E & P Technology Way, Buildings A & B – Use Permits #P22-00307 & #P22-00308

Summary

SCH Number
2024100855

Lead Agency
Napa County

Document Title
E & P Technology Way, Buildings A & B – Use Permits #P22-00307 & #P22-00308

Document Type
MND - Mitigated Negative Declaration

Received
10/18/2024

Present Land Use
Industrial Park: Airport Compatibility (IP:AC) / Industrial

Document Description
Building A project proposes wine production facility within the proposed 143,312 SF building with an annual production capacity of 450,000 gallons. The winery uses will include grape crushing, bulk wine processing and storage, stainless steel tank and barrel storage, bottling, and office space. In addition, approximately 13,000 SF of covered outdoor work area will be located on the north side of the building. The proposal also includes 129 parking spaces and eight (8) spaces for semi-trailers. Access will be provided by three (3) new driveways; one (1) on Technology and two (2) on Morris Court.

Building B project proposes to allow warehouse uses within the proposed 66,915 SF building. The warehouse uses are consistent with allowable warehouse uses as outlined in Industrial Park zoning district (18.40.020) and the Napa Valley Business Park Specific Plan (NVBPSP.) The floor area ratio (FAR) after full build out will be 22.4%, below the allowable 35%. All vehicles will enter from a new access driveway on Technology Way that runs along the eastern property line. Trucks will then off load or pick up at the rear of the building. Trucks will be able to circulate around the building in a one-way loop, exiting at a second driveway on Technology Way on the west side the building. The entrance driveway will be wide enough to accommodate two-way traffic.

Contact Information

Name

Sean Kennings

Agency Name
LAK Associates, LLC

Job Title
contract planner

Contact Types
Consulting Firm

Address
PO Box 7043
Corte Madera, CA 94976

Phone
(415) 533-2111

Email
sean@lakassociates.com

Name
Mike Kelley

Agency Name
Kelley Commercial

Job Title
project manager

Contact Types
Project Applicant

Address
5150 Fair Oaks Blvd, Suite 101-219
Carmichael, CA 94608

Phone
(916) 956-0524

Email
mkelley@kelley-commercial.com

Name
Sean Trippi

Agency Name
Napa County PBES

Job Title
Supervising Planner

Contact Types
Lead/Public Agency

Address

1195 Third Street, Suite 210
Napa, CA 94559

Phone

(707) 299-1353

Email

sean.trippi@countyofnapa.org

Location

Coordinates

38°13'36"N 122°16'46"W

Cities

American Canyon

Counties

Napa

Regions

Countywide

Cross Streets

Technology Way and Morris Ct, American Canyon, CA

Zip

94558

Total Acres

20.07

Jobs

100

Parcel #

057-250-030, -031, -032

State Highways

12 / 29

Railways

California Northern Railroad

Airports

Napa County

Schools

N/A

Waterways

Napa River

Township

4n

Range
4w

Section
2

Base
Mt Diabl

Other Location Info
Napa Valley Business Park

Notice of Completion

State Review Period Start
10/18/2024

State Review Period End
11/18/2024

State Reviewing Agencies
California Air Resources Board (ARB), California Coastal Commission (CCC), California Department of Forestry and Fire Protection (CAL FIRE), California Department of Parks and Recreation, California Department of Toxic Substances Control (DTSC), California Department of Transportation, District 4 (DOT), California Department of Transportation, Division of Aeronautics (DOT), California Department of Transportation, Division of Transportation Planning (DOT), California Department of Water Resources (DWR), California Fish and Game Commission (CDFGC), California Governor's Office of Emergency Services (OES), California Highway Patrol (CHP), California Native American Heritage Commission (NAHC), California Natural Resources Agency, California Public Utilities Commission (CPUC), California Regional Water Quality Control Board, San Francisco Bay Region 2 (RWQCB), California State Coastal Conservancy (SCC), California State Lands Commission (SLC), Office of Historic Preservation, San Francisco Bay Conservation and Development Commission (BCDC), State Water Resources Control Board, Division of Drinking Water, State Water Resources Control Board, Division of Drinking Water, District 3, State Water Resources Control Board, Division of Water Quality, State Water Resources Control Board, Divison of Financial Assistance, California Department of Fish and Wildlife, Bay Delta Region 3 (CDFW)

State Reviewing Agency Comments
California Department of Fish and Wildlife, Bay Delta Region 3 (CDFW)

Development Types
Industrial (two separate buildings (A&B): A winery; B warehouse)(Sq. Ft. 210727, Acres 14, Employees 65)

Local Actions
Use Permit

Project Issues
Biological Resources, Cultural Resources, Mandatory Findings of Significance, Transportation

Public Review Period Start
10/19/2024

Public Review Period End
11/17/2024

Attachments

Draft Environmental Document [Draft IS, NOI_NOA_Public notices, OPR Summary Form, Appx,]

- 20241017_E & P ISMND_final DOCX 270 K
- 20241018_Summary_Form_for_Document_Submittal_E&P PDF 492 K
- E & P NOI DOCX 282 K
- EP Tech Bldg A WSR APN_057-250-030 PDF 879 K
- EP Tech Bldg B WSL_APN_057-250-031_&_-032 PDF 432 K
- Geotechnical Report PDF 35375 K
- NapaSan WILLSR-100 - Technology Way Bldg AB PDF 217 K
- TIS for a Winery and Warehouse at the Napa Airport Business Park PDF 6780 K

Notice of Completion [NOC] Transmittal form

- 20241018_NOC_E&P PDF 1064 K

State Comment Letters [Comments from State Reviewing Agency(ies)]

- 2024100855_CDFW Comment PDF 358 K

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Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: E & P Technology Way, Buildings A & B – Use Permits #P22-00307 & #P22-00308

Lead Agency: Napa County Planning, Building, Environmental Services (PBES) Contact Person: Sean Trippi, Supervising Planner
Mailing Address: 1195 THIRD STEET SUITE 210 Phone: (707) 253-4417
City: Napa Zip: 94559 County: Napa

Project Location: County: Napa City/Nearest Community: American Canyon
Cross Streets: Technology Way / Morris Court Zip Code: 94558
Longitude/Latitude (degrees, minutes and seconds): 38 ° 13 ′ 36.23 ″ N / 122 ° 16.04 ′ 46 ″ W Total Acres: 20.07
Assessor's Parcel No.: 057-250-030, -031, -032 Section: 2 Twp.: 4n Range: 4w Base: Mt Diablo
Within 2 Miles: State Hwy #: 12 / 29 Waterways: Napa River
Airports: Napa County Airport Railways: CA Northern Railroad Schools: N/A

Document Type:

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☒ Mit Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent EIR (Prior SCH No.) ____ Other: ____
NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI
Other: ☐ Joint Document ☐ Final Document ☐ Other: ____

Local Action Type:

☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan
☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan
☐ Rezone ☐ Prezone ☒ Use Permit ☐ Land Division (Subdivision, etc.)
☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☐ Other: ____

Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☒ Industrial: Sq.ft. 210,727 Acres ____ Employees 65
☐ Educational: ____
☐ Recreational: ____
☐ Water Facilities: Type ____ MGD ____
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☐ Other: ____

Project Issues Discussed in Document:

☐ Aesthetic/Visual ☐ Agricultural Land ☐ Air Quality ☒ Archeological/Historical ☒ Biological Resources ☐ Coastal Zone ☐ Drainage/Absorption ☐ Economic/Jobs
☐ Fiscal ☐ Flood Plain/Flooding ☐ Forest Land/Fire Hazard ☐ Geologic/Seismic ☐ Minerals ☐ Noise ☐ Population/Housing Balance ☐ Public Services/Facilities
☐ Recreation/Parks ☐ Schools/Universities ☐ Septic Systems ☐ Sewer Capacity ☐ Soil Erosion/Compaction/Grading ☐ Solid Waste ☐ Toxic/Hazardous ☒ Traffic/Circulation
☐ Vegetation ☐ Water Quality ☐ Water Supply/Groundwater ☐ Wetland/Riparian ☐ Growth Inducement ☐ Land Use ☐ Cumulative Effects ☒ Other: mandatory findings

Present Land Use/Zoning/General Plan Designation:

Industrial Park: Airport Compatibility (IP:AC) / Industrial

Project Description: *(please use a separate page if necessary)*

Building A project proposes wine production facility within the proposed 143,312 SF building with an annual production capacity of 450,000 gallons. The winery uses will include grape crushing, bulk wine processing and storage, stainless steel tank and barrel storage, bottling, and office space. In addition, approximately 13,000 SF of covered outdoor work area will be located on the north side of the building. The proposal also includes 129 parking spaces and eight (8) spaces for semi-trailers. Access will be provided by three (3) new driveways; one (1) on Technology and two (2) on Morris Court.

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Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2010

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "**X**".
If you have already sent your document to the agency please denote that with an "**S**".

X Air Resources Board
___ Boating & Waterways, Department of
___ California Emergency Management Agency
___ California Highway Patrol
___ Caltrans District # ___
___ Caltrans Division of Aeronautics
___ Caltrans Planning
___ Central Valley Flood Protection Board
___ Coachella Valley Mtns. Conservancy
___ Coastal Commission
___ Colorado River Board
___ Conservation, Department of
___ Corrections, Department of
___ Delta Protection Commission
___ Education, Department of
___ Energy Commission
X Fish & Game Region # 3
___ Food & Agriculture, Department of
___ Forestry and Fire Protection, Department of
___ General Services, Department of
___ Health Services, Department of
___ Housing & Community Development
X Native American Heritage Commission
___ Office of Historic Preservation
___ Office of Public School Construction
___ Parks & Recreation, Department of
___ Pesticide Regulation, Department of
___ Public Utilities Commission
X Regional WQCB # 2
___ Resources Agency
___ Resources Recycling and Recovery, Department of
___ S.F. Bay Conservation & Development Comm.
___ San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
___ San Joaquin River Conservancy
___ Santa Monica Mtns. Conservancy
___ State Lands Commission
___ SWRCB: Clean Water Grants
___ SWRCB: Water Quality
___ SWRCB: Water Rights
___ Tahoe Regional Planning Agency
___ Toxic Substances Control, Department of
___ Water Resources, Department of

___ Other: ___
___ Other: ___

Local Public Review Period (to be filled in by lead agency)

Starting Date October 19, 2024 Ending Date November 20, 2024

Lead Agency (Complete if applicable):

Consulting Firm: LAK Associates, LLC
Address: PO Box 7043
City/State/Zip: Corte Madera, CA 94976
Contact: Sean Kennings
Phone: 415-533-2111

Applicant: Mike Kelly
Address: 5150 Fair Oaks Blvd, Suite 101-219
City/State/Zip: Carmichael, CA 94608
Phone: (916) 956-0524

Signature of Lead Agency Representative: Sean Kennings Digitally signed by Sean Kennings Date: 2024.10.17 15:26:29 -07'00' **Date:** 10/17/24

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

Revised 2010

Print From

Summary Form for Electronic Document Submittal

Form F

Lead agencies may include 15 hardcopies of this document when submitting electronic copies of Environmental Impact Reports, Negative Declarations, Mitigated Negative Declarations, or Notices of Preparation to the State Clearinghouse (SCH). The SCH also accepts other summaries, such as EIR Executive Summaries prepared pursuant to CEQA Guidelines Section 15123. Please include one copy of the Notice of Completion Form (NOC) with your submission and attach the summary to each electronic copy of the document.

SCH #: ____________________

Project Title: E & P Technology Way, Buildings A & B – Use Permits #P22-00307 & #P22-00308

Lead Agency: County of Napa PBES

Contact Name: Sean Kennings, contract planner

Email: sean@lakassociates.com Phone Number: 415-533-2111

Project Location: Technology Way and Morris Ct, American Canyon, CA (*City*) Napa (*County*)

Project Description (Proposed actions, location, and/or consequences).

Building A project proposes wine production facility within the proposed 143,312 SF building with an annual production capacity of 450,000 gallons. The winery uses will include grape crushing, bulk wine processing and storage, stainless steel tank and barrel storage, bottling, and office space. In addition, approximately 13,000 SF of covered outdoor work area will be located on the north side of the building. The proposal also includes 129 parking spaces and eight (8) spaces for semi-trailers. Access will be provided by three (3) new driveways; one (1) on Technology and two (2) on Morris Court.

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Identify the project's significant or potentially significant effects and briefly describe any proposed mitigation measures that would reduce or avoid that effect.

biological resources: BIO-1: silt fencing plan to protect the Sheehy Creek Conservation Easement; BIO-2: The project sponsor or permittee shall conduct protocol-level special-status plant surveys during the flowering time of the target species; BIO-3: A survey for active bird nests shall be conducted by a qualified biologist; BIO-4 (Swainson's Hawk Surveys and Avoidance Buffer): If Project activities are scheduled during the nesting season for Swainson's hawk (March 1 to September 15), prior to beginning work on the Project, a qualified biologist shall conduct surveys; BIO-5: Impacts to Swainson's hawk foraging habitat shall be quantified by a qualified biologist; BIO-6 (Burrowing Owl Habitat Assessment and Surveys): A qualified biologist shall conduct a habitat assessment and surveys for wintering burrowing owls prior to construction; BIO-7 (Burrowing Owl Foraging Habitat Mitigation): Impacts to burrowing owl foraging habitat shall be quantified by a qualified biologist; BIO-8: The project sponsor or permittee shall install exclusion fencing during the wet season; BIO-9: The project sponsor or permittee shall provide an arborists report and tree protection plan prepared by a qualified biologist/arborist; CULT-1: Prior to ground disturbance activities on site, the project sponsor shall provide a cultural resources and tribal cultural resources sensitivity and awareness training program (Worker Environmental Awareness Program [WEAP]); TRANS-1: The project sponsor for the Building B warehouse building shall submit a Transportation Demand Management Plan prepared by a qualified traffic engineer

Revised September 2011

If applicable, describe any of the project's areas of controversy known to the Lead Agency, including issues raised by agencies and the public.

biological resources
cultural resources
traffic and circulation

Provide a list of the responsible or trustee agencies for the project.

CDFW

LII > Wex **> public trust doctrine**

public trust doctrine

Public trust doctrine is a legal principle establishing that certain natural and cultural resources are preserved for public use. Natural resources held in trust can include navigable waters, wildlife, or land. The public is considered the owner of the resources, and the government protects and maintains these resources for the public's use.

The doctrine is most frequently used in the context of water bodies. Throughout the United States, most lakes and streams are maintained under the public trust doctrine, typically for the purposes of drinking and recreational activities. The public trust doctrine also prevents private property from extending to the ocean.

For more information on the public trust doctrine, see this California State Lands Commission document.

[Last reviewed in May of 2022 by the Wex Definitions Team]

Keywords

- property
- private property rights
- public trust doctrine
- public property

Wex

- CIVICS
- wex definitions
- government
- legal education and practice
- property law

EPA

How Wetlands are Defined and Identified under CWA Section 404

> *"Wetlands are 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. Wetlands generally include swamps, marshes, bogs, and similar areas."* - Definition of wetlands as used by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) since the 1970s for regulatory purposes.

In more common language, wetlands are areas where the frequent and prolonged presence of water at or near the soil surface drives the natural system meaning the kind of soils that form, the plants that grow and the fish and/or wildlife communities that use the habitat. Swamps, marshes and bogs are well-recognized types of wetlands. However, many important specific wetland types have drier or more variable water systems than those familiar to the general public. Some examples of these are vernal pools (pools that form in the spring rains but are dry at other times of the year), playas (areas at the bottom of undrained desert basins that are sometimes covered with water) and prairie potholes.

