NEVADA COUNTY, CALIFORNIA

IDAHO-MARYLAND MINE

RECLAMATION PLAN

NOVEMBER | 2020

UPDATED MARCH 2021

Lead Agency:
Nevada County, Community Development Planning Department

Prepared for:
Rise Grass Valley Inc.

Preparer:
Benchmark Resources

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1. SUMMARY

Rise Grass Valley Inc. (Rise) proposes to reinitiate underground mining and gold mineralization processing of the Idaho-Maryland Mine (the "site") in unincorporated Nevada County (County) (see Figure 1, "Regional Location," and Figure 2, "Site Location"). Thus, a reclamation plan must be prepared for all surface-related disturbance, in accordance with the requirements of the California Surface Mining and Reclamation Act (SMARA), found in California Public Resources Code (PRC) Section 2710 et seq., Title 14 of California Code of Regulations (CCR) Section 3500 et seq., and the County's (the lead agency) implementing ordinance (Nevada County Code Section L-II 3.22, Surface Mining Permits and Reclamation Plans).

The facilities and operations will be located on two properties owned by Rise and referred to as the Brunswick Industrial Site and Centennial Industrial Site. The operation comprises five primary elements (see Sheets 1, "Brunswick Industrial Site Plan—Final Grading and Topography," 2, "Brunswick Industrial Site—Site Plan Details," 3, "Brunswick Industrial Site—Grading Plan," and 4, "Centennial Industrial Site Plan," and 5, "Centennial Industrial Site—Grading Plan" and 6, "Brunswick and Centennial Industrial Site—Section Views"):

1. dewatering the existing underground mine workings,
2. mining existing and new underground mine workings,
3. processing gold mineralization and rock,
4. placing engineered fill at the Brunswick and Centennial Industrial Sites, and
5. export of engineered fill from the Brunswick Industrial Site to support local construction projects.

The majority of aboveground facilities, the treated-water outfall structure, and engineered fill will be located on Rise's 119-acre Brunswick Industrial Site. Engineered fill will also be placed on Rise's 56-acre Centennial Industrial Site. Of the total 175 acres in surface land holdings, approximately 104 acres will be disturbed as a result of construction of the facilities proposed to support dewatering, mining, and processing at the Idaho-Maryland Mine. In addition, Rise owns approximately 2,585 acres of subsurface rights that encompass the historic Idaho-Maryland Mine workings and Idaho-Maryland gold mining operation. Once the aboveground facilities are constructed, Rise will begin dewatering the mine, performing advanced exploration, and mining the underground workings.

Table 1, "Reclamation Plan Summary for Operation Components," lists the components of the operation and the plan for each component at reclamation. Appendix A, "Index to Required Content," provides a table with the location in this document for specific requirements, practices, and standards for reclamation plans.

TABLE 1
RECLAMATION PLAN SUMMARY FOR OPERATION COMPONENTS

Site Component	Reclamation Plan
Potable water extension	To remain to service East Bennett residential area.
BRUNSWICK INDUSTRIAL SITE	
Engineered fill	Transported from process plant. Compacted and graded to 3:1 (horizontal to vertical) slopes. Side slopes and pads will be vegetated and the pad will be an area for future industrial use.

Site Component	Reclamation Plan
Covered conveyor from Brunswick headframe to process plant	To be dismantled and removed.
Brunswick and Service shaft headframes and headframe buildings	To be dismantled and removed.
Brunswick shaft	To be closed per applicable stated and federal regulations.
Service shaft	To be closed per application state and federal regulations.
Buildings (Including Mineral processing plant, changeroom and office, warehouse, hoist rooms, generator, water treatment plant, etc.)	Contents of buildings to be removed; buildings to remain for future industrial use.
Site drainage facilities	To remain on-site for support of future industrial development.
Diesel fuel tank (30,000 gallon)	To be emptied and removed.
Process tanks (clean water, process water, tailing thickener, paste filter feed tank, cement silo, finish water tank)	To remain for future industrial use
Water treatment pond	To remain for future industrial use
South Fork Wolf Creek	Outfall pipeline to be removed after mine dewatering activities no longer needed.
Paved surfaces, access, and roads	To remain.
CENTENNIAL INDUSTRIAL SITE	
Engineered fill	Transported from process plant, compacted and graded in lifts per geotechnical report recommendations. Side slopes will be vegetated and the pad will be an area for future industrial use.
Site drainage facilities	To remain on-site for support of future industrial development.
Paved surfaces, access, and roads	To remain.

2. BACKGROUND

The Idaho-Maryland Mine is a historic, past-producing, underground gold mine. The mine produced 2,414,000 ounces of gold between 1866 and 1956. The mine has been inactive since its closure in 1956 and was inactive for several periods during its production period. In 1901 the mine was allowed to flood with water, and then the mine was dewatered in 1904. In 1914 it was again allowed to flood, and then it was dewatered in 1919. The mine was allowed to flood again after its final closure in 1956.

During its operation, the Idaho-Maryland Mine was one of California's and the United States' most important mines. In 1941, the mine employed approximately 1,000 workers and was California's largest lode gold mine and the United States' second-largest lode gold mine by annual production. The Idaho-Maryland Mine encompasses an extensive system of approximately 73 miles of underground tunnels, many raises, four inclined shafts, and two vertical shafts. The historic mining operation had extensive surface infrastructure adjacent to the Centennial Industrial Site and at the Brunswick Industrial Site, most of which has been dismantled and removed.

Idaho-Maryland Mine used the Centennial Industrial Site to deposit mine tailings. These mine tailings were never compacted. Some of the materials used to build the tailings berm and small quantities of mineralized rock contain elevated metals. As a result, under existing conditions, the majority of the Centennial Industrial Site cannot be developed because of unstable soils and/or contamination. Rise is working with the California Department of Toxic Substances Control (DTSC) to develop a plan that consolidates and caps the contaminated soils in a manner consistent with current federal and state regulations. Rise will use the engineered fill to fill and grade the Centennial Industrial Site. The

environmental cleanup work at the Centennial Industrial Site will be completed under the DTSC voluntary cleanup program and is not a component of the operation for review under SMARA.

The Idaho-Maryland Mine as it now exists represents a consolidation of past mines, including Eureka, Idaho, Maryland and Brunswick. The Union Hill Mine is a smaller mine adjacent to the Idaho-Maryland Mine that was closed in 1918 and has been flooded with groundwater since then. The Union Hill Mine is not connected to the Idaho-Maryland Mine, but is near the Brunswick portion of the Idaho-Maryland Mine. The gold-quartz veins of the Union Hill Mine are believed to be part of the Brunswick vein system. Rise is proposing to dewater the Idaho-Maryland Mine, but not the Union Hill Mine.

A sawmill previously operated on the Brunswick Industrial Site and closed in 1991. All buildings related to the sawmill have been removed. A clay-lined constructed pond and significant paved areas remain from the sawmill operation.

In 1995, in an effort to reopen the Idaho-Maryland Mine, Emgold Mining Corporation acquired a use permit from Nevada County to dewater the mine. This permit was allowed to expire and no work was completed on the dewatering project. In 2005, Emgold submitted an application to the City of Grass Valley to dewater the Idaho-Maryland Mine and restart mining and processing operations. Between 2005 and 2011, the City of Grass Valley implemented environmental review of the application consistent with the California Environmental Quality Act. Emgold subsequently abandoned the use permit application because it could not pay the fees required for continued processing. Rise has no affiliation with Emgold.

3. SITE DESCRIPTION

The following sections provide general site details such as contact information for the mine owner and operator; evidence of landowner notification of reclamation; reclamation responsibility; and site location, size, site features, and land uses.

3.1 Contact Information

Owner of Property Name: Rise Grass Valley, Inc.
Owner of Mineral Rights: Rise Grass Valley, Inc.
Street Address: PO Box 271
City, State, Zip Code: Grass Valley, California 95945
Telephone Number: (604) 260-4577

3.2 Operator

Mine Operator: Rise Grass Valley, Inc.
Street Address: PO Box 271
City, State, Zip Code: Grass Valley, California 95945
Telephone Number: (604) 260-4577
Contact Person: Ben Mossman, President

3.3 Notification of Landowner

Rise Grass Valley, Inc. is the sole owner of the property.

3.4 Reclamation Responsibility

A statement for responsibility to complete reclamation in accordance with this plan is provided by the current operator in Appendix B, "Statement of Responsibility."

3.5 Location, Size, and Legal Description

The site location is shown on Figures 1 and 2 and includes the Brunswick and Centennial Industrial Sites and the route of the potable pipeline. The site is located in western unincorporated Nevada County, California. The Centennial Industrial Site is adjacent to the Grass Valley city limits and within the City of Grass Valley's (City's) near-term annexation boundary (see Figure 2). The Brunswick Industrial Site is approximately 2 miles from the center of the city of Grass Valley and State Route 49 (SR 49) (see Figure 2).

The location is also identified as follows:

- **Assessor's Parcel Numbers (APNs):**
  - **Brunswick Industrial Site:**
    006-441-003, 006-441-004, 006-441-005, 006-441-034, 009-630-037, 009-630-039
  - **Centennial Industrial Site:**
    009-550-032, 009-550-037, 009-550-038, 009-550-039, 009-550-040, 009-560-036
  - **Potable Water Pipeline Easement:** 009-560-045, 009-560-016
- **U.S. Geological Survey Township and Range:** Sections 25, 26, and 36 of Township 16 North, Range 8 East and Section 31 of Township 16 North, Range 9 East of the Grass Valley U.S. Geological Survey 7.5-minute quadrangle
- **Latitude and Longitude:** 39.207272, -121.013084 degrees at the Brunswick Industrial Site, Brunswick Road entrance; 39.222170, -121.039058 degrees at Centennial Industrial Site, Whispering Pines Lane entrance

The property includes approximately 175 acres (118.93 acres on the Brunswick Industrial Site and 56.41 acres on the Centennial Industrial Site). The legal description of the property and parcels under ownership is provided in Appendix C, "Parcels, Legal Description, and Easements." In addition, a new potable water pipeline (approximately 1.5 miles long) will be constructed primarily along East Bennett Road.

3.6 Conditions of Approval and Mitigation Measures

In accordance with PRC Section 2772(b)(1)(B), Appendix D, "Conditions of Approval and Mitigation Measures," provides a listing of conditions of approval or binding mitigation measures adopted by the County upon approval of this reclamation plan pursuant to the California Environmental Quality Act (CEQA) that were deemed necessary to meet the requirements of SMARA.

3.7 Existing and Allowed Land Uses

Land use on the site is visible in Figure 3a, "Existing Conditions Aerial Photograph," Figure 3b, "Existing Site Conditions: Brunswick Industrial Site," and Figure 3c, "Existing Site Conditions: Centennial Industrial Site." The majority of the approximately 175-acre site is open space. Remnants of the previous gold mining and sawmill operations exist on-site.

Table 2, "Land Use and Zoning Designations," provides the *Nevada County General Plan* (Nevada County 2014) and zoning land use designations for each parcel within the site. Figure 4, "General Plan Designations," shows these *Nevada County General Plan* designations for the site and surrounding area. All parcels are designated for industrial uses. The Light Industrial (M1) district provides for production, repairs, distribution, goods and equipment warehouses, storage of explosives, and storage of bulk petroleum products. The County allows surface drilling on properties zoned M1, and drilling has been conducted periodically since October 2017.

TABLE 2
LAND USE AND ZONING DESIGNATIONS

Parcel Number	Acreage	General Plan Designation	Zoning
BRUNSWICK INDUSTRIAL SITE			
006-441-003	15.19	Industrial (IND)	Light Industrial (M1) with Site Performance Combining District (SP)
006-441-004	0.85	Industrial (IND)	Light Industrial (M1) with Site Performance Combining District (SP)
006-441-005	50.01	Industrial (IND)	Light Industrial (M1) with Site Performance Combining District (SP)
006-441-034	16.01	Industrial (IND)	Light Industrial (M1) with Site Performance Combining District (SP)
009-630-037	21.8	Industrial (IND)	Light Industrial (M1) with Site Performance Combining District (SP)
009-630-039	15.07	Industrial (IND)	Light Industrial (M1) with Site Performance Combining District (SP)
CENTENNIAL INDUSTRIAL SITE			
009-550-032	0.48	Industrial (IND)	Light Industrial (M1)
009-550-037	4.47	Industrial (IND)	Light Industrial (M1)
009-550-038	40.1	Industrial (IND)	Light Industrial (M1)
009-550-039	0.98	Industrial (IND)	Light Industrial (M1)
009-550-040	0.13	Industrial (IND)	Light Industrial (M1)
009-560-036	10.25	Industrial (IND)	Light Industrial (M1)

Sources: Nevada County 2019, Nevada County Zoning Ordinance.

As shown in Table 2 and Figure 5, "Zoning," the site is zoned Light Industrial with six parcels having a Site Performance Combining District. With implementation of the operation, the Brunswick Industrial Site will be rezoned a Light Industrial with Mineral Extraction Combining District (M1-ME). The ME zoning allows for mining operations on the surface, including processing, waste disposal, and the reclamation thereof, subject to the regulations in Section L-II 3.22, Surface Mining Permits and Reclamation Plans, of the County Zoning Ordinance.

3.8 Site Features, including Utilities and Easements

Existing site features are shown in Figures 3a, b, and c, and Appendix C provides the easements. The following utilities are necessary for operation and are available at the site:

- **Power:** Electricity will be supplied by Pacific Gas and Electric Company. Total connected load is estimated at approximately 10 megawatts (MW) with a net load of approximately 6 MW. Backup power generation will be provided by four diesel generators with a capacity to provide approximately 6 MW on a continuous basis.

- **Water:** The Idaho-Maryland Mine will have a surplus of water from the natural groundwater flow into the underground workings. Once dewatering is completed, approximately 1.9 cubic feet per second (cfs), 850 gallons per a minute (approximately 1,224,000 gallons per a day) are estimated to be pumped to the surface and settling pond. This water will support all operation-related water demand. Total consumptive water requirements are estimated at 123,000 gallons per day. Potable water for sinks, toilets, and showers installed in buildings at the Brunswick Industrial Site will be purchased from Nevada Irrigation District (NID). Water for compaction and dust suppression at the Centennial Industrial Site will also be purchased from NID. Approximately 42,000 gallons of water per day may be required for dust suppression and compaction. Compaction of the engineered fill, conducted 8 hours per day, 5 day per week, requires up to 125 gallons of water per minute.
- **Sewage:** An on-site septic field system will be built at the Brunswick Industrial Site for toilets, sinks, and shower facilities planned. The operation will include providing sanitary systems using portable chemical toilets and hand-washing stations to employees working underground and at the Centennial Industrial Site.

3.9 Topography, Climate Characteristics, and Soil Types

3.9.1 Topography

The elevation of the site ranges from approximately 2,500 feet mean sea level (msl) on the Centennial Industrial Site to 3,000 feet msl on the Brunswick Industrial Site. The topography of the sites varies between flat ridges and valleys to gently and moderately sloping hillsides.

3.9.2 Climate

Summers in the property area are hot, arid, and mostly clear and the winters are long, cold, wet, and partly cloudy. Over the course of the year, the average temperature typically varies from 39°F to 88°F and is rarely below 32°F or above 95°F (Weather Spark 2019).

3.9.3 Soil Types

The U.S. Department of Agriculture (USDA) identifies several soil types within the property. Figure 6, "Site Soils," shows the locations of these soil types on-site.

Brunswick Industrial Site

The USDA Soil Survey Mapper (Web Soil Survey 2019) indicates that the Brunswick Industrial Site includes 10 soil types: Aiken loam on 9 to 15 percent slopes (AfC), Aiken loam on 15 to 30 percent slopes (AfD), Aiken loam on 30 to 50 percent slopes (AfE), Alluvial land, clayey (Ao), Cohasset loam, summits, on 2 to 15 percent slopes (CmB), Cohasset loam, shoulders, on 3 to 20 percent slopes (CmC), Cohasset loam, back slopes, on 5 to 30 percent slopes (CmD), Cohasset cobbly loam on 5 to 30 percent slopes (CoD), Placer diggings (Pr), and Sites loam on 15 to 30 percent slopes (SID). These soil types are described in detail below and are shown in Figure 6:

- **Aiken loam on 9 to 15 percent slopes (AfC):** The Aiken series consists of deep, well-drained soils typically occurring on ridgetops and side slopes of andesitic flows. These soils form from the weathering of volcanic rock. Drainage is moderately slow with a medium rate of surface runoff. The Aiken series is not hydric. A typical profile for this series consists of dark to reddish brown (5YR 3/3) loam from 0 to 11 inches. This layer is underlain by a yellowish

red (5YR 4/6) loam from 11 to 21 inches. A dark red (2.5 YR 3/6) loam is present from 21 to 29 inches followed by a clay loam layer of the same color from 29 to 42 inches. From 42 to 52 inches is yellowish red (5YR 4/6) clay loam which is underlain by a reddish brown (SYR 4/4) clay loam. This layer is underlain by bedrock.

- **Aiken loam on 15 to 30 percent slopes (AfD):** The description of this soil is the same as the AfC description, only it is found on steeper slopes.
- **Aiken loam on 30 to 50 percent slopes (AfE):** The description of this soil is the same as the AfC description, only it is found on steeper slopes than AfD soils.
- **Alluvial land, clayey (Ao):** This series consists of moderately well-drained soils in floodplains and drainages. These soils formed from alluvium derived from granitic or mixed metabasic rocks. Permeability and runoff are both slow. This is a hydric soil. A typical soil for alluvial soils consists of 3 to 10 inches of sandy loam or loam underlain by 30 to 45 inches of a clay loam.
- **Cohasset loam, summits, on 2 to 15 percent slopes (CmB):** The Cohasset series consists of well-drained soils on ridgetops and side slopes. These soils formed from weathered volcanic rock. Drainage is moderate and runoff is slow to rapid. These soils are not hydric. A typical profile for the Cohasset series consists of pine and fir needles from 0 to 3 inches. This layer is underlain by a dark reddish brown (ranges from 5YR 3/2, 3/3, 3/4) cobbly loam from 0 to 24 inches. This layer is underlain by a dark reddish brown (5YR 3/4 or 4/4) cobbly clay loam from 24 to 96 inches. At 96 inches is a weathered andesitic conglomerate.
- **Cohasset loam, shoulders, on 3 to 20 percent slopes (CmC):** The description of this soil is the same as the CmB description, only it is found on steeper slopes and shoulders.
- **Cohasset loam, backslopes, on 5 to 30 percent slopes (CmD):** The description of this soil is the same as the CmB description above, only it is found on steeper slopes and backslopes.
- **Cohasset cobbly loam on 5 to 30 percent slopes (CoD):** The description of this soil is the same as the CmB description above, only it is found on steeper slopes and is a cobbly loam rather than a Cohasset loam like CmB, CmC, and CmD above, containing a mixture of cobbles within the loamy soil.
- **Placer diggings (Pr):** The soil series description for Placer diggings is above within the descriptions for the Centennial Industrial Site area.
- **Sites loam on 15 to 30 percent slopes (SID):** The Sites series consists of well drained soils that occur in mountain uplands. The soils formed from weathered residuum of metabasic and metasedimentary rocks. Drainage is moderately soil and runoff is slow to very high. This soil is not hydric. A typical profile for this complex consists of dark reddish brown loam (5YR 3/4) from 0 to 3 inches. This layer is underlain by yellowish red loam (5YR 4/6) from 3 to 12 inches. From 12 to 23 inches is a layer of red (2.5 YR 4/6) clay loam. This layer is underlain by red (10R 4/6) clay from 23 to 56 inches and red (10R 4/8) light clay from 53 to 69 inches. From 68 to 78 inches is a red (2Y 4/8) clay loam underlain at 78 inches by a layer of weathered metasedimentary rock.

Centennial Industrial Site

The USDA Soil Survey Mapper (Web Soil Survey 2019) indicates that the Centennial Industrial Site includes four soil types: cut and fill land (Ct), Placer diggings (Pr), Rock outcrop-Dubakella complex on 5 to 50 percent slopes (RrE), and Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE). These soil types are described in detail below and are shown in Figure 6:

- **Cut and fill land (Ct):** This soil type consists of areas that have been altered by activities other than mining such that there are no intact soil characteristics. This soil is not hydric.
- **Placer diggings (Pr):** The Placer diggings series consists of remnant tertiary river deposits associated with hydraulic mining and placer mining operations as well natural deposits within stream channels. Areas with this soil type are 90 to 100 percent rock, cobble or gravel. 50 to 75 percent of these lands have a mixture of rock, cobbles, gravel, and soil. This soil contains unnamed hydric inclusions in drainages and depressions.
- **Rock outcrop-Dubakella complex on 5 to 50 percent slopes (RrE):** The rock outcrop-Dubakella complex consists of well-drained soils on mountains. This complex is made up of 50 percent Dubakella gravelly loam, 40 percent rock outcrop, and 10 percent included soils. These soils formed from weathered rocks with a large amount of serpentinitic minerals. Drainage is slow and runoff is very high. These soils are not hydric. A typical profile for this complex consists of dark-brown (7.5YR 3/2) gravelly loam from 0 to 2 inches underlain by a reddish-brown (5YR 3/4) gravelly clay loam from 2 to 10 inches. This layer is underlain by a variegated yellowish-brown (10YR 4/4) and reddish-brown (7.5YR 4/4) very cobbly clay from 11 to 21 inches. This layer underlain by a blue-green, hard, fractured and partly weathered serpentinized layer at 21 inches.
- **Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE):** This complex consists of moderately well-drained soils on gently sloping to steep mountain terrain. These soils formed from basic igneous and metamorphic rock. Drainage is slow and runoff is slow to rapid. These soils are not hydric. A typical profile for Secca-Rock outcrop complex consists of brown (5YR 3/4), gravelly, silt loam from 0 to 6 inches. This layer is underlain by a reddish-brown (5YR 3/4), gravelly, silt loam from 6 to 15 inches. This layer is underlain by dark-reddish-brown (5YR 3/4), cobbly, silty clay loam from 15 to 22 inches. From 22 to 36 inches is a strong brown (7.5YR 4/4), cobbly clay, which is underlain by a yellowish-brown (10YR 5/6), cobbly clay from 36 to 45 inches. At 45 inches is weathered metabasic rock.

3.10 Geology of the Site and Surrounding Area

The site is located within a region underlain by a complex assemblage of igneous and metamorphic rocks in the western foothills of the Sierra Nevada. The regional structure of the foothills is characterized by the north-northwest trending Foothills Fault System, a feature formed during the Mesozoic era (between approximately 65 million and 248 million years agio) in a compressional tectonic environment. A checnge to an extensional tectonic environments during the late Cenozoic (approximately within the last 30 million years), resulted in normal faulting which has occurred coincident with some segments of the older faults near the site.

According to the *Geologic Map of the Chico Quadrangle, California* (California Department of Conservation, Division of Mines and Geology, 1992) the northern and central portion of the site is underlain by massive diabase, and the southeastern portion of the site is underlain by metavolcanic rocks. Both of these units are associated with the Mesozoic Lake Combie Complex. The south and southwester portion of the site is mapped as Miocene to Pliocene volcanics, predominantly andesitic pyroclastic rocks. The Mesozoic era spans the period of time between 525 and 66 million years before present and the Miocene to Pliocene epochs span the period of time between 23 and 2.6 million years before present. See Figure 7, "Geology."

The *Geologic Map of the Grass Valley – Colfax Areas* (A. Tuminas, 1983) presents the findings of a more detailed local study. According to this geologic map, one inferred fault trends north-northwest through the center of the site with four rock units mapped underlying the site. The eastern portion of the site is

mapped as early Mesozoic Lake Combie metavolcanic rock. The northern and western sloping flanks of the site are mapped as early Mesozoic Lake Combie massive diabase. The lower valley portions encompassing the South Form of Wolf Creek is mapped as Quaternary alluvium. Tertiary clastic strata of the volcanic Mehrten formation is mapped in the south and southwestern -portion of the site.

3.11 Hydrological Setting

The following subsections include descriptions of the surface water and groundwater hydrology related to the Idaho-Maryland Mine site.

3.11.1 Surface Water

The site includes two perennial streams: South Fork Wolf Creek and Wolf Creek. Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Industrial Site. South Fork Wolf Creek begins within the Brunswick Industrial Site (forming near an existing large, clay-lined pond) and runs within the northwestern section of the Brunswick Industrial Site before heading northwest along the southern side of East Bennett Road, where it eventually connects with the main stem of Wolf Creek within the City of Grass Valley (west of the Centennial Industrial Site). Water within the site drains generally to Wolf Creek or South Fork Wolf Creek.

Natural hydrological sources for the site include precipitation, upstream drainage, and surface runoff from adjacent lands. Mean annual rainfall in the area is 53.74 inches (NRCS 2018).

Brunswick Industrial Site

South Fork Wolf Creek, a perennial stream, begins along the southwest side of a large clay-lined pond and is fed by surface drainage from a large culvert that runs underneath the Brunswick Industrial Site. The large culvert connecting to South Fork Wolf Creek is not connected to the large, clay-lined pond. Several additional mapped intermittent and ephemeral streams cross the Brunswick Industrial Site and flow towards South Fork Wolf Creek. Surface and subsurface hydrologic inputs combine in this area to support a large continuous wetland across much of the northwestern section of the site (see Appendix E, "Brunswick Industrial Site and East Bennett Road Right of Way (ROW) Biological Resources Assessment").

Centennial Industrial Site

Wolf Creek, a perennial creek, runs along the north side of the Centennial Industrial Site from east to west. A pond located just east of the Centennial Industrial Site drains onto the property through a culvert providing a regular source of water for the eastern and northern portions of the site. An unnamed drainage flows onto the Centennial Industrial Site from a neighboring property to the west and feeds into the northwestern wetland complex. A small spring feeds water in a small wetland and a small drainage connecting another small wetland.

The wetlands and waters in the eastern portion of this site drain to the northwest through an apparent artificial intermittent drainage. This drainage ends in an area containing Fremont cottonwood trees in the northwest portion of the site and flows into the main stem of Wolf Creek through several culverts. Each of the mapped wetlands and drainage features within this site has a

direct connection to Wolf Creek (see Appendix F, "Centennial Industrial Site Biological Resources Assessment").

3.11.2 Groundwater

Groundwater occurs within fractured bedrock at and near the site. No alluvial groundwater basins are near the mine site (DWR 2019). The nearest groundwater basin is the South Yuba portion of the Sacramento Valley groundwater basin (DWR Basin No. 5-21.61), located more than 15 miles west of Grass Valley.

3.12 Biological Setting

The site is located in the northern-central Sierra Nevada foothills. The Sierra Nevada foothills lie between the western edge of the Sierra Nevada and the eastern border of the Central Valley. The foothills form a belt 10 to 30 miles wide that ranges from 500 to 5,000 feet in elevation in a series of northwest to north-northwest aligned ridges that decline in elevation from northeast to southwest. Many rapidly flowing rivers and streams run westerly in deeply incised canyons with bedrock channels to the Central Valley and eventually to the Pacific Ocean. Alluvial fans, floodplains, and terraces are not extensive; and all but the largest streams are generally dry during the summer. Dominant vegetation communities include grasslands, oak woodlands, and chaparral.

Within the site, terrain varies between flat ridges and valleys to gently and moderately sloping hillsides. Site elevation ranges from approximately 2,600 to 2,800 feet msl. The site is located between Wolf Creek and South Fork Wolf Creek.

Primary upland habitats within the site areas include ponderosa pine, montane hardwood, montane hardwood-conifer, mixed chaparral, annual grassland, Sierran mixed conifer forest, montane riparian, wet meadow and seasonal wetlands, freshwater emergent marsh wetlands, and a large pond.

See Appendix E and F for the Brunswick Industrial Site and Centennial Industrial Site biological resources assessments.

3.12.1 Special-Status Species

Plant Species

The Pine Hill flannelbush (*Fremontodendron decumbens)* special-status plant species was identified on the Centennial Industrial Site.

No special-status plant species were identified on the Brunswick Industrial Site

The site does not contain protected oak resources per the Nevada County Land Use and Development Code.

Wildlife Species

The California Natural Diversity Database 5-mile buffer search revealed six special-status wildlife species that have previously been identified and mapped within 5 miles of the mine sites:

- California black rail *(Laterallus jamaicensis coturiculus)*,
- Cooper's hawk *(Accipiter cooperii)*,

- coast horned lizard *(Phrynosoma blainvillii),*
- western bumble bee *(Bombus occidentalis),*
- foothill yellow-legged frog *(Rana boylii), and*
- Townsend's big-eared bat *(Corynorhinus townsendii).*

Two additional species have the potential to occur given the presence of perennial streams and a large pond within the sites:

- western pond turtle *(Emys marmorata)* and
- California red-legged frog *(Rana aurora draytonii).*

3.12.2 Wetlands

Within the Brunswick Industrial Site and East Bennet Road right-of-way, a total of 9.44 acres of waters of the United States, including wetlands, was identified and mapped. The 9.44 acres of wetland waters includes 8.72 acres of mapped wetlands and 0.72 acres of mapped other waters of the United States, including South Fork Wolf Creek and several intermittent and ephemeral streams.

Within the Centennial Industrial Site, a total of 4.97 acres of waters of the United States, including wetlands, was identified and mapped. The 4.97 acres of wetland waters includes 4.37 acres of mapped wetlands and 0.60 acres of mapped other waters of the United States, including the main stem of Wolf Creek and several intermittent and ephemeral streams.

4. MINING

The following sections provide an overview of the mining operation.

4.1 Brunswick Industrial Site

The site plan for the Brunswick Industrial Site comprises five areas: aboveground site facilities, underground mining, treated and potable water pipelines, the Brunswick engineered fill area, and outfall for the treated water to South Fork Wolf Creek (see Sheet 1–3 and 6). The approximately 29-acre aboveground area will provide all the facilities and infrastructure necessary to support dewatering, underground mining, gold mineralization and rock processing, and loading and transport off-site. An aboveground pipe will convey treated water from the water treatment facility at the Brunswick Industrial Site along an existing trail to the planned discharge point at South Fork Wolf Creek. The pipe and discharge point are located entirely within the property boundaries. Engineered fill will be placed on approximately 31 acres of the Brunswick Industrial Site to create a level pad of approximately 21 acres for future industrial use. In total, up to approximately 60 of the 119-acre site could be subject to surface disturbance and/or development for the aboveground facilities and fill placement. Removal of vegetation and overburden preceding disturbance activities will be limited to those areas where disturbance is necessary to implement operation activities. The remaining 59 acres will remain as open space and will not be subject to surface disturbance or infrastructure improvements (see Sheets 1–3).

Surface drilling on the Brunswick Industrial Site is an allowed use on property zoned Light Industrial (M1). Drilling is conducted to characterize underground resources in anticipation of future mining. Core from the drilling is logged and samples are analyzed off-site.

4.2 Centennial Industrial Site

Engineered fill will be transported by truck from the Brunswick Industrial Site and placed on approximately 44 acres of the Centennial Industrial Site to create approximately 37 acres for future industrial use (see Sheets 4–6). Removal of vegetation and overburden preceding disturbance activities will be kept to a minimum. The remaining approximately 12 acres will remain as a private driveway for site access and open space. The open space area will include Wolf Creek, a 100-foot setback area on Wolf Creek, and an undisturbed zone containing special status plant species.

4.3 Material Quantity and Type

Approximately 20 tons of gold concentrate will be produced and bagged on-site per day. Engineered fill is generated as a waste by-product of the gold mining process. Engineered fill consists of crushed barren rock and sand tailings not returned to the underground mine as fill. Underground mine development is expected to result in the production of approximately 500 tons per day (182,500 tons per year) of barren rock (i.e. unmineralized rock). Tunneling and long-hole blasting produces 1,000 tons of gold mineralization per day (365,000 tons per year). The site is proposed to be permitted for 80 years.

4.4 Mining Initiation and Termination Dates

The operation will begin upon approval of the use permit and continue for 80 years from the date of approval, approximately December 31, 2099.

4.5 Equipment Storage

Equipment and supplies are to be stored inside the various buildings to be constructed on the Brunswick Industrial Site, as shown in Sheet 1–3.

5. RECLAMATION

5.1 Subsequent Use and Approach

The reclaimed land use plan for the sites following mining is industrial and open space. Additional surfaces for industrial use will be created on-site through placement of engineered fill, a by-product of the underground mining. The majority of facilities and infrastructure added to the Brunswick Industrial Site will remain on-site to support future industrial uses. Open space of 12 acres on the Centennial Industrial Site will include Wolf Creek, a 100-foot setback on Wolf Creek, and an undisturbed zone containing special status plant species. An undisturbed area of 59 acres on the Brunswick Industrial Site will include South Fork Wolf Creek, a large area of meadow wetlands and riparian wetlands, and surrounding areas.

5.2 Future Mining Potential and Impact of Reclamation on Surrounding Land Uses

Reclamation activities will not physically or economically preclude future access to mineral resources, should additional recovery be pursued in the future. The engineered fill pads will facilitate future industrial use of the site, consistent with the industrial use designations provided in the *Nevada County General Plan* and County Zoning Ordinance. The open space that would be left in place on-site would have no impacts.

5.3 Soil Resources, Salvage, and Storage

The following subsections provide details on when and how vegetation, topsoil, and mine waste materials (i.e., crushed barren rock and sand tailings not returned to the underground mine as fill) are to be removed and stored. See Section 3.9.3, "Soil Types," for details on soil redistribution. See Section 5.13, "Phased Reclamation," for details on the timing of mining and reclamation activities.

5.3.1 Topsoil and Vegetation Stripping and Salvaging

When areas are graded for placement of engineered fill, facilities, and infrastructure, available topsoil will be salvaged from those areas and stockpiled on-site. Before topsoil is salvaged, the area will be cleared of woody vegetation and root balls using chainsaws and a portable excavator. Plant debris will be chipped in place and spread on the topsoil. This organic matter will be blended with the topsoil during harvest. In addition, topsoil may be imported to augment the topsoil available on-site.

Salvaging topsoil for reclamation helps ensure productivity of reclaimed lands. Identifying topsoil locations and depth is important to securing appropriate topsoil in optimal locations. Topsoil depth can vary and can be identified by color. When bright-colored earth tones or distinct color change occurs, it usually means topsoil has ended.

5.3.2 Topsoil Stockpiling

The following actions will be implemented related to topsoil stockpiles:

- Topsoil and vegetation will not be removed more than 1 year before necessary and will be kept to a minimum.
- After topsoil is stripped, it will be hauled and stored if it cannot be used at that time for concurrent reclamation activities.
- Topsoil will be stockpiled in a manner that will not obstruct natural drainage.
- The topsoil will be compacted as little as possible. If compacting of a portion of the stockpiles is necessary for stability, compacting will occur to the minimum extent necessary. Topsoil compaction will not be such that its ability to perform as a planting medium will be compromised.
- Topsoil stockpiles will be protected from sediment transport by surface roughening, watering, and perimeter silt fencing.
- Topsoil stockpile areas will be identified and well-marked.
- Relocation of topsoil after it is stockpiled will be minimized.
- If topsoil is stored during the winter rainy season, erosion control measures will be implemented. See Section 5.5 for erosion control measures.
- A small bulldozer or similar equipment will be used to rip and blend the soil materials as necessary.
- To the extent feasible, rocks and plant material in excess of 4 inches in greatest dimension should be removed from the topsoil.
- Any topsoil stockpile remaining longer than 30 days will be seeded with a sterile temporary cover or the specified erosion-control seed mixture.

5.3.3 Overburden and Mine Waste Stockpiling

Any overburden that must be removed from the surface, if it will not be immediately transported to the fills areas, will be stockpiled for future use.

Barren rock will be crushed underground to specification meeting engineered fill criteria, skipped to the surface, and stored in a concrete silo, as shown in Sheets 1–3. The engineered fill will be conveyed from the silo to a truck loadout facility.

No piles or dumps will be placed in wetlands or any waters of the U.S. without mitigation.

5.4 Geotechnical

The following subsections cover cut and fill slopes and compaction specifications.

5.4.1 Cut Slopes

This is an underground mine. Thus, cut slopes on-site will consist of grading to repair a pond berm and to create the service shaft collar, the building pad, the entrance area, roads, and the engineered fill area. The topography and design for these areas is shown in Sheets 1–6.

5.4.2 Final Slopes

Rise will use the engineered fill generated as waste by-product of the gold mining process to create the engineered fill areas. The topography and design for these areas is shown in Sheets 1–6. The engineered fill areas for both sites will include placing, grading, and compacting the fill in a series of lifts (see Section 5.4.3, "Compaction" for details).

The proposed fill slopes will be addressed like any other engineered fill slope designed to support roadways or foundations. Thus, the local building code (including Chapter 18/18A and Appendix J of the California Building Code) will govern the grading design.

The fill slopes will be 3:1 (horizontal to vertical). Consistent with SMARA Section 3704(d), final reclaimed fill slopes will not exceed 2:1, and therefore, no site-specific geologic and engineering analysis would be required in order to show slope stability. The proposed fill material will comprise a flexible composite range of blast rock and sand tailings produced underground. The predicted "critical gradient" (angle of repose/angle of internal friction) for compacted angular gravel and cobbles is 45 degrees (approximately 1:1), and for medium dense (compacted) sand it is 35–40 degrees (approximately 1.3:1 to 1.1:1 slopes). The inclusion of silt into these compacted granular materials would provide additional cohesion, and therefore would increase the friction angle of the fill. A conservative critical gradient of the proposed fill, for design purposes, would be 35 degrees. This would include the lower end of medium dense sand with no rock, or a fill comprising only the sand tailings. However, the fill slope angle will be 3:1, or 18.4 degrees, which is half of the conservative critical gradient estimate for the proposed fill material. Following completion of fill activities, the fill slopes will be revegetated to control erosion and ensure slope stability.

Details on each engineered fill area are provided in the following subsections.

Brunswick Industrial Site

Engineered fill will be transported across the Brunswick Industrial Site using haul trucks for placement on an approximately 31-acre area for future industrial use. The elevation of the fill will be between 2,820 and 2,830 msl (approximately 80 feet to 90 feet above ground surface).

Centennial Industrial Site

The fill will be transported by truck from the Brunswick Industrial Site to the Centennial Industrial Site for placement on an approximately 44-acre area to create a pad for future industrial uses. Engineered fill will be placed to an elevation between 2,520 and 2,570 msl (approximately 30 to 70 feet above ground surface).

5.4.3 Compaction

Engineered fill will be processed, moisture conditioned, placed and compacted in accordance with the geotechnical recommendations and the California Building Code, including compaction testing and oversight by geotechnical specialists during construction.

5.5 Grading, Drainage, and Erosion Control

The site is designed to include erosion-control methods sufficient for a 20-year, 1-hour intensity return frequency interval (or intensity duration frequency) storm event and be consistent with Nevada County Ordinance section L-II 3.22(G)(3) regarding protection of water quality and quantity. BMPs for construction, operation, and reclamation activities will be applied as outlined in the storm water pollution prevention plan (SWPPP). Temporary measures such as silt fences, berms, hay bales, or similar means to deter erosion may be employed as necessary at locations of identified concern, depending upon the particular configuration of the grading work and roadways. Engineered fill will be stored in silos and topsoil and overburden stockpiles will comply with BMPs. Processing equipment is stored underground and in enclosed structures, where material processing is also performed, which will prevent stormwater from coming in contact with pollutants. In accordance with the SWPPP, an inspection for erosion of slopes, drainage channels, and unpaved areas at the facility is completed after each significant rain storm. The SWPPP is required to be revised and implemented prior to specific changes in industrial activities, as specified by the National Pollutant Discharge Elimination System General Permit.

Both the Brunswick and Centennial Industrial Sites include stormwater drainage, storage, and conveyance features meeting County requirements. As shown on Sheets 1–3, the developed portions of the Brunswick Industrial Site will be graded to drain into storm drain lines. In addition, concrete-lined v-ditches will be constructed at the top and toe of the engineered fill pad. The storm drain lines and v-ditches will transport stormwater flows to a detention basin. The detention basin is designed to accommodate up to a 100-year storm event and discharge into South Wolf Creek.

As described in Appendix G, "Drainage Study," engineered fill will be brought onto the Centennial Industrial Site to construct a pad for future development. The engineered fill pad will be surrounded by both storm drain lines and concrete v-ditches that transport stormwater flows to a detention basin designed to accommodate up to a 100-year storm event. The detention basin will discharge to the existing discharge point into Wolf Creek.

The proposed detention basins at each site are intentionally located at the downstream toe of each fill site. This is done so that they may be constructed and made functional relatively early in the process of the fill

operations. Therefore, as the fill areas rise throughout the anticipated duration of this portion of the mining operation, flows will be directed to these facilities via the drainage pipes, which proceed downhill from the surface of the fill, allowing the flows to be directed to the detention basins. These pipes in the proposed 3:1 slope, at any given point in the process of placing the fills, will be extended up slope from the detention basins to the then current surface. Interceptor ditches and catchment sumps will be formed at the surface and will be replaced periodically as the fill operation progresses and the surface elevation rises. Thus, site drainage will continually be positively controlled throughout the process of the engineered fill placement operation.

Spillways are designed to be constructed from concrete to prevent erosion.

5.6 Disposal of Mine Waste and Overburden

Mine waste and overburden will be placed as engineered fill on the Brunswick and Centennial Industrial Sites, as shown in Sheets 1–6. Approximately 1.6 million tons of engineered fill over a 5-year period will be trucked from the Brunswick Industrial Site to the Centennial Industrial Site for placement and compaction. The final grading will result in the development of 37 acres of flat developable land on property zoned industrial. Following completion of fill placement at the Centennial Industrial Site, engineered fill will be transported from silos on the Brunswick Industrial Site for placement, where approximately 2.2 million tons of engineered fill over a 6-year period will be placed and compacted to result in approximately 21 acres of flat developable land on property zoned industrial. Engineered fill produced will also be used in the local and regional construction markets.

5.7 Soil Amendments and Topsoil Placement

After final grading activities have been completed, planting areas will be prepared for the 3:1 engineered fill slopes. Topsoil will be placed to a uniform depth of approximately 6 inches. No fertilizers or soil amendments are planned to be used, but would be applied if determined to be necessary. If test plots or monitoring of revegetation (see section 58 below) identifies potential topsoil issues, topsoil analysis will be conducted to determine the need for potential supplements, fertilizers, or soil amendments.

5.8 Revegetation

As explained in section 5.1 above, the reclaimed land use plan for the sites following mining is industrial and open space. Additional surfaces for industrial use will be created on-site through placement of engineered fill, a by-product of the underground mining. The only portion of the sites requiring revegetation treatment are the slopes of the fill stockpiles to minimize erosion and maintain fill slope stability.

5.8.1 Vegetation

Following the completion of each fill stockpile lift/level, the fill slopes will be hydroseeded with an erosion-control native seed mix to reduce erosion and maintain fill slope stability. See Table 3, "Seed List," for a complete list of native seeds. The hydroseed mix is consistent with erosion control seed mixes used by Caltrans and County Public Works in the surrounding area. As a result, no baseline studies to document surrounding vegetation will be conducted. Irrigation will be used as necessary to support revegetation. If irrigation is required, revegetation will be shown to be self-sustaining for two-years prior to release of the financial assurance cost estimate. Upon completion of the fill stockpiles, the flat surface of the fill pads will be revegetated.

TABLE 3
SEED LIST[1]

Common Name	Latin Name
Lotus purshianus	4.4
Nassella cernua	2.2
Bromus carinatus	13.8
Festuca rubra molate	2.4
Hordeum californicum	7.1
Leymus triticoides	3.1
	TOTAL: 33 POUNDS PLS PER ACRE

Note: PLS= Pure Live Seed.
[1] Minor species and/or quantity adjustment may be made based on availability at the time of purchase.

5.8.2 Revegetation Timing and Protection

Planting shall be conducted during the most favorable period of the year for plant establishment typically late fall prior to winter rains. Measures to prevent potential erosion of seeded areas will be implemented as necessary and could include silt fences, hay bales, wattles, or similar means to deter erosion. Protection measures such as high visibility fencing shall be used where needed to prevent unauthorized vehicle access or trespass. Pedestrian access to the revegetated fill slopes will be prevented through signage and fencing, as necessary. Protection measures shall be maintained until revegetation efforts are successfully.

5.8.3 Test Plots

Test plots may be required to determine the suitability of growth media, refine the seed mix, determine appropriate seed mix application rates, and other factors affecting revegetation success. To the extent necessary, 100-foot x 100-foot test plots, as well as control and no seed plot areas, will be established. These plots will be representative of fill stockpile slopes. The test plots will be maintained and monitored, and tests will be conducted to refine revegetation techniques and seeding rates. Additional tests will be conducted if the initial tests and active revegetation are not successful. Test plots shall begin after the first level of the fill stockpile has been graded to ensure successful implementation of the proposed revegetation plan.

5.8.4 Revegetation Success Criteria

Performance standards will be measured through comparisons of species richness, absolute plant cover, species composition, and the presence of noxious weeds. Acceptable threshold values for each of these parameters are presented in Table 4, "Performance Standards for Revegetation Areas." This table describes the minimum targets for plant survival, species composition, and plant cover. These performance standards were tailored based on growth patterns for the plants in Table 3, above. Performance standards represent anticipated conditions three (3) years after installation.

TABLE 4
PERFORMANCE STANDARDS FOR REVEGETATED AREAS

Performance Criteria	Year 1	Year 2	Year 3
Species Richness	25%	50%	65%
Plant Cover	25%	50%	65%
Noxious Weed Cover	<30%	<30%	<20%

5.8.5 Monitoring and Maintenance

Monitoring

A qualified biologist, restoration ecologist, or revegetation specialist will monitor revegetated fill slope conditions following revegetation. General site inspections will be conducted twice per year, before the rainy season (approximately September) and after the rainy season (approximately March). Revegetation sites will be identified on a map and monitored to assure revegetation adequately achieved within a minimum of 80 percent confidence levels. Sampling plots will be selected randomly throughout the areas seeded with grasses to determine success. These assessments will document the general site conditions and identify immediate maintenance needs, such as weed control, soil amendments/conditioners, and erosion repair, or additional analysis (e.g., soil analysis, alternative seed mix) to ensure revegetation success.

Maintenance

Maintenance of revegetated areas, including weed control, will occur as necessary based on monitoring. Maintenance of revegetated areas will consist of reseeding unsuccessful revegetation areas to the extent necessary, to limit the extent of noxious weeds, and to repair erosion damage. If revegetation efforts are not successful within five (5) years following initial seeding, the underperforming areas will be re-evaluated to determine measures necessary to improve performance.

5.9 Weed Abatement

After revegetation of the engineered fill slopes, targeted invasive plants will be removed and maintained using a combination of mechanical (e.g., mowing or pruning) and chemical (i.e., herbicide application) methods. The site will be monitored to determine the appropriate time to mow or plan for herbicide applications.

