	98.02	98.021	0.12
1220	20.33	0.006	0.07	0.12	37.1	37.2	-0.2	133.5	98.02	98.021	0.12
1225	20.42	0.006	0.07	0.12	37.1	37.2	-0.1	133.4	98.02	98.021	0.12
1230	20.50	0.006	0.07	0.12	37.1	37.1	-0.1	133.3	98.02	98.021	0.12
1235	20.58	0.006	0.07	0.12	37.1	37.1	0.0	133.3	98.02	98.021	0.12
1240	20.67	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1245	20.75	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1250	20.83	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1255	20.92	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1260	21.00	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1265	21.08	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1270	21.17	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1275	21.25	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1280	21.33	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1285	21.42	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1290	21.50	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1300	21.67	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1305	21.75	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1310	21.83	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1315	21.92	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1320	22.00	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1325	22.08	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1330	22.17	0.006	0.07	0.12	37.1	37.1	0.0	133.2	98.02	98.021	0.12
1335	22.25	0.005	0.06	0.10	30.9	37.1	-6.2	127.0	98.02	98.021	0.12
1340	22.33	0.005	0.06	0.10	30.9	36.2	-5.3	121.7	98.02	98.02	0.12
1345	22.42	0.005	0.06	0.10	30.9	34.6	-3.7	118.0	98.02	98.019	0.11
1350	22.50	0.005	0.06	0.10	30.9	33.3	-2.5	115.5	98.02	98.019	0.11
1355	22.58	0.005	0.06	0.10	30.9	32.5	-1.6	113.9	98.02	98.018	0.11
1360	22.67	0.005	0.06	0.10	30.9	31.9	-1.0	112.9	98.02	98.018	0.11
1365	22.75	0.005	0.06	0.10	30.9	31.6	-0.7	112.2	98.02	98.018	0.10
1370	22.83	0.005	0.06	0.10	30.9	31.3	-0.4	111.8	98.02	98.018	0.10
1375	22.92	0.005	0.06	0.10	30.9	31.2	-0.3	111.5	98.02	98.018	0.10
1380	23.00	0.005	0.06	0.10	30.9	31.1	-0.2	111.3	98.02	98.018	0.10
1385	23.08	0.005	0.06	0.10	30.9	31.0	-0.1	111.2	98.02	98.018	0.10
1390	23.17	0.005	0.06	0.10	30.9	31.0	-0.1	111.1	98.02	98.018	0.10
1395	23.25	0.005	0.06	0.10	30.9	30.9	0.0	111.1	98.02	98.018	0.10
1400	23.33	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1405	23.42	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1410	23.50	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1415	23.58	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1420	23.67	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1425	23.75	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1430	23.83	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1435	23.92	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10
1440	24.00	0.005	0.06	0.10	30.9	30.9	0.0	111.0	98.02	98.018	0.10

Detention Stage-Storage-Discharge Calculation

Pace Supply Detention Basin

10-year

Detention and Basin Parameters

Area = 2.6 ac
Total 24-hr rainfall= 4.48 in C = 0.66
Elev = 580

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
0	0.00	0.006	0.07	0.12	37.1	0.0	0.0	0.0	98.00	0	0.00
5	0.08	0.007	0.08	0.14	43.2	0.0	43.2	43.2	98.01	98.003	0.02
10	0.17	0.007	0.08	0.14	43.2	6.0	37.2	80.5	98.01	98.01	0.06
15	0.25	0.007	0.08	0.14	43.2	17.2	26.0	106.5	98.02	98.015	0.09
20	0.33	0.007	0.08	0.14	43.2	26.0	17.2	123.7	98.02	98.018	0.11
25	0.42	0.007	0.08	0.14	43.2	32.0	11.2	134.9	98.02	98.021	0.12
30	0.50	0.007	0.08	0.14	43.2	36.0	7.2	142.2	98.02	98.022	0.13
35	0.58	0.007	0.08	0.14	43.2	38.6	4.7	146.8	98.02	98.023	0.13
40	0.67	0.007	0.08	0.14	43.2	40.2	3.0	149.9	98.02	98.024	0.14
45	0.75	0.007	0.08	0.14	43.2	41.3	1.9	151.8	98.02	98.024	0.14
50	0.83	0.007	0.08	0.14	43.2	42.0	1.3	153.1	98.02	98.024	0.14
55	0.92	0.007	0.08	0.14	43.2	42.4	0.8	153.9	98.02	98.025	0.14
60	1.00	0.007	0.08	0.14	43.2	42.7	0.5	154.4	98.02	98.025	0.14
65	1.08	0.007	0.08	0.14	43.2	42.9	0.3	154.7	98.02	98.025	0.14
70	1.17	0.007	0.08	0.14	43.2	43.0	0.2	155.0	98.02	98.025	0.14
75	1.25	0.007	0.08	0.14	43.2	43.1	0.1	155.1	98.02	98.025	0.14
80	1.33	0.007	0.08	0.14	43.2	43.2	0.1	155.2	98.02	98.025	0.14
85	1.42	0.007	0.08	0.14	43.2	43.2	0.1	155.3	98.02	98.025	0.14
90	1.50	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
95	1.58	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
100	1.67	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
105	1.75	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
110	1.83	0.007	0.08	0.14	43.2	43.2	0.0	155.3	98.02	98.025	0.14
115	1.92	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
120	2.00	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
125	2.08	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
130	2.17	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
135	2.25	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
140	2.33	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
145	2.42	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
150	2.50	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
155	2.58	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
160	2.67	0.008	0.10	0.16	49.4	43.2	6.2	161.5	98.03	98.025	0.15
165	2.75	0.008	0.10	0.16	49.4	44.1	5.3	166.9	98.03	98.026	0.15
170	2.83	0.008	0.10	0.16	49.4	45.7	3.7	170.6	98.03	98.027	0.16
175	2.92	0.008	0.10	0.16	49.4	47.0	2.5	173.0	98.03	98.027	0.16
180	3.00	0.008	0.10	0.16	49.4	47.8	1.6	174.6	98.03	98.028	0.16
185	3.08	0.008	0.10	0.16	49.4	48.4	1.0	175.7	98.03	98.028	0.16
190	3.17	0.008	0.10	0.16	49.4	48.8	0.7	176.3	98.03	98.028	0.16
195	3.25	0.008	0.10	0.16	49.4	49.0	0.4	176.8	98.03	98.028	0.16
200	3.33	0.008	0.10	0.16	49.4	49.1	0.3	177.0	98.03	98.028	0.16
205	3.42	0.008	0.10	0.16	49.4	49.2	0.2	177.2	98.03	98.028	0.16
210	3.50	0.008	0.10	0.16	49.4	49.3	0.1	177.3	98.03	98.028	0.16
215	3.58	0.008	0.10	0.16	49.4	49.3	0.1	177.4	98.03	98.028	0.16

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
220	3.67	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
225	3.75	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
230	3.83	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
235	3.92	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
240	4.00	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
245	4.08	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
250	4.17	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
255	4.25	0.008	0.10	0.16	49.4	49.4	0.0	177.5	98.03	98.028	0.16
260	4.33	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
265	4.42	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
270	4.50	0.009	0.11	0.19	55.6	49.4	6.2	183.7	98.03	98.029	0.17
275	4.58	0.009	0.11	0.19	55.6	50.3	5.3	189.0	98.03	98.03	0.17
280	4.67	0.009	0.11	0.19	55.6	51.9	3.7	192.8	98.03	98.031	0.18
285	4.75	0.009	0.11	0.19	55.6	53.1	2.5	195.2	98.03	98.031	0.18
290	4.83	0.009	0.11	0.19	55.6	54.0	1.6	196.8	98.03	98.031	0.18
295	4.92	0.009	0.11	0.19	55.6	54.6	1.0	197.9	98.03	98.032	0.18
300	5.00	0.009	0.11	0.19	55.6	54.9	0.7	198.5	98.03	98.032	0.18
305	5.08	0.009	0.11	0.19	55.6	55.2	0.4	199.0	98.03	98.032	0.18
310	5.17	0.009	0.11	0.19	55.6	55.3	0.3	199.2	98.03	98.032	0.18
315	5.25	0.009	0.11	0.19	55.6	55.4	0.2	199.4	98.03	98.032	0.18
320	5.33	0.009	0.11	0.19	55.6	55.5	0.1	199.5	98.03	98.032	0.19
325	5.42	0.009	0.11	0.19	55.6	55.5	0.1	199.6	98.03	98.032	0.19
330	5.50	0.009	0.11	0.19	55.6	55.6	0.0	199.7	98.03	98.032	0.19
335	5.58	0.009	0.11	0.19	55.6	55.6	0.0	199.7	98.03	98.032	0.19
340	5.67	0.009	0.11	0.19	55.6	55.6	0.0	199.7	98.03	98.032	0.19
345	5.75	0.009	0.11	0.19	55.6	55.6	0.0	199.7	98.03	98.032	0.19
350	5.83	0.010	0.12	0.21	61.8	55.6	6.2	205.9	98.03	98.032	0.19
355	5.92	0.010	0.12	0.21	61.8	56.5	5.3	211.2	98.03	98.033	0.19
360	6.00	0.010	0.12	0.21	61.8	58.1	3.7	215.0	98.03	98.034	0.20
365	6.08	0.010	0.12	0.21	61.8	59.3	2.5	217.4	98.03	98.035	0.20
370	6.17	0.010	0.12	0.21	61.8	60.2	1.6	219.0	98.04	98.035	0.20
375	6.25	0.010	0.12	0.21	61.8	60.7	1.0	220.1	98.04	98.035	0.20
380	6.33	0.010	0.12	0.21	61.8	61.1	0.7	220.7	98.04	98.035	0.20
385	6.42	0.010	0.12	0.21	61.8	61.3	0.4	221.2	98.04	98.035	0.20
390	6.50	0.010	0.12	0.21	61.8	61.5	0.3	221.4	98.04	98.035	0.21
395	6.58	0.010	0.12	0.21	61.8	61.6	0.2	221.6	98.04	98.035	0.21
400	6.67	0.010	0.12	0.21	61.8	61.7	0.1	221.7	98.04	98.035	0.21
405	6.75	0.011	0.13	0.23	68.0	61.7	6.3	228.0	98.04	98.036	0.21
410	6.83	0.011	0.13	0.23	68.0	62.6	5.4	233.3	98.04	98.037	0.21
415	6.92	0.011	0.13	0.23	68.0	64.2	3.7	237.1	98.04	98.038	0.22
420	7.00	0.011	0.13	0.23	68.0	65.5	2.5	239.6	98.04	98.038	0.22
425	7.08	0.011	0.13	0.23	68.0	66.3	1.6	241.2	98.04	98.038	0.22
430	7.17	0.011	0.13	0.23	68.0	66.9	1.0	242.2	98.04	98.039	0.22
435	7.25	0.011	0.13	0.23	68.0	67.3	0.7	242.9	98.04	98.039	0.23
440	7.33	0.011	0.13	0.23	68.0	67.5	0.4	243.3	98.04	98.039	0.23
445	7.42	0.011	0.13	0.23	68.0	67.7	0.3	243.6	98.04	98.039	0.23
450	7.50	0.011	0.13	0.23	68.0	67.8	0.2	243.8	98.04	98.039	0.23
455	7.58	0.012	0.14	0.25	74.1	67.8	6.3	250.1	98.04	98.04	0.23
460	7.67	0.012	0.14	0.25	74.1	68.7	5.4	255.5	98.04	98.04	0.23
465	7.75	0.012	0.14	0.25	74.1	70.4	3.8	259.3	98.04	98.041	0.24
470	7.83	0.012	0.14	0.25	74.1	71.6	2.5	261.8	98.04	98.042	0.24
475	7.92	0.012	0.14	0.25	74.1	72.5	1.6	263.4	98.04	98.042	0.24
480	8.00	0.012	0.14	0.25	74.1	73.1	1.0	264.4	98.04	98.042	0.24

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
485	8.08	0.012	0.14	0.25	74.1	73.5	0.7	265.1	98.04	98.042	0.25
490	8.17	0.013	0.16	0.27	80.3	73.7	6.6	271.7	98.04	98.043	0.25
495	8.25	0.013	0.16	0.27	80.3	74.7	5.6	277.3	98.04	98.044	0.25
500	8.33	0.013	0.16	0.27	80.3	76.4	3.9	281.2	98.04	98.045	0.26
505	8.42	0.013	0.16	0.27	80.3	77.7	2.6	283.8	98.05	98.045	0.26
510	8.50	0.013	0.16	0.27	80.3	78.6	1.7	285.5	98.05	98.046	0.26
515	8.58	0.014	0.17	0.29	86.5	79.2	7.3	292.7	98.05	98.046	0.27
520	8.67	0.014	0.17	0.29	86.5	80.5	6.0	298.7	98.05	98.047	0.27
525	8.75	0.014	0.17	0.29	86.5	82.3	4.2	302.9	98.05	98.048	0.28
530	8.83	0.014	0.17	0.29	86.5	83.7	2.8	305.7	98.05	98.049	0.28
535	8.92	0.014	0.17	0.29	86.5	84.7	1.8	307.5	98.05	98.049	0.28
540	9.00	0.015	0.18	0.31	92.7	85.3	7.3	314.8	98.05	98.05	0.29
545	9.08	0.015	0.18	0.31	92.7	86.6	6.1	320.9	98.05	98.051	0.29
550	9.17	0.015	0.18	0.31	92.7	88.5	4.2	325.1	98.05	98.052	0.30
555	9.25	0.015	0.18	0.31	92.7	89.9	2.8	327.8	98.05	98.052	0.30
560	9.33	0.016	0.19	0.33	98.8	90.9	8.0	335.8	98.05	98.053	0.31
565	9.42	0.016	0.19	0.33	98.8	92.4	6.5	342.3	98.05	98.054	0.31
570	9.50	0.016	0.19	0.33	98.8	94.4	4.5	346.8	98.06	98.055	0.32
575	9.58	0.017	0.20	0.35	105.0	95.9	9.1	355.9	98.06	98.056	0.33
580	9.67	0.017	0.20	0.35	105.0	97.8	7.2	363.1	98.06	98.058	0.33
585	9.75	0.017	0.20	0.35	105.0	100.1	5.0	368.1	98.06	98.058	0.34
590	9.83	0.018	0.22	0.37	111.2	101.8	9.4	377.5	98.06	98.06	0.35
595	9.92	0.018	0.22	0.37	111.2	103.8	7.4	384.9	98.06	98.061	0.35
600	10.00	0.018	0.22	0.37	111.2	106.1	5.1	390.0	98.06	98.062	0.36
605	10.08	0.019	0.23	0.39	117.4	107.9	9.5	399.5	98.06	98.063	0.37
610	10.17	0.019	0.23	0.39	117.4	109.9	7.5	407.0	98.07	98.065	0.37
615	10.25	0.020	0.24	0.41	123.6	112.3	11.3	418.3	98.07	98.066	0.38
620	10.33	0.021	0.25	0.43	129.7	114.9	14.9	433.2	98.07	98.068	0.40
625	10.42	0.021	0.25	0.43	129.7	118.5	11.2	444.4	98.07	98.07	0.41
630	10.50	0.022	0.26	0.45	135.9	122.1	13.8	458.2	98.07	98.072	0.42
635	10.58	0.023	0.28	0.47	142.1	125.6	16.5	474.7	98.08	98.075	0.43
640	10.67	0.023	0.28	0.47	142.1	129.8	12.3	486.9	98.08	98.077	0.45
645	10.75	0.024	0.29	0.49	148.3	133.8	14.4	501.4	98.08	98.079	0.46
650	10.83	0.025	0.30	0.51	154.4	137.5	16.9	518.3	98.08	98.082	0.47
655	10.92	0.027	0.32	0.56	166.8	141.9	24.9	543.1	98.09	98.085	0.49
660	11.00	0.028	0.34	0.58	173.0	147.7	25.3	568.4	98.09	98.089	0.52
665	11.08	0.029	0.35	0.60	179.2	154.7	24.5	592.9	98.09	98.093	0.54
670	11.17	0.031	0.37	0.64	191.5	161.6	29.9	622.7	98.10	98.097	0.56
675	11.25	0.033	0.40	0.68	203.9	169.2	34.7	657.4	98.11	98.102	0.59
680	11.33	0.036	0.43	0.74	222.4	178.2	44.2	701.7	98.11	98.109	0.63
685	11.42	0.039	0.47	0.80	240.9	189.1	51.8	753.4	98.12	98.116	0.68
690	11.50	0.042	0.50	0.86	259.5	202.5	57.0	810.4	98.13	98.125	0.73
695	11.58	0.047	0.56	0.97	290.3	217.6	72.7	883.1	98.14	98.135	0.79
700	11.67	0.054	0.65	1.11	333.6	235.7	97.9	981.0	98.16	98.149	0.86
705	11.75	0.065	0.78	1.34	401.5	259.4	142.1	1123.1	98.18	98.168	0.98
710	11.83	0.085	1.02	1.75	525.1	292.8	232.3	1355.4	98.22	98.198	1.15
715	11.92	0.142	1.70	2.92	877.2	344.9	532.3	1887.7	98.30	98.259	1.50
720	12.00	0.425	5.10	8.75	2625.5	451.3	2174.1	4061.8	98.62	98.461	2.67
725	12.08	0.104	1.25	2.14	642.5	802.5	-160.0	3901.8	98.60	98.61	4.24
730	12.17	0.073	0.88	1.50	451.0	1273.1	-822.1	3079.7	98.49	98.546	3.46
735	12.25	0.059	0.71	1.21	364.5	1039.3	-674.8	2404.9	98.38	98.439	2.54
740	12.33	0.050	0.60	1.03	308.9	763.3	-454.4	1950.5	98.31	98.348	2.02
745	12.42	0.045	0.54	0.93	278.0	606.1	-328.1	1622.3	98.26	98.286	1.66