Characteristics of Wetlands

When the upper part of the soil is saturated with water at growing season temperatures, soil organisms consume the oxygen in the soil and cause conditions unsuitable for most plants. Such conditions also cause the development of soil characteristics (such as color and texture) of so-called "hydric soils." The plants that can grow in such conditions, such as marsh grasses, are called "hydrophytes." Together, hydric soils and hydrophytes give clues that a wetland area is present.

The presence of water by ponding, flooding or soil saturation is not always a good indicator of wetlands. Except for wetlands flooded by ocean tides, the amount of water present in wetlands fluctuates as a result of rainfall patterns, snow melt, dry seasons and longer droughts.

Some of the most well-known wetlands, such as the Everglades and Mississippi bottomland hardwood swamps, are often dry. In contrast, many upland areas are very wet during and shortly after wet weather. Such natural fluctuations must be considered when identifying areas subject to Federal wetlands jurisdiction. Similarly, the effects of upstream dams, drainage ditches, dikes, irrigation and other modifications must also be considered.

Manual for Defining Wetlands

The EPA and the Corps use the 1987 Corps of Engineers Wetlands Delineation Manual and Regional Supplements <https://www.usace.army.mil/missions/civil-works/regulatory-program-and-permits/reg_supp/> to define wetlands for the Clean Water Act Section 404 permit program. Section 404 requires a permit from the Corps or authorized state for the discharge of dredged or fill material into the waters of the United States <https://epa.gov/wotus>, including wetlands.

The 1987 Corps of Engineers Wetlands Delineation Manual and Regional Supplements organizes characteristics of a potential wetland into three categories: soils, vegetation and hydrology. The manual and supplements contain criteria for each category. With this approach, an area that meets all three criteria is considered a wetland.

Jurisdictional Determinations

Jurisdictional Determinations are issued by the Army Corps of Engineers, and determine whether a water will be regulated under CWA 404. These are often determined by performing a jurisdictional delineation of waters on a property.

Jurisdictional Delineations are performed on a property in order to delineate which waters are Waters of the U.S. and are therefore subject to CWA 404. Most often, a preliminary jurisdictional delineation is submitted to the Army Corps by the permit applicant, which the Corps then verifies. The applicant can decide whether they would like a final approved delineation or would like to proceed with an application with only a verified preliminary delineation, which makes for a shorter process. When and how do I do a jurisdictional delineation? <https://epa.gov/cwa-404/what-jurisdictional-delineation-under-cwa-section-404>

Last updated on July 1, 2025

WETLAND DELINEATION FIELD EVALUATION QUESTIONNAIRE

This questionnaire should be completed for each boundary delineation performed. The assumption is that <u>two communities</u> were evaluated, one wetland (= "lower community") and one upland (= "upper community") so that a boundary between them could be identified. Fill in the blanks or check spaces as appropriate. Attach copies of the completed field data forms.

Site Name or Location____ **Date**________________
Evaluator(s)_________________________________ **Affiliation(s)**__________________________
____ _____________________________________
____ _____________________________________

General Site Characteristics

Is the site ___typical or ___problematic? *If problematic, explain*:__________________________
____
____

<u>Wetland</u> (lower community)

Ecological System: ___Saline Tidal ___Fresh Tidal ___Fresh Nontidal ___Saline Nontidal
Wetland Type: ___Forested ___Shrub ___Emergent ___Moss/Lichen ___Farmed (hay or crop)
___Other (specify____)
HGM Class: ___Depression ___Riverine ___Fringe ___Slope ___Flat
Vegetative Cover: ___Dense ___Evenly Mixed w/Nonvegetated ___Sparse

<u>Nonwetland</u> (upper community)

Habitat Type: ___Forest ___ Shrub ___Meadow/Prairie ___Moss/Lichen ___Farmed
___Other (specify:____)

1. Was there a marked difference in the two plant communities? ___Yes ___No
2. Was there a gradual change in vegetation between the two communities creating a significant "transition zone" between? ___Yes ___No. If so, how wide was this transition zone? _____feet
3. Was there an abrupt topographic change between the two communities? ___Yes ___No

Boundary Determination

Compare results from the two methods: (1) current practice using the 1987 Manual and guidance memos, and (2) 1987 Manual with the draft Regional Supplement.

1. The wetland boundary was: ___the same or ___ different.
2. If different, which method produced the boundary higher on the landscape?
   ___Manual with current guidance or ___Manual with Regional Supplement
3. What was the linear distance between the two boundaries? ________feet
4. What type of indicator(s) were responsible for the difference in the boundaries?
   ___Hydrophytic vegetation ___Hydric soil ___Wetland hydrology (*check all that apply*)

Assessment of the Indicators

Hydrophytic Vegetation

1. Did the lower community pass the current basic test for hydrophytic vegetation (i.e., >50% of the dominants had an indicator status of FAC or wetter, *excluding FAC-*)? ___Yes ___No
2. Did the lower community pass the "dominance test" in the Regional Supplement (i.e., >50% of the dominants were FAC or wetter, *counting FAC- as FAC*)? ___Yes ___No
3. What other indicators of hydrophytic vegetation were observed in the lower community?
   a) List those from the Manual with current guidance: ____________________________________

____
____
____

   b) List those from the Regional Supplement: ____

____
____
____

4. Was the vegetation in the lower community a problematic wetland community type?
   ___Yes ___No. *If so, briefly describe and explain how the problem was handled*__________

____
____
____
____
____

5. Did the upper community pass the current basic test for hydrophytic vegetation (i.e., >50% of the dominants had an indicator status of FAC or wetter, *excluding FAC-*)? ___Yes ___No
6. Did the upper community pass the "dominance test" in the Regional Supplement (i.e., >50% of the dominants were FAC or wetter, *counting FAC- as FAC*)? ___Yes ___No
7. What other indicators of hydrophytic vegetation were observed in the upper community?
   a) List those from the Manual with current guidance: ____________________________________

____
____
____

   b) List those from the Regional Supplement: ____

____
____
____

8. Did both methods reach the same conclusion regarding the presence of hydrophytic vegetation for the upper community? ___Yes ___No. *If not, briefly explain*_________________________

____
____
____
____
____

9. Were the hydrophytic vegetation indicators in the Regional Supplement clearly described and easy to apply? ___Yes ___No. *If not, briefly explain*___________________________________

____
____
____
____
____

Hydric Soil

1. Did both methods find indicators of hydric soil in the lower community? ___Yes ___No
   a) List those from the Manual with current guidance: ________________________________
   ____
   ____
   ____
   b) List those from the Regional Supplement: _____________________________________
   ____
   ____
   ____

2. Did the lower community contain a problematic hydric soil (i.e., one that lacked indicators)? ___Yes ___No. *If so, briefly describe the problem and explain how it was handled:* _______
____
____
____
____

3. Did both methods reach the same conclusion regarding the presence of hydric soil in the upper community? ___Yes ___No. *If not, briefly explain*_________________________________
____
   a) List indicators from the Manual with current guidance: ____________________________
   ____
   ____
   ____
   b) List indicators from the Regional Supplement: ___________________________________
   ____
   ____
   ____

4. Were the hydric soil indicators in the Regional Supplement clearly described and easy to apply? ___Yes ___No. *If not, briefly explain*_______________________________________
____
____
____
____
____

Wetland Hydrology

1. Did both methods determine that wetland hydrology was present in the lower community? (Requires 1 primary indicator or 2 secondary indicators.) ___Yes ___No
   a) List indicators from the Manual with current guidance:
      Primary:______________________________ Secondary:_____________________________
      ______________________________________ ______________________________________
      ______________________________________ ______________________________________
      ______________________________________ ______________________________________
   b) List indicators from the Regional Supplement:
      Primary:______________________________ Secondary:_____________________________
      ______________________________________ ______________________________________
      ______________________________________ ______________________________________
      ______________________________________ ______________________________________

2. Did the lower community contain a problematic wetland hydrology situation (i.e., one that lacked indicators)?
___Yes ___No. *If so, briefly describe the problem and explain how it was handled:* ______
____
____
____
____

3. Did both methods reach the same conclusion regarding wetland hydrology for the upper community? ___Yes ___No. *If not, briefly explain*___________________________________
____

a) List indicators from the Manual with current guidance:
Primary:_____________________________ Secondary:_____________________________
_____________________________________ _____________________________________
_____________________________________ _____________________________________
_____________________________________ _____________________________________

b) List indicators from the Regional Supplement:
Primary:_____________________________ Secondary:_____________________________
_____________________________________ _____________________________________
_____________________________________ _____________________________________
_____________________________________ _____________________________________

4. Were the wetland hydrology indicators in the Regional Supplement clearly described and easy to apply? ___Yes ___No. *If not, briefly explain*_____________________________________
____
____
____
____
____

Comments on the Regional Supplement

1. Were the indicators and procedures in the Supplement clear and easy to apply?
___Yes ___No. *If not, how could they be improved*?_________________________________
____
____
____
____
____
____
____

2. In your opinion, did the Regional Supplement make this wetland determination more defensible? ___Yes ____No. *Briefly explain*____
____
____
____
____
____
____
____

3. Based on your testing, do you want to recommend other indicators that should be considered for further evaluation? ___Yes ___No. *List by indicator type:*___________________________

4. Was the Regional Supplement's field data form complete, understandable, and easy to fill out? ___Yes ___No. *If not, how could it be improved?* ______________________________________

5. Any additional comments or suggestions? ____


GIS Napa County Online Public Map
Environmental
Layers
Erosion Control Plans
Hazmat District
Hazmat Spills NON LOP
Hazmat Spills LOP
Vegetation
Agriculture
Coniferous forest
Developed
Grassland
Oak woodlands
Other
Riparian woodland
Rock Outcrop
Shrubland
Streams and reservoirs
Wetlands
others
National Hydrography Dataset Flowlines
Stream (perennial)
Stream (intermittent)
Stream (ephemeral)
Canal / Ditch
Aqueduct (underground)
Pipeline (underground)
Connector
Artificial Path (for hydrology calcs)
others
Water_Bodies
FEMA_NFHL - L_XS_ELEV

Source: Pinecrest Environmental Consulting, Google Earth PEC Inc.

FIRSTCARBON SOLUTIONS™

Exhibit 3
Watercourse - West

58160001 • 01/2023 | 3_watercourse_west.cdr

E&P PROPERTIES, INC.
TECHNOLOGY WAY BUILDINGS A AND B
BIOLOGICAL RESOURCES ASSESSMENT

: Pinecrest Environmental Consulting; Google Earth PEC Inc.

STCARBON LUTIONS™

Exhibit 4
Watercourse - East

001 • 01/2023 | 4_watercourse_east.cdr

E&P PROPERTIES, INC.
TECHNOLOGY WAY BUILDINGS A AND B
BIOLOGICAL RESOURCES ASSESSMENT

Riparian Terminology: Confusion and Clarification

by Richard A. Fischer,[1] Chester O. Martin,[1] John T. Ratti,[2] and John Guidice[2]

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INTRODUCTION

Riparian zones occur throughout the United States as long strips of vegetation adjacent to streams, rivers, lakes, reservoirs, and other inland aquatic systems that affect or are affected by the presence of water. This vegetation contributes to unique ecosystems that perform a large variety of ecological functions. Unfortunately, considerable variation is associated with riparian terminology, similar to problems associated with wetlands terminology (Mitsch and Gosselink 1993). This can lead to confusion when people attempt to communicate about riparian zones, particularly if they come from different disciplinary backgrounds. The goals of this paper are to promote awareness of this problem by describing variation associated with semantics in riparian terminology, to explain why this contributes to confusion, to show the importance of attempting to standardize this terminology, and to suggest ways that natural resource professionals can better describe what comprises a riparian ecosystem.

WHY IS THERE CONFUSION?

No Universally Accepted Riparian Definition.

No single wetland definition appears to meet or satisfy the needs of all scientists or agencies. For example, Cowardin et al. (1979) defined wetlands and deepwater habitats for the National Wetlands Classification System and Inventory (NWI), whereas the U. S. Army Corps of Engineers uses a different definition under Section 404 of the Clean Water Act to regulate the deposition of dredged and fill materials into wetlands. Similarly, there is no universally recognized or widely accepted definition that adequately describes all riparian zones (Anderson 1987). Riparian definitions found in some texts are over-simplified, and some books on wildlife habitats and plant communities do not adequately distinguish riparian communities from upland communities (Ohmart and Anderson 1986).

Riparian definitions range from simple descriptions, such as "associated with water courses" (Dick-Peddie and Hubbard 1977:86), to technical and detailed descriptions for specific areas (e.g., Minshall et al. (1989)). Recently, Ilhardt et al. (2000; p. 29) proposed a more functional definition for riparian zones. They suggested that riparian zones are, "three-dimensional ecotones of interaction that include terrestrial and aquatic ecosystems, that extend down into the groundwater, up above the canopy, outward across the floodplain, up the near-slopes that drain to the water, laterally into the terrestrial ecosystem, and along the water course at a variable width." However, there is no indication that this or other recent definitions will become universally accepted as the standard.

Regional Differences.

Stream and river ecosystems differ regionally and locally in many characteristics, including width, depth, frequency of flooding, hydrogeomorphic factors, and vegetation. These differences are most apparent between Eastern and Western regions of the United States. Riparian zones in the arid West often occur on low-order streams having extreme and variable fluvial conditions (Mitsch and

[1]USAE Research and Development Center, Environmental Laboratory, 3909 Halls Ferry Rd., Vicksburg, MS 39180
[2]University of Idaho, College of Forestry, Wildlife, and Range Sciences, Moscow, ID

Gosselink 1993). In arid and semi-arid regions, there typically is a strong visual contrast between riparian and upland vegetation communities (Figure 1). Often, these streams are ephemeral, with steep gradients and narrow floodplains.

Figure 1. Riparian zones in the Western United States tend to be much narrower than in the East and contrast highly with surrounding uplands.

Riparian vegetation often consists of a lush mixture of trees, shrubs, and herbaceous vegetation, while adjacent upland areas are typically non-forested ecosystems such as grasslands and deserts. Stream and riparian ecosystems in this region often are referred to by a number of regional terms such as desert washes and bosques higher in the watershed, and cottonwood bottomlands and arroyos along larger river systems. Other Western riparian zones, such as those in the Rocky Mountains and the Pacific Northwest, are also very different from most Eastern systems. They typically occur along faster-moving systems that occur in deeply incised valleys. Many Midwestern riparian zones in agricultural-dominated landscapes are also very apparent on the landscape; these riparian zones are often called gallery forests.

The most extensive riparian zones in the United States are bottomland hardwood forests (BLH) that occur as vast forests along broad river floodplains or alluvial valleys in the Eastern, Southeastern, and Central United States (Huffman and Forsythe 1981, Mitsch and Gosselink 1993) (Figure 2). Unlike many Western riparian systems, both BLH and adjacent uplands frequently are dominated by deciduous hardwoods, making the riparian zone a less-conspicuous component of the landscape (Johnson and Lowe 1985).

Figure 2. Bottomland hardwoods, typically labeled as a floodplain forest, are a type of riparian community.

Lack of Consistent Terminology.

Riparian zones are studied and managed by a variety of individuals (e.g., landscape ecologists, urban planners, hydrologists, fisheries and wildlife biologists, agronomists, range managers, geomorphologists), who have developed and used their own specific terminology. This lack of consistency among different perspectives further heightens confusion regarding riparian definitions and terminology (Bennett et al. 1989, Gregory et al. 1991). For example, what constitutes a properly functioning riparian zone for water quality protection to an agronomist or hydrologist may be only a fraction of the land area that a wildlife ecologist considers adequate to provide habitat or a wildlife movement corridor among larger habitat patches (Fischer and Fischenich 2000).