Revegetation of the mined slopes is planned to discourage weedy species by incorporating fast-growing annual species as a deterrent and by limiting water and nutrient soil conditions to those most favorable to annual and perennial grass species.

5.10 Environmental Protections

SMARA Section 2772.1(a)(7)(B) requires that official copy of the reclamation plan amendment include an index showing any permit conditions of approval or binding mitigation measures adopted or certified pursuant to the California Environmental Quality Act that are necessary to comply with SMARA and the County's Surface Mining Ordinance. Those conditions of approval and mitigation measures are included in an Appendix D and are considered part of the reclamation compliance requirements and subject to the annual inspection requirements.

The following subsections describe actions to protect biological resources, water quality and drainages, and control erosion.

5.10.1 Sensitive Species and Habitat

As described in Section 3.12 above, the site contains potentially suitable biological habitat for several special-status wildlife and bird species. In addition to special-status species, nests of nearly all other native birds are protected by the Migratory Bird Treaty Act and California Fish and Game Code. The project will comply with County use permit conditions of approval, Nevada County Ordinance section L-II 4.3.12, and responsible agency (e.g., United States Fish & Wildlife Service, United States Army Corps of Engineers) permit requirements for the protection of special status species. In addition to those requirements, reasonable measures such as area avoidance, buffers, preconstruction surveys, and additional state or federal permitting may be undertaken to avoid potential impacts to special status species.

Development of the site will result in the removal of some regulated aquatic features. These aquatic features may be within the jurisdiction of the Army Corps of Engineers (ACOE) under Section 404 of the Clean Water Act (CWA; except the ephemeral streams) and the Regional Water Quality Control Board (RWQCB) under Section 401 of the CWA and the Porter-Cologne Act. California Department of Fish and Wildlife (CDFW) jurisdiction within the site includes the ephemeral streams. The "fill" of these aquatic features requires permits from the beforementioned agencies. The operator will obtain all required resource agency permits approvals prior to disturbance within jurisdictional waters and wetlands and will comply with any specific conditions of those approvals. Permit approvals may include a Section 404 Permit from the ACOE, a Section 401 Water Quality Certification from the RWQCB, and a Section 1602 Lake and Streambed Alteration Agreement from the CDFW.

Consistent with Nevada County Ordinance section L-II 4.3.12, management plans have been prepared for the Pine Hill Flannelbush and onsite aquatic features. These management plans are included as Appendix H, "Centennial Industrial Site Habitat Management Plan for the Pine Hill Flannelbush," Appendix I, "Brunswick Industrial Site, Idaho Maryland Mine Project, Watercourse/Wetlands/Riparian Areas Management Plan," and Appendix J, "Centennial Industrial Site, Idaho Maryland Mine Project, Watercourse/Wetlands/Riparian Areas Management Plan." In addition, the Biological Resources Assessments included in Appendix E and F provide recommended protection measures. If the lead agency accepts these measures, or other biological protection measures are approved as part of the environmental review process, they will be incorporated as appropriate and required by 2772.1(a)(7)(B).

5.10.2 Surface Water Protection

Best management practices (BMPs) will include good housekeeping, preventative maintenance, spill prevention and response, stormwater management practices, employee training, inspections, and monitoring. A SWPPP (under the Statewide General Permit for Storm Water Discharges Associated with Industrial Activities, Order 2014-0057-DWQ as amended by 2015-0122-DWQ [2018]) will be prepared before operations begin.

The site design and actions to control drainage, siltation, and erosion will be effective in protecting downstream beneficial uses of surface water in accordance with the Porter-Cologne Water Quality Control Act, Water Code § 13000, et seq., and the federal Clean Water Act, 33 U.S. Code § 1251, et seq.

5.10.3 Groundwater Protection

BMPs will be included in the industrial SWPPP that will help to protect surface water from exposure to contaminants and thus reduce the potential for contaminants in groundwater related to mining and reclamation activities.

5.10.4 Groundwater Recharge

The actions that would occur as part of the operation on-site would not reduce the potential for groundwater recharge through the compaction of soils or installation of impermeable surfaces (e.g., pavement) in areas where those effects have not already occurred as part of past activities. The development of new operating facilities and infrastructure, including installation of the potable water lines, would occur on land that has already been disturbed and partially paved for previous industrial activities on the sites. Installation of the potable water lines and the treated water discharge line would occur within East Bennett Road and across industrial land between East Bennett Road and Wolf Creek. These areas consist of paved, disturbed, and previously compacted soils due to the long history of industrial and public right-of-way uses along the pipeline route.

The areas of engineered fill placement will affect areas where the native soils have already been compacted from past industrial activities. Engineered fill will be placed to develop pads for future industrial uses of this property, consistent with current zoning.

5.10.5 Floodplain and State Highway Bridge Protection

No state highway bridges are within 1 mile up- or downstream of either site. The northern boundary of the Centennial Industrial Site, in the area of Wolf Creek, is within a high-risk floodplain area (see Figure 8, "Centennial Industrial Site Floodplain Area"); however, the remaining area of the site is not within the floodplain (FEMA 2019) and site activities and engineered fill would be set back 100 feet from Wolf Creek (see Sheets 4 and 5). The Brunswick Industrial Site is not within the floodplain (FEMA 2019).

5.11 Public Safety Considerations

5.11.1 Land Status

The site is private property. The postmining land use of industrial will not increase the level of public exposure to the site. Final fill slopes are consistent with SMARA and therefore will not pose safety hazard.

5.11.2 Access

Access to the sites is through gated entrances. Security will be provided during construction at the Centennial Industrial Site. The Brunswick Industrial Site is fenced and gated; these features will remain at reclamation.

5.12 Removal and Closure Activities

The following subsections describe those operation components that will be removed or remain and their related reclamation activities.

5.12.1 Waste Disposal

Mine waste disposal is required to be consistent with Title 27, Chapter 7, Article 1 of the California Code of Regulations (CCR) (formerly codified as CCR Title 23, Chapter 15, Article 7). No waste from mining remains on-site. The SWPPP will ensure all other waste is disposed of in accordance with state and local health and safety ordinances.

5.12.2 Structure and Equipment Removal

Equipment, vehicles, and the general contents of all structures on-site will be removed. As shown on Sheet 1 the structures that will be removed include the headframes for the main and service shafts and the covered conveyor associated with the main headframe. All remaining buildings and structures will remain.

5.12.3 Roads

All roads will remain in place to support the future industrial use.

5.12.4 Closure of Openings

Drill holes, water wells, monitoring wells will be completed or abandoned in accordance with laws, unless necessary for the proposed end use. Access to underground openings will be protected from public and wildlife (e.g., bats) in accordance with applicable local, state, and federal regulations.

5.12.5 Water Supply Pipeline

The buried potable water pipeline providing water to residences along a portion of East Bennett Road will remain.

5.13 Phased Reclamation

Table 5, "Mining and Reclamation Schedule," provides the duration for each component of the mine operation and reclamation. Placement of engineered at the Centennial Industrial Site and the Brunswick Industrial Site will occur concurrent with underground exploration and mining activities. After operations cease, dewatering will stop; related piping to the South Fork Wolf Creek will be removed; and the equipment, vehicles, and the general contents of all structures on-site will be removed; however, all structures (except for the headframes and covered conveyor), paved surfaces, roads, and site fencing and gating will remain.

TABLE 5
MINING AND RECLAMATION SCHEDULE

Operation Element	Duration[1]
BEFORE SURFACE DISTURBANCE ACTIVITIES	
Permitting	Through approximately January 2021
INITIAL ACTIVITIES	
Initial dewatering	6 months (June – December 2021)
Aboveground facility outside construction	18 months (January 2021 – June 2022)

Operation Element	Duration[1]
Aboveground facility inside construction	18 months (January 2021 – June 2022)
DURING MINE OPERATION	
Aboveground facility operations—gold mineralization processing	80 years (June 2022 – December 2082)
Underground exploration/mining	80 years (June 2022 – December 2082)
Placement, grading, and compaction of engineered fill at Centennial Industrial Site (concurrent with underground exploration/mining[2]	5 years[3] (June 2022 – December 2027)
Placement, grading, and compaction of engineered fill at Brunswick Industrial Site (after completion of fill placement at the Centennial Industrial Site)[2]	6 years[3] (June 2022 – December 2028)
Off-site hauling—gold concentrate	80 years (June 2022 – December 2082)
Off-site hauling—engineered fill	80 years (June 2022 – December 2082)
Outside truck loading by loader	80 years (June 2022 – December 2082)
AFTER MINE OPERATIONS CEASE	
Removal of equipment, vehicles, and the general contents of structures; closure of shaft openings, removal of headframes and covered conveyor (after operations cease)[4]	2-5 years (January 2082 – December 2087)

Notes: CUP = conditional use permit.

1 Durations and dates are approximate, and may be extended, depending on factors such as regulatory permitting (e.g. grading permit, 404 permit, air district authority to construct and permit to operate permits), equipment and personnel availability, fluctuations in the economy, and technical details.

2 As discussed in section 5.8.1 above, each fill stockpile lift/level will be revegetated using a native erosion control seed mix as they are completed. Revegetation of the final engineered fill stockpile lift/level will occur within 6 months and prior to the upcoming rainy season.

3 Upon commencement of mining, trucks would transport barren rock from the Brunswick Industrial Site to the Centennial Industrial Site or Brunswick Industrial Site-engineered fill areas. It is the applicant's intent to prioritize the placement of the engineered fill at the Centennial Industrial Site. Notwithstanding the priority of placing engineered fill at the Centennial Industrial Site, the ultimate approach to engineered fill placement will remain flexible to address any potential unforeseen circumstances. One such scenario would be if the remediation of the Centennial Industrial Site, currently under DTSC oversight, is not complete upon commencement of mining, in which case engineered fill would be placed at the Brunswick Industrial Site and/or transported off-site to be utilized in local and regional construction markets.

4 As discussed in section 5.12.2 and shown on Sheet 1, a majority of the structures and building will remain to support the post-mining land use of industrial. Only the headframes for the main and service shafts and the covered conveyor associated with the main headframe will be removed.

FIGURES

SOURCES: ESRI World Shaded Relief accessed May 2019, ESRI World Topographic Map accessed May 2019; ESRI World Streetmap, 2009; compiled by Benchmark Resources in 2019

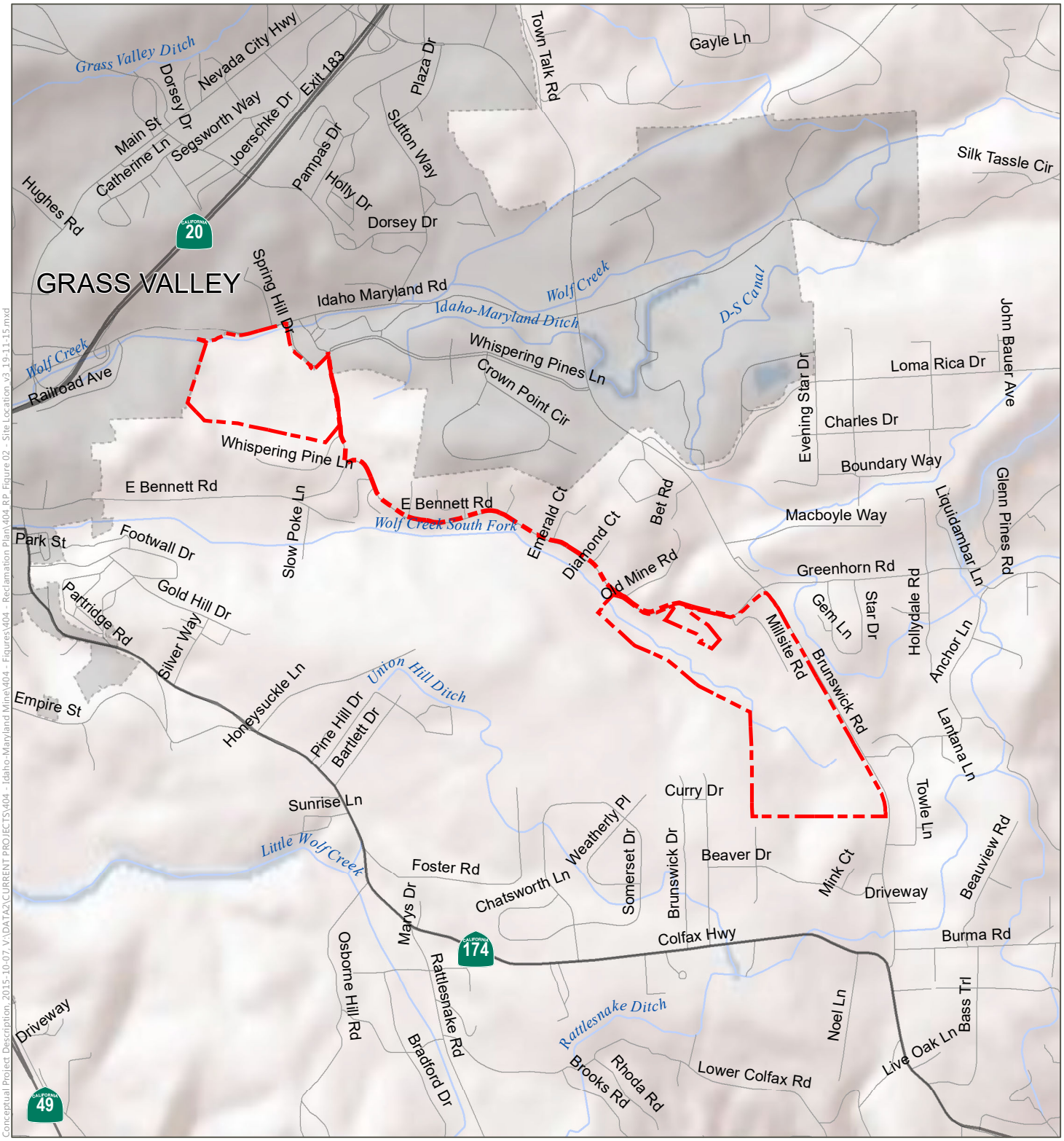
Site Location
City Boundary
County Boundary
Interstate Highway
State Route

BENCHMARK RESOURCES

N

0 2.5 5 10 Miles

Regional Location
IDAHO-MARYLAND MINE RECLAMATION PLAN
Figure 1



SOURCES: ESRI World Shaded Relief accessed May 2019, ESRI World Topographic Map accessed May 2019; ESRI World Streetmap, 2009; City Boundary–Nevada County Open Data - GIS Division, accessed November 2019; adapted by Benchmark Resources in 2019

Site Boundary
City Boundary
State Route
Street
Waterway

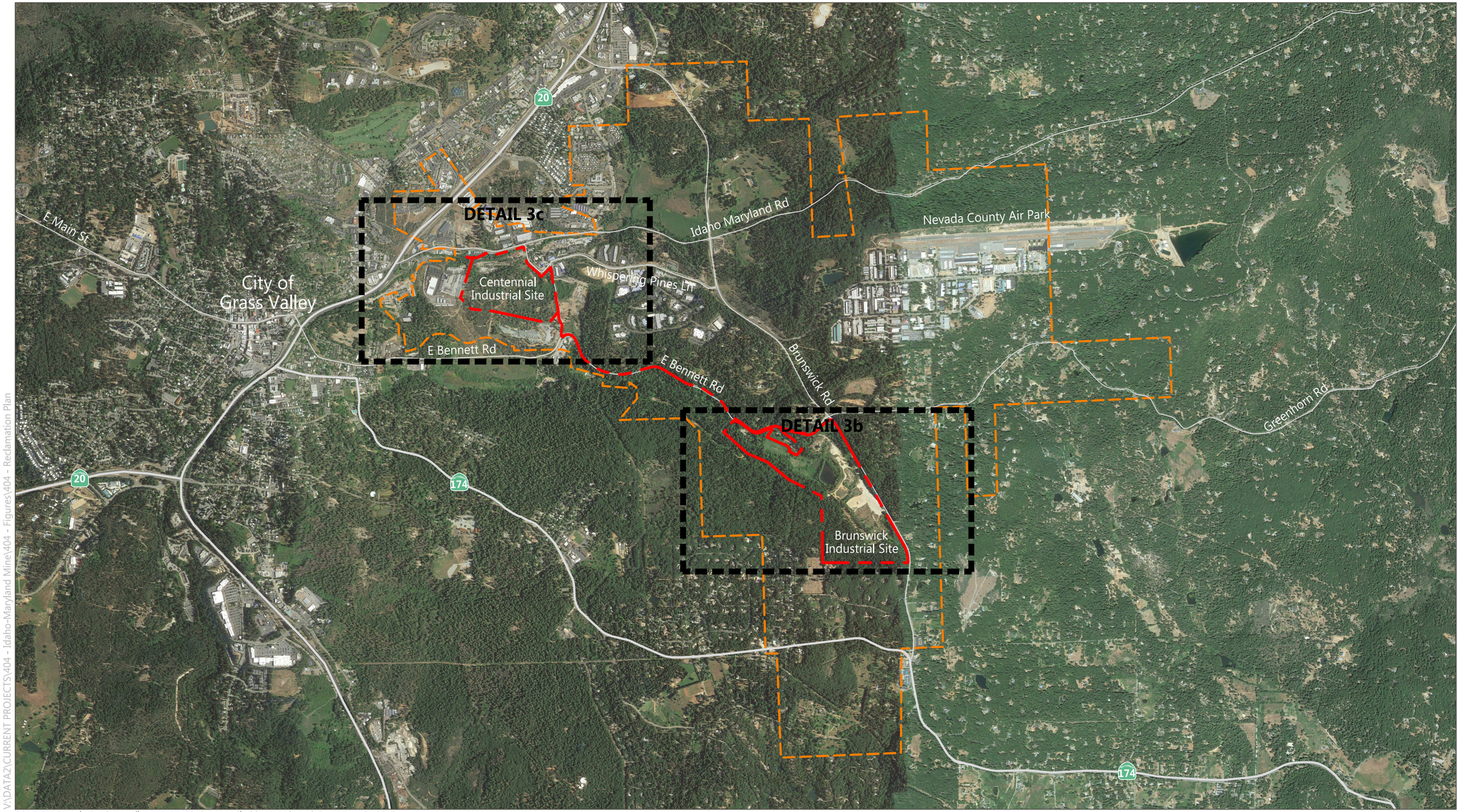
BENCHMARK RESOURCES

N

0 1,000 2,000 4,000 Feet

Site Location
IDAHO-MARYLAND MINE RECLAMATION PLAN
Figure 2

Conceptual Project Description_2015-10-07, V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan\404 RP Figure 02 - Site Location v3_19-11-15.mxd



V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\

SOURCE: Google Earth Pro (flown 5-17-2018); compiled by Benchmark Resources in 2019

NOTES:
1. New underground workings will not extend within 500 feet of the surface, except at access points on-site.
2. See Figure 3b and Figure 3c for detail maps shown.

Site Boundary

Underground Mineral Rights Boundary

State Route

Street

BENCHMARK RESOURCES

N

0 400 2,000 1,600 Feet

Existing Conditions Aerial Photograph

IDAHO-MARYLAND MINE RECLAMATION PLAN

Figure 3a

V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan

SOURCE: AERIAL–Google Earth Pro (flown 5-17-2018); compiled by Benchmark Resources in 2019

NOTES:

1. See Figure 3a for detail location.

Site Boundary

Buried Culvert

Waterway

BENCHMARK RESOURCES

N

0 200 400 800 Feet

Existing Site Conditions: Brunswick Industrial Site

IDAHO-MARYLAND MINE RECLAMATION PLAN

Figure 3b

V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Figures\404 - Reclamation Plan

SOURCE: Google Earth Pro (flown 5-17-2018); compiled by Benchmark Resources in 2019

NOTES:

1. See Figure 3a for detail location.

Site Boundary

Waterway

BENCHMARK RESOURCES

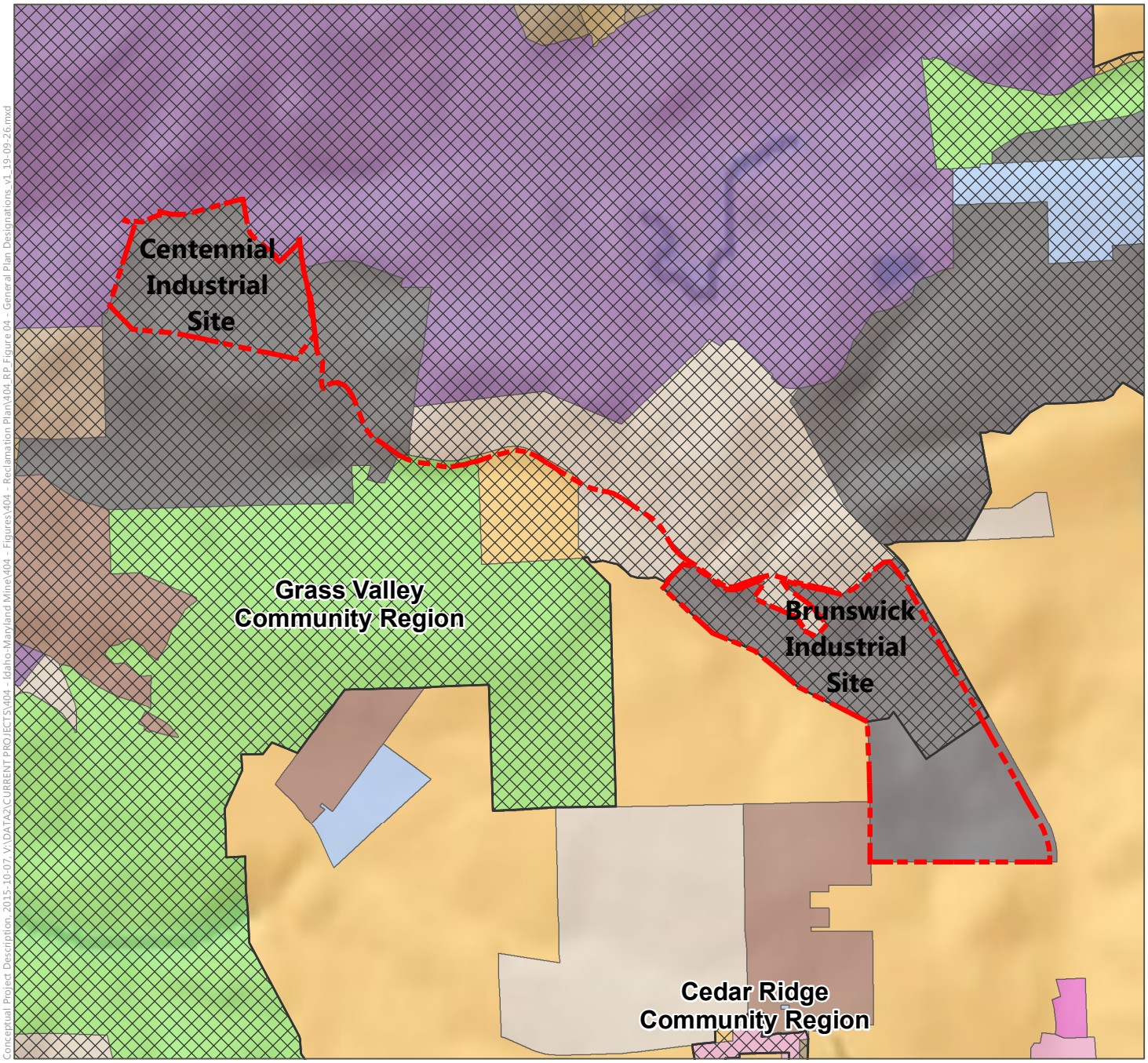
N

0 200 400 800 Feet

Existing Site Conditions: Centennial Industrial Site

IDAHO-MARYLAND MINE RECLAMATION PLAN

Figure 3c



SOURCES: ESRI World Shaded Relief accessed May 2019, ESRI World Topographic Map accessed May 2019; ESRI World Streetmap, 2009; General Plan Designations–County of Nevada - Open Data - GIS Division "General Plan - Landuse"; adapted by Benchmark Resources in 2019

- Site Boundary
- Community Regions
- Business Park
- Estate
- Incorporated Area
- Industrial
- Neighborhood Commercial
- Office & Professional
- Open Space
- Public
- Residential
- Urban High Density Residential
- Urban Medium Density Residential
- Urban Single-Family Residential

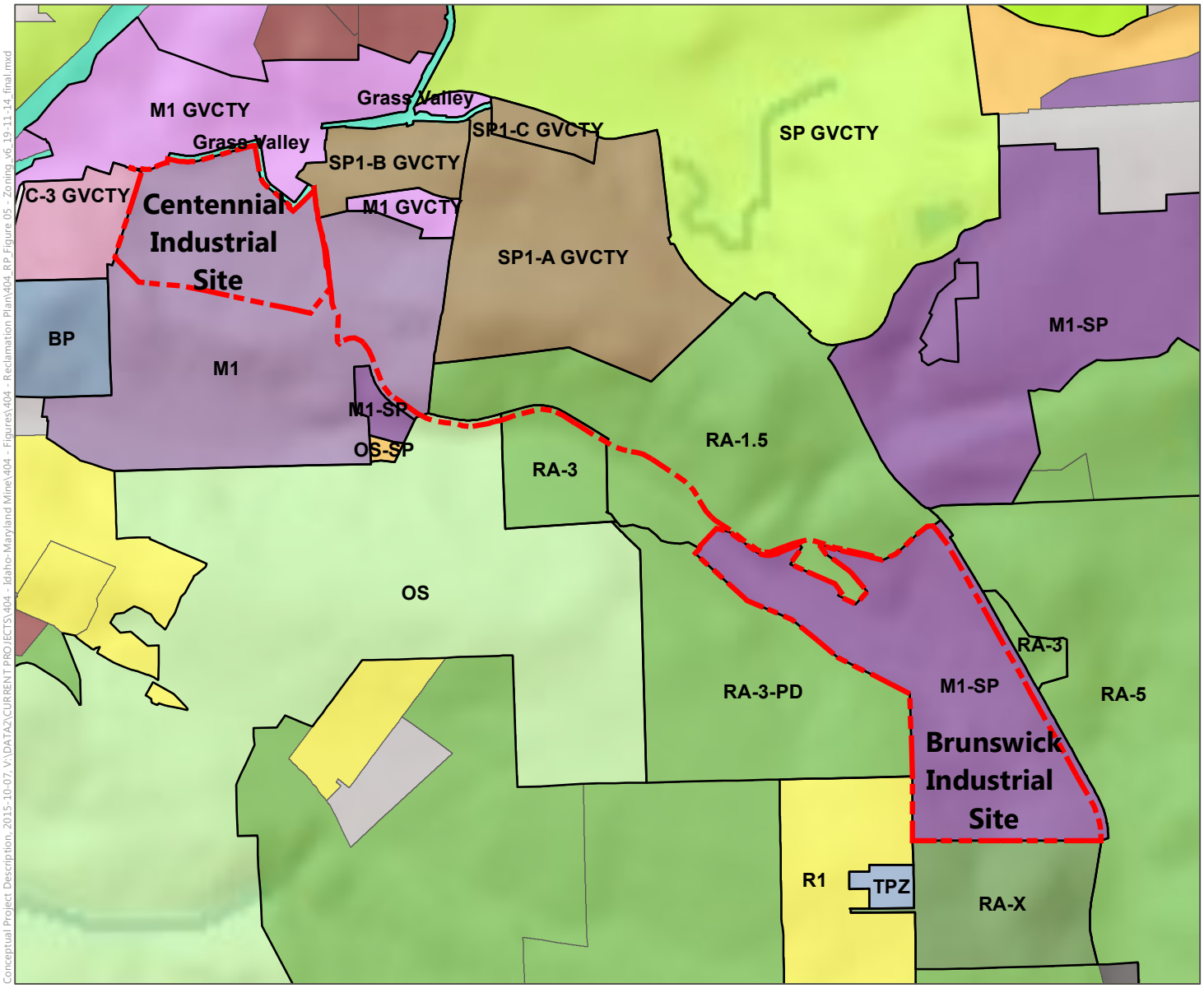
BENCHMARK RESOURCES

N

0 800 1,600 3,200 Feet

General Plan Designations
IDAHO-MARYLAND MINE RECLAMATION PLAN
Figure 4

Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan\404 RP Figure 04 - General Plan Designations_v1_19-09-26.mxd



Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan\404_RP_Figure 05 - Zoning_v6_19-11-14_final.mxd

SOURCES: ESRI World Shaded Relief accessed May 2019, Zoning–County of Nevada - Open Data - GIS Division "Zoning Districts" (10-17-2018); Nevada County Zoning Ordinance (Article 2; Section L-II 2.1 Establishment of Zoning Districts); adapted by Benchmark Resources in 2019

NOTES:

1. "GVCTY" refers to City of Grass Valley Zoning Ordinance descriptions.
2. Zoning descriptions pulled from "ZONEDETAIL" field attributes for areas under Nevada County Zoning Ordinance; descriptions pulled from "ZONETYPE" field attributes for areas under City of Grass Valley Zoning Ordinance.
3. Labels pulled from "ZONECODE" filed with some labels combined in legend for simplicity.

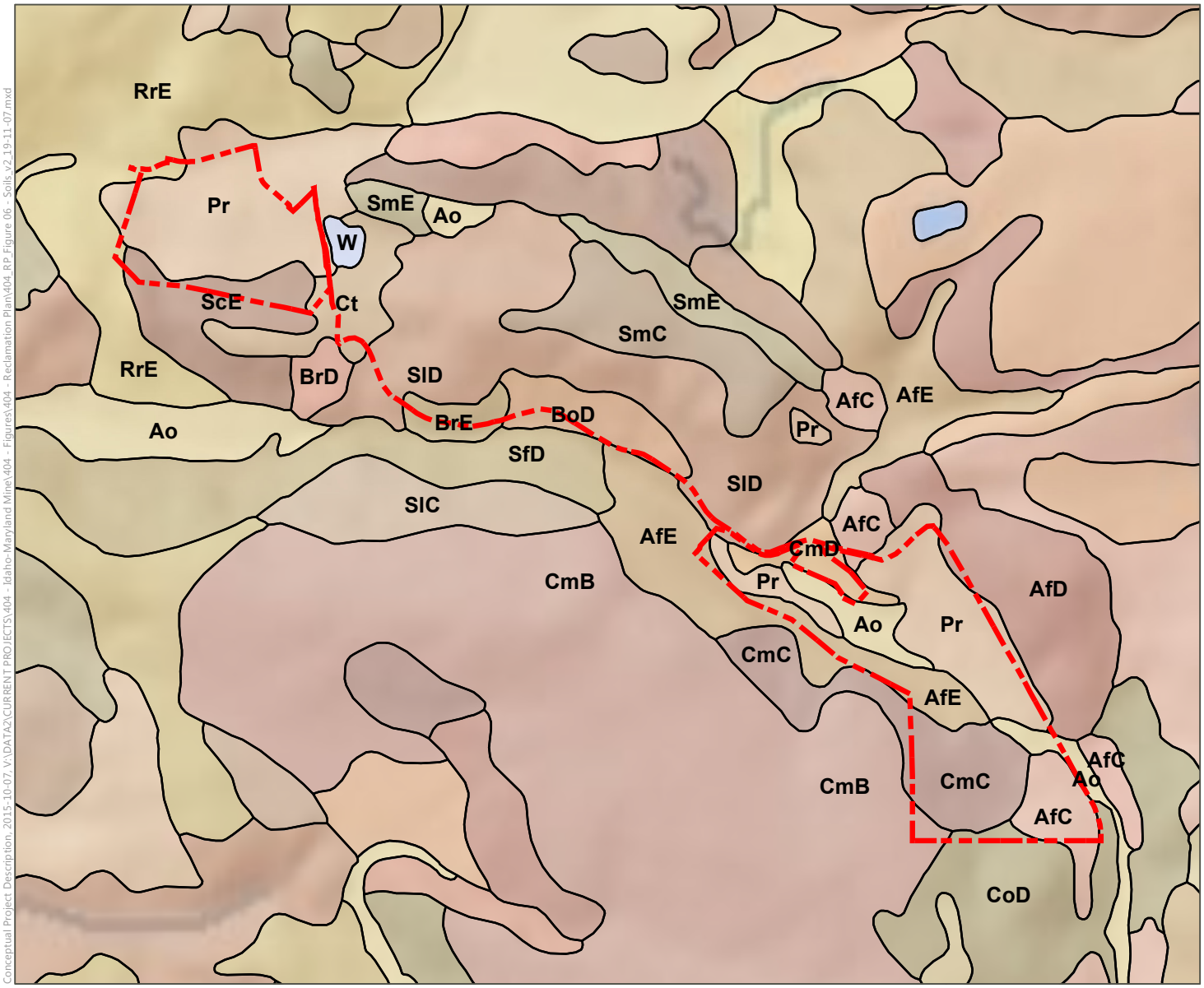
- Site Boundary
- BP—Business Park
- C-3 GVCTY—Heavy Commercial GVCTY
- Grass Valley
- M1—Light Industrial
- M1 GVCTY—Light Industrial GVCTY
- M1-SP—Light Industrial, Site Performance Combining District
- OS—Open Space
- OS-SP—Open Space, Site Performance Combining District
- R1—Single-Family Residential
- RA-(1.5;3;3-PD;5)—Residential Agricultural
- RA-X—Residential Agricultural, Subdivision Limitation Combining District
- SP GVCTY—Specific Plan GVCTY
- SP1-(A;B;C) GVCTY—Whispering Pines Specific Plan
- TPZ—Timberland Production Zone

BENCHMARK RESOURCES

N

0 800 1,600 3,200 Feet

Zoning
IDAHO-MARYLAND MINE RECLAMATION PLAN
Figure 5



Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan\404_RP_Figure 06 - Soils_v2_19-11-07.mxd

SOURCES: ESRI World Shaded Relief accessed Nov. 2019, U.S. Department of Agriculture Natural Resources Conservation Service Web Soils Survey (USDA NRCS WSS), accessed Nov. 2019; adapted by Benchmark Resources in 2019

NOTES:

1. Labels pulled from "MUSYM" field of USDA NRCS WSS data set.

Site Boundary

AfC	Aiken loam, 15 to 30 percent slopes, N Low Mid Montane
AfD	Aiken loam, 30 to 50 percent slopes
AfE	Aiken loam, 9 to 15 percent slopes, high precip
Ao	Alluvial land, clayey
BoD	Boomer loam, hard bedrock, 7 to 28 percent slopes
BrD	Boomer, hard bedrock - Rock outcrop complex, 15 to 60 percent slopes
BrE	Boomer, hard bedrock - Rock outcrop complex, 5 to 30 percent slopes
CmB	Cohasset loam, backslopes, 5 to 30 percent slopes
CmC	Cohasset loam, shoulders, 3 to 20 percent slopes
CmD	Cohasset loam, summits, 2 to 15 percent slopes
CoD	Cohasset cobbly loam, 5 to 30 percent slopes
Ct	Cut and fill land
Pr	Placer diggings
RrE	Rock outcrop-Dubakella complex, 5 to 50 percent slopes
ScE	Secca-Rock outcrop complex, 2 to 50 percent slopes
SfD	Sierra sandy loam, deep, 15 to 30 percent slopes, LRU 18XI
SIC	Sites silt loam, 15 to 30 percent slopes, N low montane
SID	Sites silt loam, 9 to 15 percent slopes, N low montane
SmC	Sites very stony loam, 15 to 50 percent slopes
SmE	Sites very stony loam, 2 to 15 percent slopes
W	Water

BENCHMARK RESOURCES

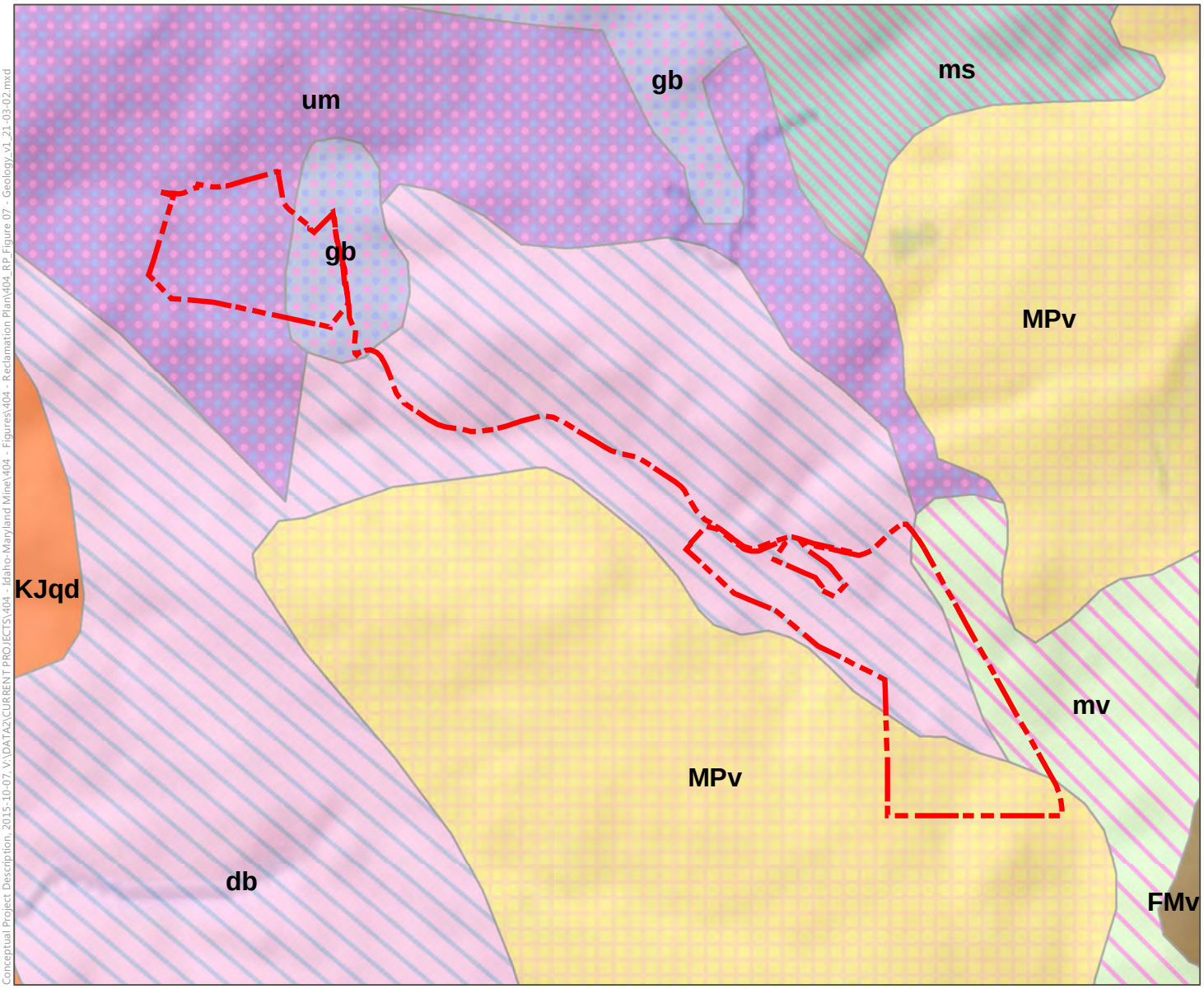
N

0 800 1,600 3,200 Feet

Site Soils

IDAHO-MARYLAND MINE RECLAMATION PLAN

Figure 6



Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan\404_RP_Figure 07 - Geology_v1_21-03-02.mxd

SOURCES: ESRI World Shaded Relief accessed March. 2021, U.S Geological Survey, Quadrangle Goelogic Map (Chico), 1992; adapted by Benchmark Resources in 2021

NOTES:

1. Labels pulled from "MUSYM" field of USDA NRCS WSS data set.

- Site Boundary
- db — Massive diabase
- FMv — Oligocene-Miocene volcanic rocks
- KJqd — Quartz diorite, tonalite, trondhemite, quartz monzonite
- gb — Gabbrioc rocks
- MPv — Miocene-Pilocevolcanic rocks
- ms — metasedimentary rocks
- mv — Volcanic rocks
- oMv — Oligocene-Miocene volcanic rocks
- um — Ultramafic rocks

BENCHMARK RESOURCES

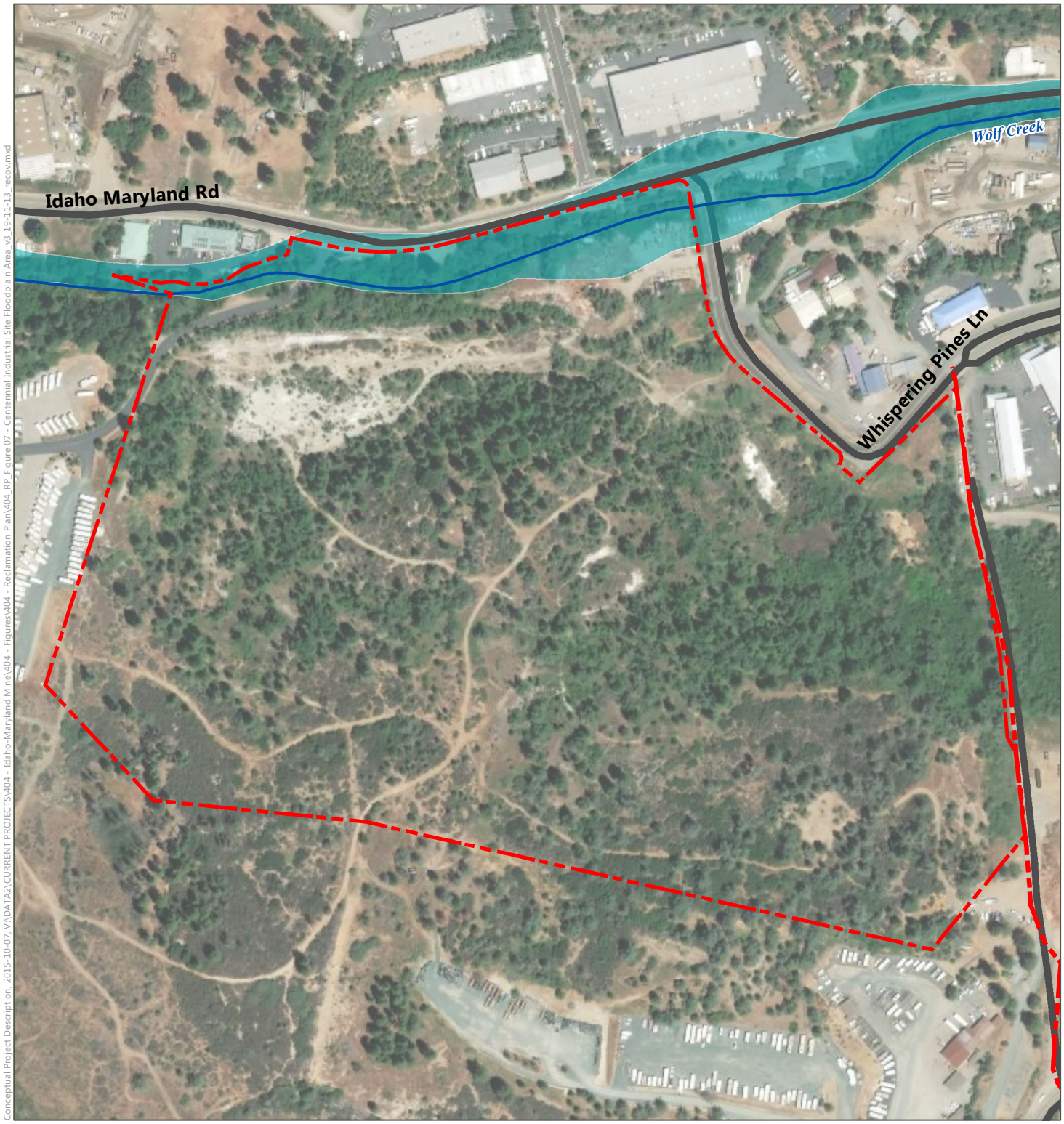
N

0 800 1,600 3,200 Feet

Geology

IDAHO-MARYLAND MINE RECLAMATION PLAN

Figure 7



Conceptual Project Description, 2015-10-07, V:\DATA2\CURRENT PROJECTS\404 - Idaho-Maryland Mine\404 - Figures\404 - Reclamation Plan\404_RP_Figure 07 - Centennial Industrial Site Floodplain Area_v3_19-11-13_recov.mxd

SOURCE: Aerial–DigitalGlobe flown 6-22-2018; Flood Areas–Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) Viewer download, accessed November 2019; adapted by Benchmark Resources in 2019

Site Boundary
100-Year Floodplain
Street
Waterway

BENCHMARK RESOURCES

N

0 200 400 800 Feet

Centennial Industrial Site Floodplain Area
IDAHO-MARYLAND MINE RECLAMATION PLAN
Figure 8

SHEETS

LEGEND

- Engineered Fill
- Water Treatment Pond
- 1 Structure - Planned & ID number Remain onsite after mine closure
- 1 Structure - Planned & ID number Reclaimed and removed after mine closure
- Paved Road - Existing offsite
- Paved Road - Planned onsite
- Paved Parking and Sidewalks - Planned
- Paved Area - Planned
- Section Line
- Brunswick Industrial Site - Boundary
- Elevation Contour Line - 10 foot intervals
- Planned treated mine water discharge pipe
- Proposed NID potable water pipe extension
- Creek - Perennial
- Creek - Intermittent
- Creek - Ephemeral
- Buried Culvert - Planned

1. South Fork Wolf Creek Discharge Point - Above ground pipe along existing road from Water Treatment Plant to discharge point.
2. Water Treatment Plant - Treatment of mine water to meet water quality objectives for discharge.
3. Water Treatment Pond - Discharge of groundwater from mine into existing pond with ~30 acre-feet working capacity for settlement of solids, aeration of mine water, and surge capacity.
4. Brunswick Shaft - Existing shaft utilized for hoisting rock from underground, secondary escape, and exhaust ventilation. New headframe & building. Use and enclosure of existing concrete silo. Barren rock loaded into trucks inside building.
5. Process Facility - Covered conveyor to transfer mineralized material from shaft silo into grinding section of process plant building. Production of gold concentrates. Sand tailings used as underground backfill or loaded into trucks as engineered fill.
6. Service Shaft & Headframe - New shaft to underground constructed by raising. Excavation to solid bedrock and installation of concrete collar. Service shaft is main entry to mine for personnel, materials, and fresh air ventilation intake.
7. Building Complex - New buildings for employee changerooms & offices. Warehouse with 8 bays for various uses, including supply storage, core logging, assaying, and equipment maintenance.
8. Engineered Fill - Transport of engineered fill from process plant, placement, grading, and compaction in lifts to create new area for future industrial use.
9. Storm Water Detention Pond - Storm water detention pond located at toe of engineered fill pile. Run-off from site and upslope areas directed to pond and then into South Fork Wolf Creek. Post project storm flows, including mine water discharge, mitigated to less than pre-project storm flows.
10. Brunswick Road Access - Use of existing access as primary entrance / exit to site. Controlled access by security fencing and gate.
11. East Bennett Road Access - Use of existing gated access for exit by trucks turning right. Controlled access by security fencing and gate.
12. Potable Water Extension - Extension of NID potable water pipeline to service East Bennett Road residential area.
13. Onsite septic field location for domestic water only.
14. Repair of southwest pond berm. Excavation and replacement.