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
750	12.50	0.040	0.48	0.82	247.1	497.2	-250.1	1372.2	98.22	98.24	1.39
755	12.58	0.037	0.44	0.76	228.6	416.8	-188.2	1184.0	98.19	98.204	1.19
760	12.67	0.034	0.41	0.70	210.0	355.8	-145.7	1038.3	98.17	98.178	1.03
765	12.75	0.032	0.38	0.66	197.7	309.3	-111.6	926.7	98.15	98.157	0.91
770	12.83	0.030	0.36	0.62	185.3	273.5	-88.1	838.6	98.13	98.141	0.82
775	12.92	0.029	0.35	0.60	179.2	245.7	-66.5	772.0	98.12	98.129	0.75
780	13.00	0.027	0.32	0.56	166.8	224.1	-57.4	714.7	98.11	98.119	0.69
785	13.08	0.026	0.31	0.54	160.6	206.9	-46.3	668.4	98.11	98.111	0.64
790	13.17	0.025	0.30	0.51	154.4	192.5	-38.0	630.3	98.10	98.104	0.60
795	13.25	0.024	0.29	0.49	148.3	180.7	-32.5	597.9	98.10	98.098	0.57
800	13.33	0.023	0.28	0.47	142.1	170.9	-28.8	569.0	98.09	98.093	0.54
805	13.42	0.022	0.26	0.45	135.9	162.4	-26.5	542.5	98.09	98.089	0.52
810	13.50	0.022	0.26	0.45	135.9	154.7	-18.8	523.7	98.08	98.085	0.49
815	13.58	0.021	0.25	0.43	129.7	148.4	-18.7	505.1	98.08	98.082	0.48
820	13.67	0.020	0.24	0.41	123.6	143.2	-19.6	485.4	98.08	98.079	0.46
825	13.75	0.020	0.24	0.41	123.6	137.9	-14.3	471.1	98.08	98.077	0.44
830	13.83	0.019	0.23	0.39	117.4	133.1	-15.8	455.4	98.07	98.074	0.43
835	13.92	0.019	0.23	0.39	117.4	128.9	-11.6	443.8	98.07	98.072	0.42
840	14.00	0.018	0.22	0.37	111.2	125.1	-13.9	429.9	98.07	98.07	0.41
845	14.08	0.018	0.22	0.37	111.2	121.6	-10.4	419.5	98.07	98.068	0.39
850	14.17	0.017	0.20	0.35	105.0	118.2	-13.2	406.3	98.06	98.066	0.38
855	14.25	0.017	0.20	0.35	105.0	114.9	-9.9	396.4	98.06	98.064	0.37
860	14.33	0.017	0.20	0.35	105.0	111.7	-6.7	389.7	98.06	98.063	0.36
865	14.42	0.016	0.19	0.33	98.8	109.4	-10.6	379.1	98.06	98.061	0.36
870	14.50	0.016	0.19	0.33	98.8	107.0	-8.2	371.0	98.06	98.06	0.35
875	14.58	0.016	0.19	0.33	98.8	104.4	-5.6	365.4	98.06	98.059	0.34
880	14.67	0.015	0.18	0.31	92.7	102.5	-9.8	355.6	98.06	98.058	0.33
885	14.75	0.015	0.18	0.31	92.7	100.3	-7.7	347.9	98.06	98.056	0.33
890	14.83	0.015	0.18	0.31	92.7	97.9	-5.2	342.7	98.05	98.055	0.32
895	14.92	0.015	0.18	0.31	92.7	96.1	-3.4	339.2	98.05	98.055	0.32
900	15.00	0.014	0.17	0.29	86.5	94.9	-8.4	330.8	98.05	98.054	0.31
905	15.08	0.014	0.17	0.29	86.5	93.3	-6.8	324.0	98.05	98.052	0.30
910	15.17	0.014	0.17	0.29	86.5	91.1	-4.7	319.4	98.05	98.051	0.30
915	15.25	0.014	0.17	0.29	86.5	89.5	-3.1	316.3	98.05	98.051	0.29
920	15.33	0.014	0.17	0.29	86.5	88.5	-2.0	314.3	98.05	98.05	0.29
925	15.42	0.013	0.16	0.27	80.3	87.8	-7.5	306.9	98.05	98.05	0.29
930	15.50	0.013	0.16	0.27	80.3	86.5	-6.1	300.7	98.05	98.049	0.28
935	15.58	0.013	0.16	0.27	80.3	84.6	-4.3	296.5	98.05	98.048	0.28
940	15.67	0.013	0.16	0.27	80.3	83.1	-2.8	293.7	98.05	98.047	0.27
945	15.75	0.013	0.16	0.27	80.3	82.1	-1.8	291.8	98.05	98.047	0.27
950	15.83	0.013	0.16	0.27	80.3	81.5	-1.2	290.7	98.05	98.047	0.27
955	15.92	0.012	0.14	0.25	74.1	81.1	-6.9	283.7	98.05	98.046	0.27
960	16.00	0.012	0.14	0.25	74.1	79.9	-5.8	277.9	98.04	98.045	0.26
965	16.08	0.012	0.14	0.25	74.1	78.2	-4.0	273.9	98.04	98.044	0.26
970	16.17	0.012	0.14	0.25	74.1	76.8	-2.7	271.2	98.04	98.044	0.25
975	16.25	0.012	0.14	0.25	74.1	75.9	-1.7	269.5	98.04	98.043	0.25
980	16.33	0.012	0.14	0.25	74.1	75.3	-1.1	268.4	98.04	98.043	0.25
985	16.42	0.012	0.14	0.25	74.1	74.9	-0.7	267.6	98.04	98.043	0.25
990	16.50	0.011	0.13	0.23	68.0	74.6	-6.6	261.0	98.04	98.042	0.25
995	16.58	0.011	0.13	0.23	68.0	73.6	-5.6	255.4	98.04	98.041	0.24
1000	16.67	0.011	0.13	0.23	68.0	71.9	-3.9	251.5	98.04	98.041	0.24
1005	16.75	0.011	0.13	0.23	68.0	70.5	-2.6	248.9	98.04	98.04	0.23
1010	16.83	0.011	0.13	0.23	68.0	69.6	-1.7	247.2	98.04	98.04	0.23

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1015	16.92	0.011	0.13	0.23	68.0	69.0	-1.1	246.1	98.04	98.039	0.23
1020	17.00	0.011	0.13	0.23	68.0	68.7	-0.7	245.4	98.04	98.039	0.23
1025	17.08	0.011	0.13	0.23	68.0	68.4	-0.5	245.0	98.04	98.039	0.23
1030	17.17	0.011	0.13	0.23	68.0	68.2	-0.3	244.7	98.04	98.039	0.23
1035	17.25	0.010	0.12	0.21	61.8	68.1	-6.4	238.3	98.04	98.039	0.22
1040	17.33	0.010	0.12	0.21	61.8	67.2	-5.4	232.9	98.04	98.038	0.22
1045	17.42	0.010	0.12	0.21	61.8	65.6	-3.8	229.1	98.04	98.037	0.21
1050	17.50	0.010	0.12	0.21	61.8	64.3	-2.5	226.6	98.04	98.036	0.21
1055	17.58	0.010	0.12	0.21	61.8	63.4	-1.6	224.9	98.04	98.036	0.21
1060	17.67	0.010	0.12	0.21	61.8	62.8	-1.1	223.9	98.04	98.036	0.21
1065	17.75	0.010	0.12	0.21	61.8	62.5	-0.7	223.2	98.04	98.036	0.21
1070	17.83	0.010	0.12	0.21	61.8	62.2	-0.4	222.7	98.04	98.036	0.21
1075	17.92	0.010	0.12	0.21	61.8	62.1	-0.3	222.5	98.04	98.036	0.21
1080	18.00	0.010	0.12	0.21	61.8	62.0	-0.2	222.3	98.04	98.036	0.21
1085	18.08	0.010	0.12	0.21	61.8	61.9	-0.1	222.2	98.04	98.036	0.21
1090	18.17	0.010	0.12	0.21	61.8	61.9	-0.1	222.1	98.04	98.036	0.21
1095	18.25	0.009	0.11	0.19	55.6	61.8	-6.2	215.9	98.03	98.035	0.20
1100	18.33	0.009	0.11	0.19	55.6	60.9	-5.3	210.5	98.03	98.034	0.20
1105	18.42	0.009	0.11	0.19	55.6	59.3	-3.7	206.8	98.03	98.033	0.19
1110	18.50	0.009	0.11	0.19	55.6	58.1	-2.5	204.3	98.03	98.033	0.19
1115	18.58	0.009	0.11	0.19	55.6	57.2	-1.6	202.7	98.03	98.033	0.19
1120	18.67	0.009	0.11	0.19	55.6	56.6	-1.0	201.6	98.03	98.032	0.19
1125	18.75	0.009	0.11	0.19	55.6	56.3	-0.7	201.0	98.03	98.032	0.19
1130	18.83	0.009	0.11	0.19	55.6	56.0	-0.4	200.5	98.03	98.032	0.19
1135	18.92	0.009	0.11	0.19	55.6	55.9	-0.3	200.3	98.03	98.032	0.19
1140	19.00	0.009	0.11	0.19	55.6	55.8	-0.2	200.1	98.03	98.032	0.19
1145	19.08	0.009	0.11	0.19	55.6	55.7	-0.1	200.0	98.03	98.032	0.19
1150	19.17	0.009	0.11	0.19	55.6	55.7	-0.1	199.9	98.03	98.032	0.19
1155	19.25	0.009	0.11	0.19	55.6	55.6	0.0	199.8	98.03	98.032	0.19
1160	19.33	0.009	0.11	0.19	55.6	55.6	0.0	199.8	98.03	98.032	0.19
1165	19.42	0.009	0.11	0.19	55.6	55.6	0.0	199.8	98.03	98.032	0.19
1170	19.50	0.009	0.11	0.19	55.6	55.6	0.0	199.8	98.03	98.032	0.19
1175	19.58	0.008	0.10	0.16	49.4	55.6	-6.2	193.6	98.03	98.031	0.18
1180	19.67	0.008	0.10	0.16	49.4	54.7	-5.3	188.3	98.03	98.031	0.18
1185	19.75	0.008	0.10	0.16	49.4	53.1	-3.7	184.5	98.03	98.03	0.17
1190	19.83	0.008	0.10	0.16	49.4	51.9	-2.5	182.1	98.03	98.029	0.17
1195	19.92	0.008	0.10	0.16	49.4	51.0	-1.6	180.5	98.03	98.029	0.17
1200	20.00	0.008	0.10	0.16	49.4	50.5	-1.0	179.4	98.03	98.029	0.17
1205	20.08	0.008	0.10	0.16	49.4	50.1	-0.7	178.8	98.03	98.029	0.17
1210	20.17	0.008	0.10	0.16	49.4	49.9	-0.4	178.3	98.03	98.029	0.17
1215	20.25	0.008	0.10	0.16	49.4	49.7	-0.3	178.1	98.03	98.029	0.17
1220	20.33	0.008	0.10	0.16	49.4	49.6	-0.2	177.9	98.03	98.028	0.17
1225	20.42	0.008	0.10	0.16	49.4	49.5	-0.1	177.8	98.03	98.028	0.16
1230	20.50	0.008	0.10	0.16	49.4	49.5	-0.1	177.7	98.03	98.028	0.16
1235	20.58	0.008	0.10	0.16	49.4	49.5	0.0	177.6	98.03	98.028	0.16
1240	20.67	0.008	0.10	0.16	49.4	49.5	0.0	177.6	98.03	98.028	0.16
1245	20.75	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
1250	20.83	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
1255	20.92	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
1260	21.00	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
1265	21.08	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
1270	21.17	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16
1275	21.25	0.008	0.10	0.16	49.4	49.4	0.0	177.6	98.03	98.028	0.16

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1280	21.33	0.007	0.08	0.14	43.2	49.4	-6.2	171.4	98.03	98.028	0.16
1285	21.42	0.007	0.08	0.14	43.2	48.6	-5.3	166.1	98.03	98.027	0.16
1290	21.50	0.007	0.08	0.14	43.2	47.0	-3.7	162.3	98.03	98.026	0.15
1300	21.67	0.007	0.08	0.14	43.2	45.7	-2.5	159.9	98.03	98.026	0.15
1305	21.75	0.007	0.08	0.14	43.2	44.8	-1.6	158.3	98.03	98.025	0.15
1310	21.83	0.007	0.08	0.14	43.2	44.3	-1.0	157.2	98.03	98.025	0.15
1315	21.92	0.007	0.08	0.14	43.2	43.9	-0.7	156.6	98.03	98.025	0.15
1320	22.00	0.007	0.08	0.14	43.2	43.7	-0.4	156.1	98.02	98.025	0.15
1325	22.08	0.007	0.08	0.14	43.2	43.5	-0.3	155.9	98.02	98.025	0.14
1330	22.17	0.007	0.08	0.14	43.2	43.4	-0.2	155.7	98.02	98.025	0.14
1335	22.25	0.007	0.08	0.14	43.2	43.4	-0.1	155.6	98.02	98.025	0.14
1340	22.33	0.007	0.08	0.14	43.2	43.3	-0.1	155.5	98.02	98.025	0.14
1345	22.42	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1350	22.50	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1355	22.58	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1360	22.67	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1365	22.75	0.007	0.08	0.14	43.2	43.3	0.0	155.4	98.02	98.025	0.14
1370	22.83	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1375	22.92	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1380	23.00	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1385	23.08	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1390	23.17	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1395	23.25	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1400	23.33	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1405	23.42	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1410	23.50	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1415	23.58	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1420	23.67	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1425	23.75	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1430	23.83	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1435	23.92	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14
1440	24.00	0.007	0.08	0.14	43.2	43.2	0.0	155.4	98.02	98.025	0.14

Detention Stage-Storage-Discharge Calculation

Pace Supply Detention Basin

25-year

Detention and Basin Parameters

Total 24-hr rainfall= 5.13 in

Area = 2.6 ac
C = 0.72
Elev = 580

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
0	0.00	0.007	0.08	0.16	47.2	0.0	0.0	0.0	98.00	0	0.00
5	0.08	0.007	0.08	0.16	47.2	0.0	47.2	47.2	98.01	98.004	0.02
10	0.17	0.007	0.08	0.16	47.2	6.6	40.6	87.8	98.01	98.011	0.06
15	0.25	0.008	0.10	0.18	53.9	18.8	35.1	122.9	98.02	98.017	0.10
20	0.33	0.008	0.10	0.18	53.9	29.3	24.6	147.5	98.02	98.022	0.13
25	0.42	0.008	0.10	0.18	53.9	37.6	16.3	163.8	98.03	98.025	0.14
30	0.50	0.008	0.10	0.18	53.9	43.3	10.6	174.4	98.03	98.027	0.16
35	0.58	0.008	0.10	0.18	53.9	47.1	6.9	181.2	98.03	98.028	0.16
40	0.67	0.008	0.10	0.18	53.9	49.5	4.4	185.6	98.03	98.029	0.17
45	0.75	0.008	0.10	0.18	53.9	51.1	2.9	188.5	98.03	98.03	0.17
50	0.83	0.008	0.10	0.18	53.9	52.1	1.8	190.3	98.03	98.03	0.18
55	0.92	0.008	0.10	0.18	53.9	52.7	1.2	191.5	98.03	98.031	0.18
60	1.00	0.008	0.10	0.18	53.9	53.1	0.8	192.3	98.03	98.031	0.18
65	1.08	0.008	0.10	0.18	53.9	53.4	0.5	192.8	98.03	98.031	0.18
70	1.17	0.008	0.10	0.18	53.9	53.6	0.3	193.1	98.03	98.031	0.18
75	1.25	0.008	0.10	0.18	53.9	53.7	0.2	193.3	98.03	98.031	0.18
80	1.33	0.008	0.10	0.18	53.9	53.8	0.1	193.5	98.03	98.031	0.18
85	1.42	0.008	0.10	0.18	53.9	53.8	0.1	193.5	98.03	98.031	0.18
90	1.50	0.008	0.10	0.18	53.9	53.9	0.1	193.6	98.03	98.031	0.18
95	1.58	0.008	0.10	0.18	53.9	53.9	0.0	193.6	98.03	98.031	0.18
100	1.67	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
105	1.75	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
110	1.83	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
115	1.92	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
120	2.00	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
125	2.08	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
130	2.17	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
135	2.25	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
140	2.33	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
145	2.42	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
150	2.50	0.009	0.11	0.20	60.7	53.9	6.7	200.4	98.03	98.032	0.18
155	2.58	0.009	0.11	0.20	60.7	54.9	5.8	206.2	98.03	98.033	0.19
160	2.67	0.009	0.11	0.20	60.7	56.6	4.1	210.3	98.03	98.033	0.19
165	2.75	0.009	0.11	0.20	60.7	58.0	2.7	213.0	98.03	98.034	0.20
170	2.83	0.009	0.11	0.20	60.7	58.9	1.7	214.7	98.03	98.034	0.20
175	2.92	0.009	0.11	0.20	60.7	59.5	1.1	215.9	98.03	98.034	0.20
180	3.00	0.009	0.11	0.20	60.7	59.9	0.7	216.6	98.03	98.035	0.20
185	3.08	0.009	0.11	0.20	60.7	60.2	0.5	217.1	98.03	98.035	0.20
190	3.17	0.009	0.11	0.20	60.7	60.3	0.3	217.4	98.03	98.035	0.20
195	3.25	0.009	0.11	0.20	60.7	60.5	0.2	217.5	98.03	98.035	0.20
200	3.33	0.009	0.11	0.20	60.7	60.5	0.1	217.7	98.03	98.035	0.20
205	3.42	0.009	0.11	0.20	60.7	60.6	0.1	217.8	98.03	98.035	0.20
210	3.50	0.009	0.11	0.20	60.7	60.6	0.1	217.8	98.03	98.035	0.20
215	3.58	0.009	0.11	0.20	60.7	60.6	0.0	217.8	98.03	98.035	0.20