Riparian literature from journal papers in a variety of ecological fields contains many terms describing vegetation adjacent to permanent and intermittent streams, rivers, lakes, wetlands, and other aquatic systems (Table 1), often without explicit definition. Although many of these terms can be informative and descriptive, they tend to be used interchangeably without any clear understanding as to whether they described

Table 1. Terminology from the Literature and Other Sources Describing Vegetation Located Adjacent to Aquatic Systems

Riparian floodplains	Riverfront hardwoods
Riparian-wetland areas	Alluvial swamp forests
Riparian forests	Buffer strips
Riparian zones	Streamside vegetation
Riparian swamps	Streamside forests
Riparian woodlands	Streamside management zones
Riparian corridors	Floodplain forest
Riparian ecosystems	Drainage-associated vegetation
Riparian sites	Hardwood stringers
Riparian wetlands	Swamp forest
Riparian mountain meadows	Cottonwood bottomlands
Riparian forest stands	Bottomland hardwood riparian ecosystems
Riparian ribbons	Bottomland hardwoods
Riverine bands	Desert arroyos
River margins	Mesquite bosques
Riverine floodplains	Hardwood bottoms
Riverine wetlands	Aquatic buffers
Gallery forests	Desert wash

[1] Terms from the Journal of Wildlife Management, Environmental Management, Wetlands, BioScience, Condor, Wilson Bulletin, Great Basin Naturalist, Journal of Range Management, Ecological Applications, Ecology, Canadian Journal of Fisheries and Aquatic Science, Proceedings of the Southeastern Association of Fish and Wildlife Agencies, Ecological Monographs, U.S. Forest Service General Technical Reports, U.S. Fish and Wildife Service Reports, and several books.

similar areas from structural, functional, and ecological perspectives.

Differences in Legal Protection.
Although techniques exist for delineating the landward boundary of wetlands (e.g., Environmental Laboratory (1987)), no such standardized techniques exist for riparian zones. Riparian zones often are referred to as wetlands, but these two terms are not necessarily synonymous (Ohmart and Anderson 1986, Ratti and Kadlec 1992). Jurisdictional wetlands, or those wetlands that meet the soil, vegetation, and hydrologic criteria in the "Corps of Engineers Wetlands Delineation Manual" (Environmental Laboratory 1987), can occur within a riparian zone, but may only represent a small portion of the total riparian area. Examples of jurisdictional wetlands occurring within the riparian zone include palustrine wetlands in the NWI (Cowardin et al. 1979) and riverine wetlands in Brinson (1993) (e.g., bottomland hardwoods in the Southeastern United States). However, many other riparian zones were not included in the NWI because they did not meet the criteria of these classification schemes, especially in most arid and semi-arid Western states (Johnson et al. 1984, Kusler 1985, Lowe et al. 1986).

Major portions of riparian zones are not classified as wetlands by the Corps, and therefore, often are not afforded legal protection under Section 404. However, vegetation, soils, and hydrologic processes that are unique from uplands, but do not meet the criteria of current wetlands definitions, regularly occur in riparian zones. These areas are still functionally unique when compared to the adjacent upland habitats (Johnson et al. 1984, Debano and Schmidt 1989), yet they do not receive Federal protection as jurisdictional wetlands.

WHY IS CONSISTENT TERMINOLOGY IMPORTANT?

Protecting Riparian-Dependent Species.

Consistent terminology and a more universally accepted riparian definition could improve guidance for delineating riparian zones for the conservation of fish and wildlife populations. Although riparian habitats comprise a very small proportion of most landscapes, they frequently are used by wildlife in much greater proportion to their availability. Riparian zones in the Western United States comprise less than 1 percent of the total land area, yet these areas are used by more species of breeding birds than any other habitat in North America (Knopf et al. 1988). Thomas et al. (1979) reported 285 of 378 (75 percent) terrestrial species either required riparian zones year-round or were directly dependent on them for a portion of their life cycle. Approximately 190 species of North American amphibians are dependent on wetland breeding habitat (Clark 1979), and many of these wetlands occur in riparian zones. Riparian buffer strips are also very important for maintaining quality habitat for fish and other aquatic organisms (Large and Petts 1994).

Riparian habitats are extremely important for some rare, endangered, and endemic species. For example, Brinson et al. (1981) suggested that of the 276 species listed as threatened or endangered by the United States Fish and Wildlife Service (USFWS) in 1980, at least 80 (29 percent) were partially dependent on riparian habitats. Mismanagement of BLH has been implicated as a primary cause for the extinction of the ivory-billed woodpecker (*Campephilus principalis*) and Carolina parakeet (*Conuropis carolinensis*) (Harris and Gosselink 1990). The Southwestern willow flycatcher (*Empidonax traillii extimus*), which breeds in riparian habitats of the Southwest, is now listed as endangered by the USFWS because of large-scale loss of riparian habitat (USFWS 1995, Sogge et al. 1997). Other riparian-obligate birds that have experienced significant population declines due to loss of riparian habitat include the swallow-tailed kite (*Elanoides forficatus*) in the Southeast, and least Bell's vireo (*Vireo bellii pusillus*) (Guilfoyle and Wolters, in preparation) and yellow-billed cuckoo (*Coccyzus americanus*) in the Southwest (Olson and Gray 1989).

Quantifying Riparian Habitat Loss.

Many of the existing riparian zones, including associated wetlands and aquatic systems, suffer greatly from a variety of land-use practices, especially overgrazing, timber removal, flood-control, and nonpoint-source pollution. Riparian zone destruction has varied regionally in the United States, with Southeastern and Southwestern states probably receiving the greatest impact. For example, approximately 90 percent of Arizona and New Mexico's original riparian ecosystems have disappeared (Brinson et al. 1981). Similar estimates have been made for BLH in the Southeast (Haynes and Moore 1988).

Because guidance on delineating the boundaries of wetlands is much clearer, better estimates are available for the loss of wetland habitat. Despite the fact that major losses of riparian habitats have occurred, Brinson et al. (1981) suggested there was little work done in the United States to determine original and current riparian land area. They suggested that only 4-6 million ha of intact natural-riparian communities remained in the United States in the early 1980's. This and other estimates are highly dependent on how much streamside land area was included as riparian land. Past efforts to identify the historical extent of riparian vegetation have undoubtedly been hampered by a lack of consistency in terminology. Finally, because wetlands often comprise a portion of the riparian zone, separate loss estimates for wetlands and riparian zones are not always additive.

RECOMMENDATIONS AND CONCLUSIONS

Because of the diverse background of persons interested in riparian zones, standard terminology and classification schemes are critical to providing consistency. Cowardin (1982) attempted to standardize some of the semantic problems occurring in the wetlands literature, and there is a similar need for scientists to agree on standard terminology when discussing riparian systems. Until natural resource professionals can agree on a definition of riparian zones and exactly what constitutes a riparian zone (e.g., what is its landward boundary), it will be difficult to manage these systems for the range of functions that they provide. Accomplishing these goals may aid future comparisons of riparian status and trends, and possibly provide a better chance for protection of riparian systems that occur in the arid and semi-arid Western United States. Riparian zones in the Southwestern United States may not be as "wet" as those of the Eastern United States, but they play an equally important role in providing wildlife and fisheries habitat, wildlife movement corridors, erosion control, and nonpoint-source pollution control. Kusler (1985) suggested all riparian zones should be designated as a class of lands similar to and as valuable as wetlands, but not meeting the strict wetlands definitions. Riparian zones should be better recognized as unique, functional ecosystems that need better legal protection similar to wetlands.

Using specialized descriptor terms for riparian vegetation (e.g., river margins, streamside forests, hardwood stringers) should be reduced, and the term "riparian" should be used whenever possible as the primary descriptor when referring to transitional areas between aquatic and upland habitats. Other terms with regional significance could be used in conjunction with riparian as a secondary descriptor term (e.g., riparian gallery forest, riparian mesquite bosque). In addition, authors should provide a detailed description of the riparian vegetation structure and composition to assist readers in better understanding the type of system in question. Consistent terminology, and the use of "riparian" as a keyword in journal articles and other papers, will also aid literature reviews for papers addressing riparian research and management. Finally, Federal and state agencies should cooperate in an attempt to adopt a universal riparian definition and classification that is compatible with current wetland-classification systems.

The authors hope that this technical note stimulates further discussion and promotes awareness of current terminology problems. The authors also hope to reduce the confusion in riparian terminology that exists in the literature and among professionals. Additional information on riparian zone ecology and management can be obtained by contacting Dr. Richard A. Fischer, CEERD-EE-E, fischer@wes.army.mil or (601) 634-3983.

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POINTS OF CONTACT

For additional information, contact the senior author, Dr. Richard A. Fischer (601-634-3983, fischer@wes.army.mil) or the manager of the Ecosystem Management and Restoration Research Program, Dr. Russell F. Theriot (601-634-2733, therior@wes.army.mil). This technical note should be cited as follows:

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5 Difficult Wetland Situations in the Western Mountains, Valleys, and Coast Region

Introduction

Some wetlands can be difficult to identify because wetland indicators may be missing due to natural processes or recent disturbances. This chapter provides guidance for making wetland determinations in difficult-to-identify wetland situations in the Western Mountains, Valleys, and Coast Region. It includes regional examples of problem area wetlands and atypical situations as defined in the Corps Manual, as well as other situations that can make wetland delineation more challenging. Problem area wetlands are naturally occurring wetland types that lack indicators of hydrophytic vegetation, hydric soil, or wetland hydrology periodically due to normal seasonal or annual variability, or permanently due to the nature of the soils or plant species on the site. Atypical situations are wetlands in which vegetation, soil, or hydrology indicators are absent due to recent human activities or natural events. This chapter also provides a field procedure for quantifying the extent of wetlands in areas where wetlands and non-wetlands are highly interspersed in a mosaic pattern. The chapter is organized into the following sections:

- Problematic Hydrophytic Vegetation
- Problematic Hydric Soils
- Wetlands that Periodically Lack Indicators of Wetland Hydrology
- Wetland/Non-Wetland Mosaics

The list of difficult wetland situations presented in this chapter is not intended to be exhaustive and other such situations may exist in the region. See the Corps Manual for general guidance. Furthermore, more than one wetland factor (i.e., vegetation, soil, and/or hydrology) may be disturbed or problematic on a given site. In general, *wetland determinations on difficult or problematic sites must be based on the best information available to the field inspector, interpreted in light of his or her professional experience and knowledge of the ecology of wetlands in the region.*

Problematic hydrophytic vegetation

Description of the problem

Many factors affect the structure and composition of plant communities in the Western Mountains, Valleys, and Coast Region, including climatic variability, ephemeral water sources in some places, superabundance of moisture in others, salinity, and human land-use practices. As a result, some wetlands may exhibit indicators of hydric soil and wetland hydrology but lack any of the hydrophytic vegetation indicators presented in Chapter 2, at least at certain times. To identify and delineate these wetlands may require special procedures or additional analysis of factors affecting the site. To the extent possible, the hydrophytic vegetation decision should be based on the plant community that is normally present during the wet portion of the growing season in a normal rainfall year. The following procedure addresses several examples of problematic vegetation situations in the Western Mountains, Valleys, and Coast Region.

Procedure

Problematic hydrophytic vegetation can be identified and delineated using a combination of observations made in the field and/or supplemental information from the scientific literature and other sources. These procedures should be applied only where indicators of hydric soil and wetland hydrology are present, unless one or both of these factors is also disturbed or problematic, but no indicators of hydrophytic vegetation are evident. The following procedures are recommended:

1. Verify that at least one indicator of hydric soil and one primary or two secondary indicators of wetland hydrology are present. If indicators of either hydric soil or wetland hydrology are absent, the area is likely non-wetland unless soil and/or hydrology are also disturbed or problematic. If indicators of hydric soil and wetland hydrology are present (or are absent due to disturbance or other problem situations), proceed to step 2.

2. Verify that the area is in a landscape position that is likely to collect or concentrate water. Appropriate settings include the following. If the landscape setting is appropriate, proceed to step 3.

    a. Concave surface (e.g., depression or swale)
    b. Active floodplain or low terrace

c. Level or nearly level area (e.g., 0- to 3-percent slope)
d. Toe slope (Figure 4) or an area of convergent slopes (Figure 3)
e. Fringe of another wetland or water body
f. Area with a restrictive soil layer or aquitard within 24 in. (60 cm) of the surface
g. Area where groundwater discharges (e.g., a seep)
h. Other (explain in field notes why this area is likely to be inundated or saturated for long periods)

3. Use one or more of the approaches described in step 4 (Specific Problematic Vegetation Situations below) or step 5 (General Approaches to Problematic Hydrophytic Vegetation on page 108) to determine whether the vegetation is hydrophytic. In the remarks section of the data form or in the delineation report, explain the rationale for concluding that the plant community is hydrophytic even though indicators of hydrophytic vegetation described in Chapter 2 were not observed.

4. Specific Problematic Vegetation Situations

   a. *Temporal shifts in vegetation.* As described in Chapter 2, the species composition of some wetland plant communities in the Western Mountains, Valleys, and Coast Region can change in response to seasonal weather patterns and long-term climatic fluctuations. Wetland types that are influenced by these shifts include, but are not limited to, wet prairies, vernal pools and other seasonal depressional wetlands, coastal interdunal wetlands, seeps, and springs. Lack of hydrophytic vegetation during dry periods should not immediately eliminate a site from further consideration as a wetland. A site qualifies for further consideration if the plant community at the time of sampling does not exhibit hydrophytic vegetation indicators, but indicators of hydric soil and wetland hydrology are present. The following sampling and analytical approaches are recommended in these situations:

      (1) Seasonal Shifts in Plant Communities

         (a) If possible, return to the site during the normal wet portion of the growing season and re-examine the site for indicators of hydrophytic vegetation.

(b) Examine the site for identifiable plant remains, either alive or dead, or other evidence that the plant community that was present during the normal wet portion of the growing season was hydrophytic.

(c) Use off-site data sources to determine whether the plant community that is normally present during the wet portion of the growing season is hydrophytic. Appropriate data sources include early growing season aerial photography, NWI maps, soil survey reports, other remotely sensed data, public interviews, and previous reports about the site.

(d) If the vegetation on the site is substantially the same as that on a wetland reference site having similar soils, landscape position, and known wetland hydrology, then consider the vegetation to be hydrophytic (see step 5b in this procedure for more information).

(2) Extended Drought Conditions (i.e., lasting more than two growing seasons)

(a) Investigate climate records (e.g., WETS tables, drought indices) to determine if the area is under the influence of a drought (for more information, see the section on "Wetlands that Periodically Lack Indicators of Wetland Hydrology" later in this chapter). If so, evaluate any off-site data that provide information on the plant community that exists on the site during normal years, including aerial photography, NWI maps, other remote sensing data, soil survey reports, public interviews, and previous site reports. Determine whether the vegetation that is present during normal years is hydrophytic.

(b) If the vegetation on the drought-affected site is substantially the same as that on a wetland reference site in the same general area having similar soils and known wetland hydrology, then consider the vegetation to be hydrophytic (see step 5b in this procedure).

b. *Sparse and patchy vegetation.* Some wetlands in the Western Mountains, Valleys, and Coast Region have sparse or patchy vegetation cover. Examples include some tidal marshes, alkaline flats, kettle depressions, and interdunal swale wetlands. These areas may have indicators of hydric soils and wetland hydrology, but the vegetation is not continuous across or along the boundary of the wetland. Delineation of these areas can be confusing due to the interspersion of wetlands and other potential waters of the United States. For wetland delineation purposes, an area should be considered vegetated (and a potential wetland) if there is 5 percent or more areal cover of plants at the peak of the growing season. Unvegetated areas have less than 5 percent plant cover. Patchy vegetation is a mosaic of both vegetated and unvegetated areas (Figure 53). In some cases, the unvegetated portions of a wet site may meet the requirements for other waters of the United States. Therefore, delineation of such sites should include consideration of both wetlands and other waters. See the Arid West regional supplement (U.S. Army Corps of Engineers 2008) for further information.