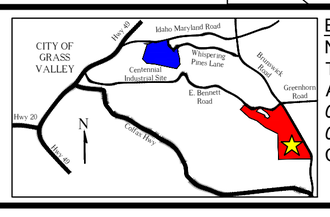
NOTES

Building Number	Building Name	Area (ft2)	Building Number	Building Name	Area (ft2)
1	Brunswick Headframe	2,600	16	Cement Silo	110
2	Brunswick Shaft Building	1,700	17	Water Treatment Plant	8,500
3	Brunswick Raise Building	280	18	Treated Water Tank	310
4	Brunswick Conveyor Building	420	19	Machinery Building	1,600
5	Brunswick Rock Truck Loading	1,700	20	Changeroom and Offices	24,600
6	Brunswick Electrical	800	21	Warehouse	28,900
7	Brunswick Mine Compressor	1,600	22	Service Shaft	2,700
8	Brunswick Hoist	2,800	22a	Service Headframe	300
9	Covered Conveyor	3,400	23	Security Building	2,400
10	Process Plant	29,200	24	Service Hoist	2,800
11	Process Plant Addition	7,300	25	Machinery Building	1,600
12	Clean Water Tank	530	26	Service Electrical	800
13	Process Water Tank	450	27	Breezeway	1,400
14	Tailings Thickener	2,400	28	Fuel Tank (30,000 gal)	600
15	Paste Filter Feed Tank	530	29	Generator Building	3,900

Domestic water source: Nevada Irrigation District
Industrial water source: Treated mine water
Sewage disposal by onsite septic system
Orphir Hill Fire Protection District
Electrical power from Pacific Gas and Electric Company

Asphalt surfacing on all roads and parking areas.
Surface run-off shown on grading and drainage plan drawings.
Exterior lighting shown on detail and lighting plan drawings.
Landscaping details shown on landscaping plan drawings.
Final grading topography based on:
Preliminary Grading Plan prepared by Nevada City Engineering Inc.

Idaho-Maryland Mine Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945



Brunswick Industrial Site
Nevada County, SEC. 31, T.16N, R.9E., M.D.M
Total Area = 118.93 Acres
Assessor Parcel Numbers:
09-630-37, 09-630-39, 09-441-03, 09-441-04, 09-441-05, 09-441-34
Current Zoning M1-SP / Proposed Zoning M1-ME

N W E S
SCALE 1"=200'
500 ft

Lidar & Airphotos by Aero Geometrics with survey control by Nevada City Engineering.May 7th 2018. Grass Valley, CA: Horizontal Datum: NAD83 (2001), Vertical Datum: GEOID 12B, NAVD 88 Projection: California State Plane Zone 2, Combined Scale Factor: 0.9979891

Reclamation Plan

Sheet 1

Brunswick Industrial Site Plan - Final Grading and Topography

Drawnby : Rise Grass Valley - Nov 10 / 19

Scale : 1" = 200 feet

Building Number	Building Name	Area (ft2)	Building Number	Building Name	Area (ft2)
1	Brunswick Headframe	2,600	16	Cement Silo	110
2	Brunswick Shaft Building	1,700	17	Water Treatment Plant	8,500
3	Brunswick Raise Building	280	18	Treated Water Tank	310
4	Brunswick Conveyor Building	420	19	Machinery Building	1,600
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6	Brunswick Electrical	800	21	Warehouse	28,900
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12	Clean Water Tank	530	26	Service Electrical	800
13	Process Water Tank	450	27	Breezeway	1,400
14	Tailings Thickener	2,400	28	Fuel Tank (30,000 gal)	600
15	Paste Filter Feed Tank	530	29	Generator Building	3,900

Existing entrance from Brunswick Road. Primary entrance and exit to site

Brunswick Road

Security gate

Employee Parking

DS Canal Extension

Brunswick Road

Engineered Fill Future Industrial Site

Fuel tank removed at mine closure

Warehouse

Changeroom & Office

Water Treatment

Process Plant

Backup Generators

Service Shaft Complex

Service Shaft Headframe removed and shaft sealed at mine closure

3H:1V slope

Detention Pond

Onsite Septic Field Area

Covered Conveyor removed at mine closure

Water Treatment Pond

12 ft

Brunswick Shaft Headframe removed and shaft sealed at mine closure

Brunswick Shaft Complex

Treated mine water discharge pipe removed at mine closure

Existing gated entrance from E. Bennett Road. Exit for trucks turning right towards Brunswick Road.

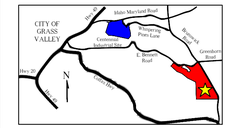
South Fork Wolf Creek

Brunswick Industrial Site - Boundary

2,204,000 N | 2,203,500 N | 2,203,000 N | 2,202,500 N | 2,202,000 N

6,841,000 E | 6,840,500 E | 6,840,000 E

Idaho-Maryland Mine Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945



Brunswick Industrial Site
Nevada County
SEC. 31, T.16N, R.9E., M.D.M
Total Area = 118.93 Acres
Assessor Parcel Numbers:
09-630-37, 09-630-39, 09-441-03, 09-441-04, 09-441-05, 09-441-34
Current Zoning M1-SP
Proposed Zoning M1-ME

LEGEND

- Water Treatment Pond
- Structure - Planned
- Structure - Planned - removed at mine closure
- Paved Road - Existing offsite
- Paved Road - Planned onsite
- Paved Parking and Sidewalks - Planned
- Paved Area - Planned
- Section Line
- Brunswick Industrial Site - Boundary
- Elevation Contour Line - 2 foot intervals
- Elevation Contour Line - 10 foot intervals
- Proposed treated mine water discharge pipe
- Creek - Perennial

Domestic water source: Nevada Irrigation District
Industrial water source: Treated mine water (groundwater)
Sewage disposal by onsite septic system
Orphir Hill Fire Protection District
Electrical power from Pacific Gas and Electric Company
Asphalt surfacing on all roads and parking areas.
Surface run-off shown on grading and drainage plan drawings
Exterior lighting details shown on lighting plan drawings
Landscaping details shown on landscaping plan drawings
Final grading topography based on:
Preliminary Grading Plan prepared by Nevada City Engineering Inc.

SCALE 1"=100'
250 ft

Lidar & Airphotos by Aero Geometrics with survey control by Nevada City Engineering.May 7th 2018. Grass Valley, CA: Horizontal Datum: NAD83 (2001), Vertical Datum: GEOID 12B, NAVD 88 Projection: California State Plane Zone 2, Combined Scale Factor: 0.9979891

Reclamation Plan

Sheet 2

Brunswick Industrial Site Plan Details

Drawnby : Rise Grass Valley
Nov 11 / 19

SCALE: 1" = 100'
CONTOUR INTERVAL: 2'

BRUNSWICK ROAD

DS CANAL

SOUTH FORK WOLF CREEK

INSTALL NEW 48" CULVERT (TYP.)

INSTALL CONCRETE V-DITCH AT TOE OF SLOPE

INSTALL CONCRETE V-DITCH AT TOP OF SLOPE

INSTALL CONCRETE "J" DRAIN (TYP.)

REMOVE OR ABANDON IN PLACE EXISTING 48" CULVERT (TYP.)

SOIL

WATER TREATMENT POND

CONSTRUCT NEW 48" OUTFALL AT SAME LOCATION AS EXISTING 48" OUTFALL

SOIL STOCKPILE AREA
TOPSOIL & SUITABLE GROWTH MEDIA TO BE MAINTINED IN SERPERATE PILES

LEGEND:

- EXISTING CONTOUR W/ ELEVATION
- PROPOSED CONTOUR W/ ELEVATION
- PROPOSED DAYLIGHT LINE
- PROPOSED FLOWLINE OF CONCRETE V-DITCH
- PROPERTY LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED STORM DRAIN INLET
- PROPOSED STORM DRAIN MANHOLE
- 30% OR GREATER SLOPES

RECLAMATION PLAN SHEET 3

ENGINEERING • SURVEYING
PLANNING

NEVADA CITY ENGINEERING, INC.

505-B COYOTE STREET NEVADA CITY
(530)265-6911

REGISTERED PROFESSIONAL ENGINEER
ROBERT M ROURKE
No. 29650
Exp. 3/31/21
CIVIL
STATE OF CALIFORNIA

REVISION:	DATE:	DESCRIPTION:

BRUNSWICK SITE

RISE GRASS VALLEY INC.

SEC. 31, T.16N., R.9E., M.D.M.

NEVADA COUNTY , CALIFORNIA

GRADING PLAN

B-1

Idaho Maryland Road

Spring Hill Drive

Centennial Drive

Whispering Pines Lane

Wolf Creek

Open space for Wolf Creek and setback

Existing Site Discharge Point

Existing Culvert

Private Driveway

Historic Drain Tower #2

Engineered Fill

~2.4% grade

~4.0% grade

Open space for special-status plant species

Centennial Industrial Site - Boundary

A

A'

B

B'

6,832,000 E

6,832,500 E

6,833,000 E

6,833,500 E

6,834,000 E

2,209,000 N

2,208,500 N

2,208,000 N

2,207,500 N

2,207,000 N

Idaho-Maryland Mine Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945

Centennial Industrial Site
Nevada County, SEC. 26, T.16N, R.8E., M.D.M
Total Area = 56.41 Acres
Assessor Parcel Numbers:
09-550-32, 09-550-37, 09-550-38, 09-550-39, 09-550-40, 09-560-36
Current Zoning M1 / Proposed Zoning M1

LEGEND

- Engineered Fill
- Paved Road - Existing
- Section Line
- Centennial Industrial Site - Boundary
- Elevation Contour Line - 10 foot intervals
- Proposed NID potable water pipe extension
- Creek - Perennial

Final grading topography based on:
Preliminary Grading Plan prepared by Nevada City Engineering Inc.

SCALE 1"=100' 250 ft

Lidar & Airphotos by Aero Geometrics with survey control by Nevada City Engineering.May 7th 2018. Grass Valley, CA: Horizontal Datum: NAD83 (2001), Vertical Datum: GEOID 12B, NAVD 88 Projection: California State Plane Zone 2, Combined Scale Factor: 0.9979891

Reclamation Plan

Sheet 4

Centennial Industrial Site Plan

Drawnby : Rise Grass Valley
Nov 11 / 19
Scale : 1" =100 feet

SCALE: 1" = 100'
CONTOUR INTERVAL: 2'

NORTH

SPRING HILL DRIVE

IDAHO MARYLAND ROAD

WOLF CREEK

CENTENNIAL DRIVE

WHISPERING PINES ROAD

EXISTING TAILINGS PILES IN THIS AREA TO BE REMOVED IN SEPARATE ENVIRONMENTAL REMEDIATION PROJECT

RIPARIAN 100' SETBACK

INSTALL CONCRETE V-DITCH AT TOE OF SLOPE

INSTALL CONCRETE V-DITCH AT TOP OF SLOPE

EXISTING SITE DISCHARGE POINT

EXISTING CULVERT

PRIVATE DRIVEWAY

HISTORIC DRAIN TOWER #2

5' RISER
2495 FL

2490
2500
2510
2520
2530
2540
2550
2560
2570
2580
2590

4.0%
2.4%

SOIL STOCKPILE AREA
TOPSOIL & SUITABLE GROWTH MEDIA
TO BE MAINTEINED IN SEPERATE PILES

CONNECT TO EXISTING CULVERT & EXTEND 30" PIPE TO OUTFALL TO CONCRETE V-DITCH

EXISTING CULVERT

LEGEND:

- EXISTING CONTOUR W/ ELEVATION
- PROPOSED CONTOUR W/ ELEVATION
- PROPOSED DAYLIGHT LINE
- PROPOSED FLOWLINE OF CONCRETE V-DITCH
- PROPERTY LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED STORM DRAIN INLET
- PROPOSED STORM DRAIN MANHOLE
- 30% OR GREATER SLOPES

RECLAMATION PLAN SHEET 5

ENGINEERING • SURVEYING
PLANNING

NEVADA CITY ENGINEERING, INC.

505-B COYOTE STREET NEVADA CITY
(530)265-6911

REGISTERED PROFESSIONAL ENGINEER
ROBERT M ROURKE
No. 29650
Exp. 3/31/21
CIVIL
STATE OF CALIFORNIA

REVISION:	DATE:	DESCRIPTION:

CENTENNIAL SITE

RISE GRASS VALLEY INC.

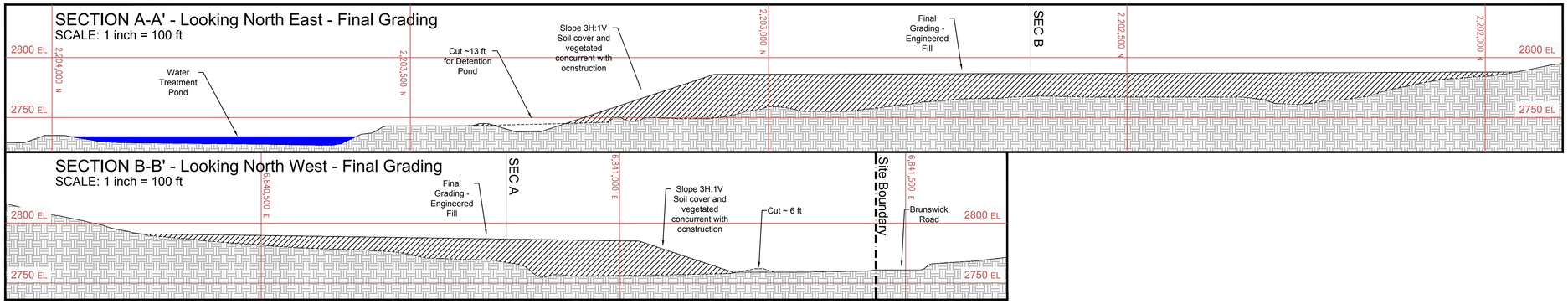
SEC. 26, T.16N., R.8E., M.D.M.

NEVADA COUNTY , CALIFORNIA

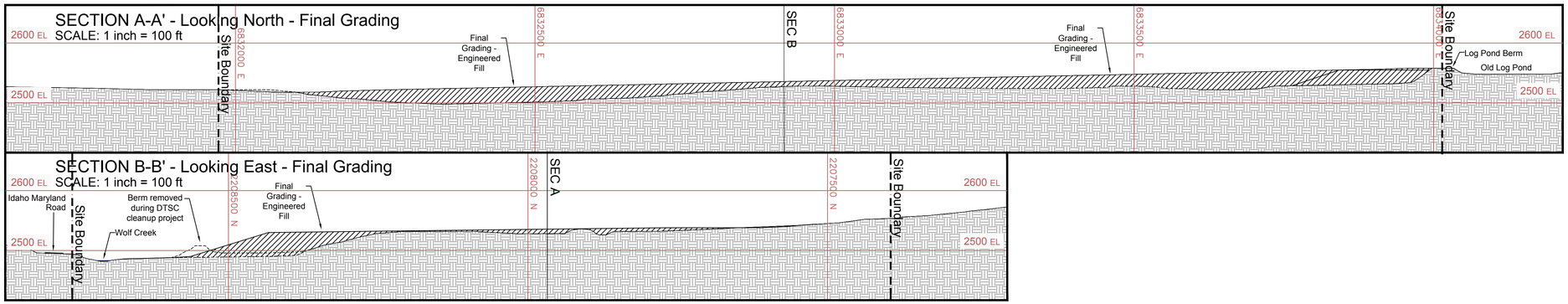
GRADING PLAN

C-1

BRUNSWICK INDUSTRIAL SITE - SECTIONS



CENTENNIAL INDUSTRIAL SITE - SECTIONS



Idaho-Maryland Mine Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945

Brunswick Industrial Site
Nevada County
SEC. 31, T.16N, R.9E., M.D.M
Total Area = 118.93 Acres
Assessor Parcel Numbers:
09-630-37, 09-630-39, 09-441-03, 09-441-04, 09-441-05, 09-441-34
Current Zoning M1-SP
Proposed Zoning M1-ME

Centennial Industrial Site
Nevada County, SEC. 26, T.16N, R.8E., M.D.M
Total Area = 56.41 Acres
Assessor Parcel Numbers:
09-550-32, 09-550-37, 09-550-38, 09-550-39, 09-550-40, 09-560-36
Current Zoning M1 / Proposed Zoning M1

LEGEND

- Area of fill excavation planned
- Undisturbed Ground
- Current / original ground surface
- Property Boundary
- Final Ground Surface

Final grading topography based on:
Preliminary Grading Plan prepared by Nevada City Engineering Inc.

SCALE 1"=100'
250 ft

Lidar & Airphotos by Aero Geometrics with survey control by Nevada City Engineering,May 7th 2018. Grass Valley, CA: Horizontal Datum: NAD83 (2001), Vertical Datum: GEOID 12B, NAVD 88 Projection: California State Plane Zone 2, Combined Scale Factor: 0.9979891

Reclamation Plan
Sheet 6
Section Views

Drawnby : Rise Grass Valley
Nov 11 / 19

REFERENCES AND RESOURCES

REFERENCES AND RESOURCES

AMEC (Amec Foster Wheeler Americas Limited). 2017. *Technical Report on the Idaho-Maryland Project, Grass Valley California, USA.* Vancouver, BC.

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Matuzak, G. 2020b (October). *Centennial Industrial Site Biological Resources Assessment*. Nevada City, CA.

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APPENDIX A
INDEX TO REQUIRED CONTENT

APPENDIX A
INDEX TO REQUIRED CONTENT

Mine Name: Idaho-Maryland Mine **Amendments:** None
End Use: Industrial and open space **Date:** November 2020 *Revised March 2021*

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
GENERAL CONSIDERATIONS			
PRC 2772(b)	Required contents chart: A chart identifying the location (e.g. page number, chapter, appendix, or other location in the reclamation plan) of content that meets the requirements of PRC Sections 2772, 2773, 2773.3 and CCR Articles 1 and 9 (as delineated in this checklist).	Yes	Appendix A
PRC 2772(c)(1)	Contact information: Name and address of the surface mining operator and any person designated by the operator as an agent for service of process (must reside in CA).	Yes	Section 3.1
PRC 2772(c)(2)	Material quantity and type: The anticipated total quantity and type of minerals to be mined (see Annual Report Instructions, Exhibit B, for mineral types and units of measure).	Yes	Section 4.3
PRC 2772(c)(3)	Dates: The initiation and termination dates of mining (be as specific as possible, e.g. December 31, 2030).	Yes	Section 4.4
PRC 2772(c)(4)	Depth of mining: The maximum anticipated depth of surface mining in relation to a verifiable benchmark such as Mean Sea Level.	No	This is an underground mine
PRC 2772(c)(5) (A-F)	Reclamation plan maps shall include**:** Size and legal description of lands affected by surface mining operations;	Yes	Appendix C
	Names and addresses of owners of all surface interests and mineral interests;	Yes	Sheets 1, 2, 4, 6
	Property lines, setbacks, and the reclamation plan boundary;	Yes	Sheets 1–6; Figures 3a, b, c
	Existing and final topography with contour lines at appropriate intervals;	Yes	Sheets 1–6
	Detailed geologic description of the area of the surface mining operation;	Yes	Figure 7
	Locations of railroads, utility features, and roads (access roads, temporary roads to be reclaimed, and any roads remaining for the end use).	Yes	Figures 3a, b, and c; Sheets 1, 2, 4
	All maps, diagrams, or calculations that are required to be prepared by a California-licensed professional shall include the preparer's name, license number, signature & seal.	Yes	Sheets 3, 5
PRC 2772(c)(6)	Mining method and schedule: A description of the mining methods and a time schedule that provides for completion of mining on each segment so that reclamation can be concurrent or phased.	Yes	Sections 4.1, 4.2, 5.13

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
PRC 2772(c)(7)	Subsequent use(s): A description of the proposed subsequent use(s) after reclamation	Yes	Section 5.1
	Evidence that all landowners have been notified of the proposed use.	Yes	Section 3.3
PRC 2772(c)(9)	Impact on future mining: A statement regarding the impact of reclamation on future mining on the site.	Yes	Section 5.2
PRC 2772(c)(10)	Signed statement: Statement signed by the operator accepting responsibility for reclamation of the mined lands per the reclamation plan.	Yes	Appendix B
PRC 2772(c)(11)	Any other information that the lead agency may require by ordinance.	Yes	Section 5.5 and 5.10
PRC 2773(b)(6)	Building, structure, and equipment removal	Yes	Section 5.12.2
PRC 2776(b-c)	Pre-SMARA areas: Reclamation plans shall apply to operations conducted after January 1, 1976 or to be conducted in the future. Mined lands disturbed prior to January 1, 1976 *and not disturbed after that date* may be excluded from the reclamation plan.	No	No pre-SMARA areas are on-site
CCR 3502(b)(2)	Public health and safety: A description of how any potential public health and safety concerns that may arise due to exposure of the public to the site will be addressed.	Yes	Section 5.11
CCR 3709(a)	Equipment storage and waste disposal: Designate areas for equipment storage and show on maps.	Yes	Sheets 1–6
	All waste shall be disposed of in accordance with state and local health and safety ordinances.	Yes	Section 5.6
CCR 3709(b)	Structures and equipment removed: Structures and equipment should be dismantled and removed at closure, except as demonstrated to be necessary for the proposed end use.	Yes	Section 5.12.2
CCR 3713(a)	Well closures: Drill holes, water wells, monitoring wells will be completed or abandoned in accordance with laws, unless demonstrated necessary for the proposed end use.	Yes	Section 5.12.4
CCR 3713(b)	Underground openings: Any portals, shafts, tunnels, or openings will be gated or protected from public entry, and to preserve access for wildlife (e.g. bats).	Yes	Section 5.12.4
GEOLOGY AND GEOTECHNICAL			
PRC 2772(c)(5)	A description of the general geology of the area	Yes	Section 3.10
	A detailed description of the geology of the mine site.	Yes	Section 3.10
PRC 2773(b)(2)	Backfilling, regrading, slope stability, and recontouring	Yes	Sections 5.4, 5.5, & 5.6
PRC 2773.3	If a metallic mine is located on, or within one mile of, any "Native American sacred site" and is located in an "area of special concern," the reclamation plan shall require that all excavations and/or excess materials be backfilled and graded to achieve the approximate original contours of the mined	No	Not located on or within 1 mile of a Native American sacred site or located in an area

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
	lands prior to mining.		of special concern
CCR 3502(b)(4)	The source and disposition of fill materials used for backfilling or grading shall be considered in the reclamation plan.	Yes	Section 5.4, 5.5
CCR 3502(b)(3)	The designed steepness and treatment of final slopes must consider the physical properties of slope materials, maximum water content, and landscaping.	Yes	Section 5.4, 5.5, 5.8
	The reclamation plan shall specify slope angles flatter than the critical gradient for the type of slope materials.	Yes	Section 5.4
	When final slopes approach the critical gradient, a Slope Stability Analysis will be required.	No	Slopes no steeper than 3:1 (Section 5.4.2)
CCR 3704.1	Backfilling required for surface mining operations for metallic minerals.	No	Not an open-pit mine
CCR 3704(a)	For urban use, fill shall be compacted in accordance with Uniform Building Code, local grading ordinance, or other methods approved by the lead agency.	Yes	Section 5.4
CCR 3704(b)	For resource conservation, compact to the standards required for that end use.	No	End use not resource conservation
CCR 3704(d)	Final reclamation fill slopes shall not exceed 2:1 (H:V), except when allowed by site-specific engineering analysis, and the proposed final slope can be successfully revegetated. See also Section 3502(b)(3).	No	Slopes no steeper than 3:1 (Section 5.4.2)
CCR 3704(e)	At closure, all fill slopes shall conform with the surrounding topography or approved end use.	Yes	Section 5.4.2, Sheets 1–6
CCR 3704(f)	Final cut slopes must have a minimum slope stability factor of safety that is suitable for the end use and conforms with the surrounding topography or end use.	Yes	Section 5.4.1
HYDROLOGY AND WATER QUALITY			
PRC 2770.5	For operations within the 100-year flood plain (defined by FEMA) and within one mile up- or downstream of a state highway bridge, Caltrans must be notified and provided a 45-day review period by the lead agency.	Yes	Section 5.10.4
PRC 2772(c)(8)(A)	Description of the manner in which contaminants will be controlled and mine waste will be disposed.	Yes	Sections 5.10, 5.12.1
PRC 2772(c)(8)(B)	The reclamation plan shall include a description of the manner in which stream banks/beds will be rehabilitated to minimize erosion and sedimentation.	Yes	Section 5.5
PRC 2773(a)	The reclamation plan shall establish site-specific sediment and erosion control criteria for monitoring compliance with the reclamation plan.	Yes	Sections 5.5 & 5.10.2
PRC 2773(b)(4)	Drainage, diversion structures, waterways, and erosion control	Yes	Sections 5.3 & 5.10 No steam or watershed diversions
PRC 2773(b)(9)	Tailings and mine waste management	Yes	Section 5.3.3, 5.5, 5.6

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
CCR 3502(b)(6)	Temporary stream and watershed diversions shall be detailed in the reclamation plan.	No	No steam or watershed diversions
CCR 3503(a)(2)	Stockpiles of overburden and minerals shall be managed to minimize water and wind erosion.	Yes	Section 5.3
CCR 3503(b)(2)	Operations shall be conducted to substantially prevent siltation of groundwater recharge areas.	Yes	Section 5.10
CCR 3503(a)(3)	Erosion control facilities shall be constructed and maintained where necessary to control erosion.	Yes	Section 5.5
CCR 3503(b)(1)	Settling ponds shall be constructed where they will provide a significant benefit to water quality.	Yes	Section 5.5
CCR 3503(d)	Disposal of mine waste and overburden shall be stable and shall not restrict natural drainage without suitable provisions for diversion.	Yes	Section 5.3.3, 5.5, 5.6
CCR 3503(e)	Grading and revegetation shall be designed to minimize erosion and convey surface runoff to natural drainage courses or interior basins.	Yes	Section 5.5
	Spillway protection shall be designed to prevent erosion.	Yes	Section 5.5
CCR 3706(a)	Surface mining and reclamation activities shall be conducted to protect on-site and downstream beneficial uses of water.	Yes	Section 5.10
CCR 3706(b)	Water quality, recharge potential, and groundwater storage that is accessed by others shall not be diminished.	Yes	Section 5.10
CCR 3706(c)	Erosion and sedimentation shall be controlled during all phases of construction, operation, reclamation, and closure of surface mining operations to minimize siltation of lakes and water courses as per RWQCB/SWRCB.	Yes	Section 5.5
CCR 3706(d)	Surface runoff and drainage shall be controlled to protect surrounding land and water resources.	Yes	Section 5.5
	Erosion control methods shall be designed for not less than 20 year/1 hour intensity storm event.	Yes	Section 5.5
CCR 3706(e)	Impacted drainages shall not cause increased erosion or sedimentation. Mitigation alternatives shall be proposed in the reclamation plan.	Yes	Section 5.5
CCR 3706(f)(1)	Stream diversions shall be constructed in accordance with the Lake and Streambed Alteration Agreement (LSAA) between the operator and the Department of Fish and Wildlife.	No	No stream diversions
CCR 3706(f)(2)	Stream diversions shall also be constructed in accordance with Federal Clean Water Act and the Rivers and Harbors Act of 1899.	No	No stream diversions
CCR 3706(g)	All temporary stream diversions shall eventually be removed and the affected land reclaimed.	No	No stream diversions
CCR 3710(a)	Surface and groundwater shall be protected from siltation and pollutants in accordance with the Porter-Cologne Act, the Federal Clean Water Act, and RWQCB/SWRCB requirements.	Yes	Section 5.5, 5.10
CCR 3710(b)	In-stream mining shall be conducted in accordance with Section 1600 et seq. of the California Fish and Game Code, Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act of 1899.	No	No in-stream mining

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
CCR 3710(c)	In-stream mining shall be regulated to prevent impacts to structures, habitats, riparian vegetation, groundwater levels, and banks.	No	No in-stream mining
	In-stream channel elevations and bank erosion shall be evaluated annually using extraction quantities, cross-sections, and aerial photos.	No	No in-stream mining
CCR 3712	Mine waste and tailings and mine waste disposal units are governed by SWRCB waste disposal regulations and shall be reclaimed in accordance with this article: CCR Article 1. Surface Mining and Reclamation Practice. Section 3500 et seq.	Yes	Section 5.12.1
SENSITIVE SPECIES AND HABITAT			
PRC 2773(b)(1)	Wildlife habitat	Yes	Sections 3.12 & 5.10.1
PRC 2773(b)(7)	Stream protection	Yes	Sections 3.12 & 5.10 No in-stream mining
CCR 3502(b)(1)	A description of the environmental setting (identify sensitive species, wildlife habitat, sensitive natural communities, e.g. wetlands).	Yes	Section 3.12
	Impacts of reclamation on surrounding land uses.	Yes	Section 5.2
CCR 3503(c)	Fish and wildlife habitat shall be protected by all reasonable measures.	Yes	Section 5.10.1
CCR 3703(a)	Sensitive species shall be conserved or mitigated as prescribed by the federal and California Endangered Species Acts.	Yes	Section 5.10.1
CCR 3703(b)	Wildlife habitat shall be established on disturbed land at least as good as pre-project, unless end use precludes its use as wildlife habitat.	Yes	Section 5.1 & 5.10.1
CCR 3703(c)	Wetlands shall be avoided or mitigated at 1:1 minimum for both acreage and habitat value.	Yes	Section 3.12.2, 5.1, & 5.10.1
CCR 3704(g)	Piles or dumps shall not be placed in wetlands without mitigation.	Yes	Section 5.3.3
CCR 3710(d)	In-stream mining shall not cause fish to be trapped in pools or off-channel pits, or restrict migratory or spawning activities.	No	No in-stream mining
TOPSOIL			
PRC 2773(b)(8)	Topsoil salvage, maintenance, and redistribution	Yes	Section 5.3
CCR 3503(a)(1)	Removal of vegetation and overburden preceding mining shall be kept to a minimum.	Yes	Section 4.1, 4.2
CCR 3503(f)	When the reclamation plan calls for resoiling, mine waste shall be leveled and covered with a layer of finer material. A soil layer shall then be placed on this prepared surface.	Yes	Section 5.7
	The use of soil conditioners, mulches, or imported topsoil shall be considered where such measures appear necessary.	Yes	Section 5.7 & 5.8.5
CCR 3704(c)	Mine waste shall be stockpiled to facilitate phased reclamation and kept separate from topsoil or other growth media.	Yes	Section 5.3.3
CCR 3705(e)	If soil is altered or other than native topsoil, soil analysis is required. Add fertilizers or soil amendments if necessary.	Yes	Section 5.7 & 5.8.5

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
CCR 3711(a)	All salvageable topsoil shall be removed as a separate layer.	Yes	Section 5.3.1
	Topsoil and vegetation removal should not precede mining by more than one year.	No	Mining is underground; surface disturbance related to building and other facility construction may begin sooner
CCR 3711(b)	Topsoil resources shall be mapped prior to stripping and location of topsoil stockpiles shown on map included in the reclamation plan.	Yes	Section 5.3.1
	Topsoil and other growth media shall be maintained in separate stockpiles.	Yes	Section 5.3.2
	Test plots may be required to determine the suitability of growth media for revegetation purposes.	No	Section 5.8.3
CCR 3711(c)	Soil salvage operations and phases of reclamation shall be set forth in the reclamation plan to minimize the area disturbed and to achieve maximum revegetation success.	Yes	Section 5.3.1, 5.13
CCR 3711(d)	Topsoil and growth media shall be used to phase reclamation as soon as can be accommodated following the mining of an area.	Yes	Section 4.1, 4.2, 5.1, 5.3, 5.5, 5.13
	Topsoil stockpiles shall not be disturbed until needed for reclamation.	Yes	Section 5.3
	Topsoil stockpiles shall be clearly identified with signs.	Yes	Section 5.3.2
	Topsoil shall be planted with vegetation or otherwise protected to prevent erosion and discourage weeds.	Yes	Section 5.3.2
CCR 3711(e)	Topsoil shall be redistributed in a manner resulting in a stable, uniform thickness consistent with the end use.	Yes	Section 5.7
REVEGETATION			
PRC 2773(a)	The reclamation plan shall be specific to the property and shall establish site-specific criteria for evaluating compliance with the reclamation plan with respect to revegetation.	Yes	Section 5.8 (Hydroseeded side slopes; no other revegetation will occur)
PRC 2773(b)(3)	Revegetation	Yes	Section 5.8 (Hydroseeded side slopes; no other revegetation will occur)
CCR 3503(g)	Available research regarding revegetation methods and selection of species given the topography, resoiling characteristics, and climate of the mined areas shall be used.	Yes	Section 5.8
CCR 3705(a)	Baseline studies shall be conducted prior to mining activities to document vegetative cover, density, and species richness.	No	Section 5.8
	Vegetative cover shall be similar to surrounding habitats and self-sustaining.	Yes	Section 5.8

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
CCR 3705(b)	Test plots shall be conducted simultaneously with mining to ensure successful implementation of the proposed revegetation plan.	No	Section 5.8.3
CCR 3705(c)	Decompaction methods, such as ripping and disking, shall be used in areas to be revegetated to establish a suitable root zone for planting.	Yes	Section 5.7
CCR 3705(d)	Roads shall be stripped of roadbase materials, resoiled, and revegetated, unless exempted.	Yes	Section 5.12.3
CCR 3705(f)	Temporary access shall not disrupt the soil surface on arid lands except where necessary for safe access. Barriers shall be installed to keep unauthorized vehicles out.	No	No arid lands
CCR 3705(g)	Use local native plant species (unless non-native species meet the end use).	Yes	Section 5.8.1
	Areas to be developed for industrial, commercial, or residential shall be revegetated for the interim period to control erosion.	Yes	Sections 5.3, 5.5, & 5.8.2
CCR 3705(h)	Planting shall be conducted during the most favorable period of the year for plant establishment.	Yes	Section 5.8.2
CCR 3705(i)	Use soil stabilizing practices and irrigation when necessary to establish vegetation.	Yes	Sections 5.5 & 5.7
CCR 3705(j)	If irrigation is used, demonstrate that revegetation has been self-sustaining without irrigation for two years prior to the release of financial assurance.	No	Section 5.8.1
CCR 3705(k)	Weeds shall be monitored and managed.	Yes	Section 5.9
CCR 3705(l)	Plant protection measures such as fencing and caging shall be used where needed for revegetation success. Protection measures shall be maintained until revegetation efforts are successfully completed and the lead agency authorizes removal.	Yes	Section 5.8.2
CCR3705(m)	Quantitative success standards for vegetative cover, density, and species richness shall be included in the reclamation plan.	No	Section 5.8.4
	Monitoring to occur until success standards have been achieved.	No	Section 5.8.5
	Sampling techniques for measuring success shall be specified. Sample size must be sufficient to provide at least an 80 percent statistical confidence level.	No	Section 5.8.5
AGRICULTURE			
PRC 2773(b)(5)	Prime and other agricultural land reclamation	No	Not agricultural end use
CCR 3707(a)	Where the end use will be agriculture, prime agricultural land shall be returned to a fertility level specified in the reclamation plan.	No	Not agricultural end use
CCR 3707(b)	Segregate and replace topsoil in proper sequence by horizon in prime agricultural soils.	No	Not agricultural land

Authority	Requirements/Practices/Standards	Applicable	Source Location or Explanation
CCR 3707(c)	Post reclamation productivity rates for prime agricultural land must be equal to pre-project condition or to a similar site for two consecutive years.	No	Not agricultural land
	Productivity rates shall be specified in the reclamation plan.	No	Not necessary for hydroseeded side slopes; no other revegetation will occur
CCR 3707(d)	If fertilizers and amendments are applied, they shall not cause contamination of surface or groundwater.		Section 5.7, 5.10
CCR 3708	For sites where the end use is to be agricultural, non-prime agricultural land must be reclaimed to be capable of sustaining economically viable crops common to the area.	No	Not agricultural end use

APPENDIX B
STATEMENT OF RESPONSIBILITY

Name and Address of Owner/Operator
(PRC § 2772[c][1]):

Rise Grass Valley, Inc.
PO Box 271
Grass Valley, California 95945
Contact: Ben Mossman
Telephone: (604) 260-4577

Name and Address of Agent
(PRC § 2772[c][1]):

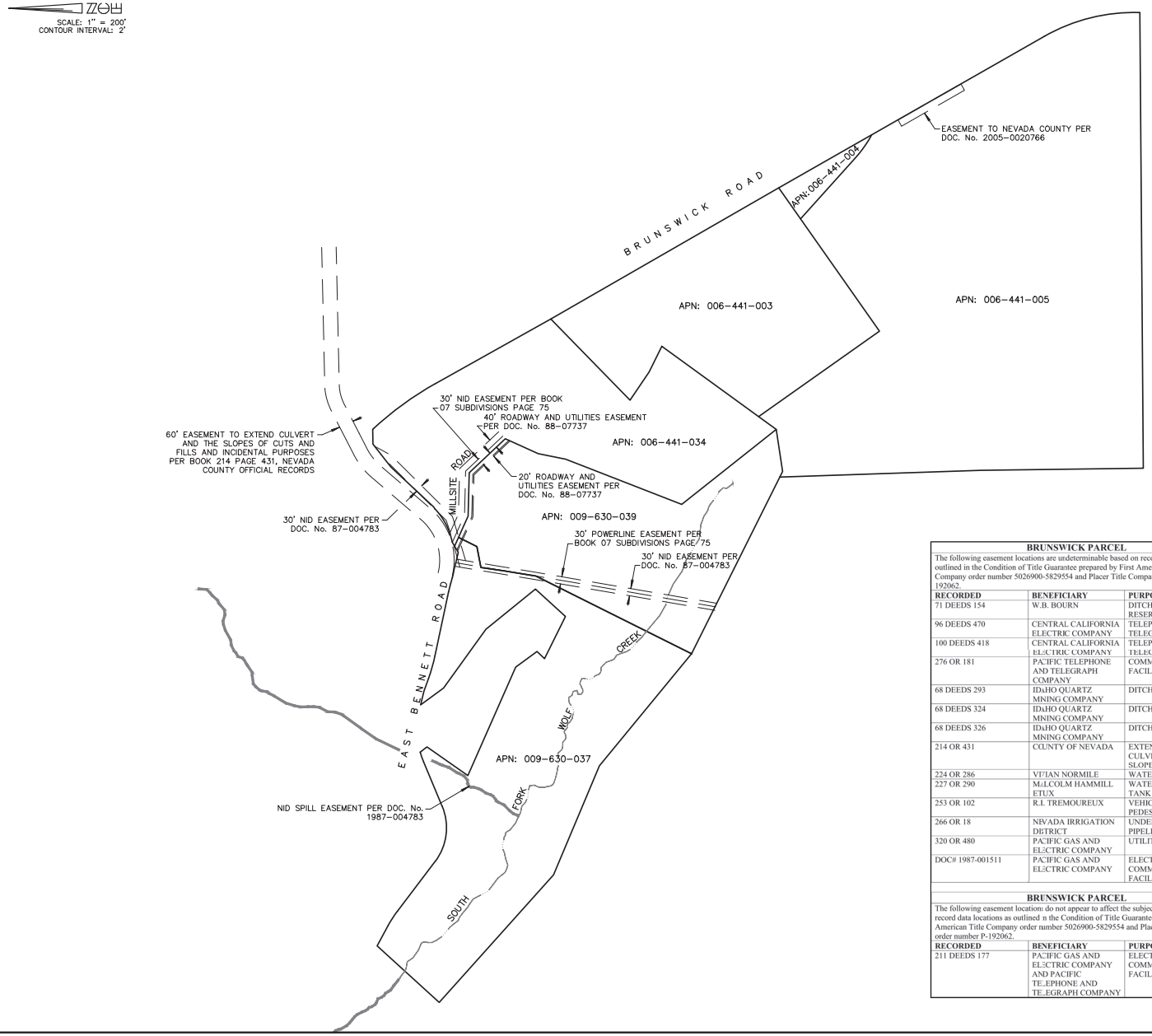
Rise Grass Valley, Inc.
PO Box 271
Grass Valley, California 95945
Contact: Ben Mossman
Telephone: (604) 260-4577

STATEMENT OF RECLAMATION RESPONSIBILITY *(PRC § 2772[c][10])*
I certify that the information in this reclamation plan is correct, to the best of my knowledge, and that all of the owners of possessory interest in the property in question have been notified of the planned operation and potential uses of the land after reclamation. I also certify that I am authorized on behalf of Rise Grass Valley, Inc. to accept responsibility for reclaiming the mined lands described and submitted herein, with any modification required by Nevada County and agreed to as conditions of approval.

Signed this 13 day of November, 2019.

Ben Mossman
President, CEO, Director for Rise Grass Valley, Inc.

APPENDIX C
PARCELS, LEGAL DESCRIPTION, AND EASEMENTS



BRUNSWICK PARCEL

The following easement locations are undeterminable based on record data locations as outlined in the Condition of Title Guarantee prepared by First American Title Company order number 5026900-5829554 and Placer Title Company order number P-192062.

RECORDED	BENEFICIARY	PURPOSE
71 DEEDS 154	W.B. BOURN	DITCH AND RESERVOIR
96 DEEDS 470	CENTRAL CALIFORNIA ELECTRIC COMPANY	TELEPHONE AND TELEGRAPH PURPOSES
100 DEEDS 418	CENTRAL CALIFORNIA ELECTRIC COMPANY	TELEPHONE AND TELEGRAPH PURPOSES
276 OR 181	PACIFIC TELEPHONE AND TELEGRAPH COMPANY	COMMUNICATION FACILITIES
68 DEEDS 293	IDAHO QUARTZ MINING COMPANY	DITCH
68 DEEDS 324	IDAHO QUARTZ MINING COMPANY	DITCH
68 DEEDS 326	IDAHO QUARTZ MINING COMPANY	DITCH
214 OR 431	COUNTY OF NEVADA	EXTENSION OF CULVERTS AND SLOPES
224 OR 286	VIVIAN NORMILE	WATER AND PIPELINE
227 OR 290	MALCOLM HAMMILL ETUX	WATER AND SEPTIC TANK
253 OR 102	R.L TREMOUREUX	VEHICLE OR PEDESTRIAN TRAVEL
266 OR 18	NEVADA IRRIGATION DISTRICT	UNDERGROUND PIPELINE
320 OR 480	PACIFIC GAS AND ELECTRIC COMPANY	UTILITY FACILITIES
DOC# 1987-001511	PACIFIC GAS AND ELECTRIC COMPANY	ELECTRICAL AND COMMUNICATION FACILITIES

BRUNSWICK PARCEL

The following easement locations do not appear to affect the subject parcels based on record data locations as outlined in the Condition of Title Guarantee prepared by First American Title Company order number 5026900-5829554 and Placer Title Company order number P-192062.

RECORDED	BENEFICIARY	PURPOSE
211 DEEDS 177	PACIFIC GAS AND ELECTRIC COMPANY AND PACIFIC TELEPHONE AND TELEGRAPH COMPANY	ELECTRICAL AND COMMUNICATION FACILITIES

ENGINEERING • SURVEYING
PLANNING

NEVADA CITY ENGINEERING, INC.

505-B COYOTE STREET NEVADA CITY
(530)265-6911

LICENSED LAND SURVEYOR
ANDREW N. CASSINO
L.S. #6370
STATE OF CALIFORNIA

REVISION:	DATE:	DESCRIPTION:

BRUNSWICK SITE

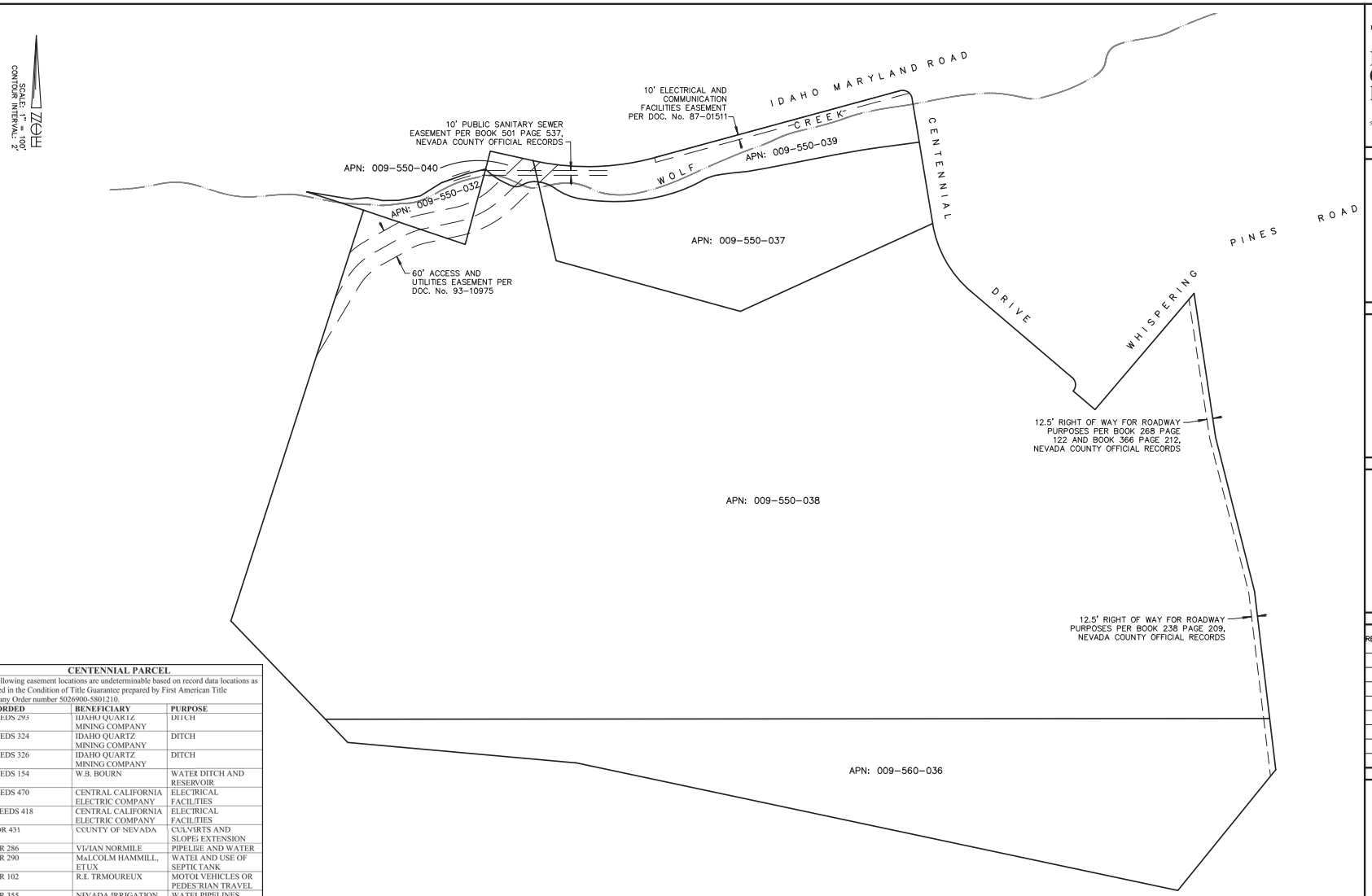
RISE GRASS VALLEY INC.