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
220	3.67	0.009	0.11	0.20	60.7	60.6	0.0	217.9	98.03	98.035	0.20
225	3.75	0.009	0.11	0.20	60.7	60.6	0.0	217.9	98.03	98.035	0.20
230	3.83	0.009	0.11	0.20	60.7	60.6	0.0	217.9	98.03	98.035	0.20
235	3.92	0.009	0.11	0.20	60.7	60.6	0.0	217.9	98.03	98.035	0.20
240	4.00	0.009	0.11	0.20	60.7	60.6	0.0	217.9	98.03	98.035	0.20
245	4.08	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20
250	4.17	0.010	0.12	0.22	67.4	60.7	6.7	224.6	98.04	98.035	0.21
255	4.25	0.010	0.12	0.22	67.4	61.6	5.8	230.4	98.04	98.036	0.21
260	4.33	0.010	0.12	0.22	67.4	63.3	4.1	234.5	98.04	98.037	0.22
265	4.42	0.010	0.12	0.22	67.4	64.7	2.7	237.2	98.04	98.038	0.22
270	4.50	0.010	0.12	0.22	67.4	65.6	1.7	238.9	98.04	98.038	0.22
275	4.58	0.010	0.12	0.22	67.4	66.3	1.1	240.1	98.04	98.038	0.22
280	4.67	0.010	0.12	0.22	67.4	66.7	0.7	240.8	98.04	98.038	0.22
285	4.75	0.010	0.12	0.22	67.4	66.9	0.5	241.3	98.04	98.039	0.22
290	4.83	0.010	0.12	0.22	67.4	67.1	0.3	241.6	98.04	98.039	0.22
295	4.92	0.010	0.12	0.22	67.4	67.2	0.2	241.8	98.04	98.039	0.22
300	5.00	0.010	0.12	0.22	67.4	67.3	0.1	241.9	98.04	98.039	0.22
305	5.08	0.010	0.12	0.22	67.4	67.3	0.1	242.0	98.04	98.039	0.22
310	5.17	0.010	0.12	0.22	67.4	67.3	0.1	242.0	98.04	98.039	0.22
315	5.25	0.010	0.12	0.22	67.4	67.4	0.0	242.1	98.04	98.039	0.22
320	5.33	0.010	0.12	0.22	67.4	67.4	0.0	242.1	98.04	98.039	0.22
325	5.42	0.011	0.13	0.25	74.1	67.4	6.8	248.8	98.04	98.039	0.23
330	5.50	0.011	0.13	0.25	74.1	68.3	5.8	254.6	98.04	98.04	0.23
335	5.58	0.011	0.13	0.25	74.1	70.1	4.1	258.7	98.04	98.041	0.24
340	5.67	0.011	0.13	0.25	74.1	71.4	2.7	261.4	98.04	98.042	0.24
345	5.75	0.011	0.13	0.25	74.1	72.4	1.7	263.1	98.04	98.042	0.24
350	5.83	0.011	0.13	0.25	74.1	73.0	1.1	264.3	98.04	98.042	0.24
355	5.92	0.011	0.13	0.25	74.1	73.4	0.7	265.0	98.04	98.042	0.25
360	6.00	0.011	0.13	0.25	74.1	73.7	0.5	265.5	98.04	98.042	0.25
365	6.08	0.011	0.13	0.25	74.1	73.8	0.3	265.8	98.04	98.042	0.25
370	6.17	0.011	0.13	0.25	74.1	73.9	0.2	266.0	98.04	98.043	0.25
375	6.25	0.011	0.13	0.25	74.1	74.0	0.1	266.1	98.04	98.043	0.25
380	6.33	0.012	0.14	0.27	80.9	74.0	6.8	272.9	98.04	98.043	0.25
385	6.42	0.012	0.14	0.27	80.9	75.0	5.9	278.8	98.04	98.044	0.26
390	6.50	0.012	0.14	0.27	80.9	76.8	4.1	282.9	98.05	98.045	0.26
395	6.58	0.012	0.14	0.27	80.9	78.2	2.7	285.6	98.05	98.045	0.26
400	6.67	0.012	0.14	0.27	80.9	79.1	1.8	287.3	98.05	98.046	0.27
405	6.75	0.012	0.14	0.27	80.9	79.7	1.1	288.5	98.05	98.046	0.27
410	6.83	0.012	0.14	0.27	80.9	80.1	0.7	289.2	98.05	98.046	0.27
415	6.92	0.012	0.14	0.27	80.9	80.4	0.5	289.7	98.05	98.046	0.27
420	7.00	0.012	0.14	0.27	80.9	80.6	0.3	290.0	98.05	98.046	0.27
425	7.08	0.012	0.14	0.27	80.9	80.7	0.2	290.2	98.05	98.046	0.27
430	7.17	0.013	0.16	0.29	87.6	80.7	6.9	297.0	98.05	98.047	0.27
435	7.25	0.013	0.16	0.29	87.6	81.7	5.9	302.9	98.05	98.048	0.28
440	7.33	0.013	0.16	0.29	87.6	83.5	4.1	307.0	98.05	98.049	0.28
445	7.42	0.013	0.16	0.29	87.6	84.9	2.7	309.8	98.05	98.049	0.29
450	7.50	0.013	0.16	0.29	87.6	85.8	1.8	311.5	98.05	98.05	0.29
455	7.58	0.013	0.16	0.29	87.6	86.5	1.1	312.7	98.05	98.05	0.29
460	7.67	0.013	0.16	0.29	87.6	86.9	0.7	313.4	98.05	98.05	0.29
465	7.75	0.014	0.17	0.31	94.3	87.1	7.2	320.6	98.05	98.051	0.29
470	7.83	0.014	0.17	0.31	94.3	88.2	6.1	326.7	98.05	98.052	0.30
475	7.92	0.014	0.17	0.31	94.3	90.1	4.3	331.0	98.05	98.053	0.31
480	8.00	0.014	0.17	0.31	94.3	91.5	2.8	333.8	98.05	98.053	0.31

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
485	8.08	0.014	0.17	0.31	94.3	92.5	1.8	335.6	98.05	98.054	0.31
490	8.17	0.014	0.17	0.31	94.3	93.2	1.2	336.8	98.05	98.054	0.31
495	8.25	0.015	0.18	0.34	101.1	93.6	7.5	344.3	98.06	98.054	0.32
500	8.33	0.015	0.18	0.34	101.1	94.8	6.3	350.6	98.06	98.056	0.32
505	8.42	0.015	0.18	0.34	101.1	96.7	4.4	355.0	98.06	98.056	0.33
510	8.50	0.015	0.18	0.34	101.1	98.2	2.9	357.9	98.06	98.057	0.33
515	8.58	0.015	0.18	0.34	101.1	99.2	1.9	359.8	98.06	98.057	0.33
520	8.67	0.016	0.19	0.36	107.8	99.9	8.0	367.7	98.06	98.058	0.34
525	8.75	0.016	0.19	0.36	107.8	101.2	6.6	374.3	98.06	98.059	0.34
530	8.83	0.016	0.19	0.36	107.8	103.3	4.6	378.9	98.06	98.06	0.35
535	8.92	0.016	0.19	0.36	107.8	104.8	3.0	381.9	98.06	98.061	0.35
540	9.00	0.017	0.20	0.38	114.6	105.9	8.7	390.6	98.06	98.062	0.36
545	9.08	0.017	0.20	0.38	114.6	107.5	7.1	397.6	98.06	98.063	0.37
550	9.17	0.017	0.20	0.38	114.6	109.7	4.9	402.5	98.06	98.064	0.37
555	9.25	0.018	0.22	0.40	121.3	111.4	10.0	412.4	98.07	98.065	0.38
560	9.33	0.018	0.22	0.40	121.3	113.4	7.9	420.3	98.07	98.067	0.39
565	9.42	0.018	0.22	0.40	121.3	115.9	5.4	425.7	98.07	98.068	0.39
570	9.50	0.019	0.23	0.43	128.0	117.8	10.3	436.0	98.07	98.069	0.40
575	9.58	0.019	0.23	0.43	128.0	119.9	8.1	444.1	98.07	98.07	0.41
580	9.67	0.019	0.23	0.43	128.0	122.5	5.5	449.7	98.07	98.071	0.41
585	9.75	0.020	0.24	0.45	134.8	124.4	10.4	460.1	98.07	98.073	0.42
590	9.83	0.020	0.24	0.45	134.8	126.6	8.2	468.2	98.07	98.074	0.43
595	9.92	0.021	0.25	0.47	141.5	129.2	12.3	480.6	98.08	98.076	0.44
600	10.00	0.021	0.25	0.47	141.5	132.0	9.5	490.0	98.08	98.078	0.45
605	10.08	0.022	0.26	0.49	148.3	135.1	13.2	503.2	98.08	98.079	0.46
610	10.17	0.022	0.26	0.49	148.3	138.2	10.0	513.3	98.08	98.081	0.47
615	10.25	0.023	0.28	0.52	155.0	141.5	13.5	526.8	98.08	98.083	0.48
620	10.33	0.024	0.29	0.54	161.7	144.7	17.0	543.8	98.09	98.086	0.50
625	10.42	0.024	0.29	0.54	161.7	149.0	12.7	556.5	98.09	98.088	0.51
630	10.50	0.025	0.30	0.56	168.5	153.1	15.3	571.9	98.09	98.09	0.52
635	10.58	0.026	0.31	0.58	175.2	157.0	18.2	590.1	98.09	98.093	0.54
640	10.67	0.027	0.32	0.61	182.0	161.7	20.2	610.3	98.10	98.096	0.56
645	10.75	0.028	0.34	0.63	188.7	167.1	21.6	631.9	98.10	98.099	0.58
650	10.83	0.029	0.35	0.65	195.4	172.9	22.6	654.5	98.10	98.103	0.60
655	10.92	0.030	0.36	0.67	202.2	179.0	23.1	677.6	98.11	98.107	0.62
660	11.00	0.032	0.38	0.72	215.7	185.4	30.3	707.9	98.11	98.111	0.64
665	11.08	0.034	0.41	0.76	229.1	192.8	36.3	744.2	98.12	98.116	0.67
670	11.17	0.036	0.43	0.81	242.6	202.1	40.5	784.7	98.13	98.122	0.71
675	11.25	0.038	0.46	0.85	256.1	212.8	43.3	828.0	98.13	98.129	0.75
680	11.33	0.041	0.49	0.92	276.3	224.4	51.9	879.9	98.14	98.137	0.79
685	11.42	0.044	0.53	0.99	296.5	237.7	58.8	938.7	98.15	98.145	0.84
690	11.50	0.048	0.58	1.08	323.5	253.1	70.4	1009.1	98.16	98.156	0.90
695	11.58	0.054	0.65	1.21	363.9	271.1	92.8	1101.9	98.18	98.169	0.98
700	11.67	0.062	0.74	1.39	417.8	293.8	124.0	1226.0	98.20	98.186	1.08
705	11.75	0.075	0.90	1.68	505.4	324.0	181.5	1407.4	98.23	98.211	1.22
710	11.83	0.097	1.16	2.18	653.7	366.5	287.2	1694.6	98.27	98.248	1.44
715	11.92	0.162	1.94	3.64	1091.8	431.7	660.0	2354.7	98.38	98.324	1.88
720	12.00	0.486	5.83	10.92	3275.3	563.5	2711.7	5066.4	98.75	98.563	3.67
725	12.08	0.119	1.43	2.67	802.0	1101.2	-299.2	4767.2	98.71	98.73	5.71
730	12.17	0.084	1.01	1.89	566.1	1713.3	-1147.2	3620.0	98.56	98.637	4.58
735	12.25	0.068	0.82	1.53	458.3	1372.8	-914.5	2705.4	98.43	98.498	2.89
740	12.33	0.058	0.70	1.30	390.9	866.8	-476.0	2229.5	98.36	98.395	2.29
745	12.42	0.051	0.61	1.15	343.7	686.8	-343.1	1886.4	98.30	98.329	1.91

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
750	12.50	0.046	0.55	1.03	310.0	572.8	-262.8	1623.6	98.26	98.281	1.63
755	12.58	0.042	0.50	0.94	283.0	488.5	-205.4	1418.1	98.23	98.243	1.41
760	12.67	0.039	0.47	0.88	262.8	423.3	-160.5	1257.6	98.20	98.214	1.24
765	12.75	0.037	0.44	0.83	249.4	372.4	-123.0	1134.6	98.18	98.191	1.11
770	12.83	0.035	0.42	0.79	235.9	332.9	-97.1	1037.5	98.17	98.174	1.01
775	12.92	0.033	0.40	0.74	222.4	302.3	-79.9	957.6	98.15	98.16	0.93
780	13.00	0.031	0.37	0.70	208.9	277.7	-68.8	888.9	98.14	98.148	0.86
785	13.08	0.030	0.36	0.67	202.2	257.0	-54.8	834.1	98.13	98.138	0.80
790	13.17	0.029	0.35	0.65	195.4	239.8	-44.3	789.7	98.13	98.13	0.75
795	13.25	0.027	0.32	0.61	182.0	226.0	-44.0	745.7	98.12	98.123	0.71
800	13.33	0.026	0.31	0.58	175.2	213.7	-38.5	707.2	98.11	98.116	0.67
805	13.42	0.026	0.31	0.58	175.2	202.2	-27.0	680.2	98.11	98.111	0.64
810	13.50	0.025	0.30	0.56	168.5	193.1	-24.6	655.6	98.10	98.107	0.62
815	13.58	0.024	0.29	0.54	161.7	185.9	-24.2	631.4	98.10	98.103	0.60
820	13.67	0.023	0.28	0.52	155.0	179.1	-24.1	607.3	98.10	98.099	0.57
825	13.75	0.023	0.28	0.52	155.0	172.4	-17.4	589.9	98.09	98.096	0.56
830	13.83	0.022	0.26	0.49	148.3	166.6	-18.4	571.6	98.09	98.093	0.54
835	13.92	0.021	0.25	0.47	141.5	161.6	-20.1	551.4	98.09	98.09	0.52
840	14.00	0.021	0.25	0.47	141.5	156.3	-14.8	536.7	98.09	98.087	0.50
845	14.08	0.020	0.24	0.45	134.8	151.4	-16.7	520.0	98.08	98.085	0.49
850	14.17	0.020	0.24	0.45	134.8	147.1	-12.3	507.7	98.08	98.082	0.48
855	14.25	0.020	0.24	0.45	134.8	143.0	-8.3	499.5	98.08	98.081	0.47
860	14.33	0.019	0.23	0.43	128.0	140.2	-12.1	487.4	98.08	98.079	0.46
865	14.42	0.019	0.23	0.43	128.0	137.3	-9.3	478.1	98.08	98.077	0.45
870	14.50	0.018	0.22	0.40	121.3	134.4	-13.1	465.0	98.07	98.075	0.44
875	14.58	0.018	0.22	0.40	121.3	131.2	-9.9	455.1	98.07	98.074	0.43
880	14.67	0.018	0.22	0.40	121.3	128.0	-6.7	448.3	98.07	98.072	0.42
885	14.75	0.017	0.20	0.38	114.6	125.7	-11.2	437.2	98.07	98.071	0.41
890	14.83	0.017	0.20	0.38	114.6	123.2	-8.7	428.5	98.07	98.069	0.40
895	14.92	0.017	0.20	0.38	114.6	120.5	-5.9	422.6	98.07	98.068	0.39
900	15.00	0.017	0.20	0.38	114.6	118.4	-3.9	418.7	98.07	98.067	0.39
905	15.08	0.016	0.19	0.36	107.8	117.1	-9.3	409.4	98.07	98.066	0.38
910	15.17	0.016	0.19	0.36	107.8	115.3	-7.4	402.0	98.06	98.065	0.38
915	15.25	0.016	0.19	0.36	107.8	112.9	-5.1	396.9	98.06	98.064	0.37
920	15.33	0.016	0.19	0.36	107.8	111.2	-3.4	393.6	98.06	98.063	0.37
925	15.42	0.015	0.18	0.34	101.1	110.0	-8.9	384.6	98.06	98.062	0.36
930	15.50	0.015	0.18	0.34	101.1	108.3	-7.2	377.4	98.06	98.061	0.35
935	15.58	0.015	0.18	0.34	101.1	106.1	-5.0	372.4	98.06	98.06	0.35
940	15.67	0.015	0.18	0.34	101.1	104.4	-3.3	369.2	98.06	98.059	0.34
945	15.75	0.015	0.18	0.34	101.1	103.2	-2.1	367.1	98.06	98.059	0.34
950	15.83	0.014	0.17	0.31	94.3	102.5	-8.1	358.9	98.06	98.058	0.34
955	15.92	0.014	0.17	0.31	94.3	101.0	-6.7	352.2	98.06	98.057	0.33
960	16.00	0.014	0.17	0.31	94.3	99.0	-4.6	347.6	98.06	98.056	0.32
965	16.08	0.014	0.17	0.31	94.3	97.4	-3.1	344.6	98.06	98.055	0.32
970	16.17	0.014	0.17	0.31	94.3	96.3	-2.0	342.6	98.05	98.055	0.32
975	16.25	0.014	0.17	0.31	94.3	95.6	-1.3	341.3	98.05	98.055	0.32
980	16.33	0.013	0.16	0.29	87.6	95.2	-7.6	333.7	98.05	98.054	0.31
985	16.42	0.013	0.16	0.29	87.6	93.9	-6.3	327.4	98.05	98.053	0.31
990	16.50	0.013	0.16	0.29	87.6	92.0	-4.4	323.0	98.05	98.052	0.30
995	16.58	0.013	0.16	0.29	87.6	90.5	-2.9	320.1	98.05	98.051	0.30
1000	16.67	0.013	0.16	0.29	87.6	89.5	-1.9	318.2	98.05	98.051	0.30
1005	16.75	0.013	0.16	0.29	87.6	88.8	-1.2	317.0	98.05	98.051	0.29
1010	16.83	0.013	0.16	0.29	87.6	88.4	-0.8	316.2	98.05	98.051	0.29