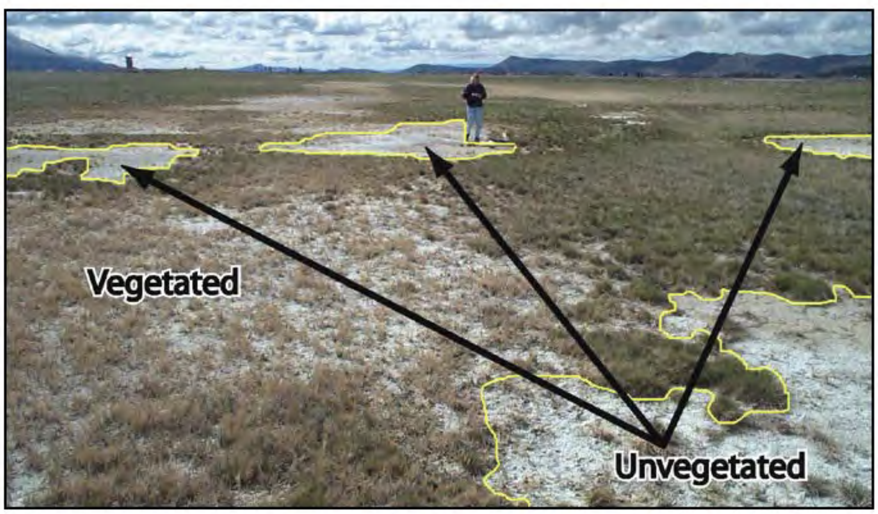

Figure 53. Example of sparse and patchy plant cover in a wetland. Areas labeled as vegetated have 5 percent or more plant cover. Unvegetated areas (less than 5 percent plant cover) may meet requirements as other waters of the United States.

c. *Riparian areas*. Riparian ecosystems are highly variable across the region, and can contain both wetland and non-wetland components. Riparian corridors can be lined with hydrophytic vegetation, upland vegetation, unvegetated areas, or a mosaic of these types. Soils may lack hydric soil indicators in recently deposited materials (i.e., Entisols) even when indicators of hydrophytic vegetation and wetland hydrology are present. Surface hydrology can vary from perennial to intermittent and, after a flooding event, water tables can drop quickly to low levels. Therefore, wetland delineation in western riparian areas is often a challenge and should consider the potential interspersion of wetlands and other potential waters of the United States. In addition, many riparian areas contain remnant stands of tree species that may have germinated during unusually high-water events or under wetter conditions than currently exist at the site (Figure 54). Examples of species that occur in these situations include narrowleaf cottonwood, willows, balsam poplar, and red alder. These areas may support phreatophytic species that, when mature, are able to exploit groundwater that is too deep to support wetlands. In such situations, there may be a hydrophytic overstory and a non-hydrophytic understory. If the soils are Entisols lacking hydric soil features and/or wetland hydrology is problematic, the hydrophytic vegetation determination should emphasize understory species, which may be more indicative of current wetland or non-wetland conditions.

Figure 54. Mature *Populus deltoides* stand on an elevated floodplain terrace with xeric understory on the South Fork of the Shoshone River, Wyoming.

d. *Areas affected by grazing*. Short- and long-term grazing can cause shifts in dominant species in the vegetation. Grazers can influence the abundance of plant species in several ways. For example, trampling by large herbivores can cause soil compaction, altering soil permeability and infiltration rates and affecting the plant community. Grazers can also influence the abundance of plant species by selectively grazing certain species or avoiding other species. Shifts in species composition due to grazing can influence a hydrophytic vegetation determination. Be aware that shifts in both directions, favoring either wetland species or non-wetland species, can occur in these situations. Limited grazing does not necessarily affect the outcome of a hydrophytic vegetation decision. However, the following approaches are recommended in cases where the hydrophytic vegetation determination would be unreliable or misleading due to the effects of grazing.

(1) Examine the vegetation on a nearby, ungrazed reference site having similar soils and hydrologic conditions. Ungrazed areas may be present on adjacent properties or in fenced exclosures or stream-side management zones. Assume that the same plant community would exist on the grazed site, in the absence of grazing.

(2) If feasible, remove livestock or fence representative livestock exclusion areas to allow the vegetation time to recover from grazing, and reevaluate the vegetation during the next growing season.

(3) If grazing was initiated recently, use offsite data sources such as aerial photography, NWI maps, and interviews with the land owner and other persons familiar with the area to determine the plant community present on the site before grazing began. If the previously ungrazed community was hydrophytic, then consider the current vegetation to be hydrophytic.

(4) If an appropriate ungrazed area cannot be located or if the ungrazed vegetation condition cannot be determined, make the wetland determination based on indicators of hydric soils and wetland hydrology.

e. *Managed plant communities*. Many natural plant communities throughout the region have been altered and are managed to meet human goals. Examples include clearing of woody vegetation on rangelands, periodic disking or plowing, planting of native and non-native species, irrigation of pastures and hayfields, suppression of wildfires, and the use of herbicides. These actions can result in elimination of certain species and their replacement with other species, changes in abundance of certain plants, and shifts in dominant species, possibly influencing a hydrophytic vegetation determination. The following approaches are recommended if the natural vegetation has been altered through management to such an extent that a hydrophytic vegetation determination may be unreliable:

(1) Examine the vegetation on a nearby, unmanaged reference site having similar soils and hydrologic conditions. Assume that the same plant community would exist on the managed site, in the absence of human alteration.

(2) For recently cleared or tilled areas (not planted or seeded), leave representative areas unmanaged for at least one growing season with normal rainfall and reevaluate the vegetation.

(3) If management was initiated recently, use offsite data sources such as aerial photography, NWI maps, and interviews with the land owner and other persons familiar with the area to determine what plant community was present on the site before the management occurred.

(4) If the unmanaged vegetation condition cannot be determined, make the wetland determination based on indicators of hydric soil and wetland hydrology.

f. *Aggressive invasive plants*. Native and non-native aggressive, invasive FACU or UPL plant species often become established in wetlands due to their adaptability and aggressive growth habits. Invasive species include planted or seeded species that have escaped and become widely established. Invasive species often prevent the establishment of other species by competing successfully for space, sunlight, or other resources. Examples of invasive species in the region include blackberry (*Rubus discolor* and *R. ursinus*), English ivy (*Hedera helix*), gorse (*Ulex europaeus*), and various pasture species, such as creeping soft grass (*Holcus mollis*) and sweet vernal grass (*Anthoxanthum odoratum*). Certain FAC and FACW species are also aggressive competitors and may dominate non-wetland areas; however, these areas are unlikely to be mistaken for wetlands due to the lack of hydric soil and/or wetland hydrology indicators. The following approaches are recommended when the site has indicators of hydric soil and wetland hydrology but the plant community is dominated by FACU or UPL aggressive, invasive plant species. To use these approaches, there must be evidence of the species' invasive nature, such as published literature or listing of the species on a state or local list of invasive plants (e.g., see the USDA Plants database http://plants.usda.gov/index.html).

(1) Examine a nearby reference site having similar soils, topography, and hydrologic conditions, and a similar plant community without or with reduced presence of the invasive species. Assume that the same plant community would exist on the original site, if invasive species were not prevalent.

(2) If feasible, remove the invasive species and reevaluate the vegetation during the next growing season. Take into consideration that many invasive species are very difficult to remove and will resprout or reemerge next season. However, even temporary removal of the invasive plant may release other species.

(3) If an appropriate reference site cannot be located and the invasive species cannot be removed and the site reevaluated next season, make the wetland determination based on indicators of hydric soil and wetland hydrology.

g. *Areas affected by fires, floods, and other natural disturbances*. Wildfires, floods, and other catastrophic disturbances can dramatically alter the vegetation on a site. Vegetation can be completely or partially removed, or its composition altered, depending upon the intensity of the disturbance. Limited disturbance does not necessarily affect the investigator's ability to determine whether the plant community is or is not hydrophytic. However, if the vegetation on a site has been removed or made unidentifiable by a recent fire, flood, or other disturbance, then one or more of the following approaches may be used to determine whether the vegetation present before the disturbance was hydrophytic. Additional guidance can be found in the Atypical Situations section of the Corps Manual.

(1) Examine the vegetation on a nearby, undisturbed reference site having similar soils and hydrologic conditions. Assume that the same plant community would exist on the disturbed site in the absence of disturbance.

(2) Use off-site information sources such as aerial photography, NWI maps, and interviews with knowledgeable individuals to determine the plant community present on the site before the disturbance.

(3) If the undisturbed vegetation condition cannot be determined, make the wetland determination based on indicators of hydric soil and wetland hydrology.

h. *Vigor and stress responses to wetland conditions*. Plant responses to wet site conditions are often easily observable. Many plants develop stress-related features, such as stunting in agricultural crops and browning or yellowing of native or planted vegetation, when subjected to long periods of soil saturation in the root zone. Crop stress in wet agricultural fields is often easily identifiable both in the field and on aerial photography. In relatively frost-free areas, such as near the Pacific coast, early-season germination of FACU and UPL species occurs in some wetlands (e.g., vernal pools) prior to the onset of seasonal hydrology. These plants may persist and dominate in wetlands during the normal wet season, but often show evidence of stress (e.g., stunting, browning, yellowing) compared to the same species growing in nearby non-wetlands. In addition, many species grow more abundantly or vigorously on wet sites, particularly later in the growing season when adjacent areas are drying out but moist soils are still present in wetlands. These responses are not species specific or easily measurable but are evident when the vegetation of wetlands and adjacent non-wetlands is compared. The following procedure can help determine whether an observed increase or decrease in plant vigor or stress is the result of growing in wetlands. The procedure assumes that indicators of hydric soil and wetland hydrology are present in the potential wetland area. Use caution in areas where variations in plant vigor or stress may be due to variations in salinity or other soil conditions, uneven application of fertilizers or herbicides, or other factors not related to wetness.

(1) Compare and describe in field notes the size, vigor, or other stress-related characteristics of individuals of the same species between the potential wetland area and the immediately surrounding non-wetlands. Emphasize features that can be measured or photographed and include this information in the field report. To qualify for this procedure, most individuals of the affected species must

show vigor/stress responses in the wet area. If there are clear differences in plant vigor/stress responses between potential wetland and adjacent non-wetland areas, proceed to step 2.

(2) Observe and describe trends in plant vigor or stress conditions along the topographic or wetness gradient from the potential wetland to the adjacent non-wetland areas. Trends in plant vigor/stress responses must reflect the distribution of hydric soils, wetland hydrology indicators, topography, and/or landscape conditions relevant to wetlands. If so, proceed to step 3.

(3) Consider the area containing indicators of hydric soil, wetland hydrology, and evidence of plant vigor or stress to be a wetland. Determine the wetland boundary based on the spatial patterns in these features plus topography and landscape characteristics.

5. General Approaches to Problematic Hydrophytic Vegetation. The following general procedures are provided to identify hydrophytic vegetation in difficult situations not necessarily associated with specific vegetation types or management practices, including wetlands dominated by FACU, NI, NO, or unlisted species that are functioning as hydrophytes. These procedures should be applied only where indicators of hydric soil and wetland hydrology are present (or are absent due to disturbance or other problem situations) but indicators of hydrophytic vegetation are not evident. The following approaches are recommended:

a. *Direct hydrologic observations*. Verify that the plant community occurs in an area subject to prolonged inundation or soil saturation during the growing season. For example, lodge-pole pine (*Pinus contorta*), a FAC to FACU species in the region, occasionally dominates the vegetation in areas that have saturated soil conditions during the early part of the growing season. Other examples of FACU species that sometimes dominate wetlands in the region include western hemlock (Kuchler 1946; Waring and Franklin 1979), ponderosa pine, salal (*Gaultheria shallon*), Himalayan blackberry (*Rubus armeniacus* = *R. discolor* = *R. procerus*), and Kentucky bluegrass (*Poa pratensis*) (indicator status may vary by plant list region). Problematic hydrophytic vegetation can be evaluated by visiting the site at 2- to 3-day intervals during the portion of the growing season when surface water is most likely to be present or water tables are normally high.

Hydrophytic vegetation is considered to be present, and the site is a wetland, if surface water is present and/or the water table is 12 in. (30 cm) or less from the surface for 14 or more consecutive days during the growing season during a period when antecedent precipitation has been normal or drier than normal. If necessary, microtopographic highs and lows should be evaluated separately. The normality of the current year's rainfall must be considered in interpreting field results, as well as the likelihood that wet conditions will occur on the site at least every other year (for more information, see the section on "Wetlands that Periodically Lack Indicators of Wetland Hydrology" in this chapter).

b. *Reference sites*. If indicators of hydric soil and wetland hydrology are present, the site may be considered to be a wetland if the landscape setting, topography, soils, and vegetation are substantially the same as those on nearby wetland reference areas. Hydrologic characteristics of wetland reference areas should be documented through long-term monitoring or by application of the procedure described in item 5a above. Reference sites should be minimally disturbed and provide long-term access. Soils, vegetation, and hydrologic conditions should be thoroughly documented and the data kept on file in the district or field office.

c. *Technical literature*. Published and unpublished scientific literature may be used to support a decision to treat specific FACU species or species with no assigned indicator status (e.g., NI, NO, or unlisted) as hydrophytes or certain plant communities as hydrophytic. Preferably, this literature should discuss the species' natural distribution along the moisture gradient, its capabilities and adaptations for life in wetlands, wetland types in which it is typically found, or other wetland species with which it is commonly associated.

Problematic hydric soils

Description of the problem

Soils with faint or no indicators

Some soils that meet the hydric soil definition may not exhibit any of the indicators presented in Chapter 3. These problematic hydric soils exist for a number of reasons and their proper identification requires additional information, such as landscape position, presence or absence of restrictive soil layers, or information about hydrology. This section describes several soil situations in the Western Mountains, Valleys, and Coast Region that are considered to be hydric if additional requirements are met. In some cases, these hydric soils may appear to be non-hydric due to the color of the parent material from which the soils developed. In others, the lack of hydric soil indicators is due to conditions that inhibit the development of redoximorphic features despite prolonged soil saturation and anoxia. In addition, recently developed wetlands may lack hydric soil indicators because insufficient time has passed for their development. Examples of problematic hydric soils in the region include, but are not limited to, the following.

1. **Moderately to Very Strongly Alkaline Soils.** This problematic situation is limited to the Rocky Mountain Forests and Rangeland Subregion (LRR E) and is associated with depressional wetlands at lower elevations. The formation of redox concentrations and depletions requires that soluble iron, manganese, and organic matter be present in the soil. In a neutral to acidic soil, iron and manganese readily enter into solution as reduction occurs and then precipitate in the form of redox concentrations as the soil becomes oxidized. Identifiable iron or manganese features do not form readily in saturated soils with high pH. High pH (7.9 or higher) can be caused by many factors. Salt content is a common cause of high soil pH in this region. If the pH is high, indicators of hydrophytic vegetation and wetland hydrology are present, and landscape position is consistent with wetlands in the area, then the soil may be hydric even in the absence of a recognized hydric soil indicator. In the absence of an approved indicator, thoroughly document soil conditions, including pH, in addition to the rationale for identifying the soil as hydric (e.g., landscape position, vegetation, evidence of hydrology, etc.). The concept of high pH includes the USDA terms Moderately Alkaline, Strongly Alkaline, and Very Strongly Alkaline (USDA Natural Resources Conservation Service 2002).