SEC. 31, T.16N., R.9E., M.D.M.

NEVADA COUNTY , CALIFORNIA

EASEMENTS

B-2



CENTENNIAL PARCEL

The following easement locations are undeterminable based on record data locations as outlined in the Condition of Title Guarantee prepared by First American Title Company Order number 5026900-5801210.

RECORDED	BENEFICIARY	PURPOSE
68 DEEDS 293	IDAHO QUARTZ MINING COMPANY	DITCH
68 DEEDS 324	IDAHO QUARTZ MINING COMPANY	DITCH
68 DEEDS 326	IDAHO QUARTZ MINING COMPANY	DITCH
71 DEEDS 154	W.B. BOURN	WATER DITCH AND RESERVOIR
96 DEEDS 470	CENTRAL CALIFORNIA ELECTRIC COMPANY	ELECTRICAL FACILITIES
100 DEEDS 418	CENTRAL CALIFORNIA ELECTRIC COMPANY	ELECTRICAL FACILITIES
214 OR 431	COUNTY OF NEVADA	CULVERTS AND SLOPES EXTENSION
224 OR 286	VIVIAN NORMILE	PIPELINE AND WATER
227 OR 290	MALCOLM HAMMILL, ETUX	WATEI AND USE OF SEPTIC TANK
253 OR 102	R.L TRMOUREUX	MOTOI VEHICLES OR PEDESTRIAN TRAVEL
280 OR 355	NEVADA IRRIGATION DISTRICT	WATEI PIPELINES
276 OR 181	PACIFIC TELEPHONE AND TELEGRAPH CCMPANY	COMMUNICATION FACILTIES
330 OR 480	PACIFIC GAS AND ELECTRIC COMPANY	UTILITY FACILITIES

CENTENNIAL PARCEL

The following easements locations do not appear to affect the subject parcels based on record data locations as outlined in the Condition of Title Guarantee prepared by First American Title Company Order number 5026900-5801210.

RECORDED	BENEFICIARY	PURPOSE
366 DEEDS 212	SUM-GOLD CORPORATION	60' ROAD AND UTILITY
475 DEEDS 234	THE COUNTY OF NEVADA	PUBLIC SANITARY SEWER

ENGINEERING • SURVEYING
PLANNING

NEVADA CITY ENGINEERING, INC.

505-B COYOTE STREET NEVADA CITY
(530)265-6911

LICENSED LAND SURVEYOR
KENNETH R. CRAWFORD
L.S. #4370
STATE OF CALIFORNIA

REVISION:	DATE:	DESCRIPTION:

CENTENNIAL SITE

RISE GRASS VALLEY INC.

SEC. 26, T.16N., R.8E., M.D.M.

NEVADA COUNTY , CALIFORNIA

EASEMENTS

C-2

5

RECORDING REQUESTED BY:

Placer Title Company

WHEN RECORDED MAIL TO:

RISE GRASS VALLEY, INC.
1090 West Georgia Street, Suite 448
Vancouver, BC V6E 3V7

Nevada County Recorder
Gregory J. Diaz
DocumentH: 20180009581
Tuesday May 15 2018, at 08:00:00 AM
Rec Fee:$26.00 Transfer tax:$2090.00
Paid: $2116.00
Recorded By:AB

Order No: P-192062 APN: 06-441-34, 06-441-03, 06-441-04, 06-441-05

Grant Deed

(Please fill in document title(s) on this line)

[X] Exempt from fee per GC27388.1 due to being recorded in connection with concurrent transfer that is subject to the imposition of documentary transfer tax, or,

[ ] Exempt from fee per GC27388.1 due to the maximum fees being paid on documents in this transaction, or,

[ ] Partially exempt from fee per GC27388.1. Only $75.00 to be charged as $150.00 in fees has been paid on documents recorded immediately prior hereto or,

[ ] Exempt from fee per GC27388.1 due to being recorded in connection with concurrent transfer that is a residential dwelling to an owner-occupier, or,

[ ] Exempt from the fee per GC27388.1(a) (1); Not related to real property, or,

[ ] Exempt from fee under GC27388.1 for the following reasons:

NOTE: The following exemptions may not be acceptable for use in all counties:

[ ] Exempt from fee per GC27388.1 due to being recorded in connection with a transfer that was subject to documentary transfer tax which was paid on document recorded previously on (date) as document number of Official Records, or,

[ ] Exempt from fee per GC27388.a due to the maximum fees having been paid on documents in the transaction(s) recorded previously on (date) as document number(s) of Official Records, or,

[ ] Partially exempt from fee per GC27388.1. Only $75.00 to be charged as $150.00 in fees having been paid on documents in this transaction(s) recorded previously on (date) as document number(s) of Official Records, or,

[ ] Exempt from fee per GC27388.1 due to it being recorded in connection with a transfer of real property that is a residential dwelling to an owner-occupier. The recorded document transferring the dwelling to the owner-occupier was recorded on (date) as document number(s) .

THIS PAGE ADDED TO PROVIDE SENATE BILL 2 EXEMPTION INFORMATION
(Additional recording fee applies)

RECORDING REQUESTED BY:

Placer Title Company
Escrow Number: P-192062
Branch: 1401

AND WHEN RECORDED MAIL TO

RISE GRASS VALLEY, INC.
1090 West Georgia Street, Suite 448
Vancouver, BC V6E 3V7

A.P.N.: 06-441-34, 06-441-03, 06-441-04, 06-441-05 SPACE ABOVE THIS LINE FOR RECORDER'S USE

GRANT DEED

The undersigned grantor(s) declare(s):
Documentary transfer tax is $2,090.00 City Transfer Tax: $0.00
(X) Unincorporated Area ( ) City of
(X) computed on full value of property conveyed, or
( ) computed on full value less value of liens and encumbrances remaining at time of sale.

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, **Sierra Pacific Industries, a California Corporation**

Hereby GRANT(S) to **RISE GRASS VALLEY, INC., A NEVADA CORPORATION**

The land described herein is situated in the State of California, County of Nevada, unincorporated area, described as follows:

(SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF)

Dated: May 7, 2018

SIERRA PACIFIC INDUSTRIES, A CALIFORNIA CORPORATION

By: _____
Name & Title: M.D. Emmerson, CFO

MAIL TAX STATEMENTS TO PARTY SHOWN ON FOLLOWING LINE; IF NO PARTY SHOWN, MAIL AS DIRECTED ABOVE

SAME AS ABOVE

Name | Street Address | City & State

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of CALIFORNIA)
) ss.
County of SHASTA)

On May 7, 2018 before me, Susan E. Witherspoon,
Notary Public personally appeared M. D. Emmerson
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct. WITNESS my hand and official seal.

SIGNATURE Susan E. Witherspoon

SUSAN E. WITHERSPOON
COMM. NO. 2089237
NOTARY PUBLIC - CALIFORNIA
SHASTA COUNTY
MY COMMISSION EXPIRES
NOVEMBER 21, 2018

Order Number: P-192062

EXHIBIT "A"
LEGAL DESCRIPTION

The land described herein is situated in the State of California, County of Nevada, unincorporated area, described as follows:

Parcel One:

The surface and sub-surface of a depth of 75 feet below the surface of a portion of the Northwest one-quarter of Section 31, Township 16 North, Range 9 East M.D.M., described as follows, to wit:

Beginning at a point on a Southwesterly line of that certain County Road known as the Brunswick Road from which the Northwest corner of Section 31, Township and Range aforesaid, bears North 38°50'44" West 1125.89 feet distant; thence from said point of commencement with true bearings South 46°19' West 469.54 feet to a steel drill; thence South 55°18' East 140.65 feet to a steel drill; thence South 62°53' East 118.76 feet to a steel drill; thence South 36°38' West 495.05 feet to a steel drill; thence South 34°37' East 612.51 feet to a steel drill; thence North 55°33' East 725.10 feet to a steel drill situate on the said Southwesterly line of the Brunswick Road; thence along said line North 29°16'14" West 1088.66 feet to a steel drill, the place of beginning.
APN: 06-441-03

Parcel Two:

All that certain portion of the Northwest one-quarter of Section 31, Township 16 North, Range 9 East, M.D.M., described as follows:

Beginning at the Southeast corner of that certain 14.044 acre tract of land as described in deed dated December 3, 1956, recorded December 10, 1956, in Book 227 of Official Records, Page 292, File No. 4997, Nevada County Records, executed by Idaho Maryland Mines Corporation to Milton Balmain and Ina V. Balmain at a point on the Southwesterly line of the "New Brunswick" County Road as described in Parcel 2 of Deed dated October 24, 1955, recorded November 4, 1955 in Book 214 of Official Records, Page 431, File No. 4722, Nevada County Records, executed by Idaho Maryland Mines Corporation to County of Nevada; thence from said point of beginning, South 55°33' West along the Southeasterly line of said 14.044 acre tract to its intersection with the Southwesterly line of the former Nevada County Narrow Gauge Railroad right of way; thence Southeasterly along the Southwesterly line of said Railroad right of way to its intersection with the Southwesterly line of said County Road; thence North 29°16'14" West along the Southwesterly line of said County Road to the point of beginning.
APN: 06-441-04

Parcel Three:

All that portion of the West one-half of Section 31, Township 16 North, Range 9 East, M.D.M., described as follows:

Beginning at the West one-quarter section corner of said Section 31; thence North 1°21' West 834.65 feet along the West line of the Northwest one-quarter of said Section 31 to a point in the Southerly line of the Wm. Ghidotti (formerly Idaho Maryland) property; thence along said Southerly line the following three courses: South 62°46' East 33.07 feet; thence North 81°56' East 176.00 feet; thence North 33°38' East 90.00 feet to a corner of Pendola (formerly Yuba River Lumber Company); thence along two courses of Pendola as follows: South 34°37' East 612.51 feet, and North 55°33' East

568.30 feet to a point in the Southwesterly right of way line of abandoned Nevada County Narrow Gauge Railroad; thence along said Southwesterly right of way line the following two courses: South 47°23' East 340.52 feet; thence along a curve to the left with radius of 490.74 feet, through an angle of 13°16'41" for a distance of 113.73 feet, the long chord of which bears South 54°01'26" East 113.47 feet; thence along the Westerly line of Brunswick Road, County Road Number 31 the following two courses: South 29°16'14" East 825.46 feet; thence along a curve to the right with radius of 750 feet; through an angle of 31°29'41" for a distance of 412.27 feet, the long chord of which bears South 13°31'26" East 407.09 feet; thence West 1886.14 feet to a point in the West line of the Southwest one-quarter of said Section 31; thence North 0°28' West 676.80 feet to the point of beginning.

Excepting therefrom all minerals, gas, oil and mineral deposits below a depth of 200 feet beneath such surface; together with all necessary and convenient rights to explore for, develop, produce, extract and take the same subject to the express limitations that the foregoing shall not include any right of entry upon the surface of said land without the consent of the owner of such surface of said land as excepted in the Deed recorded August 12, 1959, in Book 266 of Official Records, at page 185, by Idaho Maryland Mines Corporation, a Nevada Corporation.
APN: 06-441-05

Parcel Four:

Lot 8 as shown upon the Subdivision Map of Bet Acres, No. 85-7, filed in the office of the Recorder, County of Nevada, State of California, on February 24, 1987, in Book 7 of Subdivisions, Page 75.

Excepting therefrom all minerals, gas, oil and mineral deposits below a depth of 200 feet beneath such surface; together with all necessary and convenient rights to explore for, develop, produce, extract and take the same subject to the express limitations that the foregoing shall not include any right of entry upon the surface of said land without the consent of the owner of such surface of said land as excepted in the Deed recorded August 12, 1959, in Book 266 of Official Records, at page 185, by Idaho Maryland Mines Corporation, a Nevada Corporation.

Also excepting therefrom the following described portion:

Beginning at a point on the Southeasterly right of way line of Brunswick Road as described in that certain deed recorded November 4, 1955 in Book 214 Official Records, at Page 431, Nevada County Records, and being the most Northerly corner of said Lot 8 from which the Northwest corner of Section 31, Township 16 North, Range 9 East, M.D.M., bears North 64°01'34" West, 235.16 feet; thence from said point of beginning, along the Southwesterly right of way line of said Brunswick Road, in a Southeasterly direction along a curve concave to the Southwest with a radius of 1,350 feet, to which a radial line bears North 44°43'16" East; thence Southeasterly 53.62 feet along said curve through a central angle of 2°16'34", to a radial line of said curve which bears North 44°43'16" East; thence leaving said West right of way line, South 88°55'01" West, 60.76 feet; thence South 51°52'43" West, 120.52 feet to the Northwesterly line of said Lot 8 of Bet Acres; thence North 46°01'53" East, 164.25 feet, along said Northwesterly line of said Lot 8 of Bet Acres to the point of beginning; as conveyed to the County of Nevada by Deed recorded June 8, 1990, Document No. 90-17706.

Also excepting therefrom all the mineral, metal matter and rock lying below 200 feet of the surface, with the right to extract and remove said mineral, metal matter and rock from any depth up to 200 feet of the surface of said premises, without disturbing the surface thereof; as excepted and reserved by Mary Bouma, Erica Erickson and William Toms in Grant Deed recorded April 1, 1988, Document No. 88-07737.
APN: 06-441-34

Recording Requested By and When Recorded Mail To:

G. Braiden Chadwick
3001 Lava Ridge Court, Suite 120
Roseville, CA 95661

Nevada County Recorder
Gregory J. Diaz
Document#: 20170001985
Thursday January 26 2017, at 03:44:03 PM
Rec Fee:$44.00 Transfer tax:$2200.00
Paid: $2244.00
Recorded By:KP

(THE ABOVE SPACE FOR RECORDER'S USE ONLY)

APNs: 09-550-32; 09-550-37; 09-550-38; 09-550-39; 09-550-40; 09-560-36; 09-630-37; 09-630-39

The Undersigned grantor(s) declare(s)
DOCUMENTARY TRANSFER TAX is $ 2,200
[ ] computed on full value of property conveyed, or
[ ] computed on full value less value of liens or encumbrances remaining at time of sale,
[x] Unincorporated Area of Nevada County or [ ] City of

QUITCLAIM DEED

FOR GOOD AND VALUABLE CONSIDERATION, the receipt of which is hereby acknowledged, Rica Kids, LLC, a California limited liability company, Tangold, LLC, a California limited liability company, the Estate of Erica Erickson, and the Estate of Mary Bouma, (collectively "Grantors") hereby remise, release, relinquish, surrender and forever quitclaim to Rise Grass Valley Inc., a Nevada Corporation, (hereinafter referred to as "Grantee") any and all right, title and interest that Grantors may have in that certain real property in Nevada County, State of California, as set forth in Exhibit A to this Quitclaim Deed.

IN WITNESS WHEREOF, Grantors have executed this Quitclaim Deed on the date affixed to its signature. This Quitclaim Deed may be signed in counterparts, which taken together, shall constitute one original.

Rica Kids, LLC
A California limited liability company

Earlene M Johnson Date: 1/18/17
Name: Earlene M. Johnson
Title: Member

Carol A Frost Date: 1/18/17
Name: Carol A. Frost
Title: Member

This is true certified copy of the record if it bears the seal, imprinted in purple ink, of the County Recorder.
JAN 26 2017
Gregory J. Diaz
County Recorder
NEVADA COUNTY, CALIFORNIA

COUNTY of NEVADA CALIFORNIA

{00028289;1 }

**Mail Tax Statement To: Mitchell Chadwick LLP, 3001 Lava Ridge Court, ste. 120
Roseville, CA 95661

Tangold, LLC

Gail Palen
Name: Gail Palen
Title: Member

Date: 1-17-2017

Name: Leslie Toms
Title: Member

Date: _____

The Estate of Mary A. Bouma

Name: Sandra J. Brislane
Title: Executor

Date: _____

The Estate of Erica Erickson

Name: Earlene M. Johnson
Title: Executor

Date: _____

Name: Carol A. Frost
Title: Executor

Date: _____

AG GP

Tangold, LLC

_____ Date: _____
Name: Gail Palen
Title: Member

Leslie Toms Date: Jan. 18, 2017
Name: Leslie Toms
Title: Member

The Estate of Mary A. Bouma

_____ Date: _____
Name: Sandra J. Brislane
Title: Executor

The Estate of Erica Erickson

_____ Date: _____
Name: Earlene M. Johnson
Title: Executor

_____ Date: _____
Name: Carol A. Frost
Title: Executor

Tangold, LLC

_____ Date: _____
Name: Gail Palen
Title: Member

_____ Date: _____
Name: Leslie Toms
Title: Member

The Estate of Mary A. Bouma

Sandra J. Brislane Date: January 24, 2017
Name: Sandra J. Brislane
Title: Executor

The Estate of Erica Erickson

_____ Date: _____
Name: Earlene M. Johnson
Title: Executor

_____ Date: _____
Name: Carol A. Frost
Title: Executor

Tangold, LLC

_____ Date: _____
Name: Gail Palen
Title: Member

_____ Date: _____
Name: Leslie Toms
Title: Member

The Estate of Mary A. Bouma

_____ Date: _____
Name: Sandra J. Brislane
Title: Executor

The Estate of Erica Erickson

Earlene M. Johnson Date: 1/18/17
Name: Earlene M. Johnson
Title: Executor

Carol A. Frost Date: 1/18/17
Name: Carol A. Frost
Title: Executor

Exhibit "A"

(Legal Description of Property)

SURFACE LAND

Parcel Number	Description	Lot Size
09-550-32	SEC 26, TWN 16N, RNG 8E, MDBM, PTN N 1/2 26-16-8	20,908 SF
09-550-37	SEC 26, TWN 16N, RNG 8E, MDBM, PTN NE 1/4 26-16-8	4.47 AC
09-550-38	SEC 26, TWN 16N, RNG 8E, MDBM, PTN NE 1/4 26-16-8	40.1 AC
09-550-39	SEC 26, TWN 16N, RNG 8E, MDBM, PTN NE 1/4 26-16-8 344 CENTENNIAL DRIVE GRASS VALLEY, CA 95945	42,668 SF
09-550-40	SEC 26, TWN 16N, RNG 8E, MDBM, PTN NE 1/4 26-16-8	5,662 SF
09-560-36	SEC 26, TWN 16N, RNG 8E, MDBM, PTN N 1/2 SE 1/4 26-16-8	10.25 AC
09-630-37	LOT 6	21.8 AC
09-630-39	LOT 7	15.07 AC

SUBSURFACE LAND

All property described in that certain Quit Claim Deed by Idaho Maryland Industries Inc. in favor of William Ghidotti and Marian Ghidotti, his wife as tenants in common, dated June 10, 1963 and located at vol. 337, pp. 175-196 in the official records of Nevada County, as recorded on June 12, 1963.

All rights to minerals within, on, and under the property shown upon the Subdivision Map of BET ACRES, No. 85-7, filed in the Office of the County Records, Nevada County, California, on February 24, 1987, in Book 7 of Subdivisions, at Page 75 et seq.

All rights to minerals within, on, and under the land located in Sections 23, 24, 25, 26, 34, and 35, Township 16 North, Range 8 East, Mount Diablo Base and Meridian, Sections 19, 20, 29, 30, and 31, Township 16 North, Range 9 East, Mount Diablo Base and Meridian, and Section 6, Township 15 North, Range 9 East, Mount Diablo Base and Meridian, and all other mineral rights associated with the Idaho-Maryland Mine.

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

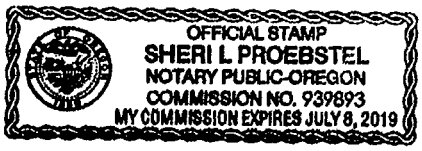
ACKNOWLEDGMENT

State of OREGON)
)ss.
County of Hood River)

On this 17 day of January, 2017, personally appeared before me Gail Palen who stated that (s)he is the Member of Tangold LLC, a corporation, and that the instrument was signed in behalf of the said corporation by authority of its board of directors and acknowledged said instrument to be its voluntary act and deed. Before me:

Sheri L Proebstel
Notary Public for Oregon
My Commission Expires: July 8, 2019.

Official Stamp



Document Description
This certificate is attached to page 4 of a Quitclaim Deed, dated Jan 17, 2017, consisting of 4 pages.
{00028634;1 }

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

ACKNOWLEDGMENT

STATE OF CALIFORNIA)
COUNTY OF Sacramento)

On Jan 18th, 2017 before me, Daniel Patrick Kelly, a Notary Public, personally appeared Leslie Toms, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument, the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

DANIEL PATRICK KELLY
Commission # 2005207
Notary Public - California
Santa Barbara County
My Comm. Expires Jan 26, 2017

NOTARY PUBLIC (Seal)

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

ACKNOWLEDGMENT

STATE OF CALIFORNIA)
)
COUNTY OF Nevada)

On January 29, 2017, before me, Linda Lee Hawkins, a Notary Public, personally appeared Sandra J. Brisland, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument, the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Linda Lee Hawkins
NOTARY PUBLIC (Seal)

LINDA LEE HAWKINS
Commission #: 2131368
Notary Public - California
Nevada County
My Comm. Expires Nov 20, 2019

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

ACKNOWLEDGMENT

STATE OF CALIFORNIA)
)
COUNTY OF Nevada)

On Jan. 18, 2017, before me, Denise L. Best, a Notary Public, personally appeared Earlene M. Johnson + Carol A. Frost, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that ~~he/she~~/they executed the same in ~~his/her~~/their authorized capacity(ies), and that by ~~his/her~~/their signature(s) on the instrument, the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Denise L. Best
NOTARY PUBLIC (Seal)

DENISE L. BEST
COMM. # 2059350
NOTARY PUBLIC • CALIFORNIA
NEVADA COUNTY
Comm. Exp. MARCH 27, 2018

APPENDIX D
CONDITIONS OF APPROVAL AND MITIGATION MEASURES

Conditions of Approval to be inserted upon approval.

APPENDIX E

BRUNSWICK INDUSTRIAL SITE AND EAST BENNETT ROAD RIGHT OF WAY (ROW) BIOLOGICAL RESOURCES ASSESSMENT

Brunswick Industrial Site and East Bennett Road Right of Way (ROW)

Biological Resources Assessment

Prepared for:
Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Prepared by:
Greg Matuzak, Principal Biologist
Greg Matuzak Environmental Consulting LLC
471 Sutton Way, Suite #210
Grass Valley, CA 95945
Email: gmatuzak@gmail.com

January 2021

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INFORMATION SUMMARY

Report Date: January 2021

Report Preparer: Mr. Greg Matuzak
Greg Matuzak Environmental Consulting LLC

Project Site: Brunswick Industrial Site
East Bennett Rd Corridor

Project Site Location: SECTION 36, T.16N, R.8E & SECTION 31, T.16N, R.9E
SECTION 25, T.16N, R.8E

BRUNSWICK INDUSTRIAL SITE		
Assessor Parcel Number	**Site Address**	**Lot Size (Acres)**
009-630-037	12603 East Bennett Road	21.8 AC
009-630-039	12301 Millsite Road	15.07 AC
006-441-003	12503 Brunswick Road	15.19 AC
006-441-004	12625 Brunswick Road	0.85 AC
006-441-005	12791 Brunswick Road	50.01 AC
006-441-034	12381 Brunswick Road	16.01 AC
Brunswick Industrial Site - Land Total:		**118.93 AC**
East Bennett Road ROW:		**10.3 AC**
Brunswick Area - Land Total:		**129.23 AC**

Property Owner / Applicant: Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Principal Investigators: Greg Matuzak, Principal
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Report Summary

The Biological Resources Assessment Report includes the biological results of the background research, biological resources field surveys, data analysis, and impact assessment for the Brunswick Industrial Site and East Bennett Road Right of Way. The key findings of this report include the following:

- Perennial marsh wetlands and a large manmade pond within the Brunswick Industrial Site contains potentially suitable habitat for several special-status aquatic wildlife species, including the California State ESA (CESA) listed (threatened) California black rail (*Laterallus jamaicensis coturiculus*), the federally listed California red-legged frog (*Rana aurora draytonii*), and the Western pond turtle (*Emys marmorata*), a California State Species of Concern. None of these species have been observed within the Brunswick Industrial Site.
- The South Fork of Wolf Creek within the western section of the Brunswick Industrial Site includes a perennial stream and riparian vegetation. The stream contains marginal suitable habitat for the foothill yellow-legged frog (*Rana boylii*), a Threatened Species listed under CESA. This species has never been observed within the Brunswick Industrial Site or along the East Bennett Road Right of Way.
- A single California Native Plant Society (CNPS) List 4 Species, the Humboldt lily (*Lilium humboldtii ssp. humboldtii*) was documented and mapped within the Brunswick Industrial Site during plant surveys. A single occurrence of the Humboldt lily consisting of 3 individuals was documented in the Brunswick Industrial Site during 2019 field surveys and a single occurrence of the species consisting of 12 individuals was documented within the East Bennett Road ROW.
- Woodland and grassland within the Brunswick Industrial Site and along the East Bennett Road Right of Way contains suitable nesting habitat for raptors and birds, However, none of these species were observed within the Brunswick Industrial Site or along the East Bennett Road Right of Way to date.
- The disturbed and developed areas within the Brunswick Industrial Site contain suitable habitat for the coast horned lizard (*Phrynosoma blainvillii*), a California Species of Concern, and the historic mining structure within the Brunswick Industrial Site contains roosting habitat for bats, including the Townsend's big-eared bat (*Corynorhinus townsendii*), a California Species of Concern. Neither the horned lizard, nor the Townsend's big-eared bat has been observed at the project site.
- A total of 9.60 acres of "waters of the U.S.", including wetlands, and "waters of the State of California", were identified and mapped within the Brunswick Industrial Site and along the East Bennett Road Right of Way. The 9.60 acres of wetland-waters include 8.72 acres of mapped wetlands and 0.88 acres of mapped "other waters of the U.S.," including South Fork Wolf Creek, a perennial drainage along

the western edge of Brunswick Road, as well as several intermittent and ephemeral streams.

- Estimates of permanent disturbance related impacts to "waters of the U.S.", including wetlands, within the Brunswick Industrial Site include 0.627 acres of permanent fill to "waters of the U.S.," including wetlands. This includes an estimated 0.01 acres of fill along approximately 15 linear feet of the south bank of the South Fork Wolf Creek, an estimated 0.05 acres of fill along approximately 188 linear feet along a mapped ephemeral stream, and 0.567 acres of permanent fill to wetlands. A potentially jurisdictional small roadside wetland along the East Bennett Road Right of Way would not be impacted by the Project nor would the perennial drainage be impacted along the western edge of Brunswick Road within the southeastern border of the Brunswick Industrial Site.
- Estimates of temporary disturbance related impacts to "waters of the U.S.", including wetlands, within the Brunswick Industrial Site includes 0.0427 acres of temporary impacts to a total of 89.5 linear feet of mapped streams within the Brunswick Industrial Site. A small roadside wetland along the East Bennett Road Right of Way would not be disturbed by the Project.

1 INTRODUCTION

At the request of Rise Grass Valley Inc. ("Rise Grass Valley" or "Rise"), Mr. Greg Matuzak was retained to prepare a Biological Resources Assessment Report ("Biological Report") for the Brunswick Industrial Site and East Bennett Road Right of Way ("Brunswick Area") located in Grass Valley, Nevada County, California (see Appendix A). The East Bennett Road Right of Way ("East Bennett Road ROW") is an approximate 1.25-mile public right of way. The Biological Report includes an evaluation of sensitive biological resources within the Brunswick Area, including sensitive biological resources under the jurisdiction of the California Department of Fish and Wildlife ("CDFW"), United States Fish and Wildlife Service ("USFWS"), United States Army Corps of Engineers ("Corps"), and the Nevada County Planning Department. Preparation of the Biological Report included background research, field biological resources surveys, and reporting as detailed herein. Additionally, this Biological Report references and incorporates the findings of a stand-alone *Brunswick Industrial Site Aquatic Resources Delineation of Waters of the United States and State of California* report (Matuzak, 2020) that was developed for the entirety of the Brunswick Area.

Mr. Greg Matuzak, Principal and owner of Greg Matuzak Environmental Consulting LLC is a wetlands ecologist and wildlife biologist with 20 years of experience conducting aquatic resources delineations and biological resources assessments in Northern California. Mr. Matuzak is 40-hour Wetland Delineation Certified (Wetland Training Institute) and has conducted aquatic resources delineations for 100's of linear miles of projects and 1000s of acres of site development projects. Additionally, Mr. Matuzak has conducted special-status biological resources surveys and developed biological resources assessments for dozens of projects in Nevada County. Mr. Matuzak has lived and worked in Nevada County for over 13 years. Ms. Wendy Boes is a local Nevada County botanist and most recently worked for the Tahoe National Forest as a botanist. Ms. Boes is an independent consultant, GIS specialist, and conducts field data collection and GIS mapping for field related projects. Mr. Matuzak and Ms. Boes were responsible for the field data collection and assessment developed as part of the development of this Biological Report. Both Mr. Matuzak and Ms. Boes are on the Nevada County Planning Department's list of Qualified Biological Resources Consultants.

1.1 Project Setting

The Biological Report includes a full coverage assessment of the 118.93-acre Brunswick Industrial Site and the 10.3-acre East Bennett Road ROW for a total Brunswick Area of 129.23 acres; see Appendix A for Brunswick Area Overview Figures. The recorded owner of the surface land which comprises the Brunswick Industrial Site is Rise Grass Valley while the East Bennett Road ROW is a public right of way.

The Brunswick Industrial Site is bordered by Brunswick Road along the eastern boundary and East Bennett Road along the northern boundary. The Brunswick Industrial Site is surrounded by private developed and undeveloped residential and industrial districts zoning and land uses. The East Bennett Road ROW study area is surrounded by private residential and industrial districts zoning and land uses, as well as public open space. The East Bennett Road ROW study area includes an easement area from East Bennett Road to the Centennial Industrial Site. The easement area crosses private industrial property that is heavily disturbed by industrial operations.

1.2 Project Understanding

Rise Grass Valley proposes to reinitiate underground mining and ore processing of the Idaho-Maryland Mine in Nevada County, CA. The proposed facilities and operations to support underground mining will be located on the Brunswick Industrial Site consisting of six contiguous parcels zoned Light Industrial ("M-1"). The project comprises four primary elements: (1) dewatering the existing underground mine workings, (2) mining existing and new underground mine workings, (3) processing ore and rock, and (4) placing engineered fill at the Centennial and Brunswick Industrial Sites.

The Brunswick Industrial Site is approximately 2 miles from the center of the city of Grass Valley and State Route 49. Several shaft entrances are located on the Brunswick Industrial Site from historic mine operations, including the Brunswick and Union Hill shafts. Other portions of the site include graveled or paved areas from previous land uses.

The project site plan for the Brunswick Industrial Site comprises five areas: aboveground site facilities, underground mining, treated and potable water pipelines, the Brunswick engineered fill area, and outfall for the treated water to South Fork Wolf Creek (see Appendix J for a figure showing the proposed site plan for the Brunswick Area). In total, approximately 60 acres of the 118.93-acre site will be subject to surface use and/or development for the aboveground facilities and fill placement to support dewatering, mining, and processing.

The groundwater from the mine will be pumped via a pipeline to an existing clay-lined settling pond for water treatment. An aboveground pipe will convey treatedwater from the water treatment facility at the Brunswick Industrial Site along an existing access road on the property to an outfall located at South Fork Wolf Creek. The pipe and discharge point are located entirely within the property boundaries. Initial dewatering of the underground workings and subsequent operational dewatering of the mine are estimated to have a maximum discharge rate of 5.6 cubic feet per second (cfs). The existing culvert that daylights creating the South Fork Wolf Creek within the Brunswick Industrial Site will be upgraded with a new culvert to replace the existing culvert.

All discharges from the water treatment plant to South Fork Wolf Creek will be discharged into South Fork Wolf Creek per the requirements of the Central Valley Regional Water Quality Control Board, National Pollutant Discharge Elimination System, Number CAG995002. The water discharged into South Fork Wolf Creek is expected to be as good or better quality than the water typically flowing through South Fork Wolf Creek.

A buried potable water pipeline will be installed to provide water to residences along the portion of the Brunswick Area containing the East Bennett Road ROW. The existing Nevada Irrigation District (NID) potable water pipeline will be extended within the East Bennet Road ROW to provide potable water service to residences currently on wells that may be affected by the project.

1.3 Previous Biological Resources Assessments of the Brunswick Site

Several previous reports were developed for a separate project that included the Brunswick Site and was completed by a different company that held a lease on the property. The previous assessments of the Brunswick Site included a special-status plant survey report and wildlife habitat evaluation report. In addition, the previously proposed Idaho-Maryland Mine Project's (which included the Brunswick Site) potential impacts on biological resources were evaluated per the California Environmental Quality Act (CEQA) guidelines requirements in 2008 when the impact assessment was completed. A Draft Environmental Impact Report (Draft EIR) was previously developed and included appendices for the previously assessed Idaho-Maryland Mine Project (ESA, 2008). Background biological resources surveys reporting developed as part of the baseline for the 2008 Draft EIR and previous regulatory agency coordination included the following:

- *Idaho-Maryland Mine Special-Status Plant Survey Report* (ESA, 2006). The ESA report includes the Brunswick Industrial Site as well as other areas associated with the overall proposed mining operations at the time.
- *Idaho-Maryland Mine Special-Status Wildlife Habitat Evaluation Report* (ESA, 2006). The ESA report includes the Brunswick Industrial Site as well as other areas associated with the overall proposed mining operations at the time.
- *Delineation of Section 404 Jurisdictional Areas Idaho-Maryland Mine, Nevada County, California* developed by WRA, Inc., dated April 2008 with follow up mapping submitted to the United States Army Corps of Engineers ("Corps") on June 5, 2008. The WRA, Inc. mapping and reporting of the Brunswick Industrial Site, includes the areas located to the west of the large clay lined pond.
- *Draft EIR Idaho-Maryland Mine Project* (ESA, 2008). The Draft EIR included previous reporting for the Brunswick Industrial Site included as appendices.

In addition, Brunswick Area reporting has been completed by the current landowner and applicant (Rise Grass Valley) for potential "waters of the U.S.," including wetlands, that may be subject to CWA Section 404 jurisdiction within the Brunswick Area. This reporting was developed as part of the development of the evaluation of the Brunswick Area and includes the identification of the presence of CNPS ranked plants and special-status plant species within the Brunswick Area and the findings of those reports are included directly and by reference into this Biological Report. The Brunswick Area biological resources reporting included directly and by reference into this Biological Report includes the following:

- Brunswick Industrial Site and East Bennett Road ROW Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020a).
- Brunswick Site Special Status Plant Survey Report (Wendy Boes Botanical Consultant, August 2020).

1.4 Biological Resources Assessment Purpose

The purpose of the Biological Report is to identify the location and extent of sensitive biological resources within the Brunswick Area, including special-status plant and wildlife species. Additionally, this Biological Report includes an impact assessment to such sensitive biological resources based on the Project Understanding outlined in Section 1.2 above. Section 6 includes avoidance, minimization, and mitigation measures to ensure that the Brunswick Area disturbance, based on the Project Understanding, would not have a significant impact on such sensitive biological resources. This Biological Report also satisfies the Nevada County General Plan and Nevada County Land Use and Development Code requirements for the development of such biological resource assessments.

2 REGULATORY OVERVIEW

2.1 Federal Regulations

2.1.1 Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers ("Corps") and the Environmental Protection Agency ("EPA") regulate the discharge of dredge or fill material into "waters of the U.S." under Section 404 of the Clean Water Act. "Waters of the U.S." include wetlands and lakes, rivers, streams, and their tributaries. Wetlands are defined for regulatory purposes as areas "…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 solid conditions" as specified in 33 Code of Federal Regulations [CFR] 328.3, 40 CFR 230.3.

Generally, wetlands include swamps, marshes, bogs, and similar areas. Lakes, rivers, and streams are defined as "other waters of the U.S." Jurisdictional limits of these features are typically noted by the Ordinary High Water Mark ("OHWM"). The OHWM is the line on the shore established by the fluctuations of water and indicated by physical characteristics such as mark a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas (33 CFR 328 and 33 CFR 329).

Isolated ponds or seasonal depressions had been previously regulated as waters of the U.S. However, in *Solid Waste Agency of Northwestern Cook County* (SWANCC) *v. USACE et al.* (January 8, 2001), the U.S. Supreme Court ruled that certain "isolated" wetlands (e.g., non- navigable, isolated, and intrastate) do not fall under the jurisdiction of the CWA and are no longer under the jurisdiction of the Corps. Some circuit courts (e.g., *U.S. v. Deaton*, 2003; *U.S. Rapanos*, 2003; *Northern California River Watch v. City of Healdsburg*, 2006), though, have ruled that SWANCC does not prevent CWA jurisdiction if a "significant nexus" such as a hydrologic connection exists, whether it be man-made (e.g., roadside ditch) or natural tributary to navigable waters, or direct seepage from the wetland to the navigable water, a surface or underground hydraulic connection, an ecological connection (e.g., the same bird, mammal, and fish populations are supported by both the wetland and the navigable water), and changes to chemical concentrations in the navigable water is present due to water from the wetland.

Areas considered to be non-jurisdictional waters include non-tidal drainage and irrigation ditches excavated on dry land, artificially-irrigated areas, artificial lakes or ponds used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water-filled depressions with no outlet for drainage (33 CFR, Part 328).

The *Clean Water Rule* is a 2015 regulation published by the EPA and Corps to clarify water resources management in the United States under a provision of the CWA. The regulation defined the scope of federal water protection in a more consistent manner, particularly over streams and wetlands, which have a significant hydrological and ecological connection to traditional navigable waters, interstate waters, and territorial seas. It is also referred to as the *Waters of the United States* rule, which defines all bodies of water that fall under U.S. federal jurisdiction. The rule has been contested in litigation and in 2017 the Trump administration announced its intent to review and rescind or revise the rule. Following a Supreme Court ruling on January 22, 2018 that lifted a nationwide stay on the rule, the Trump administration formally suspended the rule until February 6, 2020, thereby giving the EPA time to issue a draft proposal of replacement water regulatory requirements.

On October 22, 2019, the EPA and the Corps published a final rule to repeal the 2015 Clean Water Rule: Definition of "Waters of the United States" ("2015 Rule"), which amended portions of the Code of Federal Regulations (CFR), and to restore the regulatory text that existed prior to the 2015 Rule. The final rule will become effective on December 23, 2019. The EPA and the Corps will implement the pre-2015 Rule regulations informed by applicable agency guidance documents and consistent with Supreme Court decisions and longstanding agency practice.

However, on April 21, 2020, the EPA and the Corps published the Navigable Waters Protection Rule to define "Waters of the United States" in the *Federal Register*. For the first time, the agencies have streamlined the definition so that it includes four simple categories of jurisdictional waters, provides clear exclusions for many water features that traditionally have not been regulated, and defines terms in the regulatory text that have never been defined before. Congress, in the CWA, explicitly directed the Agencies to protect "navigable waters." The Navigable Waters Protection Rule regulates traditional navigable waters and the core tributary systems that provide perennial or intermittent flow into them.

Under the final rule, four clear categories of waters are federally regulated:

- The territorial seas and traditional navigable waters,
- Perennial and intermittent tributaries to those waters,
- Certain lakes, ponds, and impoundments, and
- Wetlands adjacent to jurisdictional waters

Therefore, as of June 22, 2020, the final rule details 12 categories of exclusions, features that are not "waters of the United States," such as features that only contain water in direct response to rainfall (e.g., ephemeral features); groundwater; many ditches; prior converted cropland; and waste treatment systems. The final rule clarifies key elements

related to the scope of federal CWA jurisdiction, including:

- Providing clarity and consistency by removing the proposed separate categories for jurisdictional ditches and impoundments.
- Refining the proposed definition of "typical year," which provides important regional and temporal flexibility and ensures jurisdiction is being accurately determined in times that are not too wet and not too dry.
- Defining "adjacent wetlands" as wetlands that are meaningfully connected to other jurisdictional waters, for example, by directly abutting or having regular surface water communication with jurisdictional waters.

The Navigable Waters Protection Rule is the second step in a two-step process to review and revise the definition of "waters of the United States" consistent with the February 2017 Presidential Executive Order entitled "Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the 'Waters of the United States.'" This final rule became effective on June 22, 2020 and will replaces the Step One Rule published in October, 2019 as outlined above.

2.1.2 Section 401 of the Clean Water Act

Section 401 of the CWA requires an applicant, for any federal permit which may result in a discharge into waters of the U.S., to obtain a certification from the state that the discharge will comply with provisions of the CWA. The nine regions of the State Water Quality Control Board administer this program. Any condition of water quality certification would be incorporated into the Corps permit. California has a policy of no-net-loss of wetlands and typically requires mitigation for impacts to wetlands before it will issue a water quality certification. This Project is located under the jurisdiction of Region 5, the Central Valley Regional Water Quality Control Board ("RWQCB").

2.1.3 Endangered Species Act of 1973

For the Brunswick Area, consultation with the USFWS would be necessary if a proposed action may affect a federally listed species or occupied habitat. This consultation would proceed under Section 7 of the Endangered Species Act (ESA) if a federal action is part of the proposed action or through Section 10 of the ESA if no such nexus were available (USFWS, 1973). There are three federally protected plant species listed under the ESA that have previously been documented within 5 miles of the Brunswick Area (CDFW 2019a). Scadden Flat checkerbloom (*Sidalcea stipularis*), Stebbins' morning glory (*Calystegia stebbinsii*), and Pine Hill flannelbush (*Fremontodendron decumbens*) are ESA listed species as Endangered. None of these species is known to occur within the Brunswick Area. California red-legged frog (*Rana aurora draytonii*) is federally listed as threatened and though the species has not previously been documented in the Brunswick Area

watershed or within 5 miles of the site, the species is known to occur north of the Brunswick Area in Nevada County and therefore, this species is included in the assessment of special-status wildlife species as part of this Biological Report.

2.1.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BAGEPA) (16 USC Section 668) protects bald and golden eagles and their nests from direct "take" (i.e. harm or harassment as described above). BAGEPA prohibits the take or commerce of any part of the bald or golden eagles (USFWS, 1940). The USFWS administers the Act and reviews actions that may affect species protected under the Act.

2.2 State Regulations

2.2.1 California Endangered Species Act

The California Department of Fish and Wildlife (CDFW) has jurisdiction over plant and wildlife species listed as threatened or endangered under section 2080 of the CDFW Code. The California Endangered Species Act (CESA) prohibits take of state-listed threatened and endangered species. The state Act differs from the federal Act in that it does not include habitat destruction in its definition of *take*. The CDFW defines *take* as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The CDFW may authorize *take* under the CESA through Section 2081 agreements. If the results of a biological survey indicate that a state-listed species would be affected by the project, the CDFW would issue an Agreement under Section 2081 of the CDFW Code and would establish a Memorandum of Understanding for the protection of state-listed species. CDFW maintains lists for Candidate-Endangered Species and Candidate-Threatened Species. Scadden Flat checkerbloom (*Sidalcea stipularis*) and Stebbins' morning glory (*Calystegia stebbinsii*) are State ESA listed species as Endangered, while Pine Hill flannelbush (*Fremontodendron decumbens*) is designated as a State Rare Species. All three plants have been known to occur within 5 miles of the Brunswick Area (CDFW 2019a), but none of these species has been documented within the Brunswick Area.

The foothill yellow-legged frog (*Rana boylii*) is listed as a Threatened species under the State ESA and is discussed in this Biological Report given the presence of several perennial, intermittent, and ephemeral streams within the Brunswick Area. The California black rail (*Laterallus jamaicensis coturniculus*) has been previously documented within 5 miles of the Brunswick Area and is listed as Threatened under the State ESA. This species is known to occur in freshwater marsh wetlands with a perennial water source. Neither of these two species have been documented within the Brunswick Area. However, both

species are discussed within this Biological Report given the presence of such perennial water sources within the Brunswick Industrial Site.

The western bumble bee (*Bombus occidentalis occidentalis*) is a CESA Candidate for listing as Endangered; however, the species was last documented within 5 miles of the Brunswick Area in 1968 (considered part of its historical distribution) and is currently only known (current distribution known from 2003 – 2017) from a few locations in the Sierra Nevada, none of which are within western Nevada County where the Brunswick Area is located (CDFW 2019b); therefore, it is unlikely the species would occur within the Brunswick Area.

2.2.2 Streambed Alteration Agreements: CDFG Code Section 1600 et seq.

CDFW has jurisdictional authority over substantial alterations to the bed or bank of rivers, streams, and lakes under Sections 1600–1616. CDFW has the authority to regulate all work under the jurisdiction of the State of California that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed.

The perennial and intermittent streams within the Brunswick Site would most likely be regulated by CDFW. Therefore, a CDFW Streambed Alteration Agreement may be required for encroachment into the bed and bank of the streams located within the Brunswick Site.

2.2.3 Porter-Cologne Water Quality Control Act & Section 1601 and Section 1607 of CDFG Code

These acts and codes pertain to projects with potential impacts to water quality or waterways. The Brunswick Area does contain waters of the State as defined by the State Water Resources Board (State Board 2014) and they correspond to the features mapped within the Brunswick Area (see Greg Matuzak Environmental Consulting LLC, 2019).

2.2.4 State Water Resources Control Board Wetland Policy (April 2019)

On April 2, 2019, the State Water Resources Control Board (State Water Board) adopted rules to protect wetlands and other environmentally sensitive waterways throughout the state. More than 90 percent of California's historic wetlands have been lost to development and other human activity. Wetlands are a critical natural resource that protect and improve water quality, provide habitat for fish and wildlife, and buffer developed areas from flooding and sea-level rise. The newly adopted rules provide a common, statewide definition of what constitutes a wetland. They also provide consistency in the way the State Water Board and nine regional water boards regulate

activities to protect wetlands and other waterways, such as rivers and streams, and bays and estuaries. The State of California waters of the state are, by definition, broader than "waters of the United States" covered by federal regulation. The newly adopted rules do not change that and will ensure that waters of the state will continue to be protected even if protections for federal waters are narrowed by administrative actions or the courts.