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1015	16.92	0.012	0.14	0.27	80.9	88.1	-7.2	308.9	98.05	98.05	0.29
1020	17.00	0.012	0.14	0.27	80.9	87.0	-6.1	302.8	98.05	98.049	0.28
1025	17.08	0.012	0.14	0.27	80.9	85.1	-4.3	298.5	98.05	98.048	0.28
1030	17.17	0.012	0.14	0.27	80.9	83.7	-2.8	295.7	98.05	98.048	0.28
1035	17.25	0.012	0.14	0.27	80.9	82.7	-1.8	293.9	98.05	98.047	0.27
1040	17.33	0.012	0.14	0.27	80.9	82.1	-1.2	292.7	98.05	98.047	0.27
1045	17.42	0.012	0.14	0.27	80.9	81.6	-0.8	291.9	98.05	98.047	0.27
1050	17.50	0.012	0.14	0.27	80.9	81.4	-0.5	291.4	98.05	98.047	0.27
1055	17.58	0.012	0.14	0.27	80.9	81.2	-0.3	291.1	98.05	98.047	0.27
1060	17.67	0.011	0.13	0.25	74.1	81.1	-6.9	284.2	98.05	98.046	0.27
1065	17.75	0.011	0.13	0.25	74.1	80.1	-5.9	278.2	98.04	98.045	0.26
1070	17.83	0.011	0.13	0.25	74.1	78.3	-4.1	274.1	98.04	98.044	0.26
1075	17.92	0.011	0.13	0.25	74.1	76.9	-2.7	271.4	98.04	98.044	0.25
1080	18.00	0.011	0.13	0.25	74.1	75.9	-1.8	269.6	98.04	98.043	0.25
1085	18.08	0.011	0.13	0.25	74.1	75.3	-1.2	268.4	98.04	98.043	0.25
1090	18.17	0.011	0.13	0.25	74.1	74.9	-0.7	267.7	98.04	98.043	0.25
1095	18.25	0.011	0.13	0.25	74.1	74.6	-0.5	267.2	98.04	98.043	0.25
1100	18.33	0.011	0.13	0.25	74.1	74.4	-0.3	266.9	98.04	98.043	0.25
1105	18.42	0.011	0.13	0.25	74.1	74.3	-0.2	266.7	98.04	98.043	0.25
1110	18.50	0.011	0.13	0.25	74.1	74.3	-0.1	266.6	98.04	98.043	0.25
1115	18.58	0.011	0.13	0.25	74.1	74.2	-0.1	266.5	98.04	98.043	0.25
1120	18.67	0.010	0.12	0.22	67.4	74.2	-6.8	259.7	98.04	98.042	0.24
1125	18.75	0.010	0.12	0.22	67.4	73.2	-5.8	253.9	98.04	98.041	0.24
1130	18.83	0.010	0.12	0.22	67.4	71.5	-4.1	249.8	98.04	98.04	0.23
1135	18.92	0.010	0.12	0.22	67.4	70.1	-2.7	247.1	98.04	98.04	0.23
1140	19.00	0.010	0.12	0.22	67.4	69.1	-1.8	245.3	98.04	98.039	0.23
1145	19.08	0.010	0.12	0.22	67.4	68.5	-1.1	244.2	98.04	98.039	0.23
1150	19.17	0.010	0.12	0.22	67.4	68.1	-0.7	243.5	98.04	98.039	0.23
1155	19.25	0.010	0.12	0.22	67.4	67.9	-0.5	243.0	98.04	98.039	0.23
1160	19.33	0.010	0.12	0.22	67.4	67.7	-0.3	242.7	98.04	98.039	0.23
1165	19.42	0.010	0.12	0.22	67.4	67.6	-0.2	242.5	98.04	98.039	0.23
1170	19.50	0.010	0.12	0.22	67.4	67.5	-0.1	242.3	98.04	98.039	0.22
1175	19.58	0.010	0.12	0.22	67.4	67.5	-0.1	242.3	98.04	98.039	0.22
1180	19.67	0.010	0.12	0.22	67.4	67.4	-0.1	242.2	98.04	98.039	0.22
1185	19.75	0.010	0.12	0.22	67.4	67.4	0.0	242.2	98.04	98.039	0.22
1190	19.83	0.009	0.11	0.20	60.7	67.4	-6.8	235.4	98.04	98.038	0.22
1195	19.92	0.009	0.11	0.20	60.7	66.5	-5.8	229.6	98.04	98.037	0.22
1200	20.00	0.009	0.11	0.20	60.7	64.7	-4.1	225.5	98.04	98.036	0.21
1205	20.08	0.009	0.11	0.20	60.7	63.3	-2.7	222.8	98.04	98.036	0.21
1210	20.17	0.009	0.11	0.20	60.7	62.4	-1.7	221.1	98.04	98.036	0.21
1215	20.25	0.009	0.11	0.20	60.7	61.8	-1.1	220.0	98.04	98.035	0.20
1220	20.33	0.009	0.11	0.20	60.7	61.4	-0.7	219.2	98.04	98.035	0.20
1225	20.42	0.009	0.11	0.20	60.7	61.1	-0.5	218.8	98.03	98.035	0.20
1230	20.50	0.009	0.11	0.20	60.7	61.0	-0.3	218.5	98.03	98.035	0.20
1235	20.58	0.009	0.11	0.20	60.7	60.8	-0.2	218.3	98.03	98.035	0.20
1240	20.67	0.009	0.11	0.20	60.7	60.8	-0.1	218.1	98.03	98.035	0.20
1245	20.75	0.009	0.11	0.20	60.7	60.7	-0.1	218.1	98.03	98.035	0.20
1250	20.83	0.009	0.11	0.20	60.7	60.7	-0.1	218.0	98.03	98.035	0.20
1255	20.92	0.009	0.11	0.20	60.7	60.7	0.0	218.0	98.03	98.035	0.20
1260	21.00	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20
1265	21.08	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20
1270	21.17	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20
1275	21.25	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1280	21.33	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20
1285	21.42	0.009	0.11	0.20	60.7	60.7	0.0	217.9	98.03	98.035	0.20
1290	21.50	0.008	0.10	0.18	53.9	60.7	-6.7	211.2	98.03	98.034	0.20
1300	21.67	0.008	0.10	0.18	53.9	59.7	-5.8	205.4	98.03	98.033	0.19
1305	21.75	0.008	0.10	0.18	53.9	58.0	-4.1	201.3	98.03	98.033	0.19
1310	21.83	0.008	0.10	0.18	53.9	56.6	-2.7	198.6	98.03	98.032	0.19
1315	21.92	0.008	0.10	0.18	53.9	55.7	-1.7	196.9	98.03	98.032	0.18
1320	22.00	0.008	0.10	0.18	53.9	55.0	-1.1	195.7	98.03	98.031	0.18
1325	22.08	0.008	0.10	0.18	53.9	54.6	-0.7	195.0	98.03	98.031	0.18
1330	22.17	0.008	0.10	0.18	53.9	54.4	-0.5	194.5	98.03	98.031	0.18
1335	22.25	0.008	0.10	0.18	53.9	54.2	-0.3	194.2	98.03	98.031	0.18
1340	22.33	0.008	0.10	0.18	53.9	54.1	-0.2	194.0	98.03	98.031	0.18
1345	22.42	0.008	0.10	0.18	53.9	54.0	-0.1	193.9	98.03	98.031	0.18
1350	22.50	0.008	0.10	0.18	53.9	54.0	-0.1	193.8	98.03	98.031	0.18
1355	22.58	0.008	0.10	0.18	53.9	54.0	-0.1	193.8	98.03	98.031	0.18
1360	22.67	0.008	0.10	0.18	53.9	53.9	0.0	193.8	98.03	98.031	0.18
1365	22.75	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1370	22.83	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1375	22.92	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1380	23.00	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1385	23.08	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1390	23.17	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1395	23.25	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1400	23.33	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1405	23.42	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1410	23.50	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1415	23.58	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1420	23.67	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1425	23.75	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1430	23.83	0.008	0.10	0.18	53.9	53.9	0.0	193.7	98.03	98.031	0.18
1435	23.92	0.007	0.08	0.16	47.2	53.9	-6.7	187.0	98.03	98.03	0.18
1440	24.00	0.007	0.08	0.16	47.2	53.0	-5.8	181.2	98.03	98.029	0.17

Detention Stage-Storage-Discharge Calculation

Pace Supply Detention Basin

100-year

Detention and Basin Parameters

Area = 2.6 ac
Total 24-hr rainfall= 6.41 in C = 0.77
Elev = 580

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
0	0.00	0.009	0.11	0.22	64.9	0.0	0.0	0.0	98.00	0	0.00
5	0.08	0.009	0.11	0.22	64.9	0.0	64.9	64.9	98.01	98.005	0.03
10	0.17	0.009	0.11	0.22	64.9	9.0	55.8	120.7	98.02	98.015	0.09
15	0.25	0.009	0.11	0.22	64.9	25.8	39.0	159.7	98.03	98.022	0.13
20	0.33	0.009	0.11	0.22	64.9	39.0	25.8	185.6	98.03	98.028	0.16
25	0.42	0.010	0.12	0.24	72.1	48.1	24.0	209.6	98.03	98.032	0.18
30	0.50	0.010	0.12	0.24	72.1	55.0	17.1	226.7	98.04	98.035	0.20
35	0.58	0.010	0.12	0.24	72.1	60.7	11.4	238.0	98.04	98.037	0.22
40	0.67	0.010	0.12	0.24	72.1	64.7	7.4	245.4	98.04	98.039	0.22
45	0.75	0.010	0.12	0.24	72.1	67.3	4.8	250.2	98.04	98.04	0.23
50	0.83	0.010	0.12	0.24	72.1	69.0	3.1	253.3	98.04	98.04	0.23
55	0.92	0.010	0.12	0.24	72.1	70.1	2.0	255.3	98.04	98.041	0.24
60	1.00	0.010	0.12	0.24	72.1	70.8	1.3	256.6	98.04	98.041	0.24
65	1.08	0.010	0.12	0.24	72.1	71.2	0.8	257.4	98.04	98.041	0.24
70	1.17	0.010	0.12	0.24	72.1	71.5	0.5	258.0	98.04	98.041	0.24
75	1.25	0.010	0.12	0.24	72.1	71.7	0.3	258.3	98.04	98.041	0.24
80	1.33	0.010	0.12	0.24	72.1	71.8	0.2	258.5	98.04	98.041	0.24
85	1.42	0.010	0.12	0.24	72.1	71.9	0.1	258.7	98.04	98.041	0.24
90	1.50	0.010	0.12	0.24	72.1	72.0	0.1	258.8	98.04	98.041	0.24
95	1.58	0.010	0.12	0.24	72.1	72.0	0.1	258.8	98.04	98.041	0.24
100	1.67	0.007	0.08	0.17	50.5	72.0	-21.6	237.2	98.04	98.04	0.23
105	1.75	0.010	0.12	0.24	72.1	69.0	3.0	240.3	98.04	98.038	0.22
110	1.83	0.010	0.12	0.24	72.1	66.5	5.6	245.9	98.04	98.039	0.23
115	1.92	0.010	0.12	0.24	72.1	67.7	4.4	250.3	98.04	98.04	0.23
120	2.00	0.010	0.12	0.24	72.1	69.1	3.0	253.3	98.04	98.04	0.23
125	2.08	0.010	0.12	0.24	72.1	70.1	2.0	255.3	98.04	98.041	0.24
130	2.17	0.010	0.12	0.24	72.1	70.8	1.3	256.6	98.04	98.041	0.24
135	2.25	0.011	0.13	0.26	79.3	71.2	8.0	264.6	98.04	98.042	0.24
140	2.33	0.011	0.13	0.26	79.3	72.5	6.7	271.4	98.04	98.043	0.25
145	2.42	0.011	0.13	0.26	79.3	74.6	4.7	276.1	98.04	98.044	0.25
150	2.50	0.011	0.13	0.26	79.3	76.2	3.1	279.1	98.04	98.044	0.26
155	2.58	0.011	0.13	0.26	79.3	77.3	2.0	281.2	98.04	98.045	0.26
160	2.67	0.011	0.13	0.26	79.3	78.0	1.3	282.5	98.05	98.045	0.26
165	2.75	0.011	0.13	0.26	79.3	78.4	0.8	283.3	98.05	98.045	0.26
170	2.83	0.011	0.13	0.26	79.3	78.7	0.5	283.8	98.05	98.045	0.26
175	2.92	0.011	0.13	0.26	79.3	78.9	0.3	284.2	98.05	98.045	0.26
180	3.00	0.011	0.13	0.26	79.3	79.1	0.2	284.4	98.05	98.045	0.26
185	3.08	0.011	0.13	0.26	79.3	79.1	0.1	284.6	98.05	98.046	0.26
190	3.17	0.011	0.13	0.26	79.3	79.2	0.1	284.7	98.05	98.046	0.26
195	3.25	0.011	0.13	0.26	79.3	79.2	0.1	284.7	98.05	98.046	0.26
200	3.33	0.011	0.13	0.26	79.3	79.2	0.0	284.8	98.05	98.046	0.26
205	3.42	0.011	0.13	0.26	79.3	79.3	0.0	284.8	98.05	98.046	0.26
210	3.50	0.011	0.13	0.26	79.3	79.3	0.0	284.8	98.05	98.046	0.26
215	3.58	0.011	0.13	0.26	79.3	79.3	0.0	284.8	98.05	98.046	0.26