2. **Volcanic Ash or Diatomaceous Earth.** Many of these soils have high levels of silica that naturally have high value and low chroma. These soils also are inherently low in iron, manganese, and sulfur. Many hydric soil indicators are formed predominantly by the accumulation or loss of iron, manganese, or sulfur and, therefore, cannot form in these soils. In the absence of an approved indicator, soil and landscape conditions should be documented thoroughly, along with the rationale for considering the soil

to be hydric (e.g., landscape position, vegetation, evidence of hydrology, etc.). A soil scientist with local experience may be needed to help determine whether soils were developed from volcanic ash or diatomaceous earth.

3. **Vegetated Sand and Gravel Bars within Floodplains.** Coarse-textured soils commonly occur on vegetated bars above the active channel of rivers and streams. In some cases, these soils lack hydric soil indicators due to seasonal or annual deposition of new soil material, low iron or manganese content, and low organic-matter content. Redox concentrations can sometimes be found on the bottoms of coarse fragments and should be examined closely to see if they satisfy an indicator.

4. **Dark Parent Materials.** Soils formed in dark parent materials often do not exhibit easily recognizable redoximorphic features. These soils are not dark due to high organic-matter content but, rather, because they formed from parent materials such as dark shales and phyllites. In the absence of an approved indicator, soil and landscape conditions should be documented thoroughly. Describe soil characteristics of surrounding uplands that are the likely source of dark parent materials, and include the rationale for considering the soil in question to be hydric (e.g., landscape position, vegetation, evidence of hydrology, etc.).

5. **Recently Developed Wetlands.** Recently developed wetlands include mitigation sites, wetland management areas (e.g., for waterfowl), other wetlands intentionally or unintentionally produced by human activities, and naturally occurring wetlands that have not been in place long enough to develop hydric soil indicators.

6. **Seasonally Ponded Soils.** Seasonally ponded, depressional wetlands occur in basins and valleys throughout the Western Mountains, Valleys, and Coast Region. Most are perched systems, with water ponding above a restrictive soil layer, such as a hardpan or clay layer that is at or near the surface (e.g., Vertisols). Some of these wetlands lack hydric soil indicators due to limited saturation depth, saline conditions, or other factors.

Soils with relict hydric soil indicators

Some soils in the region exhibit redoximorphic features and hydric soil indicators that formed in the recent or distant past when conditions may have been wetter than they are today. These features have persisted even though wetland hydrology may no longer be present. Examples include soils associated with abandoned river courses and areas adjacent to deeply incised stream channels. In addition, wetlands that were drained for agricultural purposes starting in the 1800s may contain persistent hydric soil features. Wetland soils drained during historic times are still considered to be hydric but they may no longer support wetlands.

Relict hydric soil features may be difficult to distinguish from contemporary features. However, if indicators of hydrophytic vegetation and wetland hydrology are present, then hydric soil indicators can be assumed to be contemporary.

Procedure

Soils that are thought to meet the definition of a hydric soil but do not exhibit any of the indicators described in Chapter 3 can be identified by the following recommended procedure. This procedure should be used only where indicators of hydrophytic vegetation and wetland hydrology are present (or are absent due to disturbance or other problem situations) but indicators of hydric soil are not evident.

1. Verify that one or more indicators of hydrophytic vegetation are present or that the vegetation is disturbed or problematic. If so, proceed to step 2.

2. Verify that at least one primary or two secondary indicators of wetland hydrology are present or that indicators are absent due to disturbance or other factors. If so, proceed to step 3. If indicators of hydrophytic vegetation and/or wetland hydrology are absent, then the area is probably non-wetland and no further analysis is required.

3. Thoroughly describe and document the soil profile and landscape setting. Verify that the area is in a landscape position that is likely to collect or concentrate water. Appropriate settings are listed below. If the landscape setting is appropriate, proceed to step 4.

    a. Concave surface (e.g., depression or swale)
    b. Active floodplain or low terrace
    c. Level or nearly level area (e.g., 0- to 3-percent slope)
    d. Toe slope (Figure 4) or an area of convergent slopes (Figure 3)
    e. Fringe of another wetland or water body

f. Area with a restrictive soil layer or aquitard within 24 in. (60 cm) of the surface
g. Area where groundwater discharges (e.g., a seep)
h. Other (explain in field notes why this area is likely to be inundated or saturated for long periods)

4. Use one or more of the following approaches to determine whether the soil is hydric. In the remarks section of the data form or in the delineation report, explain why it is believed that the soil lacks any of the NTCHS hydric soil indicators described in Chapter 3 and why it is believed that the soil meets the definition of a hydric soil.

a. Determine whether one or more of the following indicators of problematic hydric soils is present. Descriptions of each indicator are given in Chapter 3. If one or more indicators is present, then the soil is hydric.

(1) 2 cm Muck (A10)
(2) Red Parent Material (TF2)
(3) Very Shallow Dark Surface (TF12)

b. Determine whether one or more of the following problematic soil situations is present. If present, consider the soil to be hydric.

(1) Moderately to Very Strongly Alkaline Soils (LRR E)
(2) Volcanic Ash or Diatomaceous Earth
(3) Vegetated Sand and Gravel Bars within Floodplains
(4) Dark Parent Materials
(5) Recently Developed Wetlands
(6) Seasonally Ponded Soils
(7) Other (in field notes, describe the problematic soil situation and explain why it is believed that the soil meets the hydric soil definition)

c. Soils that have been saturated for long periods and have become chemically reduced may change color when exposed to air due to the rapid oxidation of ferrous iron (Fe^{2+}) to Fe^{3+} (i.e., a reduced matrix) (Figures 55 and 56). If the soil contains sufficient iron, this can result in an observable color change, especially in hue or chroma. The soil is hydric if a mineral layer 4 in. (10 cm) or more thick starting within

12 in. (30 cm) of the soil surface that has a matrix value of 4 or more and chroma of 2 or less becomes redder by one or more pages in hue and/or increases one or more in chroma when exposed to air within 30 minutes (Vepraskas 1992).

Care must be taken to obtain an accurate color of the soil sample immediately upon excavation. The colors should be observed closely and examined again after several minutes. Do not allow the sample to become dry. Dry soils usually have a different color than wet or moist soils. As always, do not obtain colors while wearing sunglasses. Colors must be obtained in the field under natural light and not under artificial light.

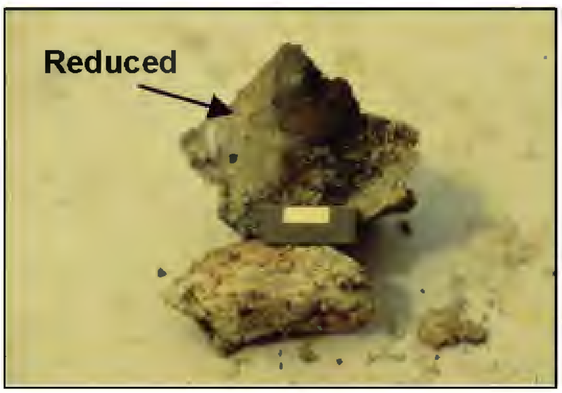

Figure 55. This soil exhibits colors associated with reducing conditions. Scale is 1 cm.

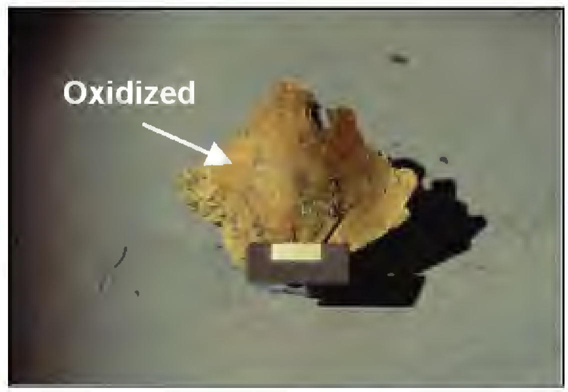

Figure 56. The same soil as in Figure 55 after exposure to the air and oxidation has occurred.

d. If the soil is saturated at the time of sampling, alpha, alpha-dipyridyl reagent can be used in the following procedure to determine if reduced (ferrous) iron is present. If ferrous iron is present as described below, then the soil is hydric.

Alpha, alpha-dipyridyl is a reagent that reacts with reduced iron. In some cases, it can be used to provide evidence that a soil is hydric when it lacks other hydric soil indicators. The soil is likely to be hydric if application of alpha, alpha-dipyridyl to mineral soil material in at least 60 percent of a layer at least 4 in. (10 cm) thick within a depth of 12 in. (30 cm) of the soil surface results in a positive reaction within 30 seconds evidenced by a pink or red coloration to the reagent during the growing season.

Using a dropper, apply a small amount of reagent to a freshly broken ped face to avoid any chance of a false positive test due to iron contamination from digging tools. Look closely at the treated soil for evidence of color change. If in doubt, apply the reagent to a sample of known upland soil and compare the reaction to the sample of interest. A positive reaction will not occur in soils that lack iron and may not occur in soils with high pH. The lack of a positive reaction to the reagent does not preclude the presence of a hydric soil. Specific information about the use of alpha, alpha-dipyridyl can be found in NRCS Hydric Soils Technical Note 8 (http://soils.usda.gov/use/hydric/ntchs/tech_notes/index.html).

e. Using gauge data, water-table monitoring data, or repeated direct hydrologic observations (see item 5a in the procedure for Problematic Hydrophytic Vegetation in this chapter), determine whether the soil is ponded or flooded, or the water table is 12 in. (30 cm) or less from the surface, for 14 or more consecutive days during the growing season in most years (at least 5 years in 10, or 50 percent or higher probability) (U.S. Army Corps of Engineers 2005). If so, then the soil is hydric. Furthermore, any soil that meets the NTCHS hydric soil technical standard (NRCS Hydric Soils Technical Note 11, http://soils.usda.gov/use/hydric/ntchs/tech_notes/index.html) is hydric.

Wetlands that periodically lack indicators of wetland hydrology

Description of the problem

Wetlands are areas that are flooded or ponded, or have soils that are saturated with water, for long periods during the growing season in most years. If the site is visited during a time of normal precipitation amounts and it is inundated or the water table is near the surface, then the wetland hydrology determination is straightforward. However, much of the Western Mountains, Valleys, and Coast Region is characterized by long, hot summer dry seasons. During the dry season, surface water recedes from wetland margins, water tables drop, and many wetlands dry out completely. Superimposed on this seasonal cycle is a long-term pattern of multi-year droughts alternating with years of higher-than-average rainfall. Wetlands in general are inundated or saturated in most years (at least 5 years in 10, or 50 percent or higher probability) over a long-term record. However, some wetlands in the region do not become inundated or saturated in some years and, during drought cycles, may not inundate or saturate for several years in a row.

Wetland hydrology determinations are based on indicators, many of which were designed to be used during dry periods when the direct observation of surface water or a shallow water table is not possible. However, some wetlands may lack any of the listed hydrology indicators, particularly during the dry season or in a dry year. The evaluation of wetland hydrology requires special care on any site where indicators of hydrophytic vegetation and hydric soil are present but hydrology indicators appear to be absent. Among other factors, this evaluation should consider the timing of the site visit in relation to normal seasonal and annual hydrologic variability, and whether the amount of rainfall prior to the site visit has been normal. This section describes a number of approaches that can be used to determine whether wetland hydrology is present on sites where indicators of hydrophytic vegetation and hydric soil are present but hydrology indicators may be lacking due to normal variations in rainfall or runoff, human activities that destroy hydrology indicators, and other factors.

Procedure

1. Verify that indicators of hydrophytic vegetation and hydric soil are present, or are absent due to disturbance or other problem situations. If so, proceed to step 2.

2. Verify that the area is in a landscape position that is likely to collect or concentrate water. Appropriate settings are listed below. If the landscape setting is appropriate, proceed to step 3.

   a. Concave surface (e.g., depression or swale)
   b. Active floodplain or low terrace
   c. Level or nearly level area (e.g., 0- to 3-percent slope)
   d. Toe slope (Figure 4) or an area of convergent slopes (Figure 3)
   e. Fringe of another wetland or water body
   f. Area with a restrictive soil layer or aquitard within 24 in. (60 cm) of the surface
   g. Area where groundwater discharges (e.g., a seep)
   h. Other (explain in field notes why this area is likely to be inundated or saturated for long periods)

3. Use one or more of the following approaches to determine whether wetland hydrology is present and the site is a wetland. In the remarks section of the data form or in the delineation report, explain the rationale for concluding that wetland hydrology is present even though indicators of wetland hydrology described in Chapter 4 were not observed.

   a. *Site visits during the dry season*. Determine whether the site visit occurred during the normal annual “dry season.” The dry season, as used in this supplement, is the period of the year when soil moisture is normally being depleted and water tables are falling to low levels in response to decreased precipitation and/or increased evapotranspiration, usually during late spring and summer. It also includes the beginning of the recovery period in late summer or fall. The Web-Based Water-Budget Interactive Modeling Program (WebWIMP) is one source for approximate dates of wet and dry seasons for any terrestrial location based on average monthly precipitation and estimated evapotranspiration (http://climate.geog.udel.edu/~wimp/). In general, the dry season in a typical year is indicated when potential evapotranspiration exceeds precipitation (indicated by negative values of DIFF in the WebWIMP output), resulting in drawdown of soil moisture storage (negative values of DST) and/or a moisture deficit (positive values of DEF, also called the unmet atmospheric demand for moisture). Actual dates for the dry season may vary by locale and year.

      In many wetlands, direct observation of flooding, ponding, or a shallow water table would be unexpected during the dry season. Wetland hydrology indicators, if present, would most likely be limited to indirect evidence, such as water marks, drift deposits, or surface cracks. In some situations, hydrology indicators may be absent during the dry season. If the site visit occurred during the dry season on a site that contains hydric soils and hydrophytic vegetation and no significant hydrologic manipulation (e.g., no dams, levees, water diversions, land grading, etc., and the site is not within the zone of influence of any drainage ditches or subsurface drains), then consider the site to be a wetland. If necessary, re-visit the site during the normal wet season and check again for the presence or absence of wetland hydrology indicators. If wetland hydrology indicators are absent during the wet portion of the growing season in a normal or wetter-than-normal rainfall year, the site is probably non-wetland.

b. *Periods with below-normal rainfall*. Determine whether the amount of rainfall that occurred in the 2 to 3 months preceding the site visit was normal, above normal, or below normal based on the normal range reported in WETS tables. WETS tables are provided by the NRCS National Water and Climate Center (http://www.wcc.nrcs.usda.gov/climate/wetlands.html) and are calculated from long-term (30-year) weather records gathered at National Weather Service meteorological stations. To determine whether precipitation was normal prior to the site visit, actual rainfall in the current month and previous 2 to 3 months should be compared with the normal ranges for each month given in the WETS table (USDA Natural Resources Conservation Service 1997; Sprecher and Warne 2000). The lower and upper limits of the normal range are indicated by the columns labeled "30% chance will have less than" and "30% chance will have more than" in the WETS table. The USDA Natural Resources Conservation Service (1997, Section 650.1903) also gives a procedure that can be used to weight the information from each month and determine whether the entire period was normal, wet, or dry. Average precipitation amounts can vary considerably over short distances, particularly in mountainous areas. Therefore, use caution in areas where elevation, aspect, rain shadow effects, or other conditions differ between the site and the location of the nearest weather station. Sometimes a more distant station is more representative of the site in question.