The new definition clarifies what is considered a wetland – and what is not – for the entire state, provides a common framework for monitoring and reporting the quality of California's remaining wetlands, helps ensure no overall net loss, and promote an increase, in the quantity, quality, and sustainability of waters of the state, including wetlands, improves transparency and consistency across the State Water Board and the nine Regional Water Quality Control Boards in how discharges of dredged or fill material in sensitive waterways are monitored and regulated, and avoids duplicative work and streamline requirements to cover all waters of the state, so both state and federal environmental concerns are addressed at once.

2.2.5 California Department of Fish and Game Code Sections 3503, 3503.5, and 3800: Nesting Migratory Bird and Raptors

Sections 3503, 3503.5, and 3800 of the CDFG Code prohibit the take, possession, or destruction of birds, their nests or eggs. Implementation of the take provisions requires that project-related disturbance within active nesting territories be reduced or eliminated during critical phases of the nesting cycle (approximately March 1 – August 31). Disturbance that causes nest abandonment and/or loss of reproductive effort (e.g. killing or abandonment of eggs or young), or the loss of habitat upon which birds are dependent, is considered "taking", and is potentially punishable by fines and/or imprisonment (LCC 2013).

2.2.6 California Special Species of Concern, Fully Protected, and Special Status Species

California designates Species of Special Concern (SSC) as species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational or educational values. These species do not have the same legal protection as listed species but may be added to official lists in the future (CDFW 2014). For example, the coast horned lizard (*Phrynosoma blainvillii*) is designated as SSC and the species is evaluated as part of this Biological Report since it has been identified within 5 miles of the Brunswick Area.

In the 1960's California created a designation to provide additional protection to rare species. This designation remains today and is referred to as "Fully Protected" species, and those listed "may not be taken or possessed at any time" (CDFW 2014). The California

black rail (*Laterallus jamaicensis coturniculus*) for instance has been previously documented within Nevada County, including within 3 miles to the southeast and southwest of the Brunswick Area. This species is designated as threatened by the State of California as well as a Fully Protected species.

California special status species are identified by the California Natural Diversity Database (CNDDB) and includes those species considered to be of greatest conservation need by the CDFW.

2.2.7 California Environmental Quality Act Guidelines Section 15380

California Environmental Quality Act (CEQA) Guidelines section 15380(b) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specific criteria. This section was included in the guidelines to deal primarily with situations in which a public agency is reviewing a project that may have a significant effect on, for example a "candidate species" that has not yet been listed by the USFWS or CDFW. CEQA, therefore, enables an agency to protect a species from significant project impacts until the respective government agencies have had an opportunity to list the species as protected, if warranted (CNRA 2012).

Plants appearing on the California Native Plant Society (CNPS) California Rare Plant Rank (CRPR) are considered to meet CEQA's Section 15380 criteria. Ranks include: 1A) plants presumed extirpated in California and either rare or extinct elsewhere, 1B) plant rare, threatened, or endangered in California and elsewhere, 2A) plants presumed extirpated in California, but more common elsewhere, and 2B) plants rare, threatened, or endangered in California, but more common elsewhere. Impacts to these species would therefore be considered "significant" requiring mitigation.

2.2.8 State Oak Woodland Regulations

State laws that regulate protection of oak woodlands include Professional Forester's Law (PFL) and CEQA according to Public Resources Code Section 21083.4. Oak woodlands are defined as areas having 10% oak canopy cover or greater. "Oaks" are defined in Public Resources Code Section 21083.4 as a native tree species in the genus *Quercus*, that is 5 inches diameter at breast height (DBH) or greater. The Oak Woodlands Conservation Act (SB 1334) provides funding for the conservation and protection of oak woodlands in California. Oak trees and oak woodland habitats are protected under both the State and the Nevada County landmark groves and landmark oak tree regulations as discussed below. The Brunswick Area does not contain any protected oak trees or oak resources per the State of California policies for the protection of oak woodlands as set

forth in Public Resources Code Section 21083.4 and the Nevada County Land Use and Development Code.

2.3 Local Regulations

2.3.1 Nevada County Landmark Groves and Landmark OakTree Regulations

The Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.18 for Trees. Landmark trees are any native oak tree species (*Quercus* species) with a trunk diameter of 36" or greater at diameter breast height (dbh or 4'6"). Identifies landmark groves as hardwood tree groves with 33+% canopy closure, or groves whose size, visual impact, or association with a historically significant structure or event has caused it to be marked for preservation by the county, state, or federal government.

Projects shall be approved only when they do not remove or disturb defined trees or groves, unless a Management Plan is prepared consistent with paragraph 3 below or other standards are met consistent with paragraph 3 below. Exempted from this standard shall be trees or groves determined to be dead, dying, or a public safety hazard by a certified professional arborist, licensed landscape architect, registered professional forester, or qualified biologist or botanist (referred to herein as a qualified professional). In addition, exemption shall apply to those trees that must be removed to ensure fire safe access or provide adequate fuel reduction as determined by the California Department of Forestry or local fire district. Tree removal may also be allowed where necessary to provide for site access and public utilities or public right-of-way.

If the above standard effectively precludes development of the project or a revised project, or adversely affects another environmentally-sensitive resource, a Management Plan shall be prepared by a certified arborist, registered forester, qualified biologist or botanist, or landscape architect. Said Plan shall evaluate the impact of the project on defined trees and groves and recommend project modifications that avoid or minimize impacts. Emphasis shall be placed on protecting groups of trees rather than individuals. Defined trees that must be removed shall be replaced on an inch for an inch replacement of the removed tree(s). The total of replacement trees shall be required to have a combined diameter of the tree(s) removed. The Management Plan shall provide for the long-term maintenance of the replacement trees.

Management Plans shall emphasize protection of two varieties of oak: blue oak (*Quercus douglasii*) and valley oak (*Quercus lobata*). Both are of very limited distribution in Nevada County and considered to be sensitive plants worthy of special protection. However, no such protected oak resources were identified within the Brunswick Area and thus a Management Plan would not be required to be developed for the protection of such landmark oak trees and/or landmark oak groves within the Brunswick Area.

2.3.2 Nevada County Water Courses, Wetlands, and Riparian Areas Management Plan

Per the Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3 17C.3 (Ordinance Number 2033) requires a Management Plan be prepared for projects in non-disturbance buffers, including areas that are within 100 feet of the high water mark of perennial streams, watercourses, and wetlands, 50 feet from the high water mark of intermittent watercourses, and 100 feet upslope or 20 feet downslope from an NID canal (Nevada County 2000. Land Use and Development Code, Chapter II: Zoning Regulations. Effective July 27, 2000). Therefore, the development of such a Management Plan would be required for any potential future development within such non-disturbance buffers. The development of such a Management Plan would meet the requirements of the Nevada County Land Use and Development Code.

2.3.3 Rare, Threatened, and Endangered Species and Their Habitat

The Nevada County Land Use and Development Code, Section L-II 4.3.12, includes regulations intended to avoid the impact of development on rare, threatened, endangered, and special status species and their habitat, or where avoidance is not possible, to minimize or compensate for such impacts and to retain their habitat as non-disturbance open space. The regulations indicate that a project may only be approved when it is determined by Nevada County that it will not adversely affect rare, threatened, or endangered species or their habitat and that it will result in no net loss of habitat function or value for the defined species. When it is determined that a project will adversely affect a defined species or their habitat, the regulations require that a site-specific habitat management plan be prepared.

2.3.4 Nevada County General Plan

Brunswick Site land use changes and/or any subsequent development would be required to comply with the goals and policies outlined in the Nevada County General Plan and thus are included here.

The following goals and policies regarding relevant biological resources are set forth in Chapter 13: Wildlife and Vegetation of the Nevada County General Plan.

Goal 13.1 Identify and manage significant areas to achieve sustainable habitat.

Objective 13.1 Discourage intrusion and encroachment by incompatible land uses in significant and sensitive habitats.

Policy 13.1 Where significant environmental features, as defined in Policy 1.17, are identified during review of projects, the County shall require all portions of the project site that contain or influence said areas to be retained as non-disturbance open space through clustered development on suitable portions of the project site, or other means

where mandatory clustering cannot be achieved. The intent and emphasis of such open space designation and non-disturbance is to promote continued viability of contiguous or inter-dependent habitats by avoiding fragmentation of existing habitat areas and preserving movement corridors between related habitats. Vegetation management for the benefit of habitat preservation or restoration shall be considered consistent with the intent of this policy.

Policy 13.2 As part of the Comprehensive Site Development Standards, include standards to minimize removal of existing vegetation and require installation and long-term maintenance of landscaping in Chapter 13: Wildlife and Vegetation Element Nevada County General Plan Volume I - Page 13-5 setbacks and buffer areas. These standards shall be applicable to all discretionary projects and to all ministerial projects other than a single-family residence located on an individual lot. Tree removal may be allowed where necessary to comply with public right-of-way development or dedication, or development of required site access and public utilities. Individual trees or groups of trees shall be protected during construction to prevent damage to the trees and their root systems. Vegetation in proximity to structures shall conform to applicable fire protection standards.

Policy 13.2A Project review standards shall include a requirement to conduct a site-specific biological inventory to determine the presence of special status species or habitat for such species that may be affected by a proposed project. The results of the biological inventory shall be used as the basis for establishing land use siting and design tools required to achieve the objective of no net loss of habitat function or value for special status species. Where a Habitat Management Plan is deemed appropriate, the Plan shall be prepared to comply with the requirements of the Federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA). The plan shall provide the background data, impact analysis, and mitigation programs necessary to obtain a FESA Section 10(a) and CESA Section 2081 permit authorizing incidental take of federal and state listed threatened and endangered species that occur in areas proposed for future development. Prior to implementation of an adopted Habitat Management Plan, project applicants proposing the development of a project that would impact a federal or state listed species, or a species that is proposed for listing, shall be individually responsible for obtaining federal and state incidental take permits on a project-by-project basis.

Policy 13.3 As part of the Comprehensive Site Development Standards, require the maximum feasible use of drought tolerant native plant species for landscaping of all new multi-family residential, commercial, industrial, and public projects. Invasive, non-native plants, as determined by a landscape architect or other similar expert, that may displace native vegetation on adjoining undeveloped lands shall not be used. Landscaping with native trees and shrubs shall be encouraged to provide suitable habitat for native wildlife, particularly in proposed open space uses of future development.

Policy 13.4 Encourage long-term sustainability and maintenance of landscaped areas.

Policy 13.4A No net loss of habitat functions or values shall be caused by development where rare and endangered species and wetlands of over 1 acre, in aggregate, are identified during the review of proposed projects. No net loss shall be achieved through avoidance of the resource, or through creation or restoration of habitat of superior or comparable quality, in accordance with guidelines of the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

Policy 13.4B Habitat that is required to be protected, restored, or created as mitigation for a project's impacts shall be monitored and maintained in accord with a County-approved Habitat Management Plan.

Objective 13.2 Minimize impacts to corridors to ensure movement of wildlife.

Objective 13.3 Provide for the integrity and continuity of wildlife environments.

Objective 13.5 Support, where feasible, the continued diversity and sustain ability of the habitat resource through restoration and protection.

Objective 13.7 Identify and preserve heritage and landmark trees and groves where appropriate.

Policy 13.9 Development in the vicinity of significant oak groves of all oak species shall be designed and sited to maximize the long-term preservation of the trees and the integrity of their natural setting. The County shall adopt a regulation to protect native heritage oak trees and significant oak groves. All native oak tree species with a trunk diameter of 36" or greater shall be protected.

3 METHODOLOGY

In order to evaluate the Brunswick Area for the presence of any sensitive biological resources, baseline information from databases and reporting for similar projects in the City of Grass Valley and Nevada County was collected and reviewed prior to conducting reconnaissance-level field biological surveys. The database searches, background research, and habitat level field surveys characterized the baseline conditions of the Brunswick Area. Baseline information also included previous biological resources survey reporting (ESA, 2006) conducted as part of the Draft EIR (ESA, 2008) developed for a similar development of the Idaho-Maryland Mine that included portions of the Brunswick Industrial Site.

Based on the baseline conditions of the Brunswick Area, an assessment was implemented to determine if any special-status plant or wildlife species use the Brunswick Area at any time during their life cycle. The baseline conditions also identified the presence of any sensitive habitat or communities, including "waters of the U.S.," including wetlands, that had been identified and mapped within the Aquatic Resources Delineation Report developed for the Brunswick Area (Matuzak, 2019a).

3.1 Sensitive Biological Resources Background Review

The following information was used to identify potential sensitive biological resources, including the presence of CNPS ranked plants and special-status plant and wildlife species, within the Brunswick Area region that could be found to use the Brunswick Area:

- California Department of Fish and Wildlife's California Natural Diversity Database records search of 5-mile buffer around the Brunswick Area (CDFW, 2019a);
- The California Native Plant Society's online Inventory of Rare and Endangered Plants of California for the Brunswick Area and Nevada County (CNPS, 2019);
- The U.S. Fish and Wildlife Service Information, Planning, and Consultation System (IPaC) for endangered, threatened, and proposed listed species for the Brunswick Area (USFWS, 2019);
- National Wetland Inventory map of the Brunswick Area (NWI, 2019);
- United States Department of Agriculture (USDA) Soils Mapper of the Brunswick Area (USDA, 2019);
- Natural Resources Conservation Service (NRCS) Hydric Soils List for Nevada County (NRCS, 2019);
- Nevada County General Plan (Nevada County, 1996 with subsequent amendments through 2012);

- Draft Environmental Impact Report, including Appendices, for the Idaho-Maryland Mine Project (ESA Associates, October 2008);
- Idaho-Maryland Mine Special-Status Plant Survey Report (ESA Associates, August 2006);
- Idaho-Maryland Mine Special-Status Wildlife Habitat Evaluation Report (ESA Associates, August 2006);
- Brunswick Industrial Site and East Bennett Road ROW Aquatic Resources Delineation of Waters of the United States and State of California (Matuzak, 2020); and
- Brunswick Site Special Status Plant Survey Report (Boes, 2020).

3.2 Reconnaissance Level Biological Resources Field Surveys

Reconnaissance level biological resources field surveys were conducted on foot for the entirety of the Brunswick Area (129.23 acres) by Greg Matuzak, Principal Biologist and owner of Greg Matuzak Environmental Consulting LLC, and Wendy Boes, a local Nevada County botanist, on December 9th through 12th and 17th and 18th, 2018. Follow up reconnaissance level biological resources field surveys were conducted by Greg Matuzak for potential special-status wildlife species habitats on December 30th, 2018 and by Wendy Boes for the special-status plant species habitat on January 3rd, 2019. The purpose of the surveys completed in December 2018 and January 2019 was to identify habitat and vegetation types and to determine the potential for any special-status plant and wildlife species identified in the desktop analysis and background research to occur within the Brunswick Area.

Further evaluation of the Brunswick Area was conducted on July 1st and 14th, and August 16th, 2019 by Ms. Boes who implemented botanical surveys within the entirety of the Brunswick Area. The follow up botanical surveys were conducted during the time of year when the target special-status plant species with potential to occur within the Brunswick Area are known to be in bloom and identification of each is most likely. Wendy Boes most recently served as a US Forest Service botanist with the local Tahoe National Forest and has also been a local botanical expert consultant in the greater project area for many years. During the site visits and surveys conducted in July 2019, Greg Matuzak also conducted reconnaissance-level wildlife surveys on July 14th and 16th, 2019 to document the presence of such species within the Brunswick Area and to document suitable habit for such species within the Brunswick Area.

Additionally, Mr. Greg Matuzak conducted a follow up review of targeted areas within the central and eastern sections of the Brunswick Industrial Site on August 27, 2020 to reevaluate the potential presence of wetlands and streams not previously mapped as

part of the December 2018 and July 2019 wetland assessment field related surveys (see Greg Matuzak Environmental Consulting LLC, 2020).

Mr. Matuzak conducted a habitat assessment and Visual Encounter Surveys (VES) for foothill yellow-legged frogs within the South Fork Wolf Creek in the Brunswick Industrial Site as well as within the portions of the creek that flow through public property downstream within the Empire Mine State Historic Park on August 29th, 2019. The VES methodology is based on a CDFW approved protocol following Yarnell et al. (January 2014) for evaluating the abundance, distribution, and habitat associations of foothill yellow-legged frogs within rivers and streams and to provide the necessary data to coordinate other stream reach study efforts, where feasible, such as instream flow studies where hydrodynamic modeling will be used. Given the intensity of the implementation of the VES methodology, it also provides the ability to assess the presence of other aquatic resources within the stream study area and to assess the overall habitat quality of the study stretch in terms of the potential of the stream to provide the necessary habitat structure and streambed substrate for macroinvertebrates, fish, and other aquatic resources.

The presence of streams and wetlands within the Brunswick Area that could be regulated by state and/or federal agencies were identified and mapped simultaneously and independently from the development of this Biological Report. See the stand-alone Aquatic Resources Delineation report (Matuzak, 2020). The entirety of the Brunswick Area was surveyed on foot and a list of plant and wildlife species observed during the field surveys was compiled (see Appendix E for species lists). A Photo Log is included in Appendix G, which documents the Brunswick Area during the field surveys.

3.3 Brunswick Area Characterization

The Brunswick Industrial Site has been disturbed by historic mining and lumber mill practices, public access, and ongoing management for many years which is the baseline condition for the Brunswick Industrial Site. Within the Brunswick Industrial Site, the dumping of soils, landscape materials, and other miscellaneous items has also occurred for many years and the current circumstances are the baseline conditions. A large section of the Brunswick Industrial Site located in the eastern areas along Brunswick Road would be characterized as disturbed and/or developed given the amount of pavement and impervious surfaces in those areas as well as the remaining infrastructure related to historic mining and mill operations. Areas not subject to this regular type of previous disturbance are dominated by native habitat and, therefore, are also the baseline condition within the Brunswick Industrial Site.

The portion of the Brunswick Area that includes the East Bennett Road ROW contains a developed and paved public road and ROW that has been used for decades. In

addition, the shoulders of East Bennett Road that are included as part of the East Bennett Road ROW are also developed given the grading and fill material associated with the development of the road.

All vascular plant species identified at the time of the survey were recorded using keys and descriptions in *The Jepson Manual* (Baldwin et al., 2012). Vegetation types were classified by ESA Associates (2006) during the previous environmental review process (hereby incorporated by reference). ESA Associates mapped and classified wildlife habitats/vegetation types using the California Department of Fish and Game's (CDFG) *A Guide to Wildlife Habitats* (Mayer and Laudenslayer, 1988). The classifications and mapping completed by ESA was found to be far more detailed than the existing CDFW California Wildlife Habitat Relationships (CWHR) layers that were evaluated for the Brunswick Area and therefore, the ESA Associates vegetation descriptions were used for a more detailed documentation of vegetation types and as a springboard for the descriptions within this Biological Report (see Appendix D for a Vegetation Community Map for the Brunswick Industrial Site). A list of plant and wildlife species identified within the Brunswick Area as part of the development of this Biological Report is located in Appendix E.

4 ENVIRONMENTAL SETTING

4.1 Environmental Setting

The Brunswick Area is located in Nevada County, CA in the northern-central Sierra Nevada foothills. The Sierra Nevada foothills lie between the western edge of the Sierra Nevada and the eastern border of the Central Valley. The foothills form a belt 10 to 30 miles wide that ranges from 500 to 5,000 feet in elevation in a series of northwest to north-northwest aligned ridges that decline in elevation from northeast to southwest. Many rapidly flowing rivers and streams run westerly in deeply incised canyons with bedrock channels to the Central Valley and eventually to the Pacific Ocean. Alluvial fans, floodplains, and terraces are not extensive; and all but the largest streams are generally dry during the summer. Dominant vegetation communities include grasslands, oak woodlands, and chaparral.

Vegetation communities within the Brunswick Area are typical of the lower Sierra Nevada foothills. However, the terrain within the Brunswick Area is not typical of the lower Sierra Nevada foothills that normally vary between flat ridges and valleys to gently and moderately sloping hillsides given the high level of development and disturbance within the Brunswick Area. The Brunswick Industrial Site elevation ranges from approximately 2,675 to 2,950 feet above mean sea level (MSL) and the East Bennett Road ROW elevation ranges from approximately 2,650 to 2,850 to feet above MSL.

Natural hydrological sources for the Brunswick Area include precipitation and surface run-off from adjacent lands. Mean annual rainfall in the area is 53.74 inches (NRCS, 2018). During rain events over the previous month prior to the field surveys, very little surface water and no snow was identified. However, evidence of surface moisture was still present in some areas. Water stained leaves and damp surface soil/leaf litter was observed and some mapped wetland features had surface ponding.

The Brunswick Area is located in an area containing South Fork Wolf Creek, a perennial stream. Several intermittent and ephemeral streams connect directly to South Fork Wolf Creek within the Brunswick Industrial Site. South Fork Wolf Creek also flows to the south of the East Bennett Road ROW within the Brunswick Area. South Fork Wolf Creek contains associated riparian woodland and scrub and large tracks of wet meadow wetlands dominant in the northwestern section of the Brunswick Industrial Site.

South Fork Wolf Creek surfaces within the Brunswick Industrial Site south of a large man-made clay lined pond and flows northwest across the Brunswick Area. South Fork Wolf Creek daylights from an existing 48" diameter culvert which is approximately 1,600 feet long (Regional Water Quality Control Board Order No. 88-185, December 18th, 1990). The 48" culvert appears is fed by surface drainage and road runoff on both the east and west sides of Brunswick Road, which crosses Brunswick Road through a culvert.

Additionally, perennial surface drainage from the west side of Brunswick Road drains north to the 48" culvert inlet. The 48" culvert was flowing water in December 2018 as well as during the July and August 2019 site surveys (see Photo Log in Appendix E).

4.2 Brunswick Area Soil Types

Brunswick Industrial Site

The USDA Soil Survey Mapper (USDA, 2019) identifies several soil types within the Brunswick Industrial Site. USDA soil mapping for the Brunswick Industrial Site is included in Appendix B and indicates that the Brunswick Industrial Site includes 10 soil types: Aiken loam on 9 to 15 percent slopes (AfC), Aiken loam on 15 to 30 percent slopes (AfD), Aiken loam on 30 to 50 percent slopes (AfE), Alluvial land, clayey (Ao), Cohasset loam, summits, on 2 to 15 percent slopes (CmB), Cohasset loam, shoulders, on 3 to 20 percent slopes (CmC), Cohasset loam, backslopes, on 5 to 30 percent slopes (CmD), Cohasset cobbly loam on 5 to 30 percent slopes (CoD), Placer diggings (Pr), and Sites loam on 15 to 30 percent slopes (SID). These soil types are described in detail below and are shown in Appendix B:

- **Aiken loam on 9 to 15 percent slopes (AfC).** The Aiken series consists of deep, well-drained soils typically occurring on ridgetops and side slopes of andesitic flows. These soils form from the weathering of volcanic rock. Drainage is moderately slow with a medium rate of surface runoff. The Aiken series is not hydric. A typical profile for this series consists of dark to reddish brown (5YR 3/3) loam from 0 to 11 inches. This layer is underlain by a yellowish red (5YR 4/6) loam from 11 to 21 inches. A dark red (2.5 YR 3/6) loam is present from 21 to 29 inches followed by a clay loam layer of the same color from 29 to 42 inches. From 42 to 52 inches is yellowish red (5YR 4/6) clay loam which is underlain by a reddish brown (SYR 4/4) clay loam. This layer is underlain by bedrock.

- **Aiken loam on 15 to 30 percent slopes (AfD).** The description of this soil is the same as the AfC description, only it is found on steeper slopes.

- **Aiken loam on 30 to 50 percent slopes (AfE).** The description of this soil is the same as the AfC description, only it is found on steeper slopes than AfD soils.

- **Alluvial land, clayey (Ao).** This series consists of moderately well-drained soils in floodplains and drainages. These soils formed from alluvium derived from granitic or mixed metabasic rocks. Permeability and runoff are both slow. This is a hydric soil. A typical soil for alluvial soils consists of 3 to 10 inches of sandy loam or loam underlain by 30 to 45 inches of a clay loam.

- **Cohasset loam, summits, on 2 to 15 percent slopes (CmB).** The Cohasset series consists of well drained soils on ridgetops and side slopes. These soils formed from weathered volcanic rock. Drainage is moderate and runoff is slow to rapid. These soils are not hydric. A typical profile for the Cohasset series consists of pine and fir needles from 0 to 3 inches. This layer is underlain by a dark reddish brown (ranges from 5YR 3/2, 3/3, 3/4) cobbly loam from 0 to 24 inches. This layer is underlain by a dark reddish brown (5YR 3/4 or 4/4) cobbly clay loam from 24 to 96 inches. At 96 inches is a weathered andesitic conglomerate.

- **Cohasset loam, shoulders, on 3 to 20 percent slopes (CmC).** The description of this soil is the same as the CmB description, only it is found on steeper slopes and shoulders.

- **Cohasset loam, backslopes, on 5 to 30 percent slopes (CmD).** The description of this soil is the same as the CmB description above, only it is found on steeper slopes and backslopes.

- **Cohasset cobbly loam on 5 to 30 percent slopes (CoD).** The description of this soil is the same as the CmB description above, only it is found on steeper slopes and is a cobbly loam rather than a Cohasset loam like CmB, CmC, and CmD above, containing a mixture of cobbles within the loamy soil.

- **Placer diggings (Pr).** The Placer diggings series consists of remnant tertiary river deposits associated with hydraulic mining and placer mining operations as well natural deposits within stream channels. Areas with this soil type are 90 to 100 percent rock, cobble or gravel. 50 to 75 percent of these lands have a mixture of rock, cobbles, gravel and soil. This soil contains unnamed hydric inclusions in drainages and depressions.

- **Sites loam on 15 to 30 percent slopes (SID).** The Sites series consists of well drained soils that occur in mountain uplands. The soils formed from weathered residuum of metabasic and metasedimentary rocks. Drainage is moderately soil and runoff is slow to very high. This soil is not hydric. A typical profile for this complex consists of dark reddish brown loam (5YR 3/4) from 0 to 3 inches. This layer is underlain by yellowish red loam (5YR 4/6) from 3 to 12 inches. From 12 to 23 inches is a layer of red (2.5 YR 4/6) clay loam. This layer is underlain by red (10R 4/6) clay from 23 to 56 inches and red (10R 4/8) light clay from 53 to 69 inches. From 68 to 78 inches is a red (2Y 4/8) clay loam underlain at 78 inches by a layer of weathered metasedimentary rock.

East Bennett Road ROW Section of Brunswick Area

The USDA Soil Survey Mapper (USDA, 2019) indicates that the East Bennett Road ROW includes 10 soil types: Aiken loam on 9 to 15 percent slopes (AfC), Aiken loam on 30 to 50 percent slopes (AfE), Boomer loam, hard bedrock, 7 to 28 percent slopes (BoD), Boomer-Rock outcrop complex on 5 to 30 percent slopes (BrD), Boomer-Rock outcrop complex on 30 to 50 percent slopes (BrE), Cohasset loam on 15 to 30 percent slopes (CmD), Cut and fill land (Ct), Placer diggings (Pr), Sierra sandy loam on 15 to 30 percent slopes (SfD), and Sites loam on 15 to 30 percent slopes (SID). These soil types are described in detail below and are shown in Appendix B:

- **Aiken loam on 9 to 15 percent slopes (AfC).** The soil series description for Aiken loam on 9 to 15 percent slopes is above within the descriptions for the Brunswick Industrial Site.

- **Aiken loam on 30 to 50 percent slopes (AfE).** The soil series description for Aiken loam on 30 to 50 percent slopes is above within the descriptions for the Brunswick Industrial Site.

- **Boomer-Rock outcrop complex on 5 to 30 percent slopes (BrD).** The Boomer-Rock outcrop series consists of well-drained soils in upland areas. These soils formed from weathered metavolcanic rock. Drainage is moderately slow and runoff is slow to rapid. These soils are not hydric. A typical profile for this series consists of a brown (5YR 3/4) gravelly loam from 0 to 11 inches. This layer is underlain by a dark reddish brown (2.SYR 3/4) loam from 11 to 18 inches. From
  18 to 29 inches is a dark red (2.5YR 3/6) clay loam layer which is underlain by a reddish yellow clay loam to 33 inches. This layer is underlain by a yellowish red (SYR 4/8) clay loam with dark red (2.5 YR 3/6) films from 29 to 37 inches followed by a hard fractured diabase at 47 inches.

- **Boomer-Rock outcrop complex on 30 to 50 percent slopes (BrE).** This soil description is the same as for BrD but is found on steeper slopes.

- **Boomer loam, hard bedroack, 7 to 28 percent slopes (BoD).** This soil description is similar to BrD described above. Runoff is medium to rapid on this soil.

- **Cohasset loam on 15 to 30 percent slopes (CmD).** The soil series description for Cohasset loam on 15 to 30 percent slopes is above within the descriptions for the Brunswick Industrial Site.

- **Cut and fill land (Ct).** This soil type consists of areas that have been altered by activities other than mining of milling such that there are no intact soil characteristics. This soil is not hydric.

- **Placer diggings (Pr).** The soil series description for Placer diggings is above within the descriptions for the Brunswick Industrial Site.

- **Sierra sandy loam on 15 to 30 percent slopes (SfD)**. The Sierra series consists of deep to very deep, well drained soils that formed in material weathered from intrusive igneous rocks. Sierra soils are on foothills and have slopes of 0 to 70 percent. The typical profile for this type of soil from 0 to 8 inches is brown (7.5YR 5/4) coarse sandy loam, dark reddish brown (5YR 3/4) moist; massive; slightly hard, friable; many very fine roots; many very fine and fine pores; moderately acid (pH 5.7); clear smooth boundary. From 8 to 20 inches it is known to be reddish brown (5YR 5/4) loam, yellowish red (5YR 3/6) moist; massive; hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine, common fine, few medium and coarse pores; few thin discontinuous clay films line pores, colloids mainly bridging mineral grains; moderately acid (pH 5.9); gradual smooth boundary.

- **Sites loam on 15 to 30 percent slopes (SID)**. The soil series description for Sites loam is above within the descriptions for the Brunswick Industrial Site.

4.3 Brunswick Area Vegetation Communities

Vegetation community types within the Brunswick Area are described below. Table 1.0 includes a list of each vegetation community identified and the associated mapped acreage (see Appendix D for the Vegetation Community Map).

TABLE 1.0 VEGETATION COMMUNITIES AND ACREAGES

Vegetation Community	Acres within Brunswick Area
Montane Hardwood-Conifer	15.63
Montane Hardwood	1.65
Ponderosa Pine	4.85
Sierran Mixed Conifer	35.98
Annual Grassland	8.15
Manmade Pond	7.28
Wet Meadow	9.36
Developed	29.49
Disturbed	16.84
Total	**129.23**

Developed

The entirety of the East Bennett Road ROW is considered developed given it contains pavement and shoulders that include fill material used as part of the construction of the road. In addition, the area connecting the northwestern end of East Bennett Road with

the Centennial Industrial Site is also considered developed given the paved and gravel access as well as the historic industrial uses within that area.

Within the Brunswick Industrial Site, a large portion of the eastern section of the site is mapped as developed as it contains asphalt, gravel, and pavement. The areas within the Brunswick Industrial Site mapped as developed contain little to no vegetation and the sparse vegetation present is considered ruderal and dominated by non-native and mostly invasive grassland species. The central area of the mapped developed section of the Brunswick Industrial Site contains artificial depressions that include some wetland and riparian species from the ponding of water that occurs within those artificial topographical low areas.

Disturbed

A small area within the northeast corner of the Brunswick Industrial Site and a large area within the southern/southeastern section of the site is mapped as disturbed. Those areas contain a mix of fill material, asphalt, and gravel that have created a mix of non-native ruderal grassland vegetation and areas of barren ground. The southern disturbed area also contains some historic artificial depressions that include some wetland and riparian species given the ponding of water that occurs within those artificial topographical low areas, but those areas are dominated mostly by invasive Himalayan blackberry shrubs (*Rubus armenicus*).

Montane Hardwood

Montane hardwood habitat is identified on the Brunswick Industrial Site within and adjacent to a drainage area within the northeastern section of the site. Montane hardwood is characterized here by stands of an overstory of native oak trees mixed with some riparian species (*Salix* sp.). There is often homogeneity in the canopy structure, and canopy closure is variable between seasons as the dominant overstories species is deciduous, ranging from 5-45%. Due to the historic disturbance, there is abundant Himalayan blackberry in the understory along with other nonnatives including bristly dogtail (*Cynosurus echinatus)* and hedgenettle (*Torilis arvensis)*.

Montane Hardwood-Conifer

Montane hardwood-conifer habitat in the Sierra Nevada occurs at elevations between 1,000 and 4,000 feet above MSL and is comprised of a mosaic of hardwoods and conifers. The Brunswick Industrial Site is likely a midpoint on the gradient between hardwood forest and conifer forest containing both hardwood and conifer tree species, often in a mosaic pattern with small pure stands of conifers interspersed with small stands of hardwoods. Species associated with montane hardwood-conifer include ponderosa pine, California black oak, canyon live oak, madrone and Douglas fir. This vegetation community has been mapped within the northwestern section of the Brunswick Industrial Site along the

South Fork Wolf Creek corridor and in two smaller areas along the southern side of East Bennett Road.

Annual Grassland

Annual grassland are open vegetation types that are dominated by annual plant species, often nonnative. These species can occur within the understory of other vegetation types like oak woodlands, but where annual grasslands are mapped there is little to no overstory or shrub cover. This vegetation type is common within the northwestern section of the Brunswick Industrial Site where there has been historic disturbance and little to no water source other than rainfall. The fall rainfall will spark germination and plants will grow through the cool months and in spring will grow rapidly and flower, fruit and senesce. Common to the environmental setting of this habitat type are yellow star thistle (*Centaurea solstitalis),* garden burnett (*Poterium sanguisorba),* soft chess (*Bromus hordeaceous),* bisnaga (*Ammi visnaga),* and patches of Himalayan blackberry.

Ponderosa Pine

Ponderosa pine (*Pinus ponderosa)* habitat is found within the northeastern corner of the Brunswick Industrial Site. The structure and composition of the ponderosa pine forest varies widely according to the amount of soil moisture available during the summer. The canopy closure tends to be low in the Brunswick Areas ranging from 5-35%. In the Brunswick Industrial Site, California black oak (*Quercus kelloggii)*, madrone (*Arbutus menziesii)*, foothill pine (*Pinus sabieniana)*, and incense cedar (*Calocedrus decurrens)* are common associates of ponderosa pine. A variety of understory shrub species occur throughout the ponderosa pine forest. In the Brunswick Areas the more common understory shrubs are white leaf manzanita (*Arctostaphylos viscida* ssp. *viscida)*, poison oak *(Toxicodendron diversilobum)*, and honeysuckle (*Lonicera hispidula)*. These understory shrubs form often dense, impenetrable stands, especially on open rocky slopes, and in areas of recent disturbance.

Sierran Mixed Conifer

The Sierran mixed conifer forest is generally a multi strata forest dominated by conifers with hardwood as a component of the understory. This vegetation type is found along the hillslope on the western and southern portions of the Brunswick Industrial Site. The forest here is more mesic, occurring on mostly east facing slopes. It is dominated by Douglas fir, incense cedar, and black oak. It has high canopy closure. It often has a midstory strata of madrone, hazelnut (*Corylus cornuta ssp. californica)* and younger black oak. The understory has high litter cover and Himalayan blackberry and honeysuckle area common in the understory.

Montane Riparian

A structural gradient generally occurs from neighboring vegetation into montane riparian, resulting in oaks or pines grading in with the more riparian species. This vegetation type is characterized by two different ecological conditions, (1) placer diggings where small depressions within the disturbed and developed mapped areas of the Brunswick Industrial Site pond water long enough for riparian species such as willows (*Salix* sp.) to occur and (2) along a narrow stretch of the South Fork Wolf Creek.

The montane riparian in the placer diggings and areas created from earth movement are characterized by black cottonwood (*Populus tremuloides),* red willow (*Salix laevigata),* arroyo willow *(Salix lasiolepis),* and occasionally ponderosa pine in the overstory. Dense thickets are often resultant with Himalayan blackberry and Baltic rush (*Juncus balticus* ssp. *atar)* in the herbaceous layer.

The montane riparian vegetation along both sides of the South Fork Wolf Creek is dominated by white alder (*Alnus rhombifolia),* red willow (*Salix laevigata), and* arroyo willow *(Salix lasiolepis)* with other overstory species from adjacent vegetation types, including California black oak, pine and Douglas fir. The understory of montane riparian along the stream is dominated by Himalayan blackberry. This vegetation type forms a very narrow band along both sides of the creek between the mapped montane conifer-hardwood and annual grassland and wet meadow vegetation communities.

Wet Meadow

Wet meadows generally contain a single vegetation stratum and are generally dominated by forbs and gramanoids. Shrub and trees are sometimes present but generally make up a small portion of this vegetation type. This is typically a diverse plant community driven by hydrologic influences. The wet meadows in the northwestern section of the Brunswick Industrial Site are within areas mapped as alluvial, clayey soil types. These wet meadows are characterized by *Agrostis, Juncus* spp.*,* Baltic rush, and common velvet grass (*Holcus lanatus*).

Freshwater Emergent Marsh Wetlands

Freshwater emergent marsh wetlands are characterized by hydrophyllic plants and generally standing water. All emergent wetlands have soils that are saturated to the extent that the soils are always anaerobic. There are freshwater emergent marsh wetlands mapped in small depressional areas mostly within developed or disturbed areas of the Brunswick Industrial Site. Within the Brunswick Industrial Site, this habitat type is dominated by arroyo willow, red willow, and pacific rush (*Juncus effuses* ssp. *pacificus)*.

5 RESULTS

Special-status species were considered for the Brunswick Area based on a current review of the CNDDB and database information provided by the United States Fish and Wildlife Service and California Native Plant Society as well as the reconnaissance-level biological resources surveys. Table 2.0 below includes the vegetation communities identified and mapped within the Brunswick Area as well as the potential special-status species that could occur within each of the vegetation communities (see Appendix D for a map of the vegetation communities within the Brunswick Industrial Site).

For the purposes of this Biological Report, special-status species is defined as those species that are:

- listed as threatened or endangered, or proposed or candidates for listing by the USFWS or National Marine Fisheries Service;
- listed as threatened or endangered and candidates for listing by CDFW;
- identified as Fully Protected species or species of special concern by CDFW;
- identified as Medium or High priority species by the Western Bat Working Group; and
- plant species considered to be rare, threatened, or endangered in California by the CNPS and CDFW [California Rare Plant Rank (CRPR) 1 and 2]:

- CRPR 1A: Plants presumed extinct.
- CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere.
- CRPR 2A: Plants extirpated in California, but common elsewhere.
- CRPR 2B: Plants rare, threatened, or endangered in California, but more common elsewhere.

The study area does not contain any mapped CDFW sensitive communities (see Appendix I for a CDFW CNDDB map of the study area and a 5-mile buffer). Therefore, CDFW sensitive communities are not discussed within this reporting effort further given the lack of mapping provided for such sensitive communities by CDFW within and adjacent to the Brunswick Area.

TABLE 2.0 SPECIAL-STATUS SPECIES ASSOCIATED WITH VEGETATION COMMUNITIES

Vegetation Community	Associated Special-Status Species
Montane Hardwood-Conifer	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Montane Hardwood	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Ponderosa Pine	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Sierran Mixed Conifer	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
South Fork Wolf Creek and Montane Riparian	Sierra blue grass (Rank 1B.3) Foothill yellow-legged frog (CSC), Western pond turtle (CSC), migratory birds (CDFW)
Disturbed and Developed	Coast horned lizard (CSC), Townsend's big-eared bat (CSC)
Annual Grassland	Brownish beaked-rush (Rank 2B.2)
Wet Meadow	Brownish beaked-rush (Rank 2B.2) and finger rush (Rank 1B.1)

5.1 Aquatic Resources Delineation Results

A total of 9.60 acres of "waters of the U.S.", including wetlands, and "waters of the State of California", were identified and mapped within the Brunswick Area. The 9.60 acres of wetland-waters include 8.72 acres of mapped wetlands and 0.88 acres of mapped "other waters of the U.S.," including South Fork Wolf Creek, as well as several intermittent and ephemeral streams.

The 8.72 acres of wetlands identified and mapped within the Brunswick Industrial Site includes:

- 6.97 acres of wet meadow wetlands (4 features mapped);
- 0.50 acres of freshwater emergent marsh wetlands (6 features mapped);
- 1.16 acres of riparian wetlands (3 features mapped); and
- 0.09 acres of roadside wetlands along the East Bennett Road ROW (1 feature mapped).
-

Table 2 includes the list of wetlands delineated and mapped within the Brunswick Area, including the wetland type, wetland identification number which corresponds to the delineation figures shown in Appendix F, and size of each feature.

Table 2. Wetlands Delineated Within Brunswick Industrial Site and Along the East Bennett Road ROW

No.	Wetland Type	Wetland ID Number	Size (Acres)
1	Meadow wetland	WM-1	0.02
2	Meadow wetland	WM-2	0.01
3	Meadow wetland	WM-3	0.01
4	Meadow wetland	WM-4	6.93
5	Marsh	MA-1	0.1
6	Marsh	MA-2	0.3
7	Marsh	MA-3	0.02
8	Marsh	MA-4	0.007
9	Marsh	MA-5	0.05
10	Marsh	MA-6	0.02
11	Riparian	RI-1	0.03
12	Riparian	RI-2	0.76
13	Riparian	RI-3	0.37
14	Roadside Wetland	RW-1	0.09
14			**8.72**

The 0.88 acres (4,392 linear feet) of streams identified and mapped within the Brunswick Industrial Site includes:

- One (1) perennial stream, the South Fork Wolf Creek, totaling 0.59 acres over 2,563 linear feet;
- One (1) perennial drainage along the western edge of Brunswick Road, totaling 0.16 acres over 701 linear feet;
- Five (5) intermittent streams totaling 0.07 acres over 745 linear feet; and
- Two (2) ephemeral streams that only flow during and immediately after precipitation events totaling 0.06 acres over 383 linear feet.
-

Table 3 includes the list of streams delineated and mapped within the Brunswick Area, including the stream type, stream identification number which corresponds to the delineation figures shown in Appendix F, and size of each feature.

Table 3. Streams Delineated Within Brunswick Industrial Site

No.	Stream Type	Wetland ID Number	Size (Acres)
1	Perennial Stream	South Fork Wolf Creek – 1	0.59
2	Perennial Drainage	P – 1	0.16
3	Intermittent Stream	I – 1	0.05
4	Intermittent Stream	I – 2	0.002
5	Intermittent Stream	I – 3	0.006
6	Intermittent Stream	I – 4	0.003
7	Intermittent Stream	I – 5	0.004
8	Ephemeral Stream	E – 1	0.01
9	Ephemeral Stream	E – 2	0.05
9			**0.88**

A targeted review of site conditions within the central and eastern sections of the Brunswick Industrial Site was conducted on August 27, 2020. The purpose of this review was to reevaluate site conditions for the potential presence of wetlands within the site based on the July 2020 Madrone Ecological Consulting peer review and a perennial drainage along Brunswick Road that were not previously mapped as part of the December 2018 and July and August 2019 field surveys. Except for the perineal drainage that runs along Brunswick Road this survey did not identify any additional potential CWA regulated wetlands. These survey areas contained a lack of the required indicators of wetland hydrology and hydric soils required by the Corps to be regulated under the CWA. As identified above, a perennial drainage was mapped that runs along the western edge of Brunswick Road in a northerly direction before entering a culvert that crosses through the central section of the Brunswick Industrial Site before exiting the large

culvert and creating the South Fork Wolf Creek. The perennial drainage appears to cross Brunswick Road from the east and most likely is fed by perennial springs coming from the eastern hillsides before entering the perennial drainage along the western side of Brunswick Road.

5.2 CNPS Ranked Plants and Special-Status Plant Species

CDFW's California Natural Diversity Database Biogeographic Information and Observation System (BIOS) 9 Quad search included the Grass Valley, Nevada City, North Bloomfield, Chicago Park, Colfax, Rough and Ready, Lake Combie, French Corral and Wolf 7.5-minute USGS quadrangles (CDFW, 2019). Based on the results of the searches 23 special-status plant species were identified as occurring within the 9 Quad search. Ten of these plant species were dropped from further consideration due to a lack of suitable habitat in the analysis area (Brunswick Area), the Brunswick Area being substantially outside of the known range and distribution for the plant species, or both (see the stand-alone Brunswick Site Special Status Plant Survey Report developed by Wendy Boes Botanical Consultant, 2019). The plant species dropped from further consideration include the following:

- Jepson's onion (*Allium jepsonii*)
- Mosquin's clarkia (*Clarkia mosquinii*)
- Ahart's buckwheat (*Eriogonum umbellatum var. ahartii*)
- Jepson's coyote thistle (*Eryngium jepsonii)*
- Minute pocket moss (*Fissidens pauperculus*)
- Yosimite tarplant (*Jensia yosimitana)*
- Inundated bog club-moss (*Lycopodiella inundata)*
- Follett's monardella (*Monardella follettii*)
- Sticky pyrrocoma (*Pyrrocoma lucida*)
- Oval-leaved viburnum (*Viburnum ellipticum)*

The CNBS ranked plants and special-status plant species with at least a low potential to occur within the Brunswick Area per the results of the 9 Quad search and CNDDB 5-mile buffer search are evaluated in the CNPS ranked plant and special-status plant table included in Appendix H. The plant species field surveys were conducted at a time when all potentially occurring CNPS ranked and special-status plant species could be identified if they were present, with the exception of Butte County fritillary. A nearby reference population of finger rush was visited on June 24th, 2019 prior to commencing field surveys to ensure this species was still detectable, which was confirmed. No other reference sites were required to be visited given the botanists local knowledge of the other target species as part of the survey effort.

A single CNPS ranked plant species was identified within the Brunswick Area, the CNPS list 4.2 Humboldt lily (*Lilium humboldtii ssp. humboldtii*), which was documented during the biological resource surveys completed in July and August 2019 (see Appendix F).

CNPS ranked plants and special-status plant species, finger rush (*Juncus digitatus*), Cedar Crest popcornflower (*Plagiobothrys glyptocarpus* var. *modestus*), brownish beaked-rush (*Rhynchospora capitellata*), Sierra blue grass (*Poa sierra*), and Scadden Flat checkerbloom (*Sidalcea stipularis*) have a moderate potential to occur within the Brunswick Area. However, given that the Brunswick Area does not contain gabbro or serpentine soils of the Dubakella and Secca-Rock complex soils, Stebbins' morning-glory (*Calystegia stebbinsii*), chaparral sedge *(Carex xerophila)*, Pine Hill flannelbush *(Fremontodendron decumbens)*, and Red Hills soaproot *(Chlorogalum grandiflorum)* have a very low potential to occur within the Brunswick Area. None of the foregoing CNPS ranked plants or special-status plant species were found during the surveys conducted.