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
220	3.67	0.012	0.14	0.29	86.5	79.3	7.2	292.0	98.05	98.046	0.27
225	3.75	0.012	0.14	0.29	86.5	80.3	6.2	298.2	98.05	98.047	0.27
230	3.83	0.012	0.14	0.29	86.5	82.1	4.3	302.6	98.05	98.048	0.28
235	3.92	0.012	0.14	0.29	86.5	83.6	2.9	305.4	98.05	98.049	0.28
240	4.00	0.012	0.14	0.29	86.5	84.6	1.9	307.3	98.05	98.049	0.28
245	4.08	0.012	0.14	0.29	86.5	85.3	1.2	308.5	98.05	98.049	0.29
250	4.17	0.012	0.14	0.29	86.5	85.7	0.8	309.3	98.05	98.049	0.29
255	4.25	0.012	0.14	0.29	86.5	86.0	0.5	309.8	98.05	98.05	0.29
260	4.33	0.012	0.14	0.29	86.5	86.2	0.3	310.1	98.05	98.05	0.29
265	4.42	0.012	0.14	0.29	86.5	86.3	0.2	310.3	98.05	98.05	0.29
270	4.50	0.012	0.14	0.29	86.5	86.4	0.1	310.5	98.05	98.05	0.29
275	4.58	0.012	0.14	0.29	86.5	86.4	0.1	310.6	98.05	98.05	0.29
280	4.67	0.012	0.14	0.29	86.5	86.4	0.1	310.6	98.05	98.05	0.29
285	4.75	0.012	0.14	0.29	86.5	86.5	0.0	310.7	98.05	98.05	0.29
290	4.83	0.013	0.16	0.31	93.7	86.5	7.2	317.9	98.05	98.05	0.29
295	4.92	0.013	0.16	0.31	93.7	87.5	6.2	324.1	98.05	98.051	0.30
300	5.00	0.013	0.16	0.31	93.7	89.3	4.3	328.4	98.05	98.052	0.30
305	5.08	0.013	0.16	0.31	93.7	90.8	2.9	331.3	98.05	98.053	0.31
310	5.17	0.013	0.16	0.31	93.7	91.8	1.9	333.2	98.05	98.053	0.31
315	5.25	0.013	0.16	0.31	93.7	92.5	1.2	334.4	98.05	98.053	0.31
320	5.33	0.013	0.16	0.31	93.7	92.9	0.8	335.2	98.05	98.054	0.31
325	5.42	0.013	0.16	0.31	93.7	93.2	0.5	335.7	98.05	98.054	0.31
330	5.50	0.013	0.16	0.31	93.7	93.4	0.3	336.0	98.05	98.054	0.31
335	5.58	0.013	0.16	0.31	93.7	93.5	0.2	336.2	98.05	98.054	0.31
340	5.67	0.014	0.17	0.34	100.9	93.6	7.3	343.6	98.05	98.054	0.32
345	5.75	0.014	0.17	0.34	100.9	94.6	6.3	349.9	98.06	98.055	0.32
350	5.83	0.014	0.17	0.34	100.9	96.5	4.4	354.3	98.06	98.056	0.33
355	5.92	0.014	0.17	0.34	100.9	98.0	2.9	357.2	98.06	98.057	0.33
360	6.00	0.014	0.17	0.34	100.9	99.0	1.9	359.1	98.06	98.057	0.33
365	6.08	0.014	0.17	0.34	100.9	99.7	1.2	360.3	98.06	98.058	0.33
370	6.17	0.014	0.17	0.34	100.9	100.1	0.8	361.1	98.06	98.058	0.33
375	6.25	0.014	0.17	0.34	100.9	100.4	0.5	361.6	98.06	98.058	0.34
380	6.33	0.014	0.17	0.34	100.9	100.6	0.3	361.9	98.06	98.058	0.34
385	6.42	0.015	0.18	0.36	108.1	100.7	7.4	369.3	98.06	98.058	0.34
390	6.50	0.015	0.18	0.36	108.1	101.8	6.3	375.7	98.06	98.06	0.35
395	6.58	0.015	0.18	0.36	108.1	103.7	4.4	380.1	98.06	98.06	0.35
400	6.67	0.015	0.18	0.36	108.1	105.2	2.9	383.0	98.06	98.061	0.35
405	6.75	0.015	0.18	0.36	108.1	106.2	1.9	384.9	98.06	98.061	0.36
410	6.83	0.015	0.18	0.36	108.1	106.9	1.2	386.2	98.06	98.062	0.36
415	6.92	0.015	0.18	0.36	108.1	107.3	0.8	387.0	98.06	98.062	0.36
420	7.00	0.016	0.19	0.38	115.3	107.6	7.7	394.7	98.06	98.063	0.36
425	7.08	0.016	0.19	0.38	115.3	108.8	6.5	401.2	98.06	98.064	0.37
430	7.17	0.016	0.19	0.38	115.3	110.8	4.6	405.8	98.06	98.065	0.37
435	7.25	0.016	0.19	0.38	115.3	112.3	3.0	408.8	98.07	98.065	0.38
440	7.33	0.016	0.19	0.38	115.3	113.4	2.0	410.7	98.07	98.066	0.38
445	7.42	0.016	0.19	0.38	115.3	114.0	1.3	412.0	98.07	98.066	0.38
450	7.50	0.016	0.19	0.38	115.3	114.5	0.8	412.8	98.07	98.066	0.38
455	7.58	0.017	0.20	0.41	122.5	114.8	7.7	420.5	98.07	98.067	0.39
460	7.67	0.017	0.20	0.41	122.5	116.0	6.5	427.1	98.07	98.068	0.39
465	7.75	0.017	0.20	0.41	122.5	118.0	4.6	431.6	98.07	98.069	0.40
470	7.83	0.017	0.20	0.41	122.5	119.5	3.0	434.7	98.07	98.069	0.40
475	7.92	0.017	0.20	0.41	122.5	120.6	2.0	436.6	98.07	98.07	0.40
480	8.00	0.018	0.22	0.43	129.7	121.3	8.5	445.1	98.07	98.071	0.41

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
485	8.08	0.018	0.22	0.43	129.7	122.7	7.0	452.1	98.07	98.072	0.42
490	8.17	0.018	0.22	0.43	129.7	124.9	4.9	457.0	98.07	98.073	0.42
495	8.25	0.018	0.22	0.43	129.7	126.5	3.2	460.2	98.07	98.073	0.43
500	8.33	0.019	0.23	0.46	136.9	127.6	9.3	469.5	98.08	98.074	0.43
505	8.42	0.019	0.23	0.46	136.9	129.4	7.6	477.0	98.08	98.076	0.44
510	8.50	0.019	0.23	0.46	136.9	131.7	5.2	482.2	98.08	98.077	0.45
515	8.58	0.019	0.23	0.46	136.9	133.5	3.4	485.7	98.08	98.077	0.45
520	8.67	0.020	0.24	0.48	144.1	134.7	9.4	495.1	98.08	98.078	0.45
525	8.75	0.020	0.24	0.48	144.1	136.5	7.6	502.8	98.08	98.08	0.46
530	8.83	0.020	0.24	0.48	144.1	138.9	5.3	508.0	98.08	98.081	0.47
535	8.92	0.021	0.25	0.50	151.4	140.7	10.7	518.7	98.08	98.082	0.48
540	9.00	0.021	0.25	0.50	151.4	142.9	8.5	527.2	98.08	98.084	0.49
545	9.08	0.021	0.25	0.50	151.4	145.6	5.8	533.0	98.09	98.085	0.49
550	9.17	0.022	0.26	0.53	158.6	147.5	11.0	544.0	98.09	98.086	0.50
555	9.25	0.022	0.26	0.53	158.6	149.9	8.7	552.7	98.09	98.088	0.51
560	9.33	0.022	0.26	0.53	158.6	152.6	5.9	558.6	98.09	98.089	0.52
565	9.42	0.023	0.28	0.55	165.8	154.7	11.1	569.7	98.09	98.09	0.52
570	9.50	0.023	0.28	0.55	165.8	157.0	8.7	578.4	98.09	98.092	0.53
575	9.58	0.024	0.29	0.58	173.0	159.8	13.2	591.6	98.09	98.094	0.54
580	9.67	0.024	0.29	0.58	173.0	162.8	10.1	601.8	98.10	98.095	0.55
585	9.75	0.025	0.30	0.60	180.2	166.1	14.1	615.9	98.10	98.097	0.56
590	9.83	0.025	0.30	0.60	180.2	169.5	10.7	626.6	98.10	98.099	0.58
595	9.92	0.026	0.31	0.62	187.4	172.9	14.5	641.1	98.10	98.101	0.59
600	10.00	0.027	0.32	0.65	194.6	176.4	18.2	659.2	98.11	98.104	0.60
605	10.08	0.027	0.32	0.65	194.6	181.0	13.6	672.9	98.11	98.107	0.62
610	10.17	0.028	0.34	0.67	201.8	185.4	16.4	689.3	98.11	98.109	0.63
615	10.25	0.029	0.35	0.70	209.0	189.6	19.4	708.7	98.11	98.112	0.65
620	10.33	0.030	0.36	0.72	216.2	194.6	21.7	730.4	98.12	98.115	0.67
625	10.42	0.030	0.36	0.72	216.2	200.3	15.9	746.3	98.12	98.118	0.69
630	10.50	0.031	0.37	0.74	223.4	205.5	17.9	764.2	98.12	98.121	0.70
635	10.58	0.033	0.40	0.79	237.8	210.2	27.6	791.8	98.13	98.124	0.72
640	10.67	0.034	0.41	0.82	245.0	216.6	28.5	820.3	98.13	98.129	0.75
645	10.75	0.035	0.42	0.84	252.3	224.4	27.9	848.2	98.14	98.133	0.77
650	10.83	0.036	0.43	0.86	259.5	232.2	27.2	875.5	98.14	98.138	0.80
655	10.92	0.038	0.46	0.91	273.9	239.9	34.0	909.4	98.15	98.143	0.83
660	11.00	0.040	0.48	0.96	288.3	248.4	39.9	949.3	98.15	98.149	0.86
665	11.08	0.042	0.50	1.01	302.7	258.7	44.0	993.3	98.16	98.155	0.90
670	11.17	0.045	0.54	1.08	324.3	270.4	54.0	1047.3	98.17	98.163	0.95
675	11.25	0.047	0.56	1.13	338.7	284.0	54.7	1102.0	98.18	98.172	1.00
680	11.33	0.051	0.61	1.23	367.6	299.1	68.4	1170.5	98.19	98.182	1.05
685	11.42	0.055	0.66	1.32	396.4	316.3	80.1	1250.6	98.20	98.194	1.12
690	11.50	0.061	0.73	1.47	439.6	336.9	102.7	1353.3	98.22	98.208	1.21
695	11.58	0.068	0.82	1.63	490.1	362.4	127.7	1481.0	98.24	98.227	1.31
700	11.67	0.078	0.94	1.87	562.2	394.5	167.7	1648.7	98.26	98.25	1.45
705	11.75	0.093	1.12	2.23	670.3	435.6	234.7	1883.4	98.30	98.283	1.64
710	11.83	0.122	1.46	2.93	879.3	491.6	387.7	2271.1	98.36	98.332	1.93
715	11.92	0.203	2.44	4.88	1463.1	578.2	884.9	3156.0	98.50	98.434	2.51
720	12.00	0.609	7.31	14.63	4389.2	754.5	3634.7	6790.7	98.97	98.738	5.80
725	12.08	0.149	1.79	3.58	1073.9	1739.9	-666.1	6124.6	98.89	98.929	8.13
730	12.17	0.105	1.26	2.52	756.8	2438.8	-1682.0	4442.6	98.67	98.778	6.29
735	12.25	0.085	1.02	2.04	612.6	1886.0	-1273.4	3169.2	98.51	98.588	3.97
740	12.33	0.072	0.86	1.73	518.9	1190.3	-671.4	2497.8	98.40	98.453	2.63
745	12.42	0.064	0.77	1.54	461.3	787.5	-326.2	2171.6	98.35	98.373	2.17

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
750	12.50	0.058	0.70	1.39	418.0	649.9	-231.8	1939.8	98.31	98.329	1.91
755	12.58	0.053	0.64	1.27	382.0	572.2	-190.2	1749.6	98.28	98.295	1.71
760	12.67	0.049	0.59	1.18	353.2	513.4	-160.3	1589.3	98.25	98.267	1.55
765	12.75	0.046	0.55	1.11	331.5	464.7	-133.1	1456.1	98.23	98.244	1.41
770	12.83	0.043	0.52	1.03	309.9	423.8	-113.9	1342.2	98.21	98.224	1.30
775	12.92	0.041	0.49	0.98	295.5	389.4	-94.0	1248.2	98.20	98.207	1.20
780	13.00	0.039	0.47	0.94	281.1	360.5	-79.4	1168.8	98.19	98.193	1.12
785	13.08	0.037	0.44	0.89	266.7	336.4	-69.7	1099.1	98.18	98.181	1.05
790	13.17	0.036	0.43	0.86	259.5	315.6	-56.2	1042.9	98.17	98.171	0.99
795	13.25	0.034	0.41	0.82	245.0	298.1	-53.1	989.9	98.16	98.163	0.94
800	13.33	0.033	0.40	0.79	237.8	282.9	-45.1	944.8	98.15	98.155	0.90
805	13.42	0.032	0.38	0.77	230.6	269.2	-38.6	906.2	98.14	98.148	0.86
810	13.50	0.031	0.37	0.74	223.4	257.6	-34.2	872.0	98.14	98.142	0.82
815	13.58	0.030	0.36	0.72	216.2	247.5	-31.3	840.7	98.13	98.137	0.79
820	13.67	0.029	0.35	0.70	209.0	238.4	-29.4	811.4	98.13	98.132	0.77
825	13.75	0.028	0.34	0.67	201.8	229.9	-28.1	783.3	98.13	98.128	0.74
830	13.83	0.028	0.34	0.67	201.8	221.9	-20.1	763.1	98.12	98.124	0.72
835	13.92	0.027	0.32	0.65	194.6	215.2	-20.6	742.5	98.12	98.12	0.70
840	14.00	0.026	0.31	0.62	187.4	209.5	-22.2	720.4	98.12	98.117	0.68
845	14.08	0.026	0.31	0.62	187.4	203.6	-16.2	704.2	98.11	98.114	0.66
850	14.17	0.025	0.30	0.60	180.2	198.3	-18.1	686.1	98.11	98.111	0.64
855	14.25	0.024	0.29	0.58	173.0	193.5	-20.5	665.6	98.11	98.108	0.63
860	14.33	0.024	0.29	0.58	173.0	188.1	-15.1	650.4	98.10	98.105	0.61
865	14.42	0.024	0.29	0.58	173.0	183.2	-10.2	640.3	98.10	98.103	0.60
870	14.50	0.023	0.28	0.55	165.8	179.6	-13.9	626.4	98.10	98.101	0.59
875	14.58	0.023	0.28	0.55	165.8	176.3	-10.5	615.9	98.10	98.099	0.58
880	14.67	0.022	0.26	0.53	158.6	172.9	-14.3	601.5	98.10	98.097	0.56
885	14.75	0.022	0.26	0.53	158.6	169.4	-10.9	590.7	98.09	98.095	0.55
890	14.83	0.021	0.25	0.50	151.4	165.9	-14.6	576.1	98.09	98.093	0.54
895	14.92	0.021	0.25	0.50	151.4	162.4	-11.0	565.1	98.09	98.091	0.53
900	15.00	0.021	0.25	0.50	151.4	158.8	-7.5	557.6	98.09	98.09	0.52
905	15.08	0.020	0.24	0.48	144.1	156.2	-12.1	545.5	98.09	98.088	0.51
910	15.17	0.014	0.17	0.34	100.9	153.5	-52.6	492.9	98.08	98.083	0.48
915	15.25	0.020	0.24	0.48	144.1	144.5	-0.4	492.5	98.08	98.079	0.46
920	15.33	0.020	0.24	0.48	144.1	137.1	7.0	499.5	98.08	98.079	0.46
925	15.42	0.019	0.23	0.46	136.9	138.1	-1.1	498.4	98.08	98.08	0.46
930	15.50	0.019	0.23	0.46	136.9	138.9	-1.9	496.4	98.08	98.08	0.46
935	15.58	0.019	0.23	0.46	136.9	138.5	-1.5	494.9	98.08	98.079	0.46
940	15.67	0.018	0.22	0.43	129.7	138.0	-8.2	486.7	98.08	98.079	0.46
945	15.75	0.018	0.22	0.43	129.7	136.6	-6.9	479.8	98.08	98.077	0.45
950	15.83	0.018	0.22	0.43	129.7	134.5	-4.8	475.0	98.08	98.076	0.44
955	15.92	0.018	0.22	0.43	129.7	132.9	-3.2	471.9	98.08	98.076	0.44
960	16.00	0.018	0.22	0.43	129.7	131.8	-2.1	469.8	98.08	98.075	0.44
965	16.08	0.017	0.20	0.41	122.5	131.1	-8.5	461.3	98.07	98.074	0.43
970	16.17	0.017	0.20	0.41	122.5	129.6	-7.1	454.2	98.07	98.073	0.42
975	16.25	0.017	0.20	0.41	122.5	127.4	-4.9	449.3	98.07	98.072	0.42
980	16.33	0.017	0.20	0.41	122.5	125.7	-3.2	446.1	98.07	98.072	0.42
985	16.42	0.017	0.20	0.41	122.5	124.6	-2.1	444.0	98.07	98.071	0.41
990	16.50	0.016	0.19	0.38	115.3	123.9	-8.6	435.4	98.07	98.07	0.41
995	16.58	0.016	0.19	0.38	115.3	122.4	-7.1	428.4	98.07	98.069	0.40
1000	16.67	0.016	0.19	0.38	115.3	120.2	-4.9	423.5	98.07	98.068	0.40
1005	16.75	0.016	0.19	0.38	115.3	118.6	-3.2	420.2	98.07	98.067	0.39
1010	16.83	0.016	0.19	0.38	115.3	117.4	-2.1	418.1	98.07	98.067	0.39