When precipitation has been below normal, wetlands may not flood, pond, or develop shallow water tables even during the typical wet portion of the growing season and may not exhibit other indicators of wetland hydrology. Therefore, if precipitation was below normal prior to the site visit, and the site contains hydric soils and hydrophytic vegetation and no significant hydrologic manipulation (e.g., no dams, levees, water diversions, land grading, etc., and the site is not within the zone of influence of any drainage ditches or subsurface drains), it should be identified as a wetland. If necessary, the site can be revisited during a period of normal rainfall and checked again for hydrology indicators.

c. *Drought years*. Determine whether the area has been subject to short- or long-term drought. Droughts lasting two to several years in a row are common in the region, particularly in interior portions away from the Pacific coast. Drought periods can be identified by comparing annual rainfall totals with the normal range of annual rainfall given in WETS tables or by examining trends in drought indices, such as the Palmer Drought Severity Index (PDSI) (Sprecher and Warne 2000). PDSI takes into account not only precipitation but also temperature, which affects evapotranspiration, and soil moisture conditions. The index is usually calculated on a monthly basis for major climatic divisions within each state. Therefore, the information is not site-specific. PDSI ranges generally between –6 and +6 with negative values indicating dry periods and positive values indicating wet periods. An index of –1.0 indicates mild drought, –2.0 indicates moderate drought, –3.0 indicates severe drought, and –4.0 indicates extreme drought. Time-series plots of PDSI values by month or year are available from the National Climatic Data Center (http://www.ncdc.noaa.gov/oa/climate/onlineprod/drought/xmgr.html#ds). If wetland hydrology indicators appear to be absent on a site that has hydrophytic vegetation and hydric soils, no significant hydrologic manipulation (e.g., no dams, levees, water diversions, land grading, etc., and the site is not within the zone of influence of any drainage ditches or sub-surface drains), and the region has been affected by drought, then the area should be identified as a wetland.

d. *Years with unusually low winter snowpack*. Determine whether the site visit occurred following a winter with unusually low snowpack. Some wetlands in mountain areas depend upon the melting winter snowpack as a major water source. In areas where the snowpack persists throughout the winter, water availability in spring and early summer depends in part on winter water storage in the form of snow and ice. Therefore, springtime water availability in a given year can be evaluated by comparing the liquid equivalent of snowfall over the previous winter (e.g., October through April) against 30-year averages calculated for NRCS Snowpack Telemetry (SNOTEL) sites (http://www.wcc.nrcs.usda.gov/factpub/ads/) or for National Weather Service meteorological stations (may require a fee, http://lwf.ncdc.noaa.gov/oa/ncdc.html). This procedure may not be reliable in areas where the snowpack is not persistent and water is released intermittently throughout the winter.

In years when winter snowpack is appreciably less than the long-term average, wetlands that depend on snowmelt as an important water source may not flood, pond, or develop shallow water tables and may not exhibit other wetland hydrology indicators. Under these conditions, a site that contains hydric soils and hydrophytic vegetation and no significant hydrologic manipulation (e.g., no dams, levees, water diversions, land grading, etc., and the site is not within the zone of influence of any drainage ditches or subsurface drains) should be considered to be a wetland. If necessary, the site can be re-visited following a winter with normal snowpack conditions and checked again for wetland hydrology indicators.

e. *Reference sites*. If indicators of hydric soil and hydrophytic vegetation are present on a site that lacks wetland hydrology indicators, the site may be considered to be a wetland if the landscape setting, topography, soils, and vegetation are substantially the same as those on nearby wetland reference areas. Hydrology of wetland reference areas should be documented through long-term monitoring (see item h below) or by application of the procedure described in item 5a on page 108 (Direct Hydrologic Observations) of the procedure for Problematic Hydrophytic Vegetation in this chapter. Reference sites should be minimally disturbed and provide long-term access. Soils, vegetation, and hydrologic conditions should be thoroughly documented and the data kept on file in the District or field office.

f. *Hydrology tools*. The "Hydrology Tools" (USDA Natural Resources Conservation Service 1997) is a collection of methods that can be used to determine whether wetland hydrology is present on a potential wetland site that lacks indicators due to disturbance or other reasons, particularly on lands used for agriculture. Generally they require additional information, such as aerial photographs or stream-gauge data, or involve hydrologic modeling and approximation techniques. They should be used only when an indicator-based wetland hydrology determination is not possible or would give misleading results. A hydrologist may be needed to help select and carry out the proper analysis. The seven tools are used to:

(1) Analyze stream and lake gauge data
(2) Estimate runoff volumes to determine duration and frequency of ponding in depressional areas
(3) Evaluate the frequency of wetness signatures on aerial photography (see item g below for additional information)

(4) Model water-table fluctuations in fields with parallel drainage systems using the DRAINMOD model
(5) Estimate the "scope and effect" of ditches or subsurface drain lines
(6) Estimate the effectiveness of agricultural drainage systems using NRCS state drainage guides
(7) Analyze data from groundwater monitoring wells (see item h below for additional information)

g. *Evaluating multiple years of aerial photography*. Each year, the Farm Service Agency (FSA) takes low-level aerial photographs in agricultural areas to monitor the acreages planted in various crops for USDA programs. NRCS has developed an off-site procedure that uses these photos, or repeated aerial photography from other sources, to make wetland hydrology determinations (USDA Natural Resources Conservation Service 1997, Section 650.1903). The method is intended for use on agricultural lands where human activity has altered or destroyed other wetland indicators. However, the same approach may be useful in other environments.

The procedure uses five or more years of growing-season photography and evaluates each photo for wetness signatures that are listed in "wetland mapping conventions" developed by NRCS state offices. Wetland mapping conventions can be found in the electronic Field Office Technical Guide (eFOTG) for each state (http://www.nrcs.usda.gov/technical/efotg/). From the national web site, choose the appropriate state, then select any county (the state's wetland mapping conventions are the same in every county). Wetland mapping conventions are listed among the references in Section I of the eFOTG. However, not all states have wetland mapping conventions, particularly in the West.

Wetness signatures for a particular state may include surface water, saturated soils, flooded or drowned-out crops, stressed crops due to wetness, differences in vegetation patterns due to different planting dates, inclusion of wet areas into set-aside programs, unharvested crops, isolated areas that are not farmed with the rest of the field, patches of greener vegetation during dry periods, and other evidence of wet conditions (see Part 513.30 of USDA Natural Resources Conservation Service 1994). For each photo, the procedure described in item b above is used to determine whether the amount of rainfall in the 2 to 3 months prior to the date of the photo was normal, below normal, or above normal. Only photos taken in normal rainfall years, or an equal number of wetter-than-normal and drier-than-normal years, are used in the analysis. If wetness signatures are observed on photos in more than half of the years included in the analysis, then wetland hydrology is present. Data forms that may be used to document the wetland hydrology determination are given in section 650.1903 of USDA Natural Resources Conservation Service (1997).

h. *Long-term hydrologic monitoring*. On sites where the hydrology has been manipulated by man (e.g., with ditches, dams, levees, water diversions, land grading) or where natural events (e.g., downcutting of streams, volcanic activity) have altered conditions such that hydrology indicators may be missing or misleading, direct monitoring of surface and groundwater may be needed to verify the presence or absence of wetland hydrology. The U.S. Army Corps of Engineers (2005) provides minimum standards for the design, construction, and installation of water-table monitoring wells, and for the collection and interpretation of groundwater monitoring data, in cases where direct hydrologic measurements are needed to determine whether wetlands are present on highly disturbed or problematic sites. This standard calls for 14 or more consecutive days of flooding, ponding, or a water table 12 in. (30 cm) or less below the soil surface during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability), unless a different standard has been established for a particular geographic area or wetland type. A disturbed or problematic site that meets this standard has wetland hydrology. This standard is not intended (1) to overrule an indicator-based wetland determination on a site that is not disturbed or problematic, or (2) to test or validate existing or proposed wetland indicators.

Wetland/non-wetland mosaics

Description of the problem

In this supplement, "mosaic" refers to a landscape where wetland and non-wetland components are too closely associated to be easily delineated or mapped separately. These areas often have complex microtopography, with repeated small changes in elevation occurring over short distances. The horizontal distance from trough to ridge may be 1 ft (30 cm) or less in some areas, to 10 ft (3 m) or more in broadly hummocky areas. Ridges and hummocks supporting non-hydrophytic species are often interspersed

TABLE 2

GUIDELINE “MINIMUM” BORING, SAMPLING, AND TESTING CRITERIA

The most important step in geotechnical design is to conduct an adequate subsurface investigation. The number, depth, spacing, and character of borings, sampling, and testing to be made in an individual exploration program are so dependent upon site conditions and the type of project and its requirements, that no “rigid” rules may be established. Usually the extent of work is established as the site investigation progresses in the field. However, the following are considered reasonable “guidelines” to follow to produce the minimum subsurface data needed to allow cost-effective geotechnical design and construction and to minimize claim problems. (Reference: “Subsurface Investigations” FHWA HI-97-021)

Geotechnical Feature	Minimum Number of Borings	Minimum Depth of Borings
Structure Foundation	1 per substructure unit under 30 m (100 ft) in width 2 per substructure unit over 30 m (100 ft) in width Additional borings in areas of erratic subsurface conditions	Spread footings: 2B where L< 2B, 4B where L > 2B and interpolate for L between 2B and 4B Deep foundations: 6m (20ft) below tip elevation or two times maximum pile group dimension, whichever is greater If bedrock is encountered: for piles core 3 m (10 ft) below tip elevation; for shafts core 3D or 2 times maximum shaft group dimension below tip elevation, whichever is greater.
Retaining Structures	Borings spaced every 30 to 60 m (100 to 200 ft). Some borings should be at the front of and some in back of the wall face.	Extend borings to depth of 0.75 to 1.5 times wall height When stratum indicates potential deep stability or settlement problem, extend borings to hard stratum
Bridge Approach Embankments over Soft Ground	When approach embankments are to be placed over soft ground, at least one boring should be made at each embankment to determine the problems associated with stability and settlement of the embankment. Typically, test borings taken for the approach embankments are located at the proposed abutment locations to serve a dual function.	Extend borings into competent material and to a depth where added stresses due to embankment load is less than 10% of existing effective overburden stress or 3 m (10 ft) into bedrock if encountered at a shallower depth Additional shallow explorations (hand auger holes) taken at approach embankment locations to determine depth and extent of unsuitable surface soils or topsoil.
Centerline Cuts and Embankments	Borings typically spaced every 60 m (200 ft) (erratic conditions) to 120 m (400 ft) (uniform conditions) with at least one boring taken in each separate landform. For high cuts and fills, should have a minimum of 3 borings along a line perpendicular to centerline or planned slope face to establish geologic cross-section for analysis.	Cuts: (1) in stable materials extend borings minimum 5 m (15 ft) below depth of cut at the ditch line and, (2) in weak soils extend borings below grade to firm materials or to twice the depth of cut whichever occurs first. Embankments: Extend borings to a hard stratum or to a depth of twice the embankment height.
Landslides	Minimum 3 borings along a line perpendicular to centerline or planned slope face to establish geologic cross-section for analysis. Number of sections depends on extent of stability problem. For active slide, place at least on boring each above and below sliding area	Extend borings to an elevation below active or potential failure surface and into hard stratum, or to a depth for which failure is unlikely because of geometry of cross-section. Slope inclinometers used to locate the depth of an active slide must extend below base of slide.
Ground Improvement Techniques	Varies widely depending in the ground improvement technique(s) being employed. For more information see “Ground Improvement Technical Summaries” FHWA SA-98-086R.	
Material Sites (Borrow sources, Quarries)	Borings spaced every 30 to 60 m (100 to 200 ft).	Extend exploration to base of deposit or to depth required to provide needed quantity.

TABLE 2 (Continued)

GUIDELINE “MINIMUM” BORING, SAMPLING, AND TESTING CRITERIA

Sand or Gravel Soils SPT (split-spoon) samples should be taken at 1.5 m (5 ft) intervals or at significant changes in soil strata. Continuous SPT samples are recommended in the top 4.5 m (15 ft) of borings made at locations where spread footings may be placed in natural soils. SPT jar or bag samples should be sent to lab for classification testing and verification of field visual soil identification.
Silt or Clay Soils SPT and “undisturbed” thin wall tube samples should be taken at 1.5 m (5 ft) intervals or at significant changes in strata. Take alternate SPT and tube samples in same boring or take tube samples in separate undisturbed boring. Tube samples should be sent to lab to allow consolidation testing (for settlement analysis) and strength testing (for slope stability and foundation bearing capacity Analysis). Field vane shear testing is also recommended to obtain in-place shear strength of soft clays, silts and well-rotted peat.
Rock Continuous cores should be obtained in rock or shales using double or triple tube core barrels. In structural foundation investigations, core a minimum of 3 m (10 ft) into rock to insure it is bedrock and not a boulder. Core samples should be sent to the lab for possible strength testing (unconfined compression) if for foundation investigation. Percent core recovery and RQD value should be determined in field or lab for each core run and recorded on boring log.
Groundwater Water level encountered during drilling, at completion of boring, and at 24 hours after completion of boring should be recorded on boring log. In low permeability soils such as silts and clays, a false indication of the water level may be obtained when water is used for drilling fluid and adequate time is not permitted after boring completion for the water level to stabilize (more than one week may be required). In such soils a plastic pipe water observation well should be installed to allow monitoring of the water level over a period of time. Seasonal fluctuations of water table should be determined where fluctuation will have significant impact on design or construction (e.g., borrow source, footing excavation, excavation at toe of landslide, etc.). Artesian pressure and seepage zones, if encountered, should also be noted on the boring log. In landslide investigations, slope inclinometer casings can also serve as water observations wells by using “leaky” couplings (either normal aluminum couplings or PVC couplings with small holes drilled through them) and pea gravel backfill. The top 0.3 m (1 ft) or so of the annular space between water observation well pipes and borehole wall should be backfilled with grout, bentonite, or sand-cement mixture to prevent surface water inflow which can cause erroneous groundwater level readings.
Soil Borrow Sources Exploration equipment that will allow direct observation and sampling of the subsurface soil layers is most desirable for material site investigations. Such equipment that can consist of backhoes, dozers, or large diameter augers, is preferred for exploration above the water table. Below the water table, SPT borings can be used. SPT samples should be taken at 1.5 m (5 ft) intervals or at significant changes in strata. Samples should be sent to lab for classification testing to verify field visual identification. Groundwater level should be recorded. Observations wells should be installed to monitor water levels where significant seasonal fluctuation is anticipated.
Quarry Sites Rock coring should be used to explore new quarry sites. Use of double or triple tube core barrels is recommended to maximize core recovery. For riprap source, spacing of fractures should be carefully measured to allow assessment of rock sizes that can be produced by blasting. For aggregate source, the amount and type of joint infilling should be carefully noted. If assessment is made on the basis of an existing quarry site face, it may be necessary to core or use geophysical techniques to verify that nature of rock does not change behind the face or at depth. Core samples should be sent to lab for quality tests to determine suitability for riprap or aggregate.

GTR REVIEW CHECKLIST FOR SITE INVESTIGATION

A. Site Investigation Information

Since the most important step in the geotechnical design process is to conduct an adequate site investigation, presentation of the subsurface information in the geotechnical report and on the plans deserves careful attention.