A description of the CNPS ranked plants and special-status plant species previously known to occur within 5 miles of the Brunswick Site (CNDDB, 2019) are discussed below, as well as the Cedar Crest popcorn flower given the species was determined to have a potential to occur within the Brunswick Area given the suitability of habitats for the species within the Brunswick Area though it has not been previously documented within 5 miles of the Brunswick Area (see Appendix I for a CNDDB 5-mile buffer figure). A description of CNPS ranked plants and special-status plant species with a low likelihood of occurring within the Brunswick Area is presented in Appendix H.

Sierra arching sedge (Carex cyrtostachya) – California Native Plant Society List 1B.2

Sierra arching sedge inhabits lower montane mesic coniferous forest, meadows and seeps, marshes and swamps, riparian forests (margin), from 2,000- 4,460 feet. Within the known distributional and elevational range for this species, though nearest known occurrence 16 miles to the north. This species was recently described so the full extent of its range and distribution are unlikely yet known. Suitable marginal habitat is present within the mesic forests located in the Brunswick Industrial Site; however, the species was not identified within the Brunswick Area during surveys implemented as part of the development of this Biological Report. Therefore, the potential for this species to occur within the Brunswick Area is considered low.

Scadden Flat checkerbloom (Sidalcea stipularis) – Federally and CA State Endangered and California Native Plant Society List 1B.1

Scadden Flat checkerbloom inhabits marshes and swamps between July and August. It is found in wet montane marshes fed by springs, normally between 2,295 and 2,395 feet above MSL. Suitable habitat for this species occurs within the perennial marsh wetlands in the Brunswick Area. The species has been documented over 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Additionally, this species was not

documented during the 2006 surveys that included the Brunswick Industrial Site nor was the species identified during field surveys conducted in December 2018 or in July and August 2019 within the Brunswick Area. Therefore, the potential for this species to occur within the Brunswick Area is considered moderate.

Pine Hill flannelbush (Fremontodendron decumbens) – Federally Endangered and CA State Rare and California Native Plant Society List 1B.2

Pine Hill flannelbush inhabits rocky ridges on gabbro and serpentine soils within chaparral and cismontane woodlands. This species is endemic to these soil types and is normally documented between 1,390 and 2,495 feet above MSL. Potential for occurrence of this species is considered low given the lack of openings and mixed chaparral vegetation in gabbroic soils within the Brunswick Area. The Pine Hill flannelbush was not found within the Brunswick Area during any of the field surveys conducted in December 2018 or in July and August 2019 within the Brunswick Area.

Stebbins' morning glory (Calystegia stebbinsii) – CA State and Federally Endangered and California Native Plant Society List 1B.1

Stebbins' morning glory inhabits chaparral and cismontane woodland. It is found in red clay soils of the pine hill formation on gabbro or serpentine soils in open areas, normally between 980 and 4,330 feet above MSL. The species is known from a location approximately 4.5 miles to west of the Brunswick Area on gabbroic chaparral on Oceola Ridge. This species was not identified during field surveys conducted in December 2018 or July and August 2019. Potential for occurrence of this species is considered low given the lack of openings and mixed chaparral vegetation in gabbroic soils within the Brunswick Area.

Cedar Crest popcorn flower (Plagiobothrys glyptocarpus var. modestus) – California Native Plant Society List 3

The species is known to occur within cismontane woodland as well as valley and foothill grasslands (mesic), from 2,850-2,855 feet. This species is known from historic collections in 1919 and 1937 from nearby Cedar Ridge less than a mile south of the Brunswick Industrial site and from historic collections in Nevada City. Suitable habitat for this species is present within the woodland areas within the Brunswick Industrial Site. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys and given the species has not been documented within 5 miles of the Brunswick Area since 1937, the potential of this species to occur within the Brunswick Area is considered moderate.

Dubious pea (Lathyrus sulphureus var. argillaceus) – California Native Plant Society List 3

Dubious pea inhabits lower and upper montane coniferous forest and cismontane woodlands, normally between 490 and 3,050 feet above MSL. The species has been previously identified within 5 miles to the Brunswick Area. This species has a low potential to occur in forested areas of the Brunswick Area. This species was not identified during the December 2018 or July and August 2019 surveys; however, the blooming period for this species is April to May. Focused special-status plant surveys will be conducted within the Brunswick Area during the April to May blooming period prior to any disturbance within the Brunswick Area to determine the species presence or absence.

Finger rush (Juncus digitatus) – California Native Plant Society List 1B.1

Finger rush inhabits open chaparral habitat surrounded by mixed oak/conifer woodland on low gradient, north-facing, and vernally moist slopes. This species also associates with sandy clay loam soil within substrates underlain by granitic bedrock. This species is found between 2,165 and 2,590 feet above MSL. There is a low potential for the occurrence of this species in gravelly, seasonally moist openings within the Brunswick Industrial Site. The species is known less than one mile to the north of the Brunswick Area near the intersection of Idaho-Maryland Road and Brunswick Road (species identified in 2011). This species was not identified during the December 2018 or July and August 2019 surveys; however, the blooming period for this species is April to June. Focused special-status plant surveys will be conducted within the Brunswick Area during the April to June blooming period prior to any disturbance within the Brunswick Area to determine the species presence or absence.

Brownish beaked-rush (Rhynchospora capitellata) – California Native Plant Society List 2B.2

Brownish beaked-rush inhabits meadows and seeps, marshes and swamps, and it is found in upper and lower montane coniferous forests, normally between 145 and 6,560 feet above MSL. This species is normally identified on mesic sites and has been identified within 3 miles west of the Brunswick Site in a marshy area along the northwest corner of the Nevada County Fairgrounds along Hwy 20 in 1973. The species was not identified during field surveys conducted in December 2018 or July and August 2019. However, suitable habitat for this species occurs within the perennial marsh wetlands within the Brunswick Industrial Site, but the species has not been identified within 5 miles of the Brunswick Area since 1973. The likelihood of this species occurring within the Brunswick Area is considered moderate.

Chaparral sedge (Carex xerophila) – California Native Plant Society List 1B.2

Chaparral sedge inhabits openings within chaparral habitat, cismontane woodland, and lower montane coniferous forests. This species is found in areas containing serpentine and

gabbroic microhabitats between 1,400 and 2,525 feet above MSL. This species has been identified within approximately 4 miles of the Brunswick Site on Oceola Ridge in gabbroic chaparral. The species was not identified during field surveys conducted in December 2018 or July and August 2019 within the Brunswick Site. Potential for occurrence of this species is considered low given the lack of openings and mixed chaparral vegetation in gabbroic soils within the Brunswick Area.

Red Hills soaproot (Chlorogalum grandiflorum) – California Native Plant Society List 1B.2

Red Hills soaproot is found in chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, between 800 and 5,545 feet above MSL and blooms between May and June. The species was not documented within 5 miles of the Brunswick Site (CNDDB 2019); however, it is known over 10 miles south in Bunch Canyon south of Colfax, with no known occurrences to north. The species was not observed during the 2019 field surveys. Potential for occurrence of this species is considered low and not expected to occur on the Brunswick Area given the lack of openings and mixed chaparral vegetation in gabbroic soils within the Brunswick Area.

Sierra blue grass (Poa sierra) – California Native Plant Society List 1B.3

Sierra blue grass is found in openings in lower montane coniferous forest, between 1,195 and 4,920 feet above MSL and blooms between April and July. There is only marginal suitable habitat for this species in the Brunswick Industrial Site, primarily in the montane hardwood and montane hardwood-conifer forests, and in the forested areas along the South Fork Wolf Creek. The species was not documented within 5 miles of the Brunswick Area (CNDDB 2019); however, it has been documented at Steephollow Creek in a collection from 1964. The species was not observed during the 2019 field surveys and the potential for the species to occur within the Brunswick Area is considered moderate.

Cantelow's lewisia (Lewisia cantelovii) – California Native Plant Society List 1B.2

Cantelow's lewisia is found in moist, granitic areas in broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest mesic, sometimes serpentinite seeps between 1,080 and 4,495 feet above MSL. The species blooms between May and October. There is a low potential for occurrence of this species within the rocky outcrops with seeps within the Brunswick Industrial Site though habitat for this species is very limited within the Brunswick Area. There are records for this species in the Middle Yuba and South Yuba river canyons within 7 miles of the Brunswick Area. The species was not documented within 5 miles of the Brunswick Site (CNDDB, 2019). The species was not observed during 2019 field surveys.

Butte County fritillary (Fritillaria eastwoodiae) – California Native Plant Society List 3.2

Butte County fritillary is found in openings in chaparral, cismontane woodland, and lower montane coniferous forest, sometimes serpentinite between 160 and 4,920 feet above MSL. The species blooms between March and June and there is potential for occurrence in open areas in the Brunswick Industrial Site. There is a 1979 record for this species on the south side of the South Yuba River canyon approximately 7 miles north of the Brunswick Site, and other occurrences on the Washington Ridge; however, the species has not been documented within 5 miles of the Brunswick Area. The species was not documented during the surveys conducted within the Brunswick Area as part of the development of this Biological Report and the potential for the species to occur within the Brunswick Area is considered low.

5.3 CNPS List 4 Species (*not rare or threatened)* Identified within the Brunswick Area

California Native Plant Species (CNPS) with a rank of List 4 are not listed at either the state or federal level, are not rare nor are they threatened or endangered.

Humboldt lily (Lilium humboldtii ssp. humboldtii) - Federal Status: not listed; State Status: not listed; CNPS Status: 4.2

Humboldt lily is known to occur in openings in chaparral, cismontane woodland and lower montane coniferous forests. It is known from Amador, Butte, Calaveras, El Dorado, Fresno, Mariposa, Nevada, Placer, Tehama, Tuolumne, and Yuba Counties at elevations ranging between 295 and 4,200 feet above MSL. Its threats include development, urbanization, horticultural collecting, deer browsing, nonnative plants, and road maintenance (CNPS, 2019). Humboldt lily is a perennial bulb that blooms May through August. It can reach 7 to 8 ft in height and has bright orange lily flowers. The Brunswick Industrial Site has suitable habitat for the species and a single occurrence consisting of 10 individuals within an area less than 110 square feet was documented within a disturbed area of the Brunswick Industrial Site and a single occurrence consisting of a few individuals was documented within the East Bennett Road ROW (see Appendix F for mapped locations of the species within the Brunswick Area).

5.4 Special-Status Wildlife Species

The CNDDB database 5-mile buffer search revealed six (6) special-status wildlife species that have previously been identified and mapped within 5 miles of the Brunswick Area (see Appendix I). The species previously identified within 5 miles of the Brunswick Area include:

- California black rail
- Cooper's hawk

- Coast horned lizard
- Western bumble bee
- Foothill yellow-legged frog
- Townsend's big-eared bat

None of these species were identified within the Brunswick Area during biological resources surveys conducted in December 2018, July 2019, and August 2019. In addition, no USFWS Designated Critical Habitat (DCH) has been mapped by USFWS for any federally listed species within the vicinity of the Brunswick Area.

Given the presence of a large manmade pond and perennial freshwater marsh wetlands within the Brunswick Industrial Site and the presence of the South Fork Wolf Creek within the western section of the Brunswick Industrial Site, western pond turtle and California red-legged frog are also included as special-status aquatic wildlife species with the potential to occur within the Brunswick Area though neither of these species was identified during the surveys conducted within the Brunswick Area as part of the development of this Biological Report.

The following is a description of the special-status wildlife species previously identified within 5 miles of the Brunswick Area. In addition, the western pond turtle and California red-legged frog are also evaluated given the presence of a large manmade pond, a perennial stream, and freshwater emergent marsh wetlands within the Brunswick Area. Additionally, two species of bat, the hoary bat (*Lasiurus cinereus*) and the pallid bat (*Antrozous pallidus*) are included in the assessment below given the have a low potential to occur within the Brunswick Area; however, neither bat species has been previously identified within 5 miles of the Brunswick Area (CDFW 2019a).

Townsend's big-eared bat (Corynorhinus townsendii) – CA State Species of Concern

The Townsend's Big-eared bat species inhabits lower montane coniferous and mixed conifer forest habitats where abandoned buildings and structures occur for roosting. This species has been identified within 3 miles southwest of the Brunswick Area within an abandoned building at the Empire Mine State Historic Park. Only the existing historic mill tower, which is located in the northeastern portion of the Brunswick Industrial Site, contains potential suitable roosting area for this species. However, the species was not identified during any of the field surveys and only limited suitable roosting sites for this species occurs given that only one abandoned structure is located within the Brunswick Area. Therefore, the potential for this species to occur within the Brunswick Area is considered low.

Coast horned lizard (Phrynosoma blainvillii) – CA State Species of Concern

The coast horned lizard occurs in open sandy areas, scattered low bushes, chaparral, manzanita, and oak woodland habitats. It is found in the Sierra Nevada foothills from Butte County to Kern County and throughout the central and southern California coast. Coast horned lizards forage on the ground in open areas, usually between shrubs and often near ant nests. The species relies on camouflage for protections. Predators and extreme heat are avoided by burrowing into loose soil. Periods of inactivity and winter hibernation are spent burrowed in the soil under surface objects such as logs or rocks, in mammal burrows, or in crevices (Zeiner et al., 2000). They inhabit mostly open country, especially sandy areas, washes, flood plains and wind-blown deposits in a wide variety of habitats and can be found at elevations up to 8,000 feet (2,438 meters) (CaliforniaHerps, 2014).

This species has been documented between 3 and 5 miles of the Brunswick Area to the west, northwest, and southwest. There is potential suitable habitat within the open disturbed and developed locations within the Brunswick Industrial Site. As the Brunswick Industrial Site includes the required open areas of exposed, sandy soils for this species, this species has a moderate potential to occur within the Brunswick Area even though no coast horned lizards were observed during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Brunswick Area.

Western pond turtle (Emys marmorata) – CA State Species of Concern

Western pond turtles associate with permanent ponds, lakes, streams, irrigation ditches, and permanent pools along intermittent streams. They are most commonly associated with permanent or nearly permanent water in a wide variety of habitats. This species requires basking sites such as partial submerged logs, rocks, mats of floating vegetation, or open mud banks. During the spring or early summer, females move overland up to 325 ft to find suitable sites for egg laying. The South Fork Wolf Creek, a perennial stream, large manmade pond, and the perennial freshwater marsh wetlands within the Brunswick Industrial Site are considered suitable habitat for this species.

This species has not been identified within 5 miles of the Brunswick Area however, and it was not identified during field surveys conducted. The potential for this species to occur within the Brunswick Area is considered high.

Foothill yellow-legged frog (Rana boylii) – Listed as Threatened under CESA

Foothill yellow-legged frogs inhabit partly shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. The species requires at least some cobble-sized substrate for egg laying. The species requires at least 15 weeks to attain metamorphosis. These frogs are ectothermic, so ambient temperature affects the likelihood of detection

during species specific Visual Encounter Survey (VES) method surveys. Whether the life form is larval or subadult, both stages will shelter in place under substrate and emerge and become active with warmth (i.e., detection probability increases with temperature).

This species has been identified approximately 3.9 miles to the southeast of the Brunswick Area within Greenhorn Creek, but it has not been previously identified within South Fork Wolf Creek. However, the species was not identified during focused VES method surveys for this species conducted on August 29, 2019 within South Fork Wolf Creek within the Brunswick Area as well as within the portions of the creek that flow through public property downstream within the Empire Mine State Historic Park (see Greg Matuzak Environmental Consulting LLC, 2020b).

The stretches of South Fork Wolf Creek within the Brunswick Industrial Site from the large 48" culvert creating the stream and downstream seven hundred (700) feet from the culvert does not contain suitable habitat for the species given the silty nature of the bed of the stream and lack of rocky stream habitat in that area. However, from approximately 700 feet downstream of the 48" culvert to the northwestern boundary of the Brunswick Industrial Site (approximately 2,000 feet of South Fork Wolf Creek) there is marginal suitable habitat for the species. Given the species has not been previously identified within the South Fork Wolf Creek watershed and only marginal suitable habitat occurs within the Brunswick Area for the species, there is a low likelihood this species occurs within the South Fork Wolf Creek.

CA red-legged Frog (Rana aurora draytonii) – Federal Threatened and CA State Species of Concern

CA red-legged frog (CRLF) is known in Nevada County in the North Bloomfield USFS Quadrangle within the Rock Creek watershed. CRLF has not been identified within 5 miles of the Brunswick Area and designated critical habitat for this federally threatened species has not been mapped for this species within the vicinity of the Brunswick Area. The species was not identified during field surveys conducted though focused surveys for this species were not implemented as part of the development of this Biological Report. Potential suitable reproductive habitat for this species may occur within the larger marsh wetlands with perennial water/ponding and the large manmade pond within the Brunswick Industrial Site. Additionally, if suitable breeding locations are located within 1.25 miles of the Brunswick Area and connected by barrier-free dispersal habitat that is at least 300 feet in width, then suitable dispersal habitat could be located within the Brunswick Area. It is unknown whether suitable breeding locations are located within 1.25 miles of the Brunswick Area. However, given that CRLF have not been identified in the Grass Valley USGS Quadrangle, the watershed associated with the Brunswick Area, or within 5 miles of the Brunswick Area, the potential for this species to occur is considered extremely low.

California black rail (Laterallus jamaicensis coturiculus) – CA State Threatened

California black rail inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. The species requires water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat. The species has been identified within 3 miles to the southeast and the southwest of the Brunswick Area. The species was not identified during field surveys. Suitable habitat for this species occurs within the larger marsh wetlands within the southwestern section of the Brunswick Industrial Site where there is permanent ponding of water and dense vegetation along the edges of those wetland features. The potential for this species to occur within the Brunswick Area is considered very low given the developed nature of the Brunswick Industrial Site where suitable habitat for the species is located.

Cooper's hawk (Accipiter cooperii) – CDFW

Cooper's hawks are forest and woodland birds. These hawks are a regular sight in parks, quiet neighborhoods, over fields, at backyard feeders, and even along busy streets if there are trees present. The species has been documented successfully nesting approximately 5 miles to the northeast of the Brunswick Area in 2014. The species is known to occur and nest in Sierra mixed conifer forest and other mixed conifer vegetation communities. Given these vegetation community types occur within and directly adjacent to the Brunswick Area, this species has a moderate potential to occur and nest within the ponderosa pine, Sierran mixed conifer, and montane hardwood habitats within and directly adjacent to the Brunswick Area. Suitable nesting and foraging habitat occur within the forested areas of the Brunswick Industrial Site as well as within the ponderosa pine habitat located adjacent to the East Bennett Road ROW. This species was not identified within the Brunswick Area during the surveys implemented as part of the development of this Biological Report.

Western bumble bee (Bombus occidentalis occidentalis) – Candidate for CESA Listing as Endangered

The western bumble bee is a CESA Candidate for listing as Endangered and is under review by the USFWS; however, the species was last documented within 5 miles of the Centennial Site in 1968 (considered its historical distribution) and is currently only known (current distribution defined by CDFW as known locations where the species has been identified between 2003 – 2017) from a few locations in the Sierra Nevada, none of which are within western Nevada County where the Centennial Site is located (CDFW 2019b). Therefore, it is unlikely the species would occur within the Centennial Site.

Hoary bat (*Lasiurus cinereus*) and Pallid bat (*Antrozous pallidus*)

The hoary bat is considered a Medium Risk species by the Western Bat Working Group and the pallid bat is a CDFW species of special concern. Neither species has been previously identified within 5 miles of the Brunswick Area (CDFW 2019a). However, the Brunswick Area does provide roosting habitat for both species within the riparian and woodlands located within the Brunswick Area. Therefore, if either species is present within the Brunswick Area during the proposed disturbance, bat day roosts could be impacted.

Nesting raptors and other migratory bird species - Protected under CA State DFG Code Sections 3503, 3503.5, and 3800

There is a moderate to high potential for nesting raptors and other nesting migratory bird species to occur within and directly adjacent to the Brunswick Area. The Brunswick Area contains suitable nesting habitat for bird species, such as tree nesting species (Cooper's hawk and other common raptors) and ground nesting species like the spotted towhee (*Pipilo maculatus*) and dark-eyed junco (*Junco hyemalis*). Additional species that are known to nest in shrub and tree habitat have the potential to nest within the Brunswick Area. The nesting season for Cooper's hawk, common raptors, and nesting birds within the Brunswick Area occurs between March 1st and August 31st.

Critical Deer Habitat

Known migratory deer ranges outlined in the Nevada County General Plan was reviewed for deer migration corridors, critical range, and critical fawning areas. Per the Migratory Deer Ranges Nevada County General Plan map, the Brunswick Area is located in an area of potential Deer Winter Range. The field surveys did not record any observations of deer. The Brunswick Area does not contain any known major deer migration corridors, known deer holding areas, nor critical deer fawning areas.

Protected Oak Resources by the State of California and Nevada County

The Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.18 for Trees. Landmark trees are any native oak tree species (*Quercus* species) with a trunk diameter of 36" or greater at diameter breast height (dbh or 4'6"). Identifies landmark groves as hardwood tree groves with 33+% canopy closure, or groves whose size, visual impact, or association with a historically significant structure or event has caused it to be marked for preservation by the county, state, or federal government. Projects shall be approved only when they do not remove or disturb defined trees or groves, unless a Management Plan is prepared consistent with the Nevada County Land Use and Development Code for such trees. This Biological Report does not include an assessment of or proposed mitigation for potential impacts to such protected oak resources given the Brunswick Area does not contain protected oak resources per the Nevada County Land Use and Development Code, which would require such an

assessment and Management Plan.

Additionally, the Brunswick Area does not contain protected oak resources per the State of California oak woodlands protections set forth in Public Resources Code Section 21083.4. Though the Brunswick Area contains several species of native oak trees, the conifer and hardwood woodlands within the Brunswick Area are dominated by ponderosa pine, incense cedar, Douglas fir, and madrone. The most dominant native oak tree within the Brunswick Area is the California black oak and it was not identified in the densities required to grant them protection under State of California law (10% canopy cover requirement) or under the Nevada County Land Use and Development Code (minimum 33% canopy cover). Therefore, protected oak resources are not discussed further in this Biological Report.

5.5 Brunswick Area Disturbance Impacts to Sensitive Biological Resources

Based on the Project Understanding outlined within Section 1.3 and the proposed disturbance site plan included in Appendix J, Table 3.0 includes estimated acreage impacts to vegetation communities as mapped within the Brunswick Area.

TABLE 3.0 ESTIMATED ACREAGE IMPACTS TO VEGETATION COMMUNITIES

Vegetation Community	Estimated Acreage Impacts	Associated Special-Status Species
Montane Hardwood-Conifer	1.24	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Montane Hardwood	0.06	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Ponderosa Pine	0.93	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Sierran Mixed Conifer	16.44	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Manmade Pond	7.28	Western pond turtle (CSC), California red-legged frog (ESA listed), migratory birds (CDFW)
Disturbed and Developed	33.44	Coast horned lizard (CSC), Townsend's big-eared bat (CSC)
Annual Grassland	0.26	Brownish beaked-rush (Rank 2B.2)
Wet Meadow	0.26	Brownish beaked-rush (Rank 2B.2) and finger rush (Rank 1B.1)
Total Acreage Disturbance	**60**	

Table 4.0 and Table 5.0 below include the estimated disturbance on mapped wetlands and streams within the Brunswick Area per the Brunswick Industrial Site and East Bennett Road ROW Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020) and Site Plan in Appendix J.

TABLE 4.0 AREA OF DISTURBANCE TO MAPPED WETLANDS WITHIN THE BRUNSWICK AREA

No.	Wetland Type	Wetland ID Number	Size (Acres)	Area of Disturbance (Acres)
1	Meadow wetland	WM-1	0.02	0.02
2	Meadow wetland	WM-2	0.01	0.01
3	Meadow wetland	WM-3	0.01	0.01
4	Meadow wetland	WM-4	6.93	-------
5	Marsh	MA-1	0.1	0.1
6	Marsh	MA-2	0.3	0.3
7	Marsh	MA-3	0.02	0.02
8	Marsh	MA-4	0.007	0.007
9	Marsh	MA-5	0.05	0.05
10	Marsh	MA-6	0.02	0.02
11	Riparian	RI-1	0.03	0.03
12	Riparian	RI-2	0.76	-------
13	Riparian	RI-3	0.37	-------
14	Roadside Wetland	RW-1	0.09	-------
14	-------	**TOTAL**	**8.72**	**0.57 acres**

TABLE 5.0 AREA OF DISTURBANCE TO MAPPED STREAMS WITHIN THE BRUNSWICK AREA

No.	Stream Type	Stream ID Number	Size (Acres)	Estimated Disturbance (acres and linear feet)
1	Perennial Stream	South Fork Wolf Creek – 1	0.59	15 lf. (0.01 acres) * 40 lf. (0.04 acres) *
2	Perennial Drainage	P – 1	0.16	-------
3	Intermittent Stream	I – 1	0.05	-------
4	Intermittent Stream	I – 2	0.002	-------
5	Intermittent Stream	I – 3	0.006	-------
6	Intermittent Stream	I – 4	0.003	-------
7	Intermittent Stream	I – 5	0.004	33.5 lf. (0.002 acres)
8	Ephemeral Stream	E – 1	0.01	16 lf. (0.0007 acres)
9	Ephemeral Stream	E – 2	0.05	188 lf. (0.05 acres)
9	-------	**TOTAL**	**0.88**	293 lf. (0.103 acres) **

* impacts estimated at 0.01 acres (permanent) and 0.04 acres (temporary)
** impacts estimated at 0.062 acres (permanent) and 0.041 acres (temporary)

A targeted review of site conditions within the central and eastern sections of the Brunswick Industrial Site was conducted on August 27, 2020. The purpose of this review was to reevaluate site conditions for the potential presence of wetlands within the site based on the July 2020 Madrone Ecological Consulting peer review and a perennial drainage along Brunswick Road that were not previously mapped as part of the December 2018 and July and August 2019 field surveys. Except for the perineal drainage that runs along Brunswick Road this survey did not identify any additional potential CWA regulated wetlands. These survey areas contained a lack of the required indicators of wetland hydrology and hydric soils required by the Corps to be regulated under the CWA. As identified above, a perennial drainage was mapped that runs along the western edge of Brunswick Road in a northerly direction before entering a culvert that crosses through the central section of the Brunswick Industrial Site before exiting the large culvert and creating the South Fork Wolf Creek. The perennial drainage appears to cross Brunswick Road from the east and most likely is fed by perennial springs coming from the eastern hillsides before entering the perennial drainage along the western side of Brunswick Road.

Given that the Brunswick Industrial Site has had no significant disturbance since 2008 and the hydrology of the site has remained similar to that identified in 2008, only a small change in the number and extent of wetlands within the Brunswick Area is to be expected. The changes that have occurred in terms of the number and extent of wetland features within the Brunswick Area could be partially explained by the change in weather patterns, including several years of drought condition, over the past decade followed by years of average to high rainfall the past 3 years. In addition, the change in extent to the riparian wetland RI-2 was due to more accurate mapping of the feature compared to the 2008 WRA delineation. It is noted that the RI-2 feature in this Delineation Report has been mapped conservatively; a greater reduction within both sides of the feature would be possible with additional access to the lower reaches of the incised channel where it is assumed that indicators of wetland hydrology, hydrophytic vegetation, and indicators of hydric soils are located.

The proposed 5.6 cfs discharge to South Fork Wolf Creek will remain within the 5.6 cfs discharge limit and in compliance with the NPDES discharge requirements will ensure that the proposed discharge to South Fork Wolf Creek will not have an adverse effect on South Fork Wolf Creek aquatic ecosystem and any sensitive aquatic biological resources, including to BMI and the food web (see Greg Matuzak Environmental Consulting LLC, 2020b for additional information regarding sensitive biological resources within South Fork Wolf Creek). Under these conditions, potential bank erosion, bed scour, and channel avulsion would not be substantial and water quality standards for constituents and parameters of concern would remain in compliance. Therefore, negative impacts to aquatic resources from excess siltation and turbidity, as well as from the exceeding safe

threshold limits caused by the proposed discharge, would be avoided and minimized from the implementation of the proposed discharge to the South Fork Wolf Creek.

The stretch of South Fork Wolf Creek from the discharge point to the City of Grass Valley Ophir Street culvert exhibits a functioning aquatic ecosystem as several small fish were identified within the stream, several invertebrates were identified along the surface of the stream, and Pacific tree frogs were identified along the edges of the stream within riparian zone vegetation. However, the stream stretches assessed in the analysis only contain marginal suitable habitat for special-status aquatic species, such as the foothill yellow-legged frog and the western pond turtle, and it is very unlikely that such species would inhabit the stretches of South Fork Wolf Creek covered under the assessment conducted specifically for South Fork Wolf Creek (see Greg Matuzak Environmental Consulting LLC, 2020b). South Fork Wolf Creek does not contain suitable habitat for any other CESA or FESA listed species or any other sensitive biological resources as defined by CDFW. Therefore, remaining in compliance with NPDES permit regulated discharge requirements and incorporation of the project stormwater design will ensure that the South Fork Wolf Creek will not be adversely affected by the discharge to the creek and its associated aquatic biological resources.

6 CONCLUSIONS AND RECOMMENDATIONS:

These conclusions and recommendations are based on the findings of this Biological Report and the impact assessment based on the Project Understanding outlined in Section 1.3 above and the site plan attached in Appendix J. Approximately 60 acres of disturbance within the Brunswick Industrial Site is proposed (see Table 3.0). Therefore, the impact assessment and recommendations below are based on the proposed 59.91 acres of disturbance included in the Site Plan attached in Appendix J. Within the East Bennett Road ROW, potential temporary impacts from the construction of an NID potable water pipeline would be maintained within the pavement of the road and would have no impact on any vegetation. For sensitive biological resources that have the potential to be impacted by such disturbance, avoidance, minimization, and mitigation measures are proposed to ensure that such disturbance does not cause a significant impact on any sensitive biological resources within the Brunswick Area.

Proposed Avoidance, Minimization, and Mitigation Measures

6.1 Potential Impacts to Special-Status Plant Species

CNPS ranked plants and special-status plant surveys were conducted in December 2018 and early January 2019 as well as July and August 2019, which is in the blooming period for most CNPS ranked plants and special-status plant species with potential to occur within the Brunswick Area. The blooming period for CNPS ranked plants and special-status plant species within the Brunswick Area range between March and October (see Appendix H). The Humboldt lily, a CNPS List 4.2 special-status plant species, was identified within the Brunswick Industrial Site and along the East Bennett Road ROW in July and August 2019 (Boes, 2020, see Appendix F) and the species within the Brunswick Industrial Site will be removed as part of the planned development within the Brunswick Industrial Site (see Site Plan attached in Appendix J). No other CNPS ranked plants or special-status plants were documented within the Brunswick Area during the site visits and surveys conducted as part of the development of this Biological Report. Therefore, the Brunswick Area contains a single plant species listed by CNPS based on the results of the July and August 2019 surveys of the Brunswick Area.

Based on Table 3.0, which identifies the acreage impacts to vegetation communities within the Brunswick Area, those vegetation communities have been identified to contain suitable habitat for special-status plant species. Therefore, the proposed disturbance within those vegetation communities mapped within the Brunswick Area could impact special-status plant species, if present during such disturbance. Therefore, prior to the implementation of future ground disturbing activities within the Brunswick Area, an additional special-status plant survey will be required to identify potential early blooming season

(April to May) special-status plant species within the Brunswick Area given that surveys were not conducted during that time of the year prior to the development of this Biological Report. The additional special-status plant surveys shall be conducted prior to such disturbance activities to document the presence or absence of each of the early blooming special-status plant species with potential to occur within the Brunswick Area.

If any special-status plant species is documented within or directly adjacent to areas proposed for disturbance within the Brunswick Area that are CNPS list 1A, 1B, 2A, or 2B per CEQA Guidelines Section 15380, or are listed under the ESA and/or CESA (see Section 2.2.7 of this Biological Report), protection of such plants would include complete avoidance, transplantation, and/or on- or offsite restoration of the special-status plant species that could be impacted by such site disturbance. These protective measures for such plants would be included as part of the required development of a Habitat Management Plan (HMP) as part of compliance with the Nevada County Land Use and Development Code, Section L-II 4.3.12, which includes regulations intended to avoid the impact of development on rare, threatened, endangered, and special-status species and their habitat, or where avoidance is not possible, to minimize or compensate for such impacts and to retain their habitat as non-disturbance open space. The HMP would include the avoidance, minimization, and mitigation measures outlined below as part of compliance with the Nevada County Land Use and Development Code, Section L-II4.3.12.

Additionally, if an ESA listed special-status plant species is identified within the Brunswick Area and would be impacted by disturbance within the Brunswick Area, then a consultation with USFWS would be required as part of any future project permitting within the Brunswick Area and therefore, additional avoidance, minimization, mitigation, and monitoring requirements may be included as part of the development of a Biological Assessment (BA) to be submitted to the USFWS and a Biological Opinion (BO) developed by the USFWS through the ESA consultation process, whether Section 7 or Section 10 of the ESA.

At a minimum, the HMP would include the following protective measures for special-status plant species with the potential to be impacted by the proposed disturbance within the Brunswick Area:

- a map of the location of special-status species that may be disturbed or need to be protected;
- location of environmental protection fencing to be placed around the individual plants to be protected;
- identification of the location of protected plants on design and construction drawings;

- environmental awareness training for all personnel working on the project during initial site disturbance to discuss the location of the protected plants and the measures to be taken to avoid impacts to them; and
- weekly site monitoring by a qualified biologist to ensure that the special-status plants are being protected during site disturbance and construction.

Where individuals would be potentially affected directly by site disturbance and transplantation of individual plants is required to minimize and mitigate for impacts to such species, the following should be integrated into the HMP:

- remove bulbs of individual plants to be directly impacted during the dormant season;
- relocate the bulbs to a site with similar soil, hydrologic, vegetation type and aspect within the Brunswick Industrial Site; and
- identify the location(s) for dormant season relocation and site selection for transplantation.

The HMP would also include a requirement to meet the following criteria:

- metrics of successful establishment, which would include a minimum of 80% survival of the transplants after 2 years of transplanting the species.

If the 80% survival is not established after 2 years, transplants of individuals grown from seed should be planted with similar soil, hydrologic, vegetation type and aspect within the Brunswick Industrial Site. Transplantation shall occur in the season deemed to have the greatest potential for success, generally the fall, after rains have commenced. Transplants will be monitored every month for the first six months, then subsequently, every two months for the first two years. After two summer seasons of monitoring identifies successful establishment of 50% of the initial transplants, transplant seedlings will have been deemed successful.

Disturbance related impacts to CNPS list 3 and list 4 species ***would not*** be considered a "significant" impact requiring additional mitigation under CEQA Guidelines Section 15380.

6.2 Potential Impacts to Special-Status Wildlife Species

The Townsend's big-eared bat and coast horned lizard are the terrestrial special-status wildlife species with at least some potential to occur within the Brunswick Area, even though neither species has been observed on the Project Site. These species are in addition to potential nesting raptors, and special-status aquatic species that have some potential to occur within the Brunswick Area as discussed in detail below.

Townsend's big-eared bat (and other bat species, including hoary and pallid bats)

Occurrence: The Townsend's big-eared bat has the potential to roost within the abandoned structures, such as the large cement silo structure within the Brunswick Area. Hoary and pallid bats roost in riparian and forested woodlands. However, these species have not been documented within the Brunswick Area and they each have a low potential to occur within the Brunswick Area.

Mitigation: Prior to disturbance of any structures or riparian and forested woodlands within the Brunswick Area and no more than seven (7) days prior to such disturbance, a pre-construction bat roosting survey should be conducted to identify the presence or absence of roosting bats. If any Townsend's big-eared bats (or any other species of bat, including the hoary and pallid bat) are identified during roosting surveys, passive removal the roosting bats prior to disturbance to structures and riparian and forested woodlands should be implemented to avoid impacts to this species. Passive removal includes allowing roosting bats to freely leave the roost site (riparian and forested woodlands and any structure). Once the roosting bats have been passively removed from the structure(s) and riparian and forested woodlands, the structure(s) would be closed off from recurring bat roosting within the structure and the proposed work within the structure(s) would no longer pose a risk to individuals of the species. For riparian and forested woodlands containing bat roosts, the removal of trees associated with such woodlands would only occur once the bats leave the day roosts. Furthermore, if a maternal (breeding) roost is documented, no disturbance will occur until the breeding roost has dispersed from the structure or riparian and forested woodlands they are found in.

Coast horned lizard

Occurrence: There is potential suitable habitat within the open disturbed and developed sections of the Brunswick Area. In addition, the Brunswick Area includes the required open areas of exposed, sandy soils for this species within those habitat types. Therefore, this species has a moderate potential to occur within the Brunswick Area though the species has not been identified within the Brunswick Area.

Mitigation: Prior to disturbance within the areas of the Brunswick Area that contain disturbed or developed surfaces and annual grassland vegetation community, and no more than seven (7) days prior to such disturbance, a pre-construction survey for the species shall be conducted prior to any disturbance within those disturbed and developed areas of the Brunswick Area in order to avoid direct impacts to the species. If the species is documented during pre-construction surveys, a qualified wildlife biologist (approved by CDFW) would have the authority to move individual coast horned lizards

outside of the proposed disturbance area(s) in order to avoid an impact to this species. Once the coast horned lizard(s) have been removed from the disturbance area(s) and out of harms way, the proposed work would no longer pose a risk to individuals of the species.

6.3 Potential Impacts to Special-Status Aquatic Species

Foothill yellow-legged frog

Occurrence: Marginal suitable habitat for this species occurs within the Brunswick Area (South Fork Wolf Creek). However, the species was not identified during focused VES survey methods within the South Fork Wolf Creek conducted in August 2019 and therefore, it is highly unlikely that any individuals of the species would occur within the Brunswick Area.

Mitigation: To ensure that any disturbance directly within or directly adjacent to South Fork Wolf Creek (within the riparian zone) within the Brunswick Area and downstream within the Empire Mine State Historic Park, doesn't have an impact on this species, a pre-construction survey for the species should be implemented to avoid any potential impacts to this species if it were present at the time of the proposed disturbance, including prior to the proposed treated mine water discharge to the creek (see Greg Matuzak Environmental Consulting LLC, 2020b). The pre-construction survey shall be conducted following CDFW recommended VES methods as implemented in August 2019 and shall be implemented no more than fourteen (14 days) prior to disturbance within and directly adjacent to the South Fork Wolf Creek (within the riparian zone).

If this species is documented during pre-construction VES method surveys (egg masses, juveniles, or adults), disturbance to the stream and species should be completely avoided given the species is listed as Threatened under CESA. If the species is documented during the pre-construction VES surveys, CDFW shall be contacted immediately. An Incidental Take Permit (ITP) may be required from CDFW as part of the development of conservation measures to ensure avoidance and minimization of potential impacts to any frogs identified within South Fork Wolf Creek. The ITP may allow a CDFW qualified wildlife biologist with a CDFW handling permit for the species to move individuals out of the disturbance areas to avoid impacting this species and/or other potential conservation measures to avoid and minimize impacts to the species (see Section 6.6 below for additional information related to an ITP).

Western Pond Turtle

Occurrence: The South Fork Wolf Creek (perennial stream), the large manmade pond, and the marsh wetlands within the Brunswick Area that contain perennial water/ponding are considered suitable habitat for this species. The species has not been documented

within 5 miles of the Brunswick Area and has not been identified within the Brunswick Area during the biological resources species surveys conducted within the Brunswick Area. The species therefore is considered to have a high potential to occur within the Brunswick Area.

Avoidance: If the species is found within the Brunswick Area, any development within these perennial water sources or within 325 feet of these perennial water sources during spring and early summer (March through July) should be avoided to minimize any potential impacts to this species.

Mitigation: If these perennial water sources can't be avoided from direct impacts or if these perennial water sources can't be avoided by a minimum of 325 feet during the spring and early summer months listed above, a pre-construction survey shall be conducted to identify the presence or absence of this species within the areas to be disturbed no more than seven (7) days prior to the proposed disturbance within the species suitable habitat. If this species is documented during pre-construction surveys, it should be allowed to move out of the way of the disturbance zone on its own or a qualified wildlife biologist with a CDFW handling permit for the species can move individuals out of the disturbance areas to avoid impacting this species.

California red-legged frog (CRLF)

Occurrence: Potential suitable reproductive habitat for this species may occur within the larger marsh wetlands with perennial water/ponding and within the large manmade pond within the Brunswick Area (see Photo Log in Appendix G). It is unknown if there are suitable breeding locations within 1.25 miles of the Brunswick Area and connected by barrier-free dispersal habitat that is at least 300 feet in width, which would be required for suitable dispersal habitat to be located within the Brunswick Area. However, the species has not been documented within the Brunswick Area, it has not been documented in the watershed, and was not documented during the biological resources surveys conducted within the Brunswick Area. Therefore, this species has a very low potential to occur within the Brunswick Area.

Avoidance: Given potential suitable reproductive habitat for this species may occur within the larger marsh wetlands with perennial water/ponding and within the large manmade pond within the Brunswick Area, avoidance of these aquatic resources within the Brunswick Area by a minimum of 328 feet (100 meters) would ensure that the species would not be impacted if present.

Mitigation: If avoidance of these aquatic resources by a minimum of 328 feet (100 meters) within the Brunswick Area is not feasible, then pre-construction surveys for CRLF shall be implemented to ensure that no CRLF are present during the proposed disturbance within the species suitable habitat. A qualified wildlife biologist approved by USFWS would be required to implement the pre-construction surveys. The *Revised Guidance on Site*

Assessment and Field Surveys for the California Red-legged Frog (USFWS Guidance, August 2005) should be implemented as part of the pre-construction surveys to avoid disturbance and take of the species. If no CRLF are identified during the pre-construction surveys, then the proposed disturbance within 328 feet (100 meters) of suitable breeding habitat for the species could occur with no further requirements.

If CRLF are identified during the pre-construction surveys, coordination and consultations with the USFWS would be required through an ESA Section 7 or Section 10 process. As part of the consultation process, specific avoidance, minimization, and mitigation measures would be required to be implemented, which could include, but may not be limited to the following: additional pre-construction surveys and daily monitoring to ensure that the proposed site disturbance will not disturb individual CRLF, environmental awareness training to contractors working within or adjacent to CRLF habitat, and exclusionary fencing installation between CRLF aquatic habitat and disturbance areas.

Additionally, a Habitat Management Plan (HMP) would also be required for any state or federally listed special-status wildlife species if documented within the Brunswick Area. The HMP would be developed for the special-status species as part of compliance with the Nevada County Land Use and Development Code, Section L-II 4.3.12 and it would include the avoidance, minimization, and mitigation measures outlined above and as part of any coordination or consultation with the USFWS compliance with the Nevada County Land Use and Development Code, Section L-II 4.3.12.

California black rail

Potential habitat for this species occurs within the larger marsh wetlands within the Brunswick Area where there is permanent ponding of water and dense vegetation. Therefore, to identify the presence or absence of the species within the Brunswick Area for any proposed disturbance within or immediately adjacent to those larger wetlands, pre-construction surveys for the species shall occur prior to the implementation of any such disturbance within or directly adjacent to the species habitat. The pre-construction surveys would include conducting call back/response surveys. This species is most active between 2 hours before and 3 hours after sunrise; therefore, surveys should start at sunrise and continue no later than 0930. If evening surveys are to be conducted, they should be paired with a morning survey, and all sites should have surveys conducted at both time periods. The preferred method for conducting surveys via the call-back/response protocol of Evens et al (1991). If a positive call back is identified during the surveys, then the species is assumed to be present and the area should be avoided from disturbance in order to avoid impacts to individuals of the species, if feasible.

Occurrence: Potential suitable habitat for this species occurs within the larger marsh wetlands within the Brunswick Area where there is permanent ponding of water and dense vegetation. The species has not been documented within the Brunswick Area but

has been previously identified within 5 miles to the southeast and southwest of the Brunswick Area. This species has a low likelihood of occurring within the Brunswick Area.

Avoidance: Avoidance of direct disturbance to the larger, perennial marsh wetlands within the Brunswick Area would ensure that the species would not be impacted if present.

Mitigation: To identify the presence or absence of this species within the Brunswick Area for any proposed disturbance within or immediately adjacent to those larger, perennial marsh wetlands, pre-construction surveys for the species shall occur prior to the implementation of any such disturbance within or directly adjacent to the species habitat. The pre-construction surveys for this species shall occur no more than fourteen (14) days prior to any such disturbance within or directly adjacent to the species habitat. The pre-construction surveys would include conducting call back/response surveys. This species is most active between 2 hours before and 3 hours after sunrise; therefore, surveys should start at sunrise and continue no later than 0930. If evening surveys are to be conducted, they should be paired with a morning survey, and all sites should have surveys conducted at both time periods. The preferred method for conducting surveys via the call-back/response protocol of Evens et al (1991). If a positive call back is identified during the surveys, then the species is assumed to be present and the area should be avoided from disturbance in order to avoid impacts to individuals of the species, if feasible.

Given the species is a CESA listed species, coordination with CDFW shall occur if a positive response to the call-back/response surveys occurs and if any proposed disturbance may impact the species. Any area containing this species would likely need to be avoided in order to avoid impacts to and take of this species, if feasible, or additional mitigation measures would be required in coordination with CDFW to minimize and avoid impacts to such species. Additional avoidance measures could include, but may not be limited to the following: environmental awareness training, daily construction monitoring by a CDFW qualified biologist when disturbance related activities occur within or directly adjacent to the species habitat, and exclusionary fencing installation between the species habitat and the proposed disturbance areas. Additionally, an ITP could be required by CDFW if complete avoidance of the species is not feasible. Areas where no positive response to the call-back/response surveys are assumed to not contain individuals of the species and therefore, disturbance in those areas would have no impact on this species.

6.4 Potential Impacts to Cooper's Hawk, Nesting Raptors, Bird Species

Given the Brunswick Area contains many larger trees and many of those trees contain suitable habitat for nesting raptors, including suitable nesting sites for Cooper's hawk,

removal of such trees should be done outside the breeding season, if possible, to avoid potential impacts to such nesting raptor species. The breeding season for raptors and MBTA protected bird species in the vicinity of the Brunswick Area is generally from February 1 to August 30. Vegetation clearing or tree removal outside of the breeding season for such bird species would not require the implementation of any avoidance, minimization, or mitigation measures. However, construction or development activities during the breeding season could disturb or remove occupied nests of raptors and would require the implementation of a pre-construction survey within 250 feet of the any disturbance area within the Brunswick Area for nesting raptors within 7 days prior to disturbance.

Occurrence: The Brunswick Area contains many larger trees and many of those trees contain suitable habitat for nesting raptors, including suitable nesting sites for Cooper's hawk. In addition, the Brunswick Area also includes smaller riparian trees and shrubs as well as grasslands that provide suitable nesting habitat for other protected bird species. The breeding season for raptors and other protected bird species in the vicinity of the Brunswick Area is generally from February 1 to August 31 but varies depending on the species and localized weather patterns.