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1015	16.92	0.016	0.19	0.38	115.3	116.7	-1.4	416.8	98.07	98.067	0.39
1020	17.00	0.015	0.18	0.36	108.1	116.2	-8.1	408.7	98.07	98.066	0.38
1025	17.08	0.015	0.18	0.36	108.1	114.9	-6.8	401.9	98.06	98.065	0.38
1030	17.17	0.015	0.18	0.36	108.1	112.8	-4.7	397.2	98.06	98.064	0.37
1035	17.25	0.015	0.18	0.36	108.1	111.2	-3.1	394.1	98.06	98.063	0.37
1040	17.33	0.015	0.18	0.36	108.1	110.1	-2.0	392.1	98.06	98.063	0.36
1045	17.42	0.015	0.18	0.36	108.1	109.4	-1.3	390.8	98.06	98.063	0.36
1050	17.50	0.015	0.18	0.36	108.1	109.0	-0.8	389.9	98.06	98.062	0.36
1055	17.58	0.014	0.17	0.34	100.9	108.7	-7.8	382.2	98.06	98.062	0.36
1060	17.67	0.014	0.17	0.34	100.9	107.5	-6.6	375.6	98.06	98.061	0.35
1065	17.75	0.014	0.17	0.34	100.9	105.5	-4.6	371.1	98.06	98.06	0.35
1070	17.83	0.014	0.17	0.34	100.9	103.9	-3.0	368.0	98.06	98.059	0.34
1075	17.92	0.014	0.17	0.34	100.9	102.9	-2.0	366.1	98.06	98.059	0.34
1080	18.00	0.014	0.17	0.34	100.9	102.2	-1.3	364.8	98.06	98.058	0.34
1085	18.08	0.014	0.17	0.34	100.9	101.7	-0.8	364.0	98.06	98.058	0.34
1090	18.17	0.014	0.17	0.34	100.9	101.4	-0.5	363.5	98.06	98.058	0.34
1095	18.25	0.014	0.17	0.34	100.9	101.2	-0.3	363.1	98.06	98.058	0.34
1100	18.33	0.013	0.16	0.31	93.7	101.1	-7.4	355.7	98.06	98.057	0.33
1105	18.42	0.013	0.16	0.31	93.7	100.0	-6.3	349.4	98.06	98.056	0.33
1110	18.50	0.013	0.16	0.31	93.7	98.1	-4.4	344.9	98.06	98.056	0.32
1115	18.58	0.013	0.16	0.31	93.7	96.6	-2.9	342.0	98.05	98.055	0.32
1120	18.67	0.013	0.16	0.31	93.7	95.6	-1.9	340.1	98.05	98.055	0.32
1125	18.75	0.013	0.16	0.31	93.7	94.9	-1.2	338.9	98.05	98.054	0.31
1130	18.83	0.013	0.16	0.31	93.7	94.5	-0.8	338.1	98.05	98.054	0.31
1135	18.92	0.013	0.16	0.31	93.7	94.2	-0.5	337.5	98.05	98.054	0.31
1140	19.00	0.013	0.16	0.31	93.7	94.0	-0.3	337.2	98.05	98.054	0.31
1145	19.08	0.013	0.16	0.31	93.7	93.9	-0.2	337.0	98.05	98.054	0.31
1150	19.17	0.013	0.16	0.31	93.7	93.8	-0.1	336.9	98.05	98.054	0.31
1155	19.25	0.012	0.14	0.29	86.5	93.8	-7.3	329.6	98.05	98.053	0.31
1160	19.33	0.012	0.14	0.29	86.5	92.7	-6.3	323.3	98.05	98.052	0.30
1165	19.42	0.012	0.14	0.29	86.5	90.9	-4.4	318.9	98.05	98.051	0.30
1170	19.50	0.012	0.14	0.29	86.5	89.4	-2.9	316.0	98.05	98.051	0.29
1175	19.58	0.012	0.14	0.29	86.5	88.4	-1.9	314.2	98.05	98.05	0.29
1180	19.67	0.012	0.14	0.29	86.5	87.7	-1.2	312.9	98.05	98.05	0.29
1185	19.75	0.012	0.14	0.29	86.5	87.3	-0.8	312.1	98.05	98.05	0.29
1190	19.83	0.012	0.14	0.29	86.5	87.0	-0.5	311.6	98.05	98.05	0.29
1195	19.92	0.012	0.14	0.29	86.5	86.8	-0.3	311.3	98.05	98.05	0.29
1200	20.00	0.012	0.14	0.29	86.5	86.7	-0.2	311.1	98.05	98.05	0.29
1205	20.08	0.012	0.14	0.29	86.5	86.6	-0.1	311.0	98.05	98.05	0.29
1210	20.17	0.012	0.14	0.29	86.5	86.6	-0.1	310.9	98.05	98.05	0.29
1215	20.25	0.012	0.14	0.29	86.5	86.5	-0.1	310.8	98.05	98.05	0.29
1220	20.33	0.011	0.13	0.26	79.3	86.5	-7.2	303.6	98.05	98.049	0.29
1225	20.42	0.011	0.13	0.26	79.3	85.5	-6.2	297.3	98.05	98.048	0.28
1230	20.50	0.011	0.13	0.26	79.3	83.6	-4.4	293.0	98.05	98.047	0.27
1235	20.58	0.011	0.13	0.26	79.3	82.2	-2.9	290.1	98.05	98.047	0.27
1240	20.67	0.011	0.13	0.26	79.3	81.2	-1.9	288.2	98.05	98.046	0.27
1245	20.75	0.011	0.13	0.26	79.3	80.5	-1.2	287.0	98.05	98.046	0.27
1250	20.83	0.011	0.13	0.26	79.3	80.1	-0.8	286.2	98.05	98.046	0.27
1255	20.92	0.011	0.13	0.26	79.3	79.8	-0.5	285.7	98.05	98.046	0.27
1260	21.00	0.011	0.13	0.26	79.3	79.6	-0.3	285.4	98.05	98.046	0.26
1265	21.08	0.011	0.13	0.26	79.3	79.5	-0.2	285.2	98.05	98.046	0.26
1270	21.17	0.011	0.13	0.26	79.3	79.4	-0.1	285.1	98.05	98.046	0.26
1275	21.25	0.011	0.13	0.26	79.3	79.4	-0.1	285.0	98.05	98.046	0.26

Input			Calculated						Interpolated		
Time (min)	Time (hr)	PI (in)	i (in/hr)	Q_{in} (cfs)	Vol_{in} (ft^3)	Vol_{out} (ft^3)	ΔVol (ft^3)	Vol_{Total} (ft^3)	Peak Stage (ft)	Avg Stage (ft)	Q_{out} (cfs)
1280	21.33	0.011	0.13	0.26	79.3	79.3	-0.1	284.9	98.05	98.046	0.26
1285	21.42	0.011	0.13	0.26	79.3	79.3	0.0	284.9	98.05	98.046	0.26
1290	21.50	0.011	0.13	0.26	79.3	79.3	0.0	284.9	98.05	98.046	0.26
1300	21.67	0.011	0.13	0.26	79.3	79.3	0.0	284.9	98.05	98.046	0.26
1305	21.75	0.011	0.13	0.26	79.3	79.3	0.0	284.8	98.05	98.046	0.26
1310	21.83	0.010	0.12	0.24	72.1	79.3	-7.2	277.6	98.04	98.045	0.26
1315	21.92	0.010	0.12	0.24	72.1	78.3	-6.2	271.4	98.04	98.044	0.25
1320	22.00	0.010	0.12	0.24	72.1	76.4	-4.3	267.1	98.04	98.043	0.25
1325	22.08	0.010	0.12	0.24	72.1	74.9	-2.9	264.2	98.04	98.042	0.25
1330	22.17	0.010	0.12	0.24	72.1	73.9	-1.9	262.3	98.04	98.042	0.24
1335	22.25	0.010	0.12	0.24	72.1	73.3	-1.2	261.1	98.04	98.042	0.24
1340	22.33	0.010	0.12	0.24	72.1	72.9	-0.8	260.4	98.04	98.042	0.24
1345	22.42	0.010	0.12	0.24	72.1	72.6	-0.5	259.8	98.04	98.042	0.24
1350	22.50	0.010	0.12	0.24	72.1	72.4	-0.3	259.5	98.04	98.042	0.24
1355	22.58	0.010	0.12	0.24	72.1	72.3	-0.2	259.3	98.04	98.041	0.24
1360	22.67	0.010	0.12	0.24	72.1	72.2	-0.1	259.2	98.04	98.041	0.24
1365	22.75	0.010	0.12	0.24	72.1	72.2	-0.1	259.1	98.04	98.041	0.24
1370	22.83	0.010	0.12	0.24	72.1	72.1	-0.1	259.0	98.04	98.041	0.24
1375	22.92	0.010	0.12	0.24	72.1	72.1	0.0	259.0	98.04	98.041	0.24
1380	23.00	0.010	0.12	0.24	72.1	72.1	0.0	259.0	98.04	98.041	0.24
1385	23.08	0.010	0.12	0.24	72.1	72.1	0.0	259.0	98.04	98.041	0.24
1390	23.17	0.010	0.12	0.24	72.1	72.1	0.0	258.9	98.04	98.041	0.24
1395	23.25	0.010	0.12	0.24	72.1	72.1	0.0	258.9	98.04	98.041	0.24
1400	23.33	0.010	0.12	0.24	72.1	72.1	0.0	258.9	98.04	98.041	0.24
1405	23.42	0.010	0.12	0.24	72.1	72.1	0.0	258.9	98.04	98.041	0.24
1410	23.50	0.010	0.12	0.24	72.1	72.1	0.0	258.9	98.04	98.041	0.24
1415	23.58	0.010	0.12	0.24	72.1	72.1	0.0	258.9	98.04	98.041	0.24
1420	23.67	0.009	0.11	0.22	64.9	72.1	-7.2	251.7	98.04	98.041	0.24
1425	23.75	0.009	0.11	0.22	64.9	71.1	-6.2	245.5	98.04	98.04	0.23
1430	23.83	0.009	0.11	0.22	64.9	69.2	-4.3	241.2	98.04	98.039	0.23
1435	23.92	0.009	0.11	0.22	64.9	67.7	-2.9	238.3	98.04	98.038	0.22
1440	24.00	0.009	0.11	0.22	64.9	66.7	-1.9	236.4	98.04	98.038	0.22

APPENDIX E
REFERENCE MATERIALS

Shallow Concentrated Overland Flow

U DOT: Hydraulic Design Series No. 2, Second Edition pg. 2-24

2.6.2.2 Shallow Concentrated Flow

After short distances, sheet flow tends to concentrate in rills and then gullies of increasing proportions. Such flow is usually referred to as shallow concentrated flow. The velocity of such flow can be estimated using an empirical relationship between the velocity and the slope:

$$V = \alpha \kappa S^{0.5}$$

Where,
V=Velocity (ft/s)
S=slope (ft/ft)
κ=dimensionless function of land cover
α=unit conversion (33)

Table 2.2. Intercept Coefficients for Velocity vs. Slope Relationship (McCuen, 1989)

k	Land Cover/Flow Regime
0.076	Forest with heavy ground litter; hay meadow (overland flow)
0.152	Trash fallow or minimum tillage cultivation; contour or strip cropped; woodland (overland flow)
0.213	Short grass pasture (overland flow)
0.274	Cultivated straight row (overland flow)
0.305	Nearly bare and untilled (overland flow); alluvial fans in western mountain regions
0.457	Grassed waterway (shallow concentrated flow)
0.491	Unpaved (shallow concentrated flow)
0.619	Paved area (shallow concentrated flow); small upland gullies

Manning's n Values

Ven Te Chow, Ph.D, *Open Channel Hydraulics* ,
McGraw-Hill Publishing Company.
Table 5-6 Values of The Roughness Coefficient

Surface Description	n
A. Closed Conduits	-
Cast Iron	0.013
HDPE	0.013
Cement	0.013
B. Lined Channels	-
Gravel bottom with rip-rap sides	0.033
Concrete with float finish	0.015
Concrete with gravel bottom	0.017
Asphalt - smooth	0.013
Asphalt - rough	0.016
Vegetal lining	0.030
D. Natural Streams	-
Clean, straight natural stream	0.030
Straight stream w/ stones or weeds	0.035
Clean, winding natural stream	0.040
Winding stream w/ stones or weeds	0.045
Sluggish stream, weedy with pools	0.070
Very weedy with deep pools	0.100
Gravel, cobbles & few boulders	0.040
Cobbles with large boulders	0.050
D-2. Flood plains	-
Pasture, no brush	0.030
Scattered Brush, heavy weeds	0.050
Light brush and trees	0.050
Dense brush	0.070

City of Redding - Hydrology Manual

Table C-9
Parameters for Overland Flow

Surface Description	n	dist
Pavement - smooth, Table C-9	0.02	50-200
Pavement - rough, Table C-9	0.05	50-200
Bare soil/newly graded, Table C-9	0.1	100-300
Range - heavily grazed, Table C-9	0.15	100-300
lawns/golf course, Table C-9	0.2	100-300
parks/medians/pasture, Table C-9	0.3	200-500
natural grassland, Table C-9	0.4	200-500
Residential landscaping, Table C-9	0.4	100-300
Few trees/natural grass, Table C-9	0.5	300-600
Scattered trees/shrubs, Table C-9	0.6	300-600
Numerous trees/dense, Table C-9	0.8	300-600

Figure 819.2A

Runoff Coefficients for Undeveloped Areas
Watershed Types

	Extreme	High	Normal	Low
Relief	.28 -.35 Steep, rugged terrain with average slopes above 30%	.20 -.28 Hilly, with average slopes of 10 to 30%	.14 -.20 Rolling, with average slopes of 5 to 10%	.08 -.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	.12 -.16 No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity	.08 -.12 Slow to take up water, clay or shallow loam soils of low infiltration capacity, imperfectly or poorly drained	.06 -.08 Normal; well drained light or medium textured soils, sandy loams, silt and silt loams	.04 -.06 High; deep sand or other soil that takes up water readily, very light well drained soils
Vegetal Cover	.12 -.16 No effective plant cover, bare or very sparse cover	.08 -.12 Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover	.06 -.08 Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops	.04 -.06 Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover
Surface Storage	.10 -.12 Negligible surface depression few and shallow; drainageways steep and small, no marshes	.08 -.10 Low; well defined system of small drainageways; no ponds or marshes	.06 -.08 Normal; considerable surface depression storage; lakes and pond marshes	.04 -.06 High; surface storage, high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes
Given	An undeveloped watershed consisting of; 1) rolling terrain with average slopes of 5%, 2) clay type soils, 3) good grassland area, and 4) normal surface depressions.		Solution: Relief 0.14 Soil Infiltration 0.08 Vegetal Cover 0.04 Surface Storage 0.06 C = 0.32	
Find	The runoff coefficient, C, for the above watershed.			

Table 819.2B

Runoff Coefficients for Developed Areas (1)

Type of Drainage Area	Runoff Coefficient
Business:	
Downtown areas	0.70 - 0.95
Neighborhood areas	0.50 - 0.70
Residential:	
Single-family areas	0.30 - 0.50
Multi-units, detached	0.40 - 0.60
Multi-units, attached	0.60 - 0.75
Suburban	0.25 - 0.40
Apartment dwelling areas	0.50 - 0.70
Industrial:	
Light areas	0.50 - 0.80
Heavy areas	0.60 - 0.90
Parks, cemeteries:	0.10 - 0.25
Playgrounds:	0.20 - 0.40
Railroad yard areas:	0.20 - 0.40
Unimproved areas:	0.10 - 0.30
Lawns:	
Sandy soil, flat, 2%	0.05 - 0.10
Sandy soil, average, 2-7%	0.10 - 0.15
Sandy soil, steep, 7%	0.15 - 0.20
Heavy soil, flat, 2%	0.13 - 0.17
Heavy soil, average, 2-7%	0.18 - 0.22
Heavy soil, steep, 7%	0.25 - 0.35
Streets:	
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Drives and walks	0.75 - 0.85
Roofs:	0.75 - 0.95

NOTES:
(1) From HDS No. 2.

regression equations are considered the best estimates of flood frequency and are used to reduce the time-sampling error that may occur in a station flood-frequency estimate.

(d) The flood-frequency flows and the maximum peak discharges at several stations in a region should be used whenever possible for comparison with the peak discharge estimated at an ungaged site using a rainfall-runoff approach or regional regression equation. The watershed characteristics at the ungaged and gaged sites should be similar.

(4) National Resources Conservation Service (NRCS) Methods. The Soil Conservation Service's SCS (former title) National Engineering Handbook, 1972, and their 1975, "Urban Hydrology for Small Watersheds", Technical Release 55 (TR-55), present a graphical method for estimating peak discharge. Most NRCS equations and curves provide results in terms of inches of runoff for unit hydrograph development and are not applicable to the estimation of a peak design discharge unless the design hydrograph is first developed in accordance with prescribed NRCS procedures. NRCS methods and procedures are applicable to drainage areas less than 3 square miles (approx. 2,000 acres) and result in a design hydrograph and design discharge that are functionally acceptable to form the basis for the design of highway drainage facilities.

819.3 Statistical Methods

Statistical methods of predicting stream discharge utilize numerical data to describe the process. Statistical methods, in general, do not require as much subjective judgment to apply as the previously described deterministic methods. They are usually well documented mathematical procedures which are applied to measured or observed data. The accuracy of statistical methods can also be measured quantitatively. However, to assure that statistical method results are valid, the method and procedures used should be verified by an experienced engineer with a thorough knowledge of engineering statistics.