Geotechnical Report Text (Introduction) (Pgs. 10-1 to 10-4)	Yes	No	Unknown or N/A
1. Is the general location of the investigation described and/or a vicinity map included?	___	___	____
2. Is scope and purpose of the investigation summarized?	___	___	____
3. Is concise description given of geologic setting and topography of area?	___	___	____
4. Are the field explorations and laboratory tests on which the report is based listed?	___	___	____
5. Is the general description of subsurface soil, rock, and groundwater conditions given?	___	___	____
*6. Is the following information included with the geotechnical report (typically included in the report appendices):			
a. Test hole logs? (Pgs. 2-24 to 2-32)	___	___	____
b. Field test data?	___	___	____
c. Laboratory test data? (Pgs. 4-22 to 4-23)	___	___	____
d. Photographs (if pertinent)?	___	___	____
Plan and Subsurface Profile (Pgs. 2-19, 3-9 to 3-12, 10-13)			
*7. Is a plan and subsurface profile of the investigation site provided?	___	___	____
8. Are the field explorations located on the plan view?	___	___	____

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

A.	Site Investigation Information (Cont.)	Yes	No	Unknown or N/A
*9.	Does the conducted site investigation meet minimum criteria outlined in Table 2?	___	___	____
10.	Are the explorations plotted and correctly numbered on the profile at their true elevation and location?	___	___	____
11.	Does the subsurface profile contain a word description and/or graphic depiction of soil and rock types?	___	___	____
12.	Are groundwater levels and date measured shown on the subsurface profile?	___	___	____
	Subsurface Profile or Field Boring Log (Pgs. 2-14, 2-15, 2-24 to 2-31)			
13.	Are sample types and depths recorded?	___	___	____
*14.	Are SPT blow count, percent core recovery, and RQD values shown?	___	___	____
15.	If cone penetration tests were made, are plots of cone resistance and friction ratio shown with depth?			
	Laboratory Test Data (Pgs. 4-6, 4-22, 4-23)			
*16.	Were lab soil classification tests such as natural moisture content, gradation, Atterberg limits, performed on selected representative samples to verify field visual soil identification?	___	___	____
17.	Are laboratory test results such as shear strength (Pg. 4-14), consolidation (Pg. 4-9), etc., included and/or summarized?	___	___	____

*A response other than (yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

Groundwater Measurement

The method selected for measuring groundwater is dependent on physical site constraints, time available for site investigation(s), project type, and the anticipated groundwater depth. When measuring groundwater within a boring, each measurement represents groundwater at a single point in time and does not provide information on how significantly it may change over time. For projects that require continuous or multiple groundwater measurements, installation of piezometers may be necessary to obtain accurate groundwater variation data.

Prior to measuring groundwater, record the northing, easting, and vertical elevation in accordance with the Borehole Location module. The vertical elevation reference point will be used to calculate the groundwater elevation from the measured groundwater depth.

Record groundwater measurements by using an electronic water sensing tape measure, otherwise known as a water level meter. This device consists of an electrical wire encased within a cable or tape with a weighted sensing tip on one end and an electric meter at the other. When the sensing tip contacts water the electric meter will make a sound, and an indicator light will illuminate. The groundwater depth can be directly read from the tape measure on the device. The groundwater depth can be subtracted from the surface elevation or reference point to determine the elevation of the groundwater. Be cautious of false readings as moisture on the inside of the boring or casing can cause the probe to sound and light. Record the depth, date, and time of measurement on the field log at the time of measurement. For subsequent measurements of piezometer installations, document the reading date, groundwater depth, and groundwater elevation.

Table 2 lists various methods available at Geotechnical Services to measure groundwater.

Table 2. Methods to Measure Groundwater

Preference	Method	Near Surface Groundwater (<10 feet)	Shallow Groundwater (10-30 feet)	Moderately Deep Groundwater (30-80 feet)	Deep Groundwater (80+ feet)
Most Preferred	Hand Auger	X			
	Test Pits	X			
	Auger Drilling	X	X	X	
	CPT Pore Pressure Dissipation Test	X	X	X	X
	Piezometer	X	X	X	X
Least Preferred	[1]Mud Rotary Drilling	[2]X	[2]X	X	X
Not Acceptable	[3]No groundwater measurement taken.	--	--	--	--
	Groundwater measurement after mud rotary drilling with no flushing or bailing	--	--	--	--

[1]Mud rotary drilling observation is the least preferred option as it may require leaving an open hole for several days for groundwater to equilibrate.

[2]Pumping is typically limited to a maximum of 20 feet.

[3]Measure groundwater as many times as needed to determine groundwater level at the project site.

Hand Auger

Hand augers are preferred when groundwater depth is anticipated to be 10 feet or less. It is a simple and quick method that can be used to directly confirm groundwater level across multiple locations. The working area has a small footprint and minor environmental impacts. To use this method, hand auger to the target depth then stop and let the groundwater level stabilize. Once stable, measure and record the depth to groundwater.

Test Pits

Test pits are an alternative to the hand auger or can be used when a test pit is already scheduled for other purposes. If groundwater is present, use a water level meter or a reeled weighted tape to measure the depth to groundwater. **If shallow groundwater is present test pit walls can rapidly destabilize. Follow all Caltrans and Cal OSHA safety requirements for entering excavations.**

Auger Drilling

If groundwater is anticipated to be present within the drilled depth, initiate drilling using solid flight or hollow stem auger methods. Measure groundwater within the boring once it is encountered then switch to mud rotary drilling to continue advancing to the target depth. This will provide the most accurate groundwater level reading without interference from drilling fluid and additives. Groundwater level measurements must be made at the end of auger drilling and after any prolonged interruptions in auger drilling. Measure groundwater until a stable reading is recorded. Groundwater level within a boring may or may not change substantially over time and it is dependent on the surrounding soils. In silts and clays, groundwater levels may not stabilize for several hours or days. In coarse-grained soils, groundwater level may stabilize in minutes to hours. In other materials, borings may cave or collapse once augers are removed. Be prepared to use an alternate method to measure groundwater should this occur.

Pore Pressure Dissipation Test Using CPT

A Pore Pressure Dissipation Test (PPDT) is an indirect measurement that can be used to measure the equilibrium water pressure of a CPT at various intervals. The measured equilibrium water pressure can be used to determine the approximate depth of groundwater level at the date and time of measurement. During the investigation using CPT, it is recommended to conduct a PPDT if groundwater is anticipated. When soils are sandy, without clays, the PPDT is a quick way to get several water measurements. The PPDT has limitations. In clayey soils it will take hours or days for the pore pressure to dissipate. It may still be used but the extended dissipation time must be considered and incorporated into the SIP.

Piezometers

Verify the presumed geology is consistent with the conditions logged during drilling operations. If consistent, observe piezometer installation in the field to confirm the piezometer is installed per the approved installation details.

For a standpipe piezometer, make a notch on the north side of the casing as a repeatable location to take measurements with the water level meter. The notch should be surveyed for northing, easting, and elevation in accordance with the Borehole Location module.

For a vibrating wire piezometer, prior to installation, perform calibration and collection of a “zero reading” per manufacturer’s instructions. When monitoring the vibrating wire piezometer, record the frequency reported using the signal readout device. Typically, there are two small wire connectors exposed at the top of the cable: one for temperature (colored green/white) and one for the frequency (colored red/black). These small wire connectors must be attached to the correct terminal on the readout device.

Mud Rotary Drilling

Mud rotary is the least-preferred method to measure groundwater but is an option when site limitations preclude the use of the auger method. Measurements of groundwater at the time of drilling can be misleading, the time required for groundwater levels to reach equilibrium after drilling with mud rotary can be lengthy. Prior to measuring groundwater in a mud rotary drilled boring, pump or bail the drilling fluid out of the boring or flush the boring with clean water until the fluid runs clear. Once the drilling fluid has been removed, measure the groundwater until a stable reading is recorded.

Hydraulic Conductivity of Subsurface Formations

Samples can be collected during the site investigation and tested in the laboratory for hydraulic conductivity. Some considerations for laboratory testing are the size of the specimen, stress level, sample disturbance, and direction of hydraulic gradient within the sample, actual groundwater used for testing (vs tap water), temperature, and anisotropy of the hydraulic conductivity. Additional pumping tests, slug testing, and drawdown tests may be necessary to assist in determining the in-situ hydraulic conductivity at the site.

Special Conditions

Groundwater behavior in areas with complex geology such as fractured rock, layered soils, or heterogeneous sediments can be unpredictable. Variations in permeability and porosity between soil layers or rock formations can cause localized differences in groundwater elevation, even over short distances. The presence of confining layers (such as clay or bedrock) that restrict groundwater movement can lead to confined aquifers or perched water tables, where groundwater levels behave differently than in unconfined aquifers. Additional information regarding some special conditions is discussed below.

Perched Groundwater

Perched groundwater is a discontinuous zone of groundwater that is not hydraulically connected to the regional groundwater. Perched groundwater can occur above regional groundwater elevation due to impermeable bedrock or clay layers. Perched groundwater may be seasonal and may not be present all year long in some areas.

An interbedded riverine depositional environment may have discontinuous clay layers present above the regional groundwater elevation. These clay layers may impede the downward infiltration of groundwater. Downward infiltrating groundwater may build up a layer of perched groundwater in the area above the clay layer.

Perched groundwater can cause challenges when designing structures or roadway improvements. Being discontinuous zones, the perched groundwater may be present in some areas of a site and may be absent in other areas. Perched groundwater must therefore be adequately characterized in the subsurface investigation.

Artesian Conditions

Artesian conditions exist where a confined aquifer has a piezometric head elevation that is greater than the elevation of the ground surface, that is, the pressure in the aquifer forces

groundwater above the ground surface. The term sub-artesian indicates where the piezometric elevation is greater than the overlying formation but is lower than the ground surface.

To measure the piezometric head elevation at the time of drilling, add additional casing above the ground surface and measure the height above the ground to the groundwater level. For multiple or continuous measurements of the artesian water pressure multiple piezometers can be installed.

Groundwater in Rock

Groundwater flow in rock with low permeability is controlled by the presence, orientation, and connectivity of fractures, joints, and faults. In fractured rock, the design groundwater elevation is usually based on the piezometric head at the site. This is typically measured from monitoring wells in fractured zones and can differ from the unconfined water table due to the nature of confined or semi-confined flow.

Design Groundwater Evaluation

Once the groundwater characterization and measurement process has been completed, the groundwater information collected must be evaluated for use in geotechnical designs and deliverables. The design groundwater elevation can have significant impact during analysis of soil and rock cut slopes, liquefaction, settlement, pile downdrag, and more.

The worst-case groundwater condition should be considered when determining design groundwater elevation. The worst-case design conditions that may rationally arise during construction or operation must be inferred using considerable judgment, knowledge of the groundwater fluctuations at the site, and any other pertinent information relating to groundwater flow. The objective when determining the design groundwater elevation is to establish an appropriate, rational, and defensible elevation for use in analyses and design of geotechnical assets.

When evaluating the worst-case groundwater condition for use in design, direct measurements that are recent and/or near the project should be considered more reliable, while indirect measurements that are old and/or far away from project should be considered less reliable. Direct measurements do not require a transformation or manipulation to produce estimates of groundwater. Indirect measurements require manipulation or transformation to produce an estimate of groundwater. For example, a CPT pore pressure dissipation test is an indirect measurement that is used to calculate groundwater elevation. Both direct and indirect measurements are subject to variability and uncertainty as groundwater conditions vary in three-dimensions and with time.

If you have minimal data, due to project constraints, it is acceptable to assign a higher groundwater elevation to account for temporal fluctuations in the water table. This practice varies depending on the historical groundwater data/trends and site-specific geologic conditions. Consider everything mentioned above, discuss with the project design team, and use your engineering judgement.

Appendix B provides an example for determining design groundwater elevation at a site.

Reporting

Groundwater measurements must be reported on Log of Test Borings and Boring Records per the requirements in the *Soil and Rock Logging, Classification, and Presentation Manual*. Follow the Foundation Report and/or Geotechnical Design Report modules to report observed groundwater measurements, design groundwater elevation(s), and to discuss pertinent groundwater conditions.

There are numerous groundwater-dependent Special Provisions; collect enough information to determine which Standard Special Provisions will be needed. Refer to the Geotechnical Notes for Specifications module for more information.

References

- ASTM D5778 *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils*, June 1, 2020.
- Drilling, Sampling, and Construction of Monitoring Wells Under Flowing Artesian Conditions, *Environmental & Engineering Geoscience, Vol. III, No. 3, Fall 1997, pp. 369-373.*
- California Water Code (https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=WAT&division=7.&title=&part=&chapter=10.&article=4)
- CA Water Code Bulletins
- U.S Department of Transportation, Federal Highway Administration, *Geotechnical Engineering Circular No.5, Geotechnical Site Characterization*, April 2017.
- VW2100 Vibrating Wire Piezometer Instruction Manual, RST Instruments, August 27, 2020.

Figure 2-3
Information Required for Field Log

Item	Description
1	**Date(s) of work**
2	**Hole Identification**
3	**Project and Site Information:** • Project Name • Structure/Bridge Name and Number (if available) • Project Number (Charge District - Expenditure Authorization, 8-digits) • District • County • Route • Postmile, range and prefix
4	**Borehole Location and Elevation:** • Location: ○ Station and offset (required if available) ○ Latitude and longitude, horizontal datum (optional) ○ Northing and Easting, local coordinate reference system (optional) *Note:* In the absence of accurate coordinate data, a suitable and verifiable field description may be temporarily used. (e.g. postmile and centerline offset, distance to fixed object or benchmark, etc.) • Elevation, vertical datum, benchmark location and description • Survey method(s) used, approximate accuracy (e.g. less than a foot)
5	**Personnel:** • Logger/Geoprofessional • Drillers
6	**Drilling and Sampling Equipment (verify with Driller):** • Drilling (manufacturer and model, and Caltrans equipment identification number) • Drilling method (mud rotary, air rotary, solid auger, hollow stem auger. etc.) • Drill rod description (type, diameter) • Drill bit description • Casing (type, diameter) and installation depth • SPT Hammer Type: Safety/Automatic Hammer, etc. ○ Lifting mechanism (for safety hammer) Hammer Energy Ratio (ERi) • Type of sampler(s) and size(s) ○ Undisturbed Shelby tube ○ Undisturbed Piston ○ Split spoon (e.g. SPT, Cal Mod, etc.) ○ Core (both rock and soil) ○ Disturbed (include auger cuttings) ○ Other
7	**Groundwater:** • Method (observed while drilling, measured in hole, etc.) • Date, time, and elevation of each reading
8	**Hole Completion:** • Reason for termination (e.g., drilled to depth, refusal, early termination of traffic control, etc.) • Backfill Method (e.g., grout, soil cuttings, dry bentonite chips, piezometers installed, slope inclinometer installed, TDR, instrumentation, etc.

Economic Impacts of the 2021 Drought on California Agriculture

Preliminary Report

Prepared for: The California Department of Food and Agriculture

Josué Medellín-Azuara
Alvar Escriva-Bou
John A. Abatzoglou
Joshua H. Viers
Spencer A. Cole
José M. Rodríguez-Flores
Daniel A. Sumner

With Research Support from:

Vicky Espinoza, Humberto Flores-Landeros, Nicholas Santos, Anna Rallings, Sarah Naumes, and Angel Fernández-Bou

February24, 2022

UNIVERSITY OF CALIFORNIA MERCED · UC MERCED WATER SYSTEMS MANAGEMENT LAB · CITRIS AND THE BANATAO INSTITUTE · PPIC PUBLIC POLICY INSTITUTE OF CALIFORNIA · UC DAVIS

About the Authors

Josué Medellín-Azuara, **Ph.D**., Associate Professor, Civil and Environmental Engineering and Director, Water Systems Management Lab, UC Merced.

Alvar Escriva-Bou, **Ph.D.,** Senior Fellow, Public Policy Institute of California.

John A. Abatzoglou, Ph.D., Associate Professor, Management of Complex Systems, UC Merced.