Avoidance: Vegetation clearing or tree removal outside of the breeding season for such bird species and/or avoidance of such potential nesting habitat would not require the implementation of any avoidance, minimization, or mitigation measures.

Mitigation: Construction or disturbance activities during the breeding season could disturb or remove occupied nests of raptors and/or protected bird species and would require the implementation of a pre-construction survey within and adjacent to any proposed disturbance area within the Brunswick Area for nesting raptors and other protected bird species within seven (7) days prior to disturbance. The nesting survey radius around the proposed disturbance would be identified prior to the implementation of the protected bird nesting surveys by a CDFW qualified biologist and would be based on the habitat type, habitat quality, and type of disturbance proposed within or adjacent to nesting habitat.

If any nesting raptors or protected birds are identified during such pre-construction surveys, trees or shrubs or grasslands with active nests should be not be removed or disturbed and a no-disturbance buffer should be established around the nesting site to avoid disturbance or destruction of the nest site until after the breeding season or after a qualified wildlife biologist determines that the young have fledged. The extent of these buffers would be determined by a CDFW qualified wildlife biologist and would depend on the special-status species present, the level of noise or construction disturbance, line of sight between the nest and the disturbance, ambient levels of noise and other disturbances, and other topographical or artificial barriers. These factors should be analyzed by a qualified wildlife biologist to make an appropriate decision on buffer

distances based on the species and level of disturbance proposed in the vicinity of an active nest.

6.5 Potential Impacts to Clean Water Act Regulated "Waters of the U.S.," Including Wetlands

Each of the mapped wetland features and stream features included as part of the Brunswick Industrial Site and East Bennett Road ROW Aquatic Resources Delineation Report (Greg Matuzak Environmental Consulting LLC, 2020a) are assumed to fall under Corps jurisdiction pursuant to Section 404 of the CWA. The RWQCB pursuant to Section 401 of the CWA also has jurisdiction over areas subject to regulation by the Corps under Section 404 of the CWA. As detailed in the CWA, any proposed action that would place fill or dredge material within areas identified as Corps jurisdictional wetlands or waters would require a Department of the Army Section 404 permit and a RWQCB Section 401 Water Quality Certification, or waiver thereof, prior to the placement of fill or dredge material within such features. Fill or dredge impacts to any features regulated under Sections 404 and 401 of the CWA would be required to be mitigated at a minimum of a 1:1 ratio. Compensatory mitigation would be included as a Section 404 and Section 401 permit condition to be implemented prior to the placement of such dredge and fill material within a "waters of the U.S.," including wetlands, and would ensure the no net loss of such features within the Brunswick Area.

Project Related Impacts

The proposed disturbance within the Brunswick Area as outlined in Section 1.3 and identified within the Site Plan attached in Appendix J, such disturbance is estimated to fill 0.57 acres of mapped wetlands, which would be permanent impacts to mapped wetlands within the Brunswick Area (see Table 4.0). The proposed discharge within the perennial stream would include a pipeline and outfall within the bank of the creek. Approximately 15 linear feet of the southern bank of the creek would be impacted. Though the pipeline would be a "temporary impact" to the riparian vegetation during construction of the pipeline, which would be revegetated within the riparian zone post construction, the outfall would have a very small permanent impact within the bank of the creek (approximately 450 square feet for outfall and energy dissipation).

The South Fork Wolf Creek culvert replacement where the existing culvert daylights within the Brunswick Industrial Site would have an estimated 40 ft. x 40 ft. area of impact (1,600 square feet). This would be a temporary impact during replacement. Existing conditions would be re-established once culvert is replaced to the extent feasible.

Additionally, the ephemeral stream connecting South Fork Wolf Creek from upstream would be filled as part of the proposed project disturbance (total of 188 linear feet and 0.05 acres). Therefore, the proposed disturbance to "waters of the U.S.," including

wetlands, within the Brunswick Area is estimated to be 0.63 acres of permanent impacts and 0.043 acres of temporary impacts. A total of 293 linear feet of mapped streams would be impacted from the proposed disturbance (203 linear feet of permanent impacts and 89.5 linear feet of temporary impacts). Specific to South Fork Wolf Creek, impacts are estimated to be 0.01 acres of permanent impacts and 0.04 acres of temporary impacts due to the proposed outfall and updated culvert within the South Fork Wolf Creek (see Table 5.0). Final impact calculations to such "waters of the U.S.," including wetlands, within the Brunswick Area will be based on an approval of the aquatic resources mapped within the Brunswick Area by the Corps and the proposed disturbance within and directly adjacent to such aquatic resources based on the final design. Given the recently passed Navigable Waters Protection Rule, ephemeral streams currently mapped within the Brunswick Area may no longer contain protections under the CWA.

Individual Permit

Under the CWA, any fill within "waters of the U.S.," including wetlands of 0.5 acres or greater would not meet the general conditions of any previously authorized Nationwide Permit and therefore, an Individual Permit (IP) or a Letter of Permission (LOP) would be required prior to the filling of 0.5 acres or greater of such CWA regulated features. Typically, an IP has the longest timeline compared to an LOP and a Nationwide Permit for approval given it includes a 404(b)(1) alternatives analysis that demonstrates that the proposed project has minimized and reduced impacts to the aquatic environment. If the fill and dredge acreage impacts can be reduced to less than 0.5 acres, then the proposed disturbance within the Brunswick Area would most likely fit under a pre-authorized Nationwide Permit (potentially a Nationwide Permit #44 for Mining Activities).

Once an application is deemed complete for an Individual Permit process with the Corps, The Corps Sacramento District states that a minimum of 120 days is required for an IP approval. As part of any IP or LOP process a functional assessment of the wetlands and waters to be impacted by the proposed site disturbance should be conducted and based on the results of the functional assessment and coordination with the Corps, an approved Compensatory Mitigation Plan that mitigates for impacts to such CWA regulated features at a minimum of a 1:1 ratio is required. Compensatory mitigation can include but is not limited to the following: onsite and/or offsite wetland creation and/or restoration, payment of an in-lieu fee, and/or purchase of mitigation credits at an approved Corps wetland mitigation or conservation bank.

6.6 Potential Impacts to Stream and Riparian Zones Under CDFW Jurisdiction

Substantial alteration to perennial, intermittent, and ephemeral streams and adjacent riparian habitat within the Brunswick Area would likely fall under CDFW jurisdiction as these areas each contain a bed and bank. Any proposed alteration of any stream would most likely require a Streambed Alteration Agreement from the CDFW pursuant to Section 1600 *et. seq.* of the California Fish and Wildlife Code prior to construction, including any disturbance within the South Fork Wolf Creek or other mapped streams within the Brunswick Industrial Site.

Project Related Impacts

The proposed disturbance within the Brunswick Area would cause an estimated 0.06 acres of permanent impacts and 0.043 acres of temporary impacts to a total of 293 linear feet of mapped streams within the Brunswick Industrial Site. Specific to South Fork Wolf Creek, impacts are estimated to be 0.01 acres of permanent impacts and 0.04 acres of temporary impacts due to the proposed outfall and updated culvert within the South Fork Wolf Creek (see Table 5.0). Additionally, small impacts to the adjacent riparian zone to the South Fork Wolf Creek would impact some riparian vegetation temporarily, but those areas would be revegetated and restored to pre-project contours, where feasible. Therefore, the proposed disturbance within the mapped stream zones within the Brunswick Area would be subject to CDFW jurisdiction and a Streambed Alteration Agreement from the CDFW pursuant to Section 1600 *et. seq.* of the California Fish and Wildlife Code would be required prior to disturbance within such CDFW jurisdiction. Based on coordination with CDFW through the Streambed Alteration Agreement development process, an ITP may be required as a condition to the Streambed Alteration Agreement if there is a potential that any CESA listed or candidate for listing may occur within the Brunswick Area and be impacted by the proposed disturbance, including potential discharge impacts to the South Fork Wolf Creek within the Brunswick Area and downstream of the Brunswick Area.

Any temporary impacts to the stream within the Brunswick Area, would be required to be restored to pre-construction contours. Site restoration would include all exposed/disturbed areas and access points within any stream as a result of the disturbance activities (pipeline, outfall, new culvert, etc.). These areas shall be restored using locally native grass and/or forb seeds, locally native grass plugs and/or a mix of quick growing sterile non-native grass with locally native grass/forb seeds. Seeded areas shall be covered with broadcast straw and/or seeded erosion control blankets.

6.7 Compliance with the Nevada County Land Use and Development Code

Aquatic Resources Management Plan

An Aquatic Resources Management Plan has been developed for the Brunswick Area to comply with Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3 17C.3 (Ordinance Number 2033) requiring such a Management Plan be prepared for projects in non-disturbance buffers, including areas that are within 100 feet of the high water mark of perennial streams, watercourses, and wetlands, 50 feet from the high water mark of intermittent watercourses, and 100 feet upslope or 20 feet downslope from an NID canal (Nevada County 2000. Land Use and Development Code, Chapter II: Zoning Regulations. Effective July 27, 2000). Therefore, the development of such a Management Plan is required for the proposed project related disturbance within the Brunswick Area given the proposed impacts to such aquatic resources and their non-disturbance buffers. The development of such a Management Plan for the proposed disturbance within the Brunswick Area would meet the requirements of the Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3 17C.3 (Ordinance Number 2033).

A comprehensive analysis of the projects consistency with applicable goals and policies of the County Land Use and Development Code has been provided under separate cover (Benchmark Resources 2020).

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Appendix A

Project Overview Area Figures

Figure. Brunswick Industrial Site

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 36 &
T16N, R9E Section 31

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 500 feet

Legend

= Brunswick Industrial Site 118.93 ac.

Figure. East Bennett Road Right of Way Overview

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 25

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 600 feet

This delineation has been conducted in accordancewith the 1987 Corps of Engineers Wetlands Delineation Manual and the Western Mountains Regional Supplement (2010). The identification of ordinary high water mark (OHWM) was based on A Guide to Ordinary High Water Mark (OHWM) for Non-Perennial Streams in the Western Mountains (2014).

Created January 1, 2019

Appendix B

USDA Soils Maps

Map Scale: 1:8,350 if printed on A landscape (11" x 8.5") sheet.

N

0 100 200 400 600 Meters

0 400 800 1600 2400 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AfC	Aiken loam, 9 to 15 percent slopes, high precip	12.91	10.9%
AfD	Aiken loam, 15 to 30 percent slopes, N Low Mid Montane	0.71	0.6%
AfE	Aiken loam, 30 to 50 percent slopes	17.7	14.9%
Ao	Alluvial land, clayey	13.8	11.7%
CmB	Cohasset loam, summits, 2 to 15 percent slopes	1.41	1.2%
CmC	Cohasset loam, shoulders, 3 to 20 percent slopes	24.7	20.9%
CmD	Cohasset loam, backslopes, 5 to 30 percent slopes	4.7	3.6%
CoD	Cohasset cobbly loam, 5 to 30 percent slopes	1.9	1.6%
Pr	Placer diggings	40.8	34.5%
SlD	Sites silt loam, 15 to 30 percent slopes, N low montane	0.3	0.2%
Totals for Area of Interest		**118.93**	**100.0%**

121° 2' 27" W
121° 0' 54" W
669200
669400
669600
669800
670000
670200
670400
670600
670800
671000
671200
39° 13' 19" N
39° 12' 32" N
4343300
4343100
4342900
4342700
4342500
4342300
4342100
4341900
Brunswick
Crown Point Cir
Bet Rd
Ct
BrD
SID
BrE
SfD
BoD
SfD
AfE
SID
CmD
AfC
Pr
Soil Map may not be valid at this scale.
Map Scale: 1:10,200 if printed on A landscape (11" x 8.5") sheet.
N
0 150 300 600 900 Meters
0 450 900 1800 2700 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

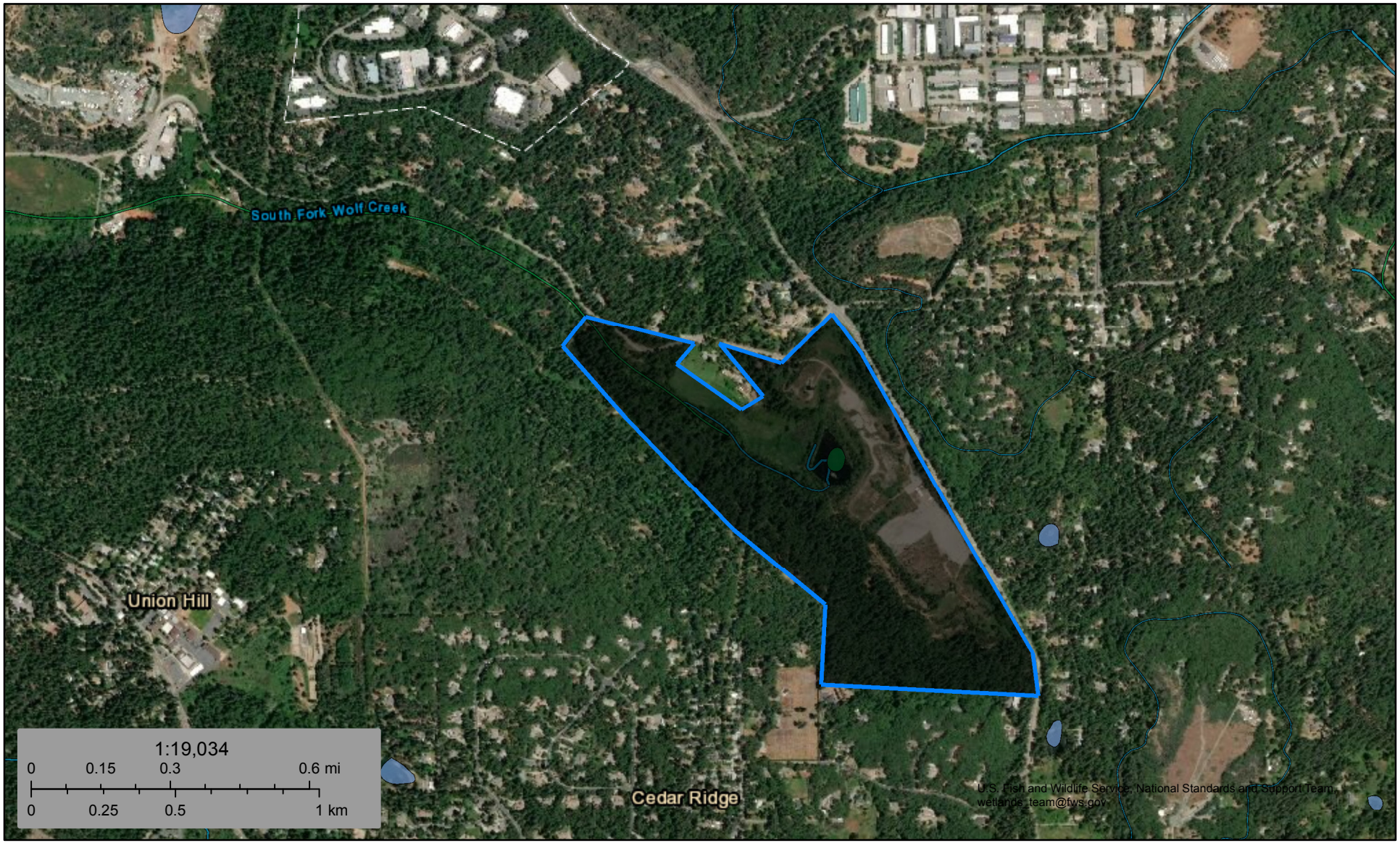
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AfC	Aiken loam, 9 to 15 percent slopes, high precip	0.3	3.8%
AfE	Aiken loam, 30 to 50 percent slopes	0.6	7.0%
BoD	Boomer loam, hard bedrock, 7 to 28 percent slopes	2.7	24.9%
BrD	Boomer, hard bedrock - Rock outcrop complex, 5 to 30 percent slopes	0.2	1.9%
BrE	Boomer, hard bedrock - Rock outcrop complex, 15 to 60 percent slopes	1.0	12.8%
CmD	Cohasset loam, backslopes, 5 to 30 percent slopes	1.1	10.3%
Ct	Cut and fill land	1.1	9.1%
Pr	Placer diggings	1.1	8.7%
SfD	Sierra sandy loam, 15 to 30 percent slopes	0.1	0.7%
SlD	Sites silt loam, 15 to 30 percent slopes, N low montane	2.1	20.8%
Totals for Area of Interest		**10.3**	**100.0%**

Appendix C

National Wetland Inventory (NWI) Maps

U.S. Fish and Wildlife Service
National Wetlands Inventory

NWI - Brunswick Industrial Site



December 7, 2018

Wetlands

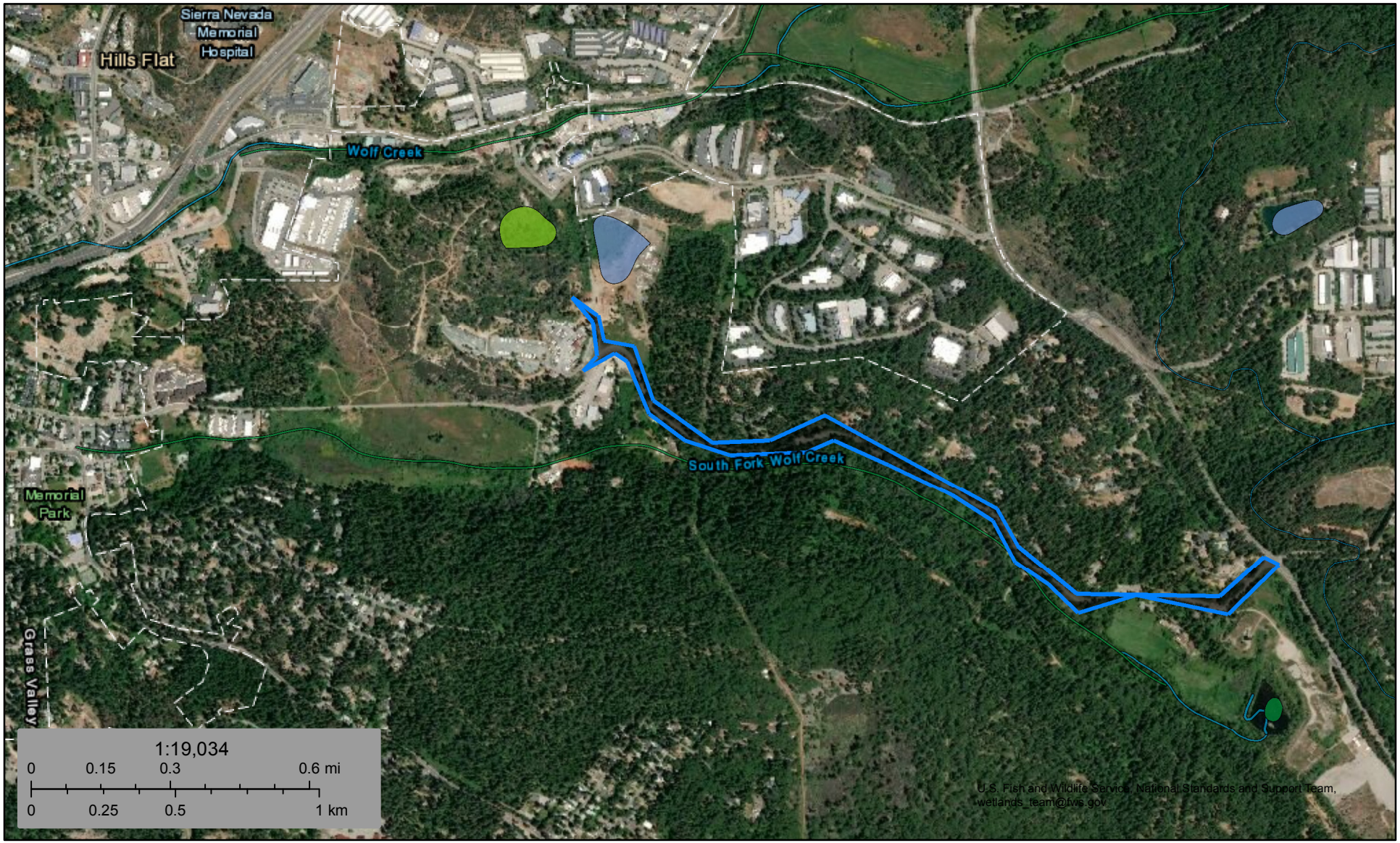
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

U.S. Fish and Wildlife Service

National Wetlands Inventory

East Bennett Road Right of Way



December 7, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Appendix D

Vegetation Community Map

Figure. Vegetation Types in Study Area

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 36 &
T16N, R9E Section 31

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 500 feet

Legend

= Brunswick Industrial Site

Vegetation Type

- Annual Grassland
- Developed
- Disturbed
- Manmade Pond
- Montane Hardwood-Conifer
- Montane Hardwood
- Pondorosa Pine
- Sierran Mixed Conifer
- Wet Meadow

Appendix E

Plants Observed During Site Surveys

VASCULAR PLANTS OCCURRING IN STUDY AREA

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Acer macrophyllum	Bigleaf maple	native	Tree	-	FACU	-
Agoseris retrorsa	Spear leaved agoseris	native	perennial herb	-	-	-
Agrostis gigantea	Creeping bentgrass	non-native	perennial grass	-	FAC	-
Ailanthus altissima	Tree of heaven	non-native (invasive)	Tree	-	FACU	Moderate
Aira caryophyllea	Silvery hairgrass	non-native (invasive)	annual grass	-	FACU	-
Allium amplectens	Narrow leaved onion	native	perennial herb (bulb)	-	-	-
Alnus rhombifolia	White alder	native	Tree	-	FACW	-
Ammi visnaga	Visnaga	non-native	annual, biennial herb	-	-	-
Anaphalis margaritacea	Pearly everlasting	native	perennial herb	-	FACU	-
Andropogon virginicus var. virginicus	Broomsedge bluestem	non-native	perennial grass	-	FAC	-
Arbutus menziesii	Madrone	native	Tree	-	-	-
Arctostaphylos mewukka ssp. mewukka	Indian manzanita	native	Shrub	-	-	-
Arctostaphylos viscida ssp. viscida	Smooth white leaf manzanita	native	tree, shrub	-	-	-
Artemisia douglasiana	California mugwort	native	perennial herb	-	FACW	-
Asclepias speciosa	Showy milkweed	native	perennial herb	-	FAC	-
Avena sp.	-	-	-	-	-	-
Baccharis pilularis	Coyote brush	native	Shrub	-	-	-
Berberis aquifolium var. repens	Creeping Oregon grape	native	Shrub	-	FACU	-
Brodiaea minor	Low brodiaea	native	perennial herb	-	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Brodiaea sierrae	Sierra foothills brodiaea	native	perennial herb	Rank 4.3	-	-
Bromus hordeaceus	Soft chess	non-native (invasive)	annual grass	-	FACU	Limited
Bromus madritensis	Foxtail chess, foxtail brome	non-native	annual grass	-	FACU	-
Calocedrus decurrens	Incense cedar	native	Tree	-	-	-
Calycadenia multiglandulosa	Rosin weed	native	annual herb	-	-	-
Carex feta	Green sheathed sedge	native	perennial grasslike herb	-	FACW	-
Ceanothus cuneatus	Buck brush	native	Shrub	-	-	-
Ceanothus integerrimus	Deer brush	native	Shrub	-	-	-
Ceanothus lemmonii	Lemmon's ceanothus	native	Shrub	-	-	-
Centaurea solstitialis	Yellow starthistle	non-native (invasive)	annual herb	-	-	High
Centaurium tenuiflorum	Slender centaury	non-native	annual herb	-	FACW	-
Centranthus sp.	-	-	-	-	-	-
Centromadia fitchii	Spikeweed	native	annual herb	-	FACU	-
Chlorogalum pomeridianum	Amole	native	perennial herb	-	-	-
Chondrilla juncea	Skeleton weed	non-native (invasive)	perennial herb	-	-	Moderate
Cichorium intybus	Chicory	non-native	perennial herb	-	FACU	-
Cirsium vulgare	Bullthistle	non-native (invasive)	perennial herb	-	FACU	Moderate
Cornus nuttallii	Mountain dogwood	native	Shrub	-	FACU	-
Cornus sericea	American dogwood	native	Shrub	-	FACW	-
Cortaderia jubata	Andean pampas grass	non-native (invasive)	perennial grass	-	FACU	High
Crataegus monogyna	Hawthorn	non-native (invasive)	Shrub	-	FAC	Limited
Croton setiger	Turkey-mullein	native	perennial herb	-	-	-
Cynodon dactylon	Bermuda grass	non-native (invasive)	perennial grass	-	FACU	Moderate
Cynosurus echinatus	Dogtail grass	non-native (invasive)	annual grass	-	-	Moderate
Cyperus eragrostis	Tall cyperus	native	perennial grasslike herb	-	FACW	-
Dactylis glomerata	Orchardgrass	non-native (invasive)	perennial grass	-	FACU	Limited

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Danthonia californica	California oatgrass	native	perennial grass	-	FAC	-
Deschampsia elongata	Hairgrass	native	perennial grass	-	FACW	-
Elymus caput-medusae	Medusa head	non-native	annual grass	-	-	-
Elymus elymoides	Squirrel tail grass	native	perennial grass	-	FACU	-
Elymus hispidus	Intermediate wheatgrass	non-native	perennial grass	-	-	-
Epilobium sp.	-	-	-	-	-	-
Epipactis gigantea	Stream orchid	native	perennial herb	-	OBL	-
Eriodictyon californicum	Yerba santa	native	Shrub	-	-	-
Eriophyllum lanatum	Wooly sunflower	native	perennial herb	-	-	-
Euthamia occidentalis	Western goldenrod	native	perennial herb	-	FACW	-
Festuca arundinacea	Reed fescue	non-native (invasive)	perennial grass	-	FAC	Moderate
Festuca idahoensis	Blue fescue	native	perennial grass	-	FACU	-
Festuca microstachys	Small fescue	native	annual grass	-	-	-
Ficus sp.	-	-	-	-	-	-
Frangula californica ssp. tomentella	Hoary coffeeberry	native	Shrub	-	-	-
Frangula rubra	Red buckthorn	native	Shrub	-	-	-
Galium porrigens	Climbing bedstraw	native	vine, shrub	-	-	-
Garrya fremontii	Fremont's silk tassel	native	Shrub	-	-	-
Grindelia camporum	Gumweed	native	perennial herb	-	FACW	-
Grindelia sp.	-	-	-	-	-	-
Hedera helix	English ivy	non-native (invasive)	vine, shrub	-	FACU	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Hemizonella minima	Opposite leaved tarweed	native	annual herb	-	-	-
Hirschfeldia incana	Mustard	non-native (invasive)	perennial herb	-	-	Moderate
Holcus lanatus	Common velvetgrass	non-native (invasive)	perennial grass	-	FAC	Moderate
Hypericum perforatum ssp. perforatum	Klamathweed	non-native	perennial herb	-	FACU	-
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	-	FACU	Moderate
Juncus articulatus ssp. articulatus	Jointed rush	native	perennial grasslike herb	-	OBL	-
Juncus balticus ssp. ater	Baltic rush	native	perennial grasslike herb	-	FACW	-
Juncus confusus	Colorado rush	native	perennial grasslike herb	-	FAC	-
Juncus effusus ssp. pacificus	Pacific rush	native	perennial grasslike herb	-	FACW	-
Juncus trilocularis	-	native	annual grasslike herb	-	-	-
Lactuca serriola	Prickly lettuce	non-native (invasive)	annual herb	-	FACU	-
Lathyrus latifolius	Sweet pea	non-native	perennial herb	-	-	-
Leontodon saxatilis	Hawkbit	non-native	annual herb	-	FACU	-
Leucanthemum vulgare	Oxe eye daisy	non-native (invasive)	perennial herb	-	FACU	Moderate
Lonicera hispidula	Pink honeysuckle	native	vine, shrub	-	FACU	-
Lonicera interrupta	Chaparral honeysuckle	native	vine, shrub	-	-	-
Lotus corniculatus	Bird's foot trefoil	non-native (invasive)	perennial herb	-	FAC	-
Lysimachia arvensis	Scarlet pimpernel	non-native	annual herb	-	FAC	-
Madia gracilis	Gumweed	native	annual herb	-	-	-
Melica californica	California melic	native	perennial grass	-	-	-
Melilotus albus	White sweetclover	non-native (invasive)	annual, biennial herb	-	-	-
Muhlenbergia rigens	Deergrass	native	perennial grass	-	UPL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Parthenocissus sp.	-	-	-	-	-	-
Penstemon heterophyllus	Foothill penstemon	native	perennial herb	-	-	-
Pickeringia montana	Chaparral pea	native	Shrub	-	-	-
Pinus ponderosa	Yellow pine	native	Tree	-	FACU	-
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	-	FACU	Limited
Polygala cornuta	Sierra milkwort	native	perennial herb	-	FACW	-
Polypogon sp.	-	-	-	-	-	-
Populus fremontii ssp. fremontii	Cottonwood	native	Tree	-	FAC	-
Poterium sanguisorba	Garden burnet	non-native	perennial herb	-	UPL	-
Prunella vulgaris	Self heal	native	perennial herb	-	FACU	-
Prunus subcordata	Sierra plum	native	tree, shrub	-	-	-
Pyracantha sp.	-	-	-	-	-	-
Quercus garryana var. semota	Oregon white oak	native	Tree	-	FACU	-
Rhamnus crocea	Redberry	native	Shrub	-	-	-
Rosa canina	Dog rose	non-native	Shrub	-	-	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	Shrub	-	FAC	High
Rubus leucodermis	White bark raspberry	native	Shrub	-	FACU	-
Rumex crispus	Curly dock	non-native (invasive)	perennial herb	-	FAC	Limited
Salix exigua	Narrowleaf willow	native	tree, shrub	-	FACW	-
Salix laevigata	Polished willow	native	Tree	-	FACW	-
Salix lasiolepis	Arroyo willow	native	tree, shrub	-	FACW	-
Salvia sonomensis	Sonoma sage	native	perennial herb	-	-	-
Schoenoplectus acutus var. occidentalis	Tule	native	perennial grasslike herb	-	OBL	-
Scutellaria tuberosa	Dannie's scullcap	native	perennial herb	-	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Solidago sp.	-	-	-	-	-	-
Toxicodendron diversilobum	Poison oak	native	vine, shrub	-	FAC	-
Tragopogon dubius	Goat's beard	non-native (invasive)	perennial herb	-	-	-
Trichostema lanceolatum	Vinegarweed	native	annual herb	-	FACU	-
Trifolium hirtum	Rose clover	non-native (invasive)	annual herb	-	-	Limited
Trifolium sp.	-	-	-	-	-	-
Triteleia hyacinthina	Wild hyacinth	native	perennial herb	-	FAC	-
Typha domingensis	Cattail	native	perennial herb	-	OBL	-
Verbascum blattaria	Moth mullein	non-native	perennial herb	-	UPL	-
Verbascum thapsus	Woolly mullein	non-native (invasive)	perennial herb	-	FACU	Limited
Vitis californica	California wild grape	native	vine, shrub	-	FACU	-
Wyethia angustifolia	Narrow leaved mule ears	native	perennial herb	-	FACU	-
Wyethia bolanderi	Bolander's wyethia	native	perennial herb	-	-	-

Appendix F

Humboldt Lily CNPS List 4 Species Location Figure

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R9E Section 31 &
T16N R8E Sections 36

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Figure. CRPR 4 Plant: Humboldt Lily

SCALE: 1 inch = 500 feet

Legend

Brunswick Industrial Site

Special-Status Plant

Humboldt Lily

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 25

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Figure. CRPR List 4 Plant: Humbold Lily
East Bennett Road Right-of-Way (ROW)

SCALE: 1 inch = 100 feet

Legend

= Humboldt Lily

= East Bennett Street ROW

Created October 25, 2019

Appendix G

Photo Log

Photos of the December 2018 and July/August 2019 Surveys of the Brunswick Site

Photo 1: Looking south and southeast within the Brunswick Industrial Site. Forested area is mapped as Sierran Mixed Conifer vegetation community type.

Photo 2: Southern/southeastern section of the Brunswick Industrial Site. Forested area is mapped as Sierran Mixed Conifer vegetation community type.

Photo 3: Eastern section of the Brunswick Industrial Site looking northeast from southern area of the site. The large area containing mostly asphalt is mapped as developed.

Photo 4: Mapped Wet Meadow Wetland within the area mapped as disturbed within the Brunswick Industrial Site.

Photo 5: Mapped freshwater marsh wetland mapped within the southwestern area of the Brunswick Site. Soils were saturated and contained characteristics of hydric soils.

Photo 6: Mapped freshwater marsh wetland just south of the South Fork Wolf Creek culvert outlet. Wetland area contains standing water and dominated by freshwater marsh wetland hydrophytic vegetation.

Photo 7: Mapped South Fork of Wolf Creek with origination from outside the Brunswick Industrial Site. Water present within the stream channel coming from existing culvert.

Photo 8: Existing culvert daylights within the Brunswick Industrial Site at the South Fork Wolf Creek just upstream from Photo 7.

Photo 9: Large mapped manmade pond within the Brunswick Industrial Site. Historical pond used during operation of the mill.

Photo 10: Area mapped as disturbed within the central west section of the Brunswick Industrial Site. This area contains remnants of historic impacts to the site.

Photo 11: Mapped riparian wetland within the central section of the Brunswick Industrial Site that is mapped as disturbed within the vegetation community map.

Photo 12: Small freshwater marsh wetland within the eastern, developed section of the Brunswick Industrial Site. Water runs off of the adjacent Brunswick Road into the site.

Photo 13: Large area of asphalt within the eastern section of the Brunswick Site is mapped as developed with ponderosa pine vegetation community mapped adjacent.

Photo 14: Mapped wet meadow vegetation community within the northwestern open section of the Brunswick Industrial Site. Photo taken in August 2019.

Photo 15: Wet meadow vegetation community with South Fork Wolf Creek along the left edge of the wet meadow and montane hardwood-conifer vegetation community along left edge of the photo within the northwestern section of the Brunswick Industrial Site.

Photo 16: Edge of mapped annual grassland and montane hardwood vegetation communities and mapped ponderosa pine vegetation community in the distance within the northeastern section of the Brunswick Industrial Site.

Photo 17: Historic mining infrastructure in background is located within the developed northeastern section of the Brunswick Industrial Site with montane hardwood vegetation community in the foreground.

Photo 18: Edge of mapped annual grassland and montane hardwood vegetation communities and mapped ponderosa pine vegetation community in the distance within the northeastern section of the Brunswick Industrial Site.

Photo 19: South Fork Wolf Creek in the northeastern corner of the Brunswick Industrial Site. Suitable habitat present for the foothill yellow-legged frog in this area of the site.

Photo 20: South Fork Wolf Creek below the culvert outfall within the Brunswick Industrial Site. Marginal suitable habitat present for the foothill yellow-legged frog in this area.

Photos of East Bennett Road ROW

Photo 21: Mapped Roadside Wetland along East Bennett Road. Wetland area contained standing water and dominated by hydrophytic vegetation.

Photo 22. East Bennett Road ROW. No drainages or wetlands along this section of Project Area. Entire area is developed and within a ponderosa pine vegetation community.

Photo 23. Manmade drainage along north side of East Bennett Rd. ROW. Drainage located outside of ROW and drains to the south side of East Bennett Rd. ROW.

Photo 24. Riparian wet area adjacent to the East Bennett Rd. ROW on north side of road. ROW is developed within this area of the site.

Photo 25. Non-jurisdictional roadside swale along northern side of E. Bennett Rd. ROW

Photo 26. South side culvert/drainage along East Bennett Road ROW. Located towards lower end of E. Bennett Road ROW and within the developed part of the ROW.

Appendix H

Species Table for CNPS Ranked Plants and Special-Status Plant and Wildlife Species

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Stebbins' morning-glory *Calystegia stebbinsii*	--/--/1.B2	Gabbroic or serpentinite soils. Openings in chaparral, cismontane woodland, lower montane coniferous forest, from 980-4,330 feet.	Apr- Jul	**Low** Known 4 miles to east on gabbroic chaparral on Oceola Ridge. Gabbroic soils not present in study area. Was not observed during targeted 2019 field surveys.
Sierra arching sedge *Carex cyrtostachya*	--/--/1B.2	Lower montane mesic coniferous forest, meadows and seeps, marshes and swamps, Riparian forests (margin), from 2,000-4,460 feet.	May -Aug	**Low.** Potential for occurrence in mesic forests. Within the known distributional and elevational range for this species, though nearest known occurrence 16 miles to the north. This species was recently described so the full extent of its range and distribution are unlikely yet known. Marginal habitat present in study area, and it was not observed during 2019 field surveys.
Chaparral sedge *Carex xerophila*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 1,400 – 2,525 feet.	Mar- Jun	**Low.** Known 4 miles away on Oceola Ridge in gabbroic chaparral. Gabbroic soils not present in study area. Was not observed during 2019 field surveys.
Red Hills soaproot *Chlorogalum grandiflorum*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 800 – 5,545 feet.	May-Jun	**Low.** Known over 10 miles south in Bunch Canyon south of Colfax, with no known occurrences to north. Gabbroic soils not present in study area. Was not observed during 2019 field surveys.
Pine Hill flannelbush *Fremontodendron decumbens*	FE/CR/1B.2	Chaparral, cismontane woodland on serpentinite and gabbroic substrates, from 1,390 – 2,495 feet.	Apr- July	**Low.** Known from two miles to the north. Gabbroic soils not present in study area. Was not observed during targeted 2019 field surveys.
Butte County fritillary *Fritillaria eastwoodiae*	--/--/3.2	Openings in chaparral, cismontane woodland, and lower montane coniferous forest, sometimes serpentinite, from 160-4,920 feet.	Mar-Jun	**Low.** Potential for occurrence in open areas in the study area. There is a 1979 record for this species on the south side of the South Yuba River canyon approximately 7 miles north of the study area, and other occurrences on the Washington Ridge. Surveys were not conducted during the appropriate phenological period for this species (April-May).

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Finger rush *Juncus digitatus*	--/--/1B.1	Seasonal wet areas, cismontane woodland openings, openings in lower montane coniferous forest, xeric vernal pools, from 2,165-2,590 feet.	Apr-Jun	**Low.** Potential for the occurrence in gravelly, seasonally moist openings. Known less than one mile to the north near the intersection of Idaho Maryland and Brunswick. Was not observed during 2019 field surveys.
Dubious pea *Lathyrus sulphureus* var. *argillaceus*	--/--/3	Cismontane woodland, Lower montane coniferous forest, Upper montane coniferous forest, from 490-3,050 feet.	Apr-May	**Low.** Potential to occur in forested areas. Known within 3 miles of study areas from a 1926 collection. Also known to SW 5 miles away near Wolf Mountain. Plant list from 2006 surveys have a *Lathyrus sulfureus* with no variety designation, but not observed during 2019 surveys.
Cantelow's lewisia *Lewisia cantelovii*	--/--/1B.2	Moist, granitic areas in broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest mesic, sometimes serpentinite seeps, from 1,080-4,495 feet.	May-Oct	**Low.** Potential for occurrence in any rocky outcrops with seeps on the parcel. There are records for this species in the Middle Yuba and South Yuba river canyons within 7 miles of the study area. The preferred habitat for this species in the study area has been disturbed and is of reduced quality. Was not observed during 2019 field surveys.
Cedar Crest popcornflower *Plagiobothrys glyptocarpus* var. *modestus*	--/--/3	Cismontane woodland, valley and foothill grasslands (mesic), from 2,850-2.855 feet.	Apr-Jun	**Moderate.** Known from historic collection potentially from nearby Cedar Ridge. Also known from historic collections in Nevada City. Suitable habitat for this species is present. Was not observed during 2019 field surveys.
Sierra blue grass *Poa sierrae*	--/--/1B.3	Openings in lower montane coniferous forest, 1,195-4,920 feet.	Apr-Jul	**Moderate.** There is only marginal suitable habitat for this species in the study area, primarily in the Sierran mixed conifer, ponderosa pine forest, and in the forested areas along South Fork of Wolf Creek. Known 7 miles to the east of the study area at Steephollow Creek from a collection from 1964. Was not observed during 2019 field surveys.

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Brownish beaked-rush *Rhynchospora capitellata*	--/--/2B.2	Wet areas (marshes, swamps, meadows, and seeps) in montane coniferous forest, from 145-6,560 feet.	Jul-Aug	**Moderate.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.
Scadden Flat checkerbloom *Sidalcea stipularis*	--/CE/1B.1	Marshes and swamps (montane freshwater), from 2,295-2,395 feet.	Jul-Aug	**Moderate.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.

[1]Status explanations:

FE = Federally Endangered
CR = State Rare
CE = State Endangered
-- = no listing.

California Native Plant Society Rare Plant Rank (formerly known as CNPS lists)
1B = Rank 1B species: rare, threatened, or endangered in California and elsewhere.
2B = Rank 2B species: rare, threatened, or endangered in California but more common elsewhere.
3 = Rank 3 species are taxonomically problematic and lack the necessary information to assign them to one of the other ranks.
4 = Rank 4 plants are of limited distribution or infrequent throughout a broader area in California; should be monitored regularly.
Source: CNPS 2019; CNDDB 2019; USFWS 2019, and Calflora 2019.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Amphibians			
California red-legged frog *Rana draytonii*	FT/SSC	Found in permanent and semi-permanent aquatic habitats, such as creeks and ponds, with emergent and submergent vegetation. May aestivate in rodent burrows or cracks during dry periods. Along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats and a large manmade pond within the Brunswick Industrial Site contain marginal suitable habitat for the species.
Foothill yellow-legged frog *Rana boylii*	SCT/SCC	Perennial rocky (pebble or cobble) streams with cool, clear water in a variety of habitats from valley and foothill oak woodland, riparian forest, ponderosa pine, mixed conifer, coastal scrub, and mixed chaparral at elevations ranging from 0 to 6,370 feet. Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet south to Kern County	**Very Low**; however, the South Fork Wolf Creek within the western section of the Brunswick Industrial Site contains marginal suitable habitat for the species.
Reptiles			
Western pond turtle *Emys marmorata*	--/SSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation, below 6,000 feet in elevation. Populations extend throughout the coast and central valley of California.	**High** potential for occurrence in areas near water, including South Fork Wolf Creek and perennial aquatic resources such as the freshwater emergent marsh habitats and manmade pond within the Brunswick Industrial Site.
Coast horned lizard *Phrynosoma blainvillii*	--/SSC	Associated with open patches of sandy soils in washes, chaparral, scrub, and grasslands.	**Moderate** potential for occurrence in areas with appropriate habitat within the Brunswick Industrial Site, including open disturbed areas.
Mammals			
Townsend's big-eared bat *Corynorhinus townsendii*	--/SSC	Associated with lower montane coniferous and mixed conifer forest habitats where abandoned buildings and structures occur for roosting.	**Low** potential for occurrence in areas containing abandoned structures, including the existing mill structure in the Brunswick Industrial Site.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Birds			
California black rail *Laterallus jamaicensis coturiculus*	--/CT	California black rail inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. The species requires water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats within the Brunswick Industrial Site contain marginal suitable habitat for the species.
Cooper's hawk *Accipiter cooperii*	MBTA/CDFW Watch List	Cooper's hawks are forest and woodland birds. These hawks are a regular sight in parks, quiet neighborhoods, over fields, at backyard feeders, and even along busy streets if there are trees present.	**Moderate** potential to occur; within the woodland habitats in the Brunswick Industrial Site. Project area contains suitable nesting habitat for the species.
Invertebrates			
Western bumble bee *Bombus occidentalis*	--/SCT	Western bumble bee was documented approximately 3 miles northeast of Nevada City (4+ miles from the Centennial Site) in 1968. It is known from a single collection on May 20th of that year. This species is of conservation concern and is listed as S1, Critically Imperiled, by NatureServe and is listed on the CNDDB.	**Unlikely to occur** in the Brunswick Industrial Site or surrounding region.

[1]Status explanations:

-- = no listing.

Federal

BCC = federal Bird of Conservation Concern

FPT = federal proposed threatened under the federal Endangered Species
FT = listed as threatened under the federal Endangered Species Act.

State

FP = state fully protected

SCT = state candidate for listing as threatened under the California Endangered Species
SE = listed as endangered under the California Endangered Species Act.

SSC = state species of special concern

ST = listed as threatened under the California Endangered Species Act.

Source: CNDDB 2019 and USFWS 2019

Appendix I

CNDDB 5-Mile Buffer Figure

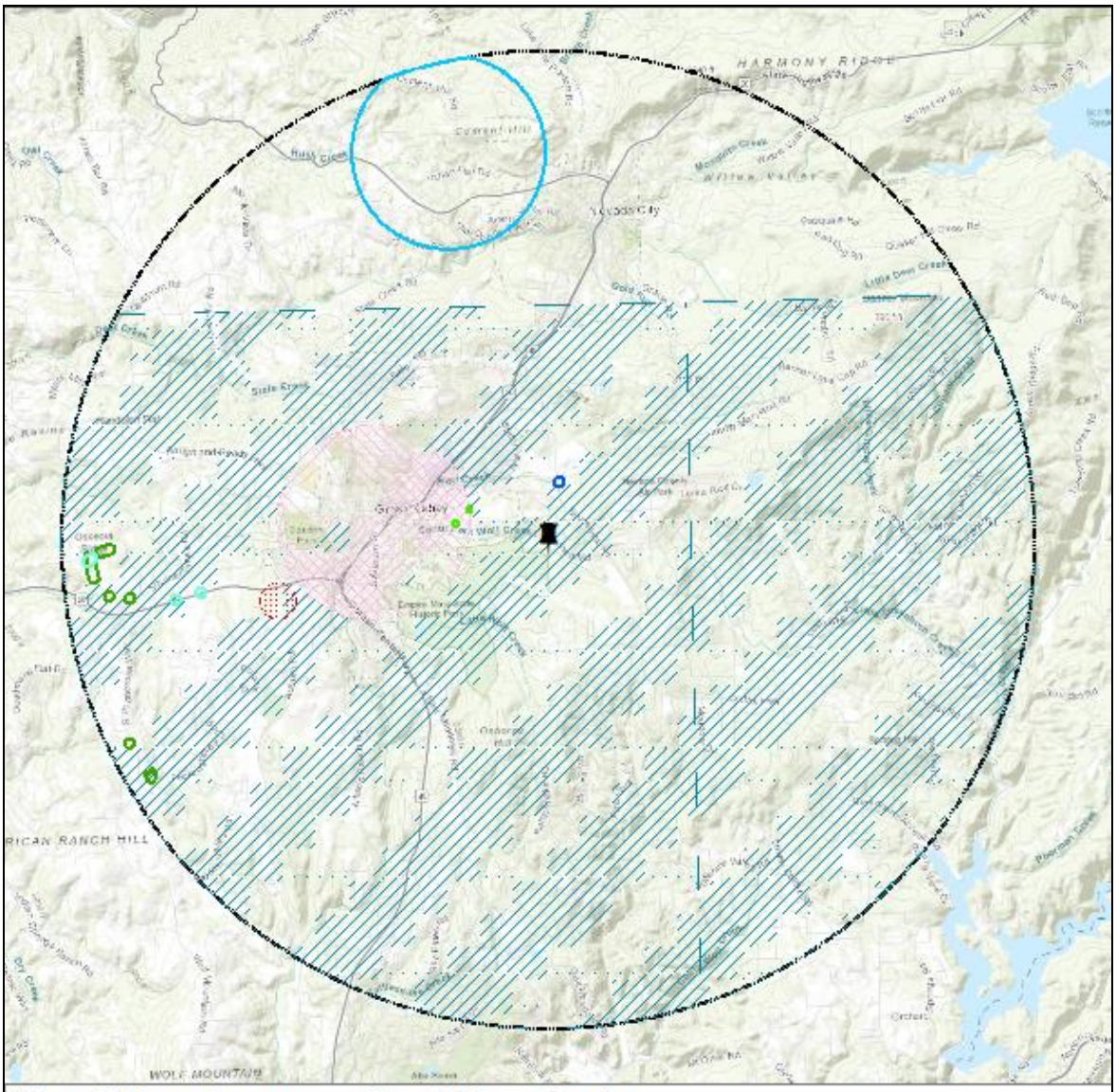


Figure X. Known Occurrences of Special Status Species

Legend

FiveMileProjectBuffer

Project Area

Common Name, Scientific Name, FESA, CESA, CNPS

Brandegee's clarkia, Clarkia biloba ssp. brandegeeae, none, none, 4.2

Pine Hill flannelbush, Fremontodendron decumbens, Endangered, Rare, 1B.2

Scadden Flat checkerbloom, Sidalcea stipularis, none, Endangered, 1B.1

Stebbins' morning-glory, Calystegia stebbinsii, Endangered, Endangered, 1B.1

brownish beaked-rush, Rynchospora capitellata, none, none, 2B.2

chaparral sedge, Carex xerophila, none, none, 1B.2

dubious pea, Lathyrus sulphureus var. argillaceus, none, none, 3

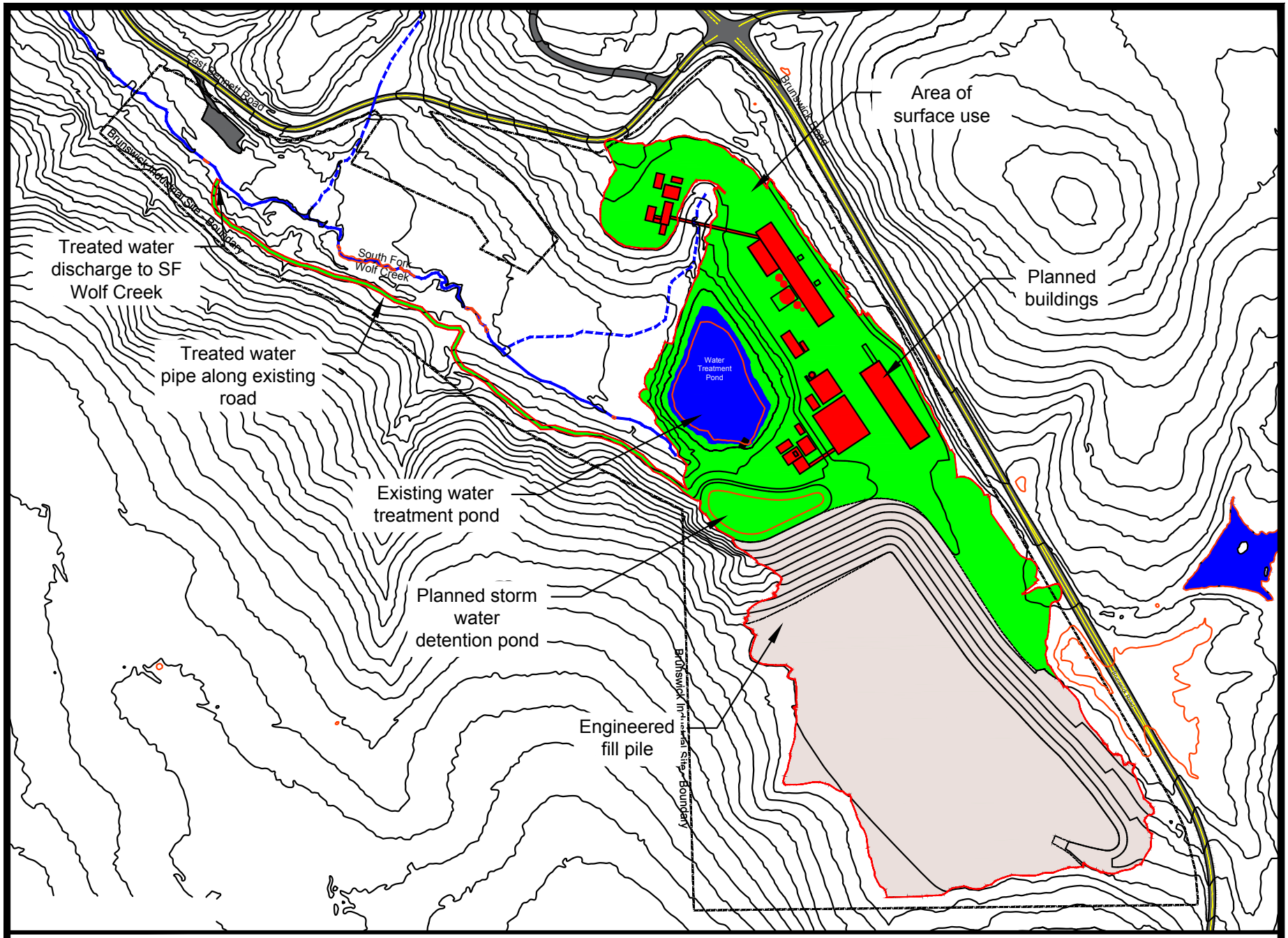
finger rush, Juncus digitatus, none, none, 1B1

0 1 2 Miles

1 in = 1 miles

Appendix J

Site Plan – Proposed Brunswick Area Disturbance



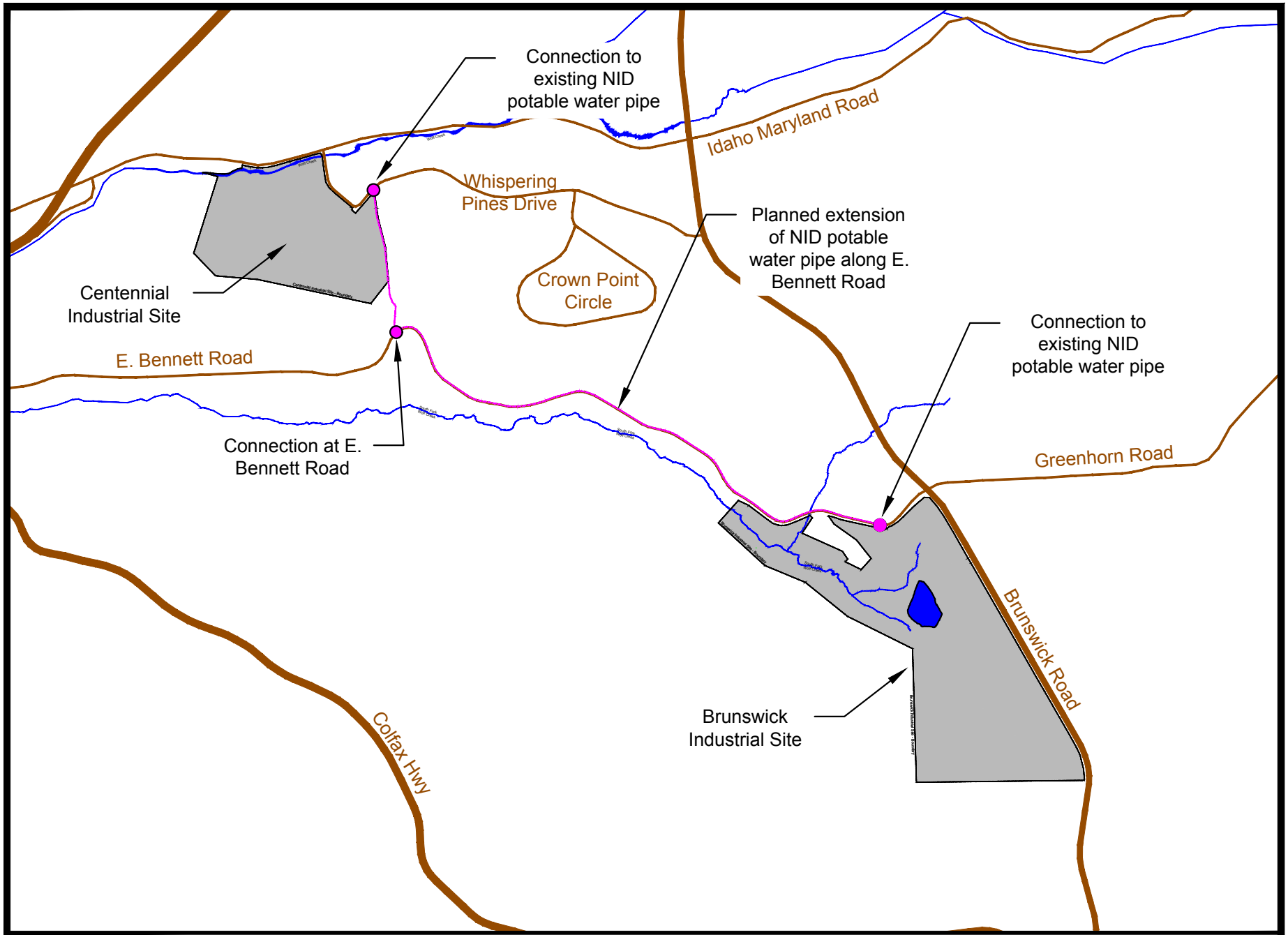
Idaho-Maryland Gold Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945

SCALE 1"=500'
500 ft

Brunswick Industrial Site

Site Plan

Showing final topography
Elevation contours at 10 ft intervals



Idaho-Maryland Gold Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945

SCALE 1"=1500'
1250 ft

NID potable water pipe extesion

Showing route of new pipe along E. Bennett Road

Appendix K

USFWS iPac Reports

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

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Location

Nevada County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Amphibians

NAME	STATUS

California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Flowering Plants

NAME	STATUS
Pine Hill Flannelbush Fremontodendron californicum ssp. decumbens No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4818	Endangered
Stebbins' Morning-glory Calystegia stebbinsii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3991	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

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Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

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NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31

California Spotted Owl Strix occidentalis occidentalis — Breeds Mar 10 to Jun 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/7266

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Williamson's Sapsucker Sphyrapicus thyroideus — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/8832

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

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3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

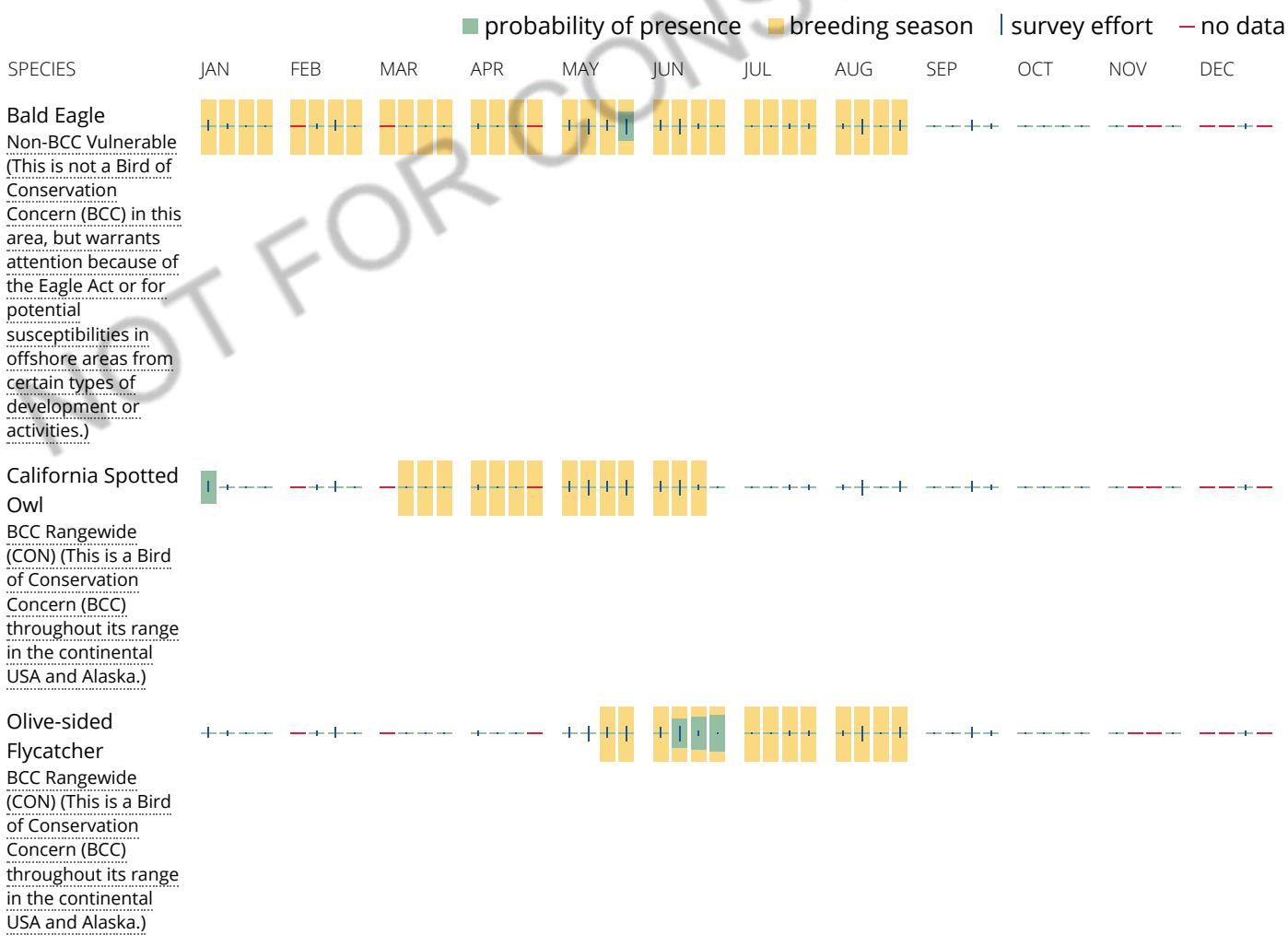
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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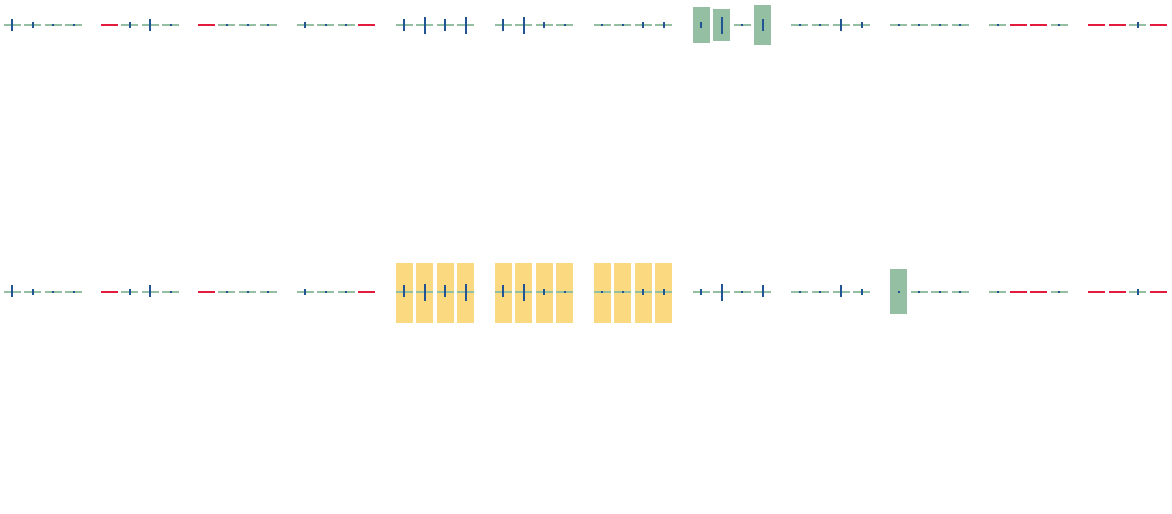

Rufous Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Williamson's Sapsucker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

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To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to

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confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

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Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER FORESTED/SHRUB WETLAND

- PFOC
- PSSA

RIVERINE

- R4SBC
- R5UBF

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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APPENDIX F
CENTENNIAL INDUSTRIAL SITE BIOLOGICAL RESOURCES ASSESSMENT

Centennial Industrial Site

Biological Resources Assessment

Prepared for:
Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Prepared by:
Greg Matuzak, Principal Biologist
Greg Matuzak Environmental Consulting LLC
471 Sutton Way, Suite #210
Grass Valley, CA 95945
Email: gmatuzak@gmail.com

January 2021

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INFORMATION SUMMARY

Report Date: January 2021

Report Preparer: Mr. Greg Matuzak
Greg Matuzak Environmental Consulting LLC

Project Site: Centennial Industrial Site

Project Site Location: SECTION 26, T.16N, R.8E

CENTENNIAL INDUSTRIAL SITE		
Assessor Parcel Number	**Site Address**	**Lot Size (Acres)**
009-550-032	N/A	20,908 SF (0.48 AC)
009-550-037	10344 Centennial Drive	4.47 AC
009-550-038	10350 Centennial Drive	40.1 AC
009-550-039	10344 Centennial Drive	42,668 SF (0.98 AC)
009-550-040	N/A	5,662 SF (0.13 AC)
009-560-036	10350 Centennial Drive	10.25 AC
Centennial Industrial Site - Land Total:		**56.41 AC**

Property Owner / Applicant: Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Principal Investigators: Greg Matuzak, Principal
Greg Matuzak Environmental Consulting LLC
471 Sutton Way, Suite #210
Grass Valley, CA 95945
E: gmatuzak@gmail.com

Wendy Boes
Botanical Consultant
21802 Purdon Road
Nevada City, CA 95959
E: wlbcarrot@gmail.com

Project Summary

The Biological Resources Assessment Report includes the biological results of the background research, reconnaissance-level biological surveys, data analysis, and impact assessment for the Centennial Industrial Site. The key findings of this report include the following:

- A total of 4.97 acres of "waters of the U.S.," including wetlands, and "waters of the State of California" was identified and mapped within the Centennial Site in 2019. The 4.97 acres of wetland-waters includes 4.37 acres of mapped wetlands and 0.60 acres of mapped "other waters of the U.S.," including the main stem of Wolf Creek, as well as several intermittent and ephemeral streams.
- Pine Hill flannelbush (*Fremontodendron decumbens*), a species listed on the federal Endangered Species Act (ESA), has been identified and mapped within the southern portion of the Centennial Site. Sixty individual mature and flowering plants occupy an absolute area of 0.22 acres over approximately 4.5 acres of the Centennial Site.
- Perennial marsh wetlands within the eastern section of the Centennial Site contain potentially suitable habitat for several special-status aquatic wildlife species, including the California State ESA (CESA) listed threatened California black rail (*Laterallus jamaicensis coturiculus*) and the federally ESA listed California red-legged frog (*Rana aurora draytonii*). None of these species have been observed within the Centennial Site and they are considered to have a low potential to occur within the Centennial Site.
- The main stem of Wolf Creek along the northern boundary of the Centennial Site includes a perennial stream and riparian vegetation. The perennial stream contains marginal suitable habitat for the foothill yellow-legged frog (*Rana boylii*), a California State Candidate for listing under CESA. This species has never been observed within the Centennial Site and it is considered to have a low potential to occur within the Centennial Site.
- The Centennial Site contains two (2) unlisted plant species. Neither species is rare nor threatened. The two California Native Plant Society (CNPS) List 4 Species, including the Humboldt lily (*Lilium humboldtii ssp. humboldtii*) and the Sierra brodiaea (*Brodiaea sierra*). A large population with thousands of individual Sierra brodiaea covering almost a quarter of the Centennial Site was mapped during 2019 field surveys and a single occurrence of the Humboldt lily consisting of 10 individuals in an area less than 110 sq. feet was documented in the Centennial Site during 2019 field surveys.
- Woodlands and grasslands within the Centennial Site contain suitable nesting habitat for some raptors and birds. None of these species have been observed

within the Centennial Site and they are considered to have a moderate to high potential to occur and nest within the Centennial Site.

1 INTRODUCTION AND SUMMARY

1.1 Introduction

At the request of Rise Grass Valley Inc. ("Rise Grass Valley" or "Rise"), Mr. Greg Matuzak was retained to prepare a Biological Resources Assessment Report ("Biological Report") for the Centennial Industrial Site ("Centennial Site") located in Grass Valley, Nevada County, California (see Appendix A). The Biological Report includes an evaluation of sensitive biological resources within the Centennial Site, including sensitive biological resources under the jurisdiction of California Department of Fish and Wildlife ("CDFW"), United States Fish and Wildlife Service ("USFWS"), United States Army Corps of Engineers ("Corps"), and/or the Nevada County Planning Department. Preparation of the Biological Report included background research, biological resources field surveys, and reporting as detailed herein. Additionally, this Biological Report references and incorporates the findings of a stand-alone delineation of "waters of the United States", including wetlands, and "waters of the State of California" report that was developed for the entirety of the Centennial Site (see Greg Matuzak Environmental Consulting LLC, 2020).

Mr. Greg Matuzak, Principal and owner of Greg Matuzak Environmental Consulting LLC is a wetlands ecologist and wildlife biologist with 20 years of experience conducting aquatic resources delineations and biological resources assessments in Northern California. Mr. Matuzak is 40-hour Wetland Delineation Certified (Wetland Training Institute) and has conducted aquatic resources delineations for 100's of linear miles of projects and 1000s of acres of site development projects. Additionally, Mr. Matuzak has implemented special-status biological resources surveys and developed biological resources assessments for dozens of projects in Nevada County. Mr. Matuzak has lived and worked in Nevada County for over 13 years. Ms. Wendy Boes is a local Nevada County botanist and most recently worked for the Tahoe National Forest as a botanist. Ms. Boes is an independent consultant, GIS specialist, and conducts field data collection and GIS mapping for field related projects. Mr. Matuzak and Ms. Boes were responsible for the field data collection and assessment developed as part of the development of this Biological Report. Both Mr. Matuzak and Ms. Boes are on the Nevada County Planning Department's list of Qualified Biological Resources Consultants.

1.2 Project Setting

The Biological Report includes a full coverage assessment of the 56.41-acre Centennial Industrial Site; see Appendix A for Centennial Site Overview Figure. The recorded owner of the surface land which comprises the Centennial Site is Rise Grass Valley.

The Centennial Site is part of the original land holdings of the historic Idaho-Maryland Mine, which operated between approximately 1851 and 1956. The Centennial Site was the location of the mine tailings storage area for the larger mine site. The site discharged water into the main stem of Wolf Creek via a decant tower, which is still in place in the northwest portion of the site. During the 1930s, the Idaho-Maryland Mine operated a mineral processing plant, located adjacent and to the east of the Centennial Site. The results of historic mine tailing deposition in the Centennial Site can still be seen in the soils within the site, some of which have the appearance of many layers of deposited material of varying color.

The Centennial Site is located along Idaho Maryland Road on the northern boundary, Centennial Drive along the northeast boundary, DeMartini RV Sales along the western boundary, commercial development along the eastern boundary, and privately-owned industrial land along the southern boundary. Overall, the Centennial Site is surrounded by private commercial and industrial land use and zoning.

The Centennial Site includes the main stem of Wolf Creek, a perennial stream. The main stem of Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Site. A Centennial Site Overview Figure is included in Appendix A.

1.3 Previous Biological Resources Assessments of the Centennial Site

Several previous reports were developed for a separate project that included the Centennial Site and was completed by a different company that held a lease on the property. The previous assessments of the Centennial Site included a special-status plant survey report and wildlife habitat evaluation report. In addition, the previously proposed Idaho-Maryland Mine Project's (which included the Centennial Site) potential impacts on biological resources were evaluated per the California Environmental Quality Act (CEQA) guidelines requirements in 2008 when the impact assessment was completed. A Draft Environmental Impact Report (Draft EIR) was previously developed and included appendices for the previously assessed Idaho-Maryland Mine Project (ESA, 2008). Background biological resources surveys reporting developed as part of the baseline for the 2008 Draft EIR and previous regulatory agency coordination included the following:

- *Idaho-Maryland Mine Special-Status Plant Survey Report* (ESA, 2006). The ESA report includes the Centennial Site as well as other areas associated with the overall proposed mining operations at the time.
- *Idaho-Maryland Mine Special-Status Wildlife Habitat Evaluation Report* (ESA, 2006). The ESA report includes the Centennial Site as well as other areas associated with the overall proposed mining operations at the time.

- *Delineation of Section 404 Jurisdictional Areas Idaho-Maryland Mine, Nevada County, California* developed by WRA, Inc., dated April 2008 with follow up mapping submitted to the Corps on June 5, 2008.
- *Draft EIR Idaho-Maryland Mine Project* (ESA, 2008). The Draft EIR included previous reporting for the Centennial Site included as appendices.

In addition, Centennial Site biological resources reporting has been completed by the current landowner and applicant (Rise Grass Valley) for any potential future development within the Centennial Site. This reporting was developed as part of the development of the evaluation of the Centennial Site, which included the identification of the presence of biological resources within the Centennial Site and the findings of those reports are included directly and by reference into this Biological Report. The Centennial Site biological resources reporting included directly and by reference into this Biological Report includes the following:

- Centennial Site Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020).
- Centennial Site Special Status Plant Survey Report (Boes, 2021).

1.4 Purpose

The purpose of the Biological Report is to identify the location and extent of biological resources within the Centennial Site, including any occupied habitat for special-status plant and wildlife species, protected and regulated by local, state, and federal agencies. This Biological Report also satisfies the Nevada County General Plan and Nevada County Land Use and Development Code requirements for the development of such biological resources assessments.

2 REGULATORY OVERVIEW

2.1 Federal Regulations

2.1.1 Section 404 of the Clean Water Act

The U.S. Army Corps of Engineers ("Corps") and the Environmental Protection Agency ("EPA") regulate the discharge of dredge or fill material into "waters of the U.S." under Section 404 of the Clean Water Act. "Waters of the U.S." include wetlands and lakes, rivers, streams, and their tributaries. Wetlands are defined for regulatory purposes as areas "…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 solid conditions" as specified in 33 Code of Federal Regulations [CFR] 328.3, 40 CFR 230.3.

Generally, wetlands include swamps, marshes, bogs, and similar areas. Lakes, rivers, and streams are defined as "other waters of the U.S." Jurisdictional limits of these features are typically noted by the Ordinary High Water Mark ("OHWM"). The OHWM is the line on the shore established by the fluctuations of water and indicated by physical characteristics such as mark a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas (33 CFR 328 and 33 CFR 329).

Isolated ponds or seasonal depressions had been previously regulated as waters of the U.S. However, in *Solid Waste Agency of Northwestern Cook County* (SWANCC) *v. USACE et al.* (January 8, 2001), the U.S. Supreme Court ruled that certain "isolated" wetlands (e.g., non- navigable, isolated, and intrastate) do not fall under the jurisdiction of the CWA and are no longer under the jurisdiction of the Corps. Some circuit courts (e.g., *U.S. v. Deaton*, 2003; *U.S. Rapanos*, 2003; *Northern California River Watch v. City of Healdsburg*, 2006), though, have ruled that SWANCC does not prevent CWA jurisdiction if a "significant nexus" such as a hydrologic connection exists, whether it be man-made (e.g., roadside ditch) or natural tributary to navigable waters, or direct seepage from the wetland to the navigable water, a surface or underground hydraulic connection, an ecological connection (e.g., the same bird, mammal, and fish populations are supported by both the wetland and the navigable water), and changes to chemical concentrations in the navigable water is present due to water from the wetland.

Areas considered to be non-jurisdictional waters include non-tidal drainage and irrigation ditches excavated on dry land, artificially-irrigated areas, artificial lakes or ponds used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water-filled depressions with no outlet for drainage (33 CFR, Part 328).

The *Clean Water Rule* is a 2015 regulation published by the EPA and Corps to clarify water resources management in the United States under a provision of the CWA. The regulation defined the scope of federal water protection in a more consistent manner, particularly over streams and wetlands, which have a significant hydrological and ecological connection to traditional navigable waters, interstate waters, and territorial seas. It is also referred to as the *Waters of the United States* rule, which defines all bodies of water that fall under U.S. federal jurisdiction. The rule has been contested in litigation and in 2017 the Trump administration announced its intent to review and rescind or revise the rule. Following a Supreme Court ruling on January 22, 2018 that lifted a nationwide stay on the rule, the Trump administration formally suspended the rule until February 6, 2020, thereby giving the EPA time to issue a draft proposal of replacement water regulatory requirements.

On October 22, 2019, the EPA and the Corps published a final rule to repeal the 2015 Clean Water Rule: Definition of "Waters of the United States" ("2015 Rule"), which amended portions of the Code of Federal Regulations (CFR), and to restore the regulatory text that existed prior to the 2015 Rule. The final rule will become effective on December 23, 2019. The EPA and the Corps will implement the pre-2015 Rule regulations informed by applicable agency guidance documents and consistent with Supreme Court decisions and longstanding agency practice.

However, on April 21, 2020, the EPA and the Corps published the Navigable Waters Protection Rule to define "Waters of the United States" in the *Federal Register*. For the first time, the agencies have streamlined the definition so that it includes four simple categories of jurisdictional waters, provides clear exclusions for many water features that traditionally have not been regulated, and defines terms in the regulatory text that have never been defined before. Congress, in the CWA, explicitly directed the Agencies to protect "navigable waters." The Navigable Waters Protection Rule regulates traditional navigable waters and the core tributary systems that provide perennial or intermittent flow into them.

Under the final rule, four clear categories of waters are federally regulated:

- The territorial seas and traditional navigable waters,
- Perennial and intermittent tributaries to those waters,
- Certain lakes, ponds, and impoundments, and
- Wetlands adjacent to jurisdictional waters

Therefore, as of June 22, 2020, the final rule details 12 categories of exclusions, features that are not "waters of the United States," such as features that only contain water in direct response to rainfall (e.g., ephemeral features); groundwater; many ditches; prior converted cropland; and waste treatment systems. The final rule clarifies key elements

related to the scope of federal CWA jurisdiction, including:

- Providing clarity and consistency by removing the proposed separate categories for jurisdictional ditches and impoundments.
- Refining the proposed definition of "typical year," which provides important regional and temporal flexibility and ensures jurisdiction is being accurately determined in times that are not too wet and not too dry.
- Defining "adjacent wetlands" as wetlands that are meaningfully connected to other jurisdictional waters, for example, by directly abutting or having regular surface water communication with jurisdictional waters.

The Navigable Waters Protection Rule is the second step in a two-step process to review and revise the definition of "waters of the United States" consistent with the February 2017 Presidential Executive Order entitled "Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the 'Waters of the United States.'" This final rule became effective on June 22, 2020 and will replaces the Step One Rule published in October, 2019 as outlined above.

2.1.2 Section 401 of the Clean Water Act

Section 401 of the CWA requires an applicant, for any federal permit which may result in a discharge into waters of the U.S., to obtain a certification from the state that the discharge will comply with provisions of the CWA. The nine regions of the State Water Quality Control Board administer this program. Any condition of water quality certification would be incorporated into the Corps permit. California has a policy of no-net-loss of wetlands and typically requires mitigation for impacts to wetlands before it will issue a water quality certification. This Project is located under the jurisdiction of Region 5, the Central Valley Regional Water Quality Control Board ("RWQCB").

2.1.3 Endangered Species Act of 1973

For the Centennial Site, consultation with the USFWS would be necessary if a proposed action may affect a federally listed species. This consultation would proceed under Section 7 of the Endangered Species Act (ESA) if a federal action is part of the proposed action or through Section 10 of the ESA if no such nexus were available (USFWS, 1973). There are three federally protected plant species listed under the ESA that have previously been documented within 5 miles of the Centennial Site (CDFW 2019a). Scadden Flat checkerbloom (*Sidalcea stipularis*), Stebbins' morning glory (*Calystegia stebbinsii*), and Pine Hill flannelbush (*Fremontodendron decumbens*) are ESA listed species as Endangered. The Pine Hill flannelbush is known to occur within the southern and southwestern sections of the Centennial Site (see Appendix G). California red-legged frog (*Rana aurora draytonii*) is federally listed as threatened and though the

species has not previously been documented in the Centennial Site watershed or within 5 miles of the site, the species is known to occur north of the Centennial Site in Nevada County and therefore, this species is included in the assessment of special-status wildlife species as part of this Biological Report.

2.1.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BAGEPA) (16 USC Section 668) protects bald and golden eagles and their nests from direct "take" (i.e. harm or harassment as described above). BAGEPA prohibits the take or commerce of any part of the bald or golden eagles (USFWS, 1940). The USFWS administers the Act and reviews actions that may affect species protected under the Act.

2.2 State Regulations

2.2.1 California Endangered Species Act

The California Department of Fish and Wildlife (CDFW) has jurisdiction over plant and wildlife species listed as threatened or endangered under section 2080 of the California Fish and Game Code. The California Endangered Species Act (CESA) regulates take of state-listed threatened and endangered species. The state Act differs from the federal Act in that it does not include habitat destruction in its definition of *take*. The CDFW defines *take* as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The CDFW may authorize *take* under the CESA through Sections 2081 agreements. If the results of a biological survey indicate that a state-listed species would be affected by the project, the CDFW would issue an Agreement under Section 2081 of the CDFW Code and would establish a Memorandum of Understanding for the protection of state-listed species. CDFW maintains lists for Candidate-Endangered Species and Candidate-Threatened Species. Scadden Flat checkerbloom (*Sidalcea stipularis*) and Stebbins' morning glory (*Calystegia stebbinsii*) are State ESA listed species as Endangered, while Pine Hill flannelbush (*Fremontodendron decumbens*) is designated as a State Rare Species. All three plants have been known to occur within 5 miles of the Centennial Site, but only the Pine Hill flannelbush has been identified on the site (CDFW 2019a).

Pine Hill flannelbush has been documented to occur within the southern and southwestern sections of the Centennial Site (see map in Appendix G). In addition, the foothill yellow-legged frog (*Rana boylii*) is a CESA listed Threatened species and although not found at the site, it is nevertheless discussed in this Biological Report given the presence of several perennial, intermittent, and ephemeral streams within the Centennial Site. The California black rail (*Laterallus jamaicensis coturniculus*) has been previously documented within 5 miles of the Centennial Site and is listed as Threatened under the

State ESA. This species is not found at the site but is known to occur in freshwater marsh wetlands with a perennial water source so it is discussed within this Biological Report given the presence of similar wetlands within the Centennial Site. The western bumble bee (*Bombus occidentalis occidentalis*) is a CESA Candidate for listing as Endangered; however, the species was last documented within 5 miles of the Centennial Site in 1968 (considered its historical distribution) and is currently only known (current distribution known from 2003 – 2017) from a few locations in the Sierra Nevada, none of which are within western Nevada County where the Centennial Site is located (CDFW 2019b); therefore, it is unlikely the species would occur within the Centennial Site.

2.2.2 Streambed Alteration Agreements: CDFG Code Section 1600 et seq.

CDFW has jurisdiction over substantial alterations to the bed or bank of rivers, streams, and lakes under Sections 1600–1616. CDFW has the authority to regulate all work that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed.

The perennial, intermittent, and ephemeral streams within the Centennial Site would most likely be regulated by CDFW. Therefore, a CDFW Streambed Alteration Agreement may be required for encroachment into the bed and bank of the streams located within the Centennial Site.

2.2.3 Porter-Cologne Water Quality Control Act & Section 1601 and Section 1607 of CDFG Code

These acts and codes pertain to projects with potential impacts to water quality or waterways. The Centennial Site does contain waters of the State as defined by the State Water Resources Board (State Board 2014) and they correspond to the features mapped within the Centennial Site (see Greg Matuzak Environmental Consulting LLC, 2020).

2.2.4 State Water Resources Control Board Wetland Policy (April 2019)

On April 2, 2019, the State Water Resources Control Board (State Water Board) adopted rules to protect wetlands and other environmentally sensitive waterways throughout the state. According to the State Water Board, more than 90 percent of California's historic wetlands have been lost to development and other human activity. Wetlands are a critical natural resource that protect and improve water quality, provide habitat for fish and wildlife, and buffer developed areas from flooding and sea-level rise. The newly adopted rules provide a new, statewide definition of what constitutes a state-regulated wetland. They also provide consistency in the way the State Water Board and nine regional water boards regulate activities to protect wetlands. The State of California

waters of the state are, by definition, broader than "waters of the United States" covered by federal regulation. The newly adopted rules do not change that and will ensure that waters of the state will continue to be protected even if protections for federal waters are narrowed by administrative actions or the courts.

The new definition clarifies what is considered a wetland – and what is not – for the entire state, provides a common framework for monitoring and reporting the quality of California's remaining wetlands, helps ensure no overall net loss, and promote an increase, in the quantity, quality, and sustainability of waters of the state, including wetlands, improves transparency and consistency across the State Water Board and the nine Regional Water Quality Control Boards in how discharges of dredged or fill material in sensitive waterways are monitored and regulated, and avoids duplicative work and streamline requirements to cover all waters of the state, so both state and federal environmental concerns are addressed at once.

2.2.5 California Department of Fish and Game Code Sections 3503, 3503.5, and 3800: Nesting Migratory Bird and Raptors

Sections 3503, 3503.5, and 3800 of the CDFG Code prohibit the take, possession, or needless destruction of birds, their nests or eggs unless otherwise provided by state law. Protected nesting bird species under these CDFG Codes should be identified during their nesting season if present prior to site disturbance. Such birds and their nests and eggs should be avoided.

2.2.6 California Special Species of Concern, Fully Protected, and Special Status Species

California designates Species of Special Concern (SSC) as species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational or educational values. These species do not have the same legal protection as listed species (CDFW 2014). For example, the coast horned lizard (*Phrynosoma blainvillii*) is designated as SSC and the species is evaluated as part of this Biological Report since it has been identified within 5 miles of the Centennial Site.

In the 1960's California created a designation to provide additional protection to rare species. This designation remains today and is referred to as "Fully Protected" species, and those listed "may not be taken or possessed at any time" (CDFW 2014). The California black rail (*Laterallus jamaicensis coturniculus*) for instance has been previously documented within Nevada County, including within 5 miles to the southeast and southwest of the Centennial Site. This species is designated as Fully Protected by the State of California. That said, the California black rail is not found at the site.

California special status species are identified by the California Natural Diversity Database (CNDDB) and includes those species considered to be of greatest conservation need by the CDFW.

2.2.7 California Environmental Quality Act Guidelines Section 15380

California Environmental Quality Act (CEQA) Guidelines section 15380(b) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specific criteria (e.g. survival of the species is in immediate jeopardy, or likely to become endangered in the foreseeable future). This section was included in the guidelines to deal primarily with situations in which a public agency is reviewing a project that may have a significant effect on, for example a "candidate species" that has not yet been listed by the USFWS or CDFW. CEQA, therefore, enables an agency to protect a species from significant project impacts until the respective government agencies have had an opportunity to list the species as protected, if warranted (CNRA 2012).

Plants appearing on the California Native Plant Society (CNPS) California Rare Plant Rank (CRPR) 1 and 2 are considered to meet CEQA's Section 15380 criteria. Ranks include: 1A) plants presumed extirpated in California and either rare or extinct elsewhere, 1B) plant rare, threatened, or endangered in California and elsewhere, 2A) plants presumed extirpated in California, but more common elsewhere, and 2B) plants rare, threatened, or endangered in California, but more common elsewhere. Impacts to these species would therefore be considered "significant" requiring mitigation.

2.2.8 State Oak Woodland Regulations

State laws that regulate protection of oak woodlands include Professional Forester's Law (PFL) and CEQA according to Public Resources Code Section 21083.4. "Oaks" are defined in Public Resources Code Section 21083.4 as a native tree species in the genus *Quercus*, that is 5 inches diameter at breast height (DBH) or greater. Oak trees and oak woodland habitats are protected under both the State and the Nevada County landmark groves and landmark oak tree regulations as discussed below. The Centennial Site does not contain any protected oak trees or oak resources per the State of California policies for the protection of oak woodlands as set forth in Public Resources Code Section 21083.4 and the Nevada County Land Use and Development Code.

2.3 Local Regulations

2.3.1 Nevada County Landmark Groves and Landmark Oak Tree Regulations

The Nevada County Land Use and Development Code, Chapter II; Zoning Regulations,

Section L-II 4.3.18 for Trees. Landmark trees are any native oak tree species (*Quercus* species) with a trunk diameter of 36" or greater at diameter breast height (dbh or 4'6"). Identifies landmark groves as hardwood tree groves with 33+% canopy closure, or groves whose size, visual impact, or association with a historically significant structure or event has caused it to be marked for preservation by the county, state, or federal government

Projects shall be approved only when they do not remove or disturb defined trees or groves, unless a Management Plan is prepared consistent with paragraph 3 below or other standards are met consistent with paragraph 3 below. Exempted from this standard shall be trees or groves determined to be dead, dying, or a public safety hazard by a certified professional arborist, licensed landscape architect, registered professional forester, or qualified biologist or botanist (referred to herein as a qualified professional). In addition, exemption shall apply to those trees that must be removed to ensure fire safe access or provide adequate fuel reduction as determined by the California Department of Forestry or local fire district. Tree removal may also be allowed where necessary to provide for site access and public utilities or public right-of-way.

If the above standard effectively precludes development of the project or a revised project, or adversely affects another environmentally sensitive resource, a Management Plan shall be prepared by a certified arborist, registered forester, qualified biologist or botanist, or landscape architect. Said Plan shall evaluate the impact of the project on defined trees and groves and recommend project modifications that avoid or minimize impacts. Emphasis shall be placed on protecting groups of trees rather than individuals. Defined trees that must be removed shall be replaced on an inch for an inch replacement of the removed tree(s). The total of replacement trees shall be required to have a combined diameter of the tree(s) removed. The Management Plan shall provide for the long-term maintenance of the replacement trees.

Management Plans shall emphasize protection of two varieties of oak: blue oak (*Quercus douglasii*) and valley oak (*Quercus lobata*). Both are of very limited distribution in Nevada County. However, no such protected oak resources were identified within the Centennial Site and thus a Management Plan would not be required to be developed for the protection of such landmark oak trees and/or landmark oak groves within the Centennial Site.

2.3.2 Nevada County Water Courses, Wetlands, and Riparian Areas Management Plan

Per the Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3 17C.3 (Ordinance Number 2033) requires a Management Plan be prepared for projects in non-disturbance buffers, including areas that are within 100 feet of the high water mark of perennial streams, watercourses, and wetlands, 50 feet from the high water mark of intermittent watercourses, and 100 feet upslope or 20 feet downslope from an NID canal (Nevada County 2000. Land Use and Development Code, Chapter II:

Zoning Regulations. Effective July 27, 2000). Therefore, the development of such a Management Plan would be required for any potential future development within such non-disturbance buffers. The development of such a Management Plan would meet the requirements of the Nevada County Land Use and Development Code.

2.3.3 Rare, Threatened, and Endangered Species and Their Habitat

The Nevada County Land Use and Development Code, Section L-II 4.3.12, includes regulations intended to follow the federal and state Endangered Species Acts, by avoiding the impact to development on rare, threatened, endangered, and special status species and their habitat, or where avoidance is not possible, to minimize or compensate for such impacts and to retain their habitat as non-disturbance open space. The regulations indicate that a project may only be approved when it is determined by the Nevada County Planning Agency that it will not adversely affect rare, threatened, or endangered species or their occupied habitat and that it will result in no net loss of habitat function or value for the defined species. When it is determined that a project will adversely affect a defined species or their habitat, the regulations require that a site-specific habitat management plan consistent with state and federal requirements be prepared.

2.3.4 Nevada County General Plan

Centennial Site land use changes and/or any subsequent development would be required to comply with those goals and policies outlined in the Nevada County General Plan and thus are included here.

The following goals and policies regarding relevant biological resources are set forth in Chapter 13: Wildlife and Vegetation of the Nevada County General Plan.

Goal 13.1 Identify and manage significant areas to achieve sustainable habitat.

Objective 13.1 Discourage intrusion and encroachment by incompatible land uses in significant and sensitive habitats.

Policy 13.1 Where significant environmental features, as defined in Policy 1.17, are identified during review of projects, the County shall require all portions of the project site that contain or influence said areas to be retained as non-disturbance open space through clustered development on suitable portions of the project site, or other means where mandatory clustering cannot be achieved. The intent and emphasis of such open space designation and non-disturbance is to promote continued viability of contiguous or inter-dependent habitats by avoiding fragmentation of existing habitat areas and preserving movement corridors between related habitats. Vegetation management for the benefit of habitat preservation or restoration shall be considered consistent with the intent of this policy.

Policy 13.2 As part of the Comprehensive Site Development Standards, include standards to minimize removal of existing vegetation and require installation and long-term maintenance of landscaping in Chapter 13: Wildlife and Vegetation Element Nevada County General Plan Volume I - Page 13-5 setbacks and buffer areas. These standards shall be applicable to all discretionary projects and to all ministerial projects other than a single-family residence located on an individual lot. Tree removal may be allowed where necessary to comply with public right-of-way development or dedication, or development of required site access and public utilities. Individual trees or groups of trees shall be protected during construction to prevent damage to the trees and their root systems. Vegetation in proximity to structures shall conform to applicable fire protection standards.

Policy 13.2A Project review standards shall include a requirement to conduct a site-specific biological inventory to determine the presence of special status species or habitat for such species that may be affected by a proposed project. The results of the biological inventory shall be used as the basis for establishing land use siting and design tools required to achieve the objective of no net loss of habitat function or value for special status species. Where a Habitat Management Plan is deemed appropriate, the Plan shall be prepared to comply with the requirements of the Federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA). The plan shall provide the background data, impact analysis, and mitigation programs necessary to obtain a FESA Section 10(a) and CESA Section 2081 permit authorizing incidental take of federal and state listed threatened and endangered species that occur in areas proposed for future development. Prior to implementation of an adopted Habitat Management Plan, project applicants proposing the development of a project that would impact a federal or state listed species, or a species that is proposed for listing, shall be individually responsible for obtaining federal and state incidental take permits on a project-by-project basis.

Policy 13.3 As part of the Comprehensive Site Development Standards, require the maximum feasible use of drought tolerant native plant species for landscaping of all new multi-family residential, commercial, industrial