Attachment K

Letters sent to the Redding Rancheria, the Paskenta Band of Nomlaki Indians, and the Wintu Tribe of Northern California

CITY OF REDDING
777 Cypress Avenue, Redding, CA 96001
PO BOX 496071, Redding, CA 96049-6071
cityofredding.org

August 17, 2023

Paskenta Band of Nomlaki Indians
Tribal Historic Preservation Officer
22580 Olivewood Avenue
Corning, CA 96021

Subject: Tribal Cultural Resources under the California Environmental Quality Act, AB 52. Formal Notification of Determination that a Decision to Undertake a Project, and Notice of Consultation Opportunity, pursuant to Public Resources Code § 21080.3.1.

Dear Tribal Historic Preservation Officer:

This letter includes information and details for proposed projects located in Redding, California, for which the City of Redding (City) is the California Environmental Quality Act (CEQA) Lead Agency. As the CEQA Lead Agency, the City has determined that the CEQA documentation is in the form of an Initial Study and Negative Declaration. Pursuant to § 21080.3.1 (d), and the City respectfully requests that the Paskenta Band of Nomlaki Indians respond with a written request for consultation within 30 days of receipt of this letter.

Below, please find the descriptions of the proposed projects and the point of contact. Attached are project location maps for each project, pursuant to Public Resources Code § 21080.3.1 (d).

PROJECT 1

Project Proponent: Quartz Hill Land, LLC

Project Location: 605 Quartz Hill Road

Project Description: Subdivision Map Application S-2023-00802, by Brentwood Subdivision, proposes to create 60 residential lots with a park and enhanced landscape areas from one existing parcel on a 9.31-acre site, in a "RM-9,PD" Residential Multiple-Family District with Planned Development Overlay District

Project Planner: Danny Castro, Assistant Planner
777 Cypress Avenue, Redding, CA 96001
(530) 225-4471
dcastro@cityofredding.org

PROJECT 2

Project Proponent: PACE Supply Corporation

Project Location: 3676 & 3678 Old 44 Drive

Project Description: Use Permit Application UP-2023-00550 proposes to expand an existing building and outside storage yard on a 6.2-acre site in a "HC" Heavy Commercial District

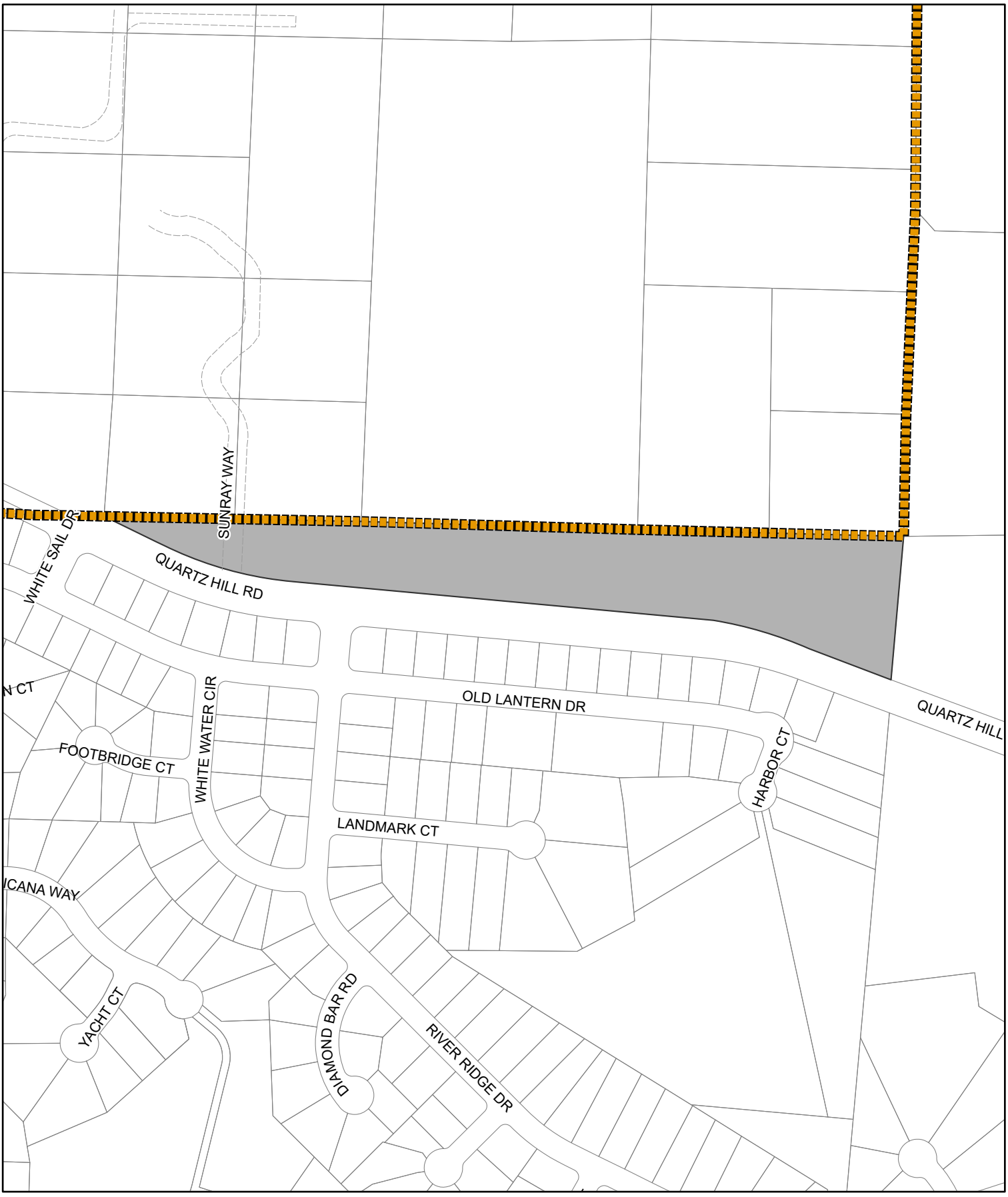
Project Planner: Danny Castro, Assistant Planner
777 Cypress Avenue, Redding, CA 96001
(530) 225-4471
dcastro@cityofredding.org

Sincerely,

Danny Castro
Assistant Planner
Development Services

DC:jg

Attachments:
Location Maps



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GIS DIVISION
INFORMATION TECHNOLOGY DEPARTMENT

DATE PRODUCED:
JUNE 2, 2023

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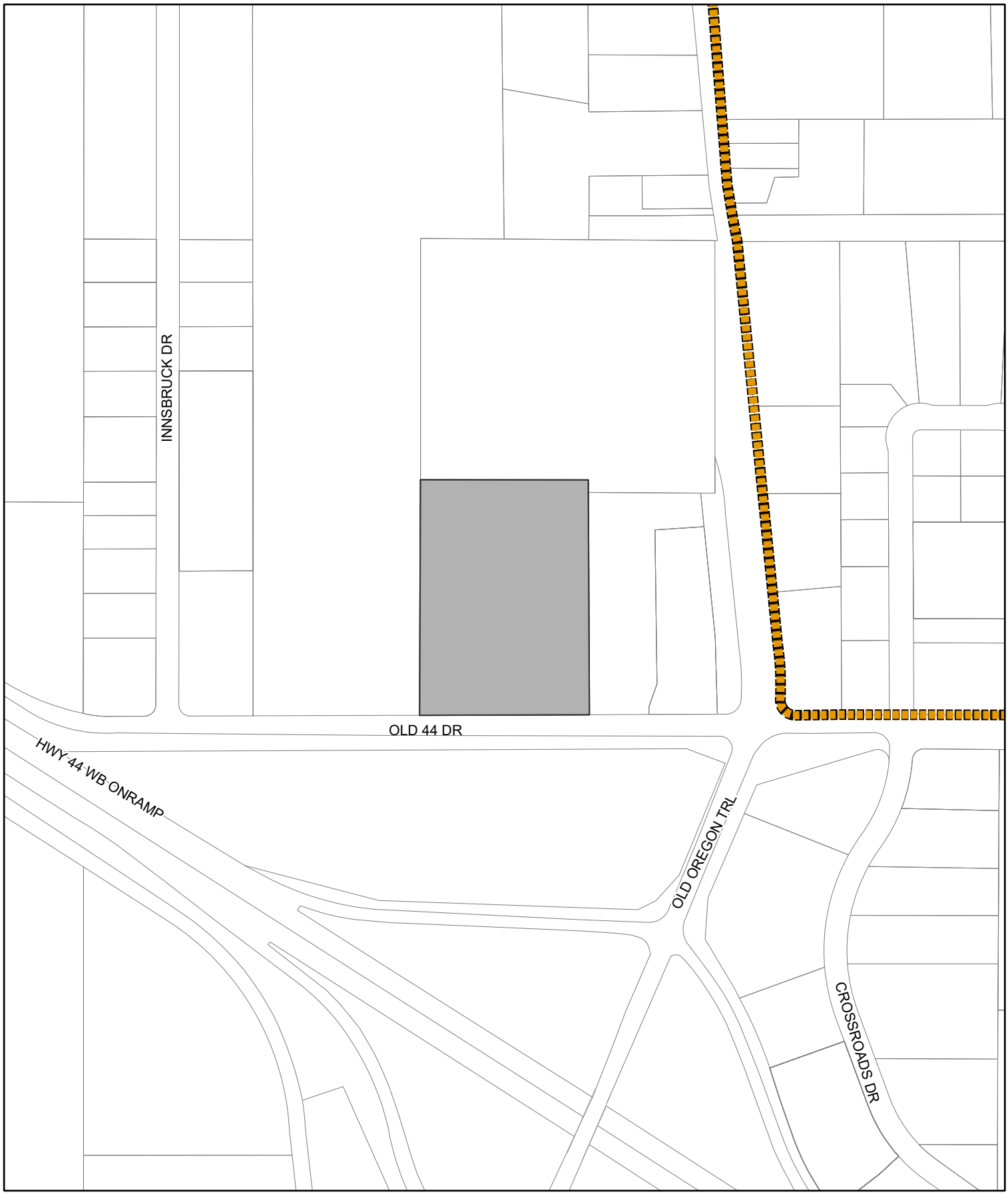
LOCATION MAP

S-2023-00802
RAMAKRISHNA KANDULA
605 QUARTZ HILL DR
AP# 115-170-014

MTG. DATE:

ITEM:

ATTACHMENT:



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GIS DIVISION
INFORMATION TECHNOLOGY DEPARTMENT

DATE PRODUCED:
APRIL 11, 2023

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LOCATION MAP

UP-2023-00550
PACE SUPPLY
3676 OLD 44 DRIVE
AP# 109-010-037

MTG. DATE:

ITEM:

ATTACHMENT:

CITY OF REDDING
777 Cypress Avenue, Redding, CA 96001
PO BOX 496071, Redding, CA 96049-6071
cityofredding.org

August 17, 2023

Paskenta Band of Nomlaki Indians
Tribal Historic Preservation Officer
22580 Olivewood Avenue
Corning, CA 96021

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777 Cypress Avenue, Redding, CA 96001
(530) 225-4471
dcastro@cityofredding.org

PROJECT 2

Project Proponent: PACE Supply Corporation

Project Location: 3676 & 3678 Old 44 Drive

Project Description: Use Permit Application UP-2023-00550 proposes to expand an existing building and outside storage yard on a 6.2-acre site in a "HC" Heavy Commercial District

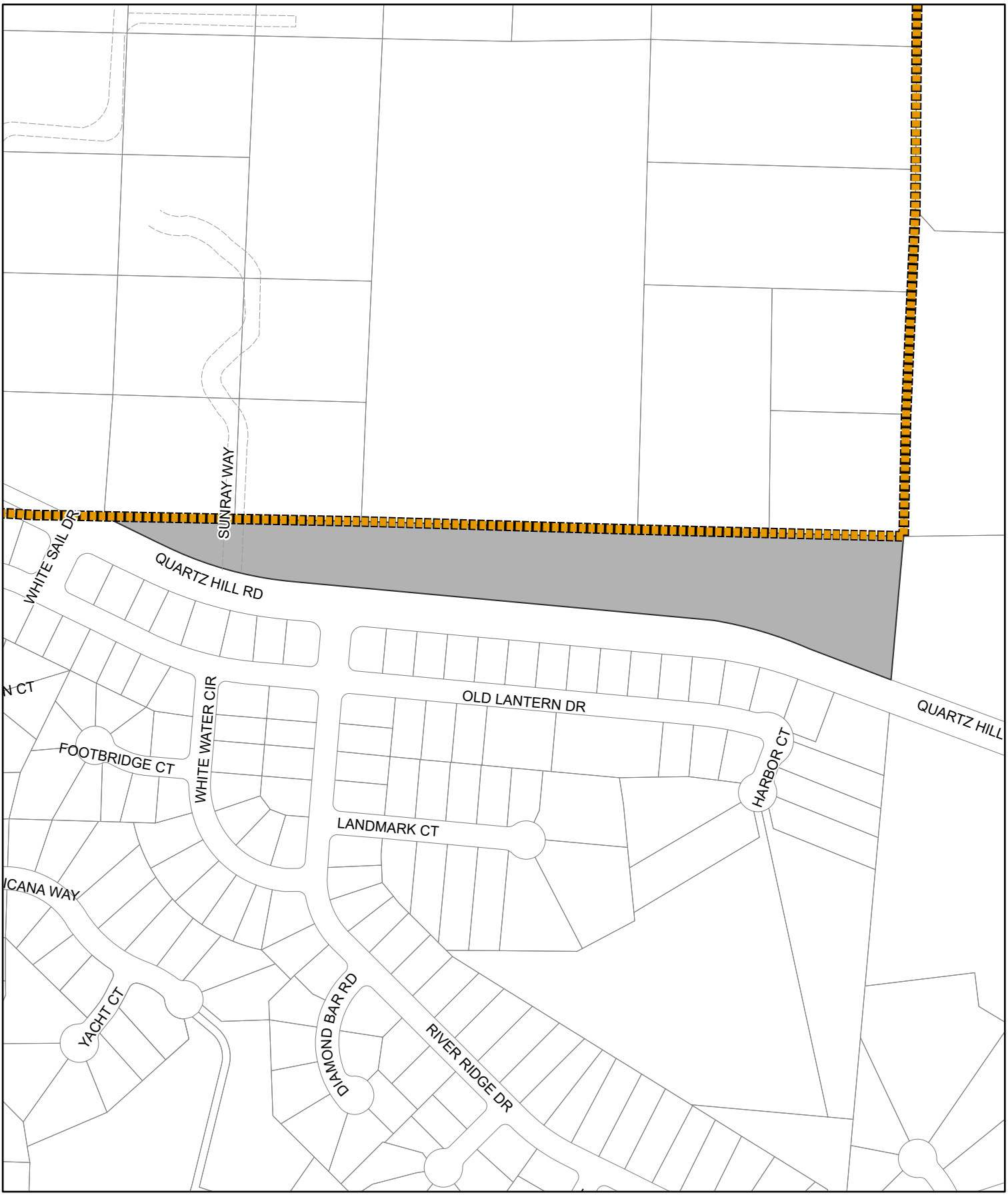
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777 Cypress Avenue, Redding, CA 96001
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dcastro@cityofredding.org

Sincerely,

Danny Castro
Assistant Planner
Development Services

DC:jg

Attachments:
Location Maps



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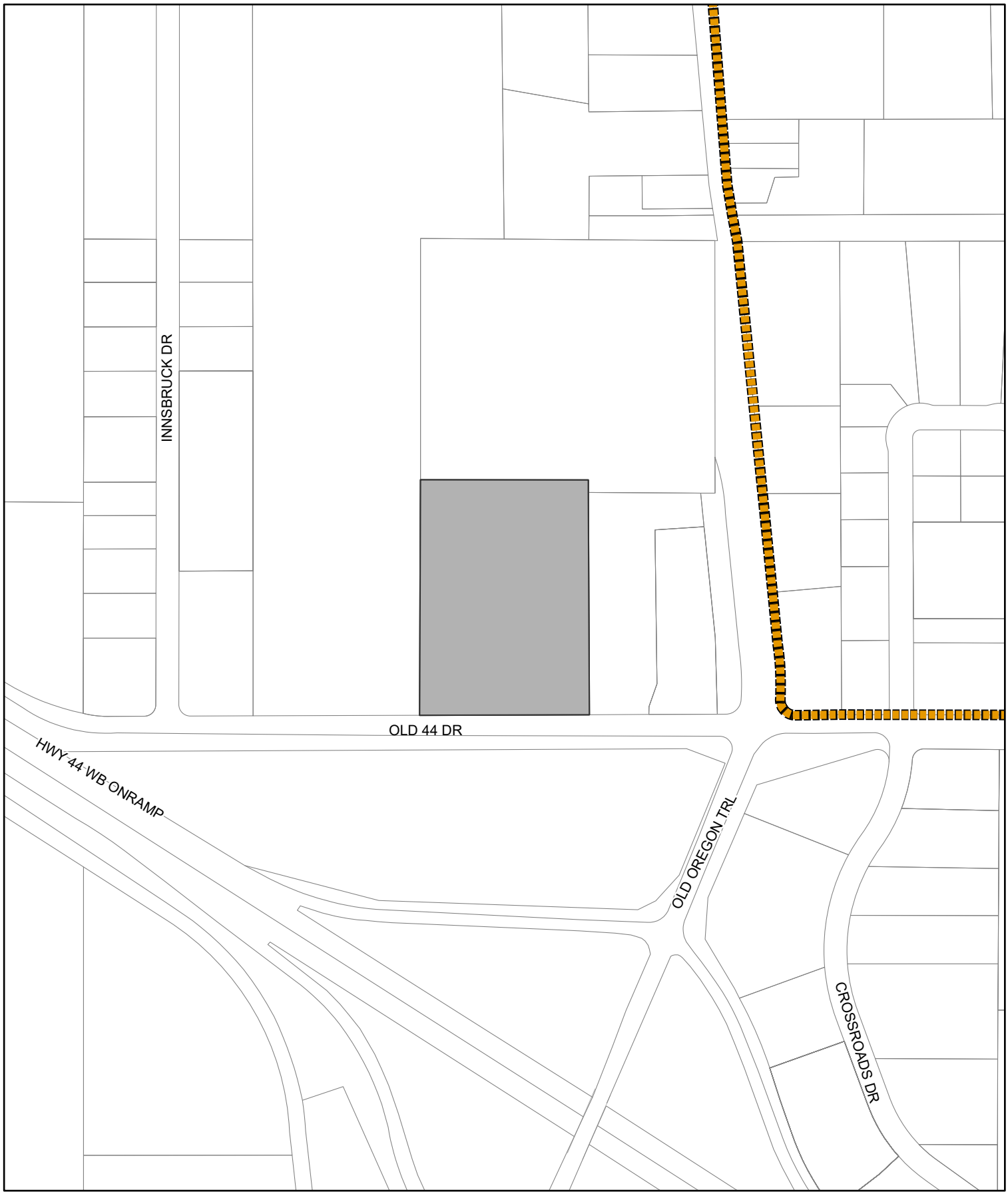
LOCATION MAP

S-2023-00802
RAMAKRISHNA KANDULA
605 QUARTZ HILL DR
AP# 115-170-014

MTG. DATE:

ITEM:

ATTACHMENT:



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DATE PRODUCED:
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LOCATION MAP

UP-2023-00550
PACE SUPPLY
3676 OLD 44 DRIVE
AP# 109-010-037

MTG. DATE:

ITEM:

ATTACHMENT:

CITY OF REDDING
777 Cypress Avenue, Redding, CA 96001
PO BOX 496071, Redding, CA 96049-6071
cityofredding.org

August 17, 2023

Wintu Tribe of Northern California
Kelli Hayward
PO Box 995
Shasta Lake, CA 96019

Subject: Tribal Cultural Resources under the California Environmental Quality Act, AB 52. Formal Notification of Determination that a Decision to Undertake a Project, and Notice of Consultation Opportunity, pursuant to Public Resources Code § 21080.3.1.

Dear Ms. Hayward:

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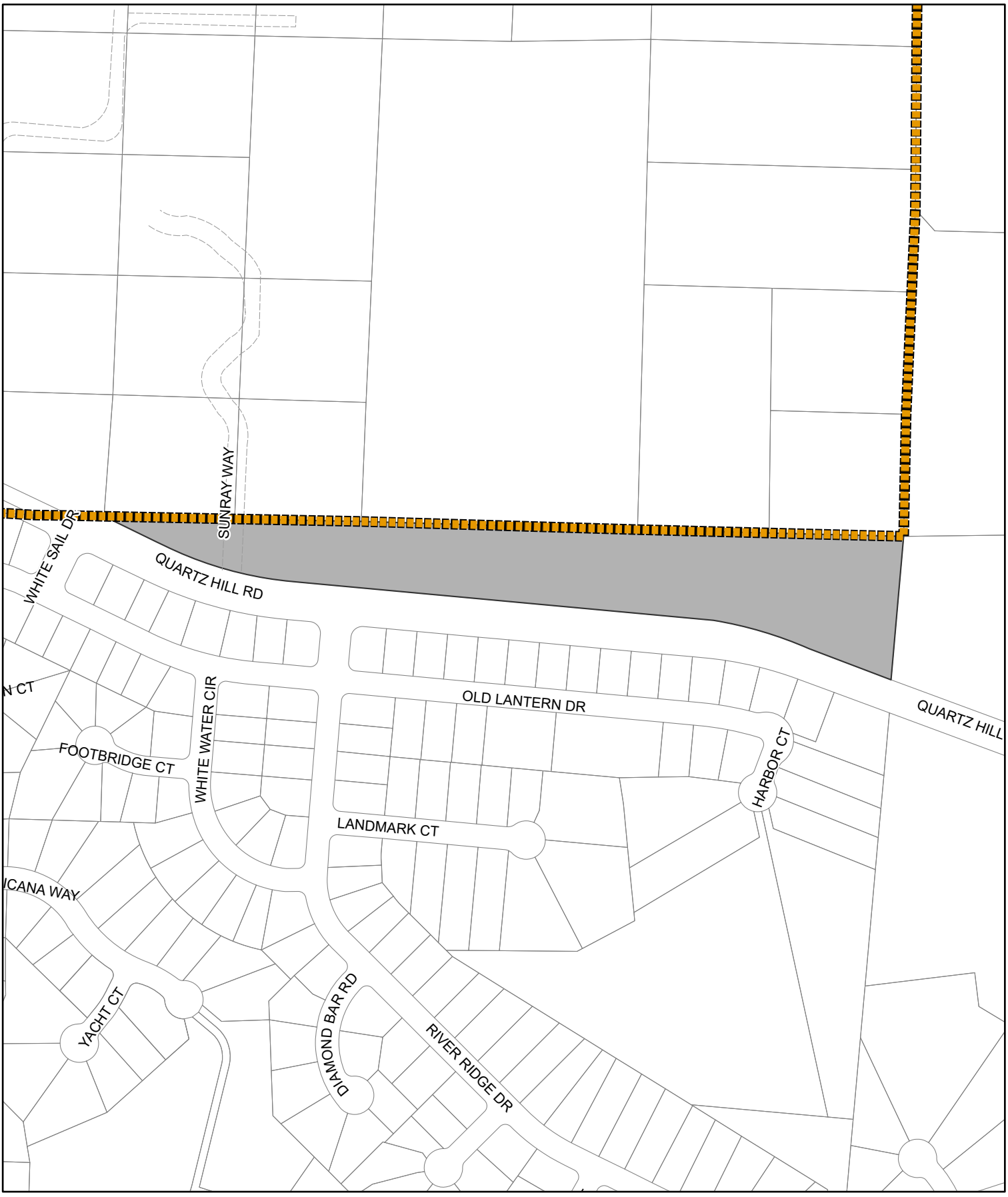
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Sincerely,

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Assistant Planner
Development Services

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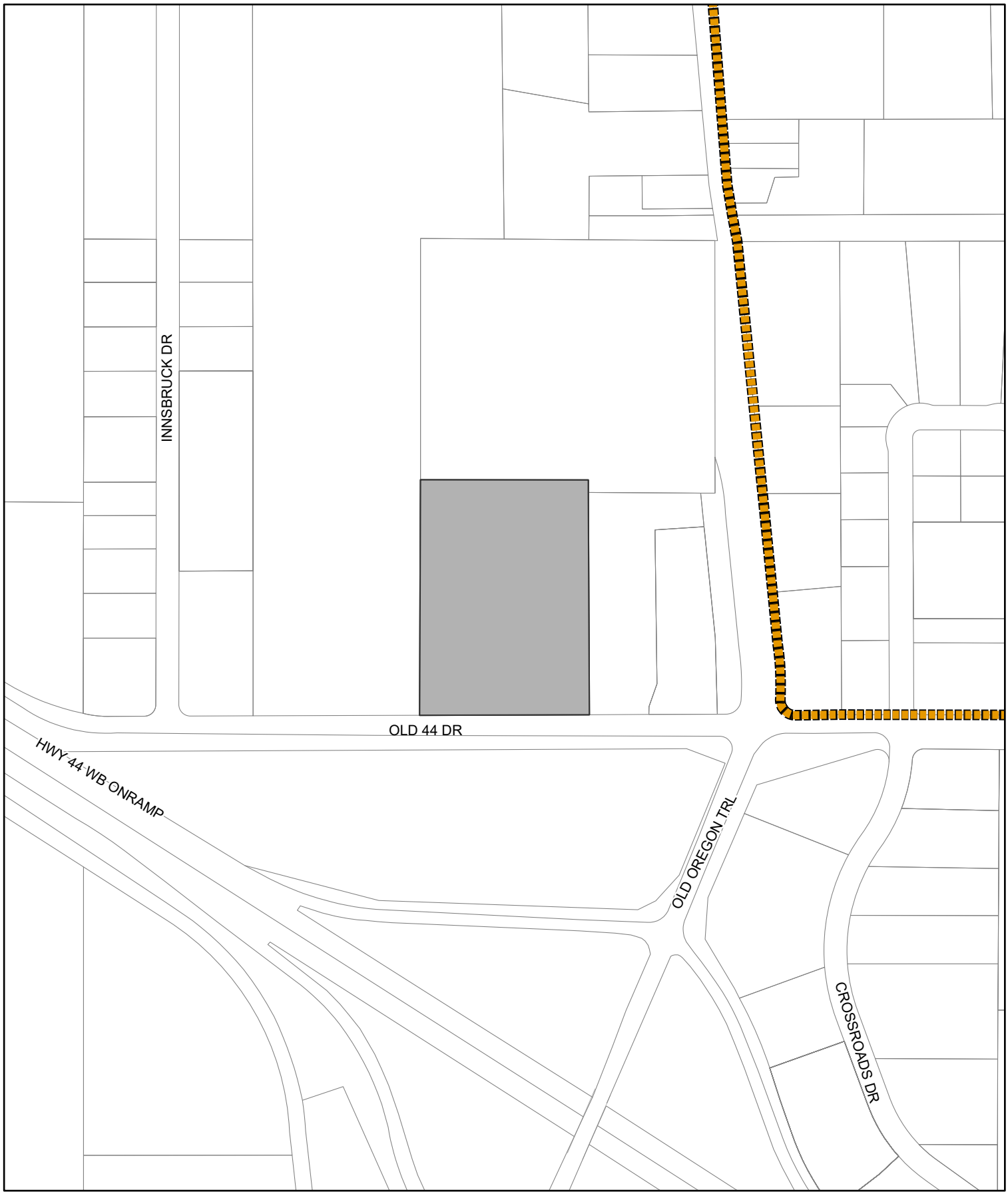
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RAMAKRISHNA KANDULA
605 QUARTZ HILL DR
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LOCATION MAP

UP-2023-00550
PACE SUPPLY
3676 OLD 44 DRIVE
AP# 109-010-037

MTG. DATE:

ITEM:

ATTACHMENT:

PACE SUPPLY CORPORATION EXPANSION
USE PERMIT UP-2023-00550

MITIGATION MONITORING PROGRAM CONTENTS

This document is the Mitigation Monitoring Program (MMP) for PACE Supply Corporation for the Use Permit Application UP-2023-00550. The MMP includes a brief discussion of the legal basis for and the purpose of the program, discussion, and direction regarding complaints about noncompliance, a key to understanding the monitoring matrix, and the monitoring matrix itself.

LEGAL BASIS OF AND PURPOSE FOR THE MITIGATION MONITORING PROGRAM

California Public Resources Code Section 21081.6 requires public agencies to adopt mitigation monitoring or reporting programs whenever certifying an environmental impact report (EIR) or a mitigated negative declaration. This requirement facilitates implementation of all mitigation measures adopted through the California Environmental Quality Act (CEQA) process.

The MMP contained herein is intended to satisfy the requirements of CEQA as they relate to the Initial Study/Mitigated Negative Declaration prepared for PACE Supply Corporation. It is intended to be used by City of Redding (City) staff, participating agencies, project contractors, and mitigation monitoring personnel during implementation of the project.

Mitigation is defined by CEQA Guidelines Section 15370 as a measure that does any of the following:

- Avoids impacts altogether by not taking a certain action or parts of an action.
- Minimizes impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifies impacts by repairing, rehabilitating or restoring the impacted environment.
- Reduces or eliminates impacts over time by preservation and maintenance operations during the life of the project.
- Compensates for impacts by replacing or providing substitute resources or environments.

The intent of the MMP is to ensure the effective implementation and enforcement of adopted mitigation measures and permit conditions. The MMP will provide for monitoring of construction activities as necessary, on-site identification and resolution of environmental problems, and proper reporting to City staff.

MITIGATION MONITORING TABLE

The Mitigation Monitoring Table identifies the mitigation measures proposed for PACE Supply Corporation. These mitigation measures are reproduced from the Initial Study and conditions of approval for the project. The tables have the following columns:

Mitigation Measure: Lists the mitigation measures identified within the Initial Study for a specific impact, along with the number for each measure as enumerated in the Initial Study.

Timing: Identifies at what point in time, review process, or phase the mitigation measure will be completed.

Agency/Department Consultation: References the City department or any other public agency with which coordination is required to satisfy the identified mitigation measure.

Verification: Spaces to be initialed and dated by the individual designated to verify adherence to a specific mitigation measure.

NONCOMPLIANCE COMPLAINTS

Any person or agency may file a complaint asserting noncompliance with the mitigation measures associated with the project. The complaint shall be directed to the City in written form, providing specific information on the asserted violation. The City shall conduct an investigation and determine the validity of the complaint. If noncompliance with a mitigation measure has occurred, the City shall take appropriate action to remedy any violation. The complainant shall receive written confirmation indicating the results of the investigation or the final action corresponding to the particular noncompliance issue.

MITIGATION MONITORING TABLE
FOR USE PERMIT UP-2023-00550 MMP

Mitigation Measure	Timing/Implementation	Enforcement/Monitoring	Verification (Date and Initials)
Biological Resources			
MM-Bio-1 Prior to construction in aquatic environments, a qualified biologist shall conduct two (2) nighttime preconstruction surveys between January and March to detect western spadefoot adults, egg masses, and/or tadpoles. Preconstruction surveys shall occur immediately following separate precipitation events that produce enough volume of rain to develop ponding events. CDFW shall be consulted prior to the initiation of project activities if any western spadefoots are observed.	Prior to construction	Planning Division, and Public Works Department	
MM-Bio-2 To the extent practicable, removal of large trees with cavities shall occur before bat maternity colonies form (i.e., prior to February 28) or after young are volant (i.e., after September 1). If construction (including the removal of large trees) occurs during the bat non-volant season (September 1 to February 28), a qualified professional shall conduct a pre-construction survey of the study area to locate maternity colonies and identify measures to protect colonies from disturbance. The preconstruction survey will be performed no more than 7 days prior to the implementation of construction activities. If a maternity colony is located within the study area, or adjacent to the study area, a disturbance free buffer shall be established by a qualified professional, in consultation with the California Department of Fish and Wildlife to ensure the colony is protected from project activities.	Prior to issuance of a grading or tree removal permit	Planning Division, and Public Works Department	
MM-Bio-3 If vegetation removal or construction activities will occur during the nesting season for migratory birds and raptors (February 1 through August 31), a	Prior to issuance of a grading permit	Planning Division, and Public Works Department	

Mitigation Measure	Timing/Implementation	Enforcement/Monitoring	Verification (Date and Initials)
qualified biologist shall conduct a pre-construction survey 7 days before construction activities begin. If any candidate, sensitive, or special-status nesting birds are found, the California Department of Fish and Wildlife (CDFW) will be notified and consulted. An appropriate buffer, as determined by the CDFW and the qualified biologist, will be placed around the nest until the young have fledged. If construction activities cease for a period greater than 7 days, additional preconstruction surveys will be required.			
MM-Bio-4 Prior to issuance of a City grading permit that may impact or cause the permanent or temporary loss of jurisdictional waters or potential jurisdictional waters, as identified by the project, the developer shall secure all required permits and authorization from the U.S. Army Corps of Engineers, Regional Water Quality Control Board, and California Department of Fish and Wildlife. All terms and conditions of the required permits and authorizations shall be met.	Prior to issuance of a grading permit	Planning Division and Public Works Department	
MM-Bio-5 Prior to issuance of a grading permit, any permanent loss of waters of the U.S. or waters of the State, including wetlands, shall be offset by purchasing credits at a U.S. Army Corps of Engineers-approved mitigation bank, by payment of in-lieu fees to the U.S. Army Corps of Engineers-approved in-lieu fee program (according to current fee schedule), and/or as required by the State. The jurisdictional status of all on-site wetland features and documentation of resolution with the U.S. Army Corps of Engineers and/or the State regarding any required offsets shall be provided to the Planning Division.	Prior to issuance of a grading permit	Planning Division and Public Works Department	

Mitigation Measure	Timing/Implementation	Enforcement/Monitoring	Verification (Date and Initials)
MM-Bio-6 Prior to issuance of a grading permit or installation of any gravel for Phase 1, 6-foot high chain-link fencing or similar as approved by the development services director shall be in place and inspected by the Planning Division. This fencing shall be installed along the boundaries of Phase 1 in the northern undeveloped portion of the site.	Prior to issuance of a grading permit or installation of any gravel for Phase 1	Planning Division and Public Works Department	