Joshua H. Viers, Ph.D., Professor, Civil and Environmental Engineering and Director, CITRIS and the Banatao Institute, UC Merced.

Spencer A. Cole, Graduate Student, Environmental Systems Graduate Group, and Water Systems Management Lab, UC Merced.

José M. Rodríguez-Flores, Ph.D., Candidate, Environmental Systems Graduate Group, and Water Systems Management Lab, UC Merced.

Daniel A. Sumner, **Ph.D.,** Frank E. Buck Jr. Distinguished Professor, Agricultural and Resource Economics, UC Davis.

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Executive Summary

The ongoing multi-year drought that began in 2020 had far below average precipitation statewide. As a result, the 2021[1] water year ended up as the second driest two-year period on record. Although precipitation deficits were widespread, drought conditions were more severe in the Sacramento and Northern Coast regions. Few atmospheric rivers and below average snowpack depleted storage in most reservoirs and aquifers during 2021. Yet drought is not only marked by water supply – in this case, warmer temperatures and antecedent dry conditions increased crop evaporative demands, furthering the gap between water supply and crop irrigation demands.

This drought has occurred early in Sustainable Groundwater Management Act (SGMA) implementation, enacted in 2014 to avoid undesirable consequences of unsustainable groundwater use. The implementation of groundwater sustainability plans (GSPs) for critically overdrafted basins began in 2020, while other medium and high priority basins had just submitted their plans earlier this year. Increased demand for groundwater pumping to minimize the impacts from drought surface water shortages contributes to challenges to meeting SGMA mandates.

This report provides preliminary estimates of economic impacts to agriculture for the current drought using a combination of surveys of irrigation districts, a review of hydrological information, and remote sensing data. We cover selected irrigated agricultural areas where drought impacts were more significant during 2021, including the Central Valley, the Russian River basin (North Coast), and northern intermountain valleys in Siskiyou, Shasta and Modoc counties. The drought reduced surface water deliveries during 2021 by 5.5 million acre-feet (maf) compared to predrought conditions. To mitigate these shortages, farms increased groundwater pumping by about 4.2 maf, resulting in a final net shortage of roughly 1.4 maf. This water shortage resulted in 395,100 additional acres of idled cropland, along with some crop yield impacts from reduced water application. Altogether, direct economic costs of drought for agriculture are estimated at $1.2 billion (including $184 million in greater pumping costs), with roughly 8,745 full and part-time job losses (Table ES-1). Considering the effects on other sectors as well, total economic impacts are estimated at $1.7 billion and 14,634 jobs. In comparing to the 2012-16 drought, impacts on idled land and direct crop revenue losses are comparable to 2014 but significantly smaller than those in 2015—the height of the past drought (Table ES-1). However, the spatial distribution of such effects varies, with more impacts through idled land and revenue losses in the Sacramento and North Coast regions.

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[1] The 2020-2021 water year runs from October 1, 2020 to September 30, 2021.

Almost all drought-idled land occurred in the Central Valley (roughly 385,000 acres). Several parts of the Sacramento River Basin, the west side of the San Joaquin Valley, Tulare County and some irrigated areas in Kern County were the most affected by increased fallowing compared to pre-drought conditions. Crops with major increased fallowing include rice in the Sacramento Valley, cotton in the San Joaquin Valley, as well as grain and other field crops statewide. Drought-related increase in pumping in the San Joaquin Valley was less extreme than a comparable point in the 2012–2016 drought. Water cutbacks in the Russian River basin during this past year reduced local grape crop yields, without significant reduction in irrigated agricultural areas. Rainfed feed crops and pastures suffered sizable losses that affected some organic dairy farms. Some limited, late-season water cutbacks in northern intermountain valleys reduced yields in forage crops and increased idled land. In the dairy sector, higher milk prices—caused by global demand—raised overall revenues and reduced drought-related effects of higher production costs. The beef cattle sector had to adapt to scarce winter pasture and higher forage prices. However, California's beef cow herd increased in size and as a share of the national cow herd, leading to potential revenue gains.

Table ES-1. Summary of Preliminary Annual Economic Impacts of the 2021 Drought on Agriculture in the Central Valley, the Russian River Basin and Northern Intermountain Valleys.

Description	Current drought	2012-16 drought*	
	2021	2014	2015
Surface water shortage (maf/year)	5.5	6.6	8.7
Groundwater replacement (maf/yr)	4.2	5.1	6
Net Water Shortage (maf/yr)	1.4	1.5	2.7
Drought-related idled land (acres/yr)	395,100	428,000	540,000
Crop Revenue Losses ($ million/yr)	$962	$876	$973
Increased Pumping Costs ($ million/yr)	$184	$491	$638
Direct Economic Costs ($ million/yr)	$1,146	$1,586	$1,989
Direct Employment Losses (jobs/yr)	8,745	6,920	10,000
Total Economic Impacts ($ million/yr)	$1,705	$2,372	$2,919
Total Employment Impacts (jobs/yr)	14,364	15,480	21,700

*Inflation adjusted. Adapted from Medellín-Azuara et al. (2015), Howitt et al. (2015) and Lund et al. (2018). Agricultural area coverage out of Central Valley differs between the current and the 2012-2016 studies.

Some elements of this assessment merit refinement, including establishing an appropriate pre-drought baseline (as some crops have been experiencing long-term changes in irrigated area), and the assessment of drought-related idled land, cutbacks, and crop yields. Additionally, distinguishing commodity market factors in planting decisions from water cutbacks may reduce some uncertainties. Nevertheless, our preliminary estimates provide a clear picture of the impacts of the 2021 drought in California's agriculture are a foundational exploration of such uncertainties to improve retrospective and predictive analyses of droughts and California's Agriculture.

A. NOVA BUSINESS PARK, LLC (RONALD FEDRICK) / NOVA BUSINESS PARK NORTH / TENTATIVE MAP NO. P22-00093-TM **23-2047**

CEQA Status: Consideration and possible adoption of a Mitigated Negative Declaration and Mitigation Monitoring & Reporting Program (MMRP). According to the proposed Mitigated Negative Declaration, the proposed project would have potentially significant effects on Biological Resources unless mitigation measures are adopted. The project site is not on any of the lists of hazardous waste sites enumerated under Government Code Section 65962.5. State Clearinghouse No. SCH 2023110424.

Request: Approval of a tentative map to subdivide six lots totaling approximately 93.2-acres to create 13 new parcels ranging in size from 2.20 to 12.15 acres. The project includes street and infrastructure improvements including two new cul-de-sacs accessed from an existing private roadway off Devlin Road. No specific land uses or buildings are proposed as part of this permit application, however potential building envelopes and parking layouts have been shown for future development of the proposed parcels. The project is proposed on six lots totaling approximately 93.2-acres on the west side of Devlin Road, south of Suscol Creek, within the Industrial Park: Airport Compatibility (IP:AC) zoning district. APN's: 057-020-092; -093; -094 and 057-170-024 (SFAP); -025 (SFAP); -027. Napa.

Staff Recommendation: Adopt the Mitigated Negative Declaration and MMRP and approve the Tentative Subdivision Map with the proposed conditions of approval.

Staff Contact: Sean Trippi (707) 299-1353, or sean.trippi@countyofnapa.org

Applicant Agent Contact: Carl Butts, CAB Consulting Engineers, P.O. Box 140, Napa, CA 94559; Phone: (707) 694-6479 or email: cbutts@cabengineering.com

Attachments: A. Recommended Findings
B. Recommended Conditions of Approval & Final Agency Approval Memos
C. Initial Study / Mitigated Negative Declaration & MMRP
D. Tentative Map Application Packet
E. Biological Reports
F. Stormwater Control Plan
G. Geotechnical Report
H. Graphics
Item 7A Memo and Additional Public Comment (added after initial agenda posting).pdf

Nova Business Park North, Tentative Map (#P22-00093-TM)

Summary

SCH Number
2023110424

Lead Agency
Napa County

Document Title
Nova Business Park North, Tentative Map (#P22-00093-TM)

Document Type
MND - Mitigated Negative Declaration

Received
11/16/2023

Present Land Use
Zoning: Industrial Park: Airport Compatibility (IP:AC); General Plan description: Industrial; Existing Land Use: Undeveloped

Document Description
The project is a request to subdivide six lots totaling approximately 93.2-acres to create 13 new parcels ranging in size from 2.20 to 12.15 acres.

Contact Information

Name
Sean Q Trippi

Agency Name
Napa County

Job Title
Supervising Planner

Contact Types
Lead/Public Agency

Address
1195 Third St Ste 210
Napa, CA 94559-3035

Phone

(707) 410-6671

Email

sean.trippi@countyofnapa.org

Location

Coordinates

38°14'4.72"N 122°16'1.84"W

Cities

unincorporated area

Counties

Napa

Regions

Unincorporated

Cross Streets

Devlin Road/Soscol Ferry Rd

Zip

94558

Total Acres

93.2

Parcel #

057-020-092; -093; -094 and 057-170-024; -025; -027

State Highways

SR 29

Railways

N/A

Airports

Napa County Airport

Schools

N/A

Waterways

Napa River & Suscol, Sheehy, & Fagan Creeks

Township

5N

Range

46W

Section

Pt. 35

Base
MDB&M

Notice of Completion

State Review Period Start
11/17/2023

State Review Period End
12/18/2023

State Reviewing Agencies
California Department of Fish and Wildlife, Marine Region 7 (CDFW), California Department of Forestry and Fire Protection (CAL FIRE), California Department of Parks and Recreation, California Department of Toxic Substances Control (DTSC), California Department of Transportation, Division of Aeronautics (DOT), California Department of Transportation, Division of Transportation Planning (DOT), California Department of Water Resources (DWR), California Governor's Office of Emergency Services (OES), California Highway Patrol (CHP), California Native American Heritage Commission (NAHC), California Natural Resources Agency, California Public Utilities Commission (CPUC), California Regional Water Quality Control Board, San Francisco Bay Region 2 (RWQCB), California State Lands Commission (SLC), San Francisco Bay Conservation and Development Commission (BCDC), State Water Resources Control Board, Division of Drinking Water, State Water Resources Control Board, Division of Water Quality, California Department of Fish and Wildlife, Bay Delta Region 3 (CDFW), California Department of Transportation, District 4 (DOT)

State Reviewing Agency Comments
California Department of Fish and Wildlife, Bay Delta Region 3 (CDFW), California Department of Transportation, District 4 (DOT)

Development Types
Other (Tentative Subdivision Map)

Local Actions
Land Division (Subdivision, etc.)

Project Issues
Biological Resources

Attachments

Draft Environmental Document [Draft IS, NOI_NOA_Public notices, OPR Summary Form, Appx,]

- Initial Study_MND Nova Bus PDF 311 K
- Nova BP North TM CEQA NOI PDF 104 K
- Nova spring botanical survey 5-13-22 PDF 217 K
- P22-00093_Biology Report PDF 7585 K
- Summary_Form_for_Document_Submittal PDF 594 K
- TentMap_Plans PDF 8793 K

Notice of Completion [NOC] Transmittal form

- ! CEQA NET NOC PDF 260 K

State Comment Letters [Comments from state reviewing agencies]

2023110424_CDFW comment PDF 634 K | 2023110424_DOT Comment PDF 312 K

Disclaimer: The Governor's Office of Land Use and Climate Innovation (LCI) accepts no responsibility for the content or accessibility of these documents. To obtain an attachment in a different format, please contact the lead agency at the contact information listed above. For more information, please visit LCI's Accessibility Site.

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September 4 ·

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Protecting Sheehy Creek: Advocates Call for Better Care Amid Napa Development

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11w

Betty Labastida
Penny Pawl Thank you!
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A Tradition of Stewardship
A Commitment to Service

SITE PLANS

Site Plan Requirements:

A Site Plan gives a clear view of the existing development on the project property. It shows all existing property improvements and the proposed improvements you are applying for with your permit application. A property improvement includes dwellings, structures, tanks, generators, septic systems, wells, bridges, driveways, turnarounds, etc. A site plan can also show the location and size of sources of electrical, gas and utility trenching if those features are part of your project.

The Site Plan gives our divisions the information needed to ensure that a proposed structure/improvement or alteration or addition to a structure/improvement on your property will be safe, conform to setbacks (distance from property line, center of road, sanitary systems and water sources, etc.). It ensures that any natural elements of the property such as creeks and streams are safe from the negative effects of proposed construction. It also assists Fire and Engineering with the details of access routes to your property in the event of an emergency.

Aerial photographs will not be accepted as Site Plans

The Site Plan page will be consistent with the size of plans at a minimum of 11 x 17" (with legible, easy to read font). Site Plans will not be accepted unless they are a part of the plans, unless it is directed otherwise. Plans must contain a Title Page, Site Plan and project drawings and or details.

What to Include on your Site Plan:

(A) **Title Block** shall include the following:
*Parcel number and property address
*Owner name and address
*Draftsman (may be yourself), Architect or Engineer and contact information.
*Date the plans were drawn and/or amended

(B) **Property line boundaries** The Site Plan must be a drawing of the **entire** project property. As some properties are large, it may be difficult to include the details that are needed. We can accept two or more drawings with one of the entire property and one or more of the developed areas drawn as an enlargement. Mark the location of the enlarged developed areas with a square/s on the entire property drawing. Please include a North Arrow.

(C) **Label existing and proposed structures and uses** Provide dimensions and distance between existing and proposed structures/development. Show all property improvements, such as buildings/dwellings/decks, storage tanks of any kind (including propane tanks), etc. Setbacks from these improvements will enable our divisions to establish safe distance from possible safety/sanitary issues.

Be sure to label all existing (E) and proposed (P) improvements, including area of addition, area of remodel, new structure, etc.

(D) **Setbacks** Provide the setbacks that we need to review your submittal for permit. Setbacks are the distance between existing and proposed property improvements. They are the distance of your project from property lines, septic systems, wells, tanks, structures, dwellings (and in case of generator exhaust, the distance from the nearest opening on the structure closest to the installation). Indicate the distance from the center of road for all improvements.

(E) **Roads/Driveways/Turnarounds** Show all driveways, access roads (including Public Roads that border the project property), turnarounds. Our Fire and Engineering Divisions will establish if your proposed project may interfere with emergency access to the project property.

(F) **Identify Natural Features** such as creeks as there are creek setbacks that must be maintained to protect the natural feature from damage and prevent possible flood issues. Identify required creek setback distance pursuant to County Code 18.108.025.

Site Plan Requirements (Continued):

(G) **Existing and proposed water, wastewater, and stormwater treatment systems** must be shown and include:

- Wells on the property
- Wells within 100 feet of the project property
- Septic system tanks and sewer line location
- Leach fields (existing and proposed)
- 100% reserve area (existing and proposed). This is the area that will be used in the event of a septic system failure.
- Storage tanks (Water, grey-water, waste storage)
- Label distances between well(s), septic tank, leach field, and creek, streams, rivers or lakes, if applicable

(H) **Flood Zone** If the project property is in a Special Flood Hazard Area (SFHA) or a portion there-of, illustrate the SFHA boundary on the site plan. To determine this visit the FEMA website at https://msc.fema.gov/portal/home. Enter your address and click on Search.

(I) **Utilities** Show utility lines or service points of connection (water, sewer, electrical, gas, cable). Indicate work areas under overhead lines or above buried lines. If a utility line crosses over a structure/improvement, show clearance above the structure/improvement.

(J) **Easements** Show any easements that exist. Indicate the location of all easements (water, sewer, roadways, open space, etc.)

(K) **Fire** Locations of fire water storage tanks, fire hydrants and Fire Department Connections/Post Indicator Valves (FDC's/PIV's.) Contact CalFire for additional information.

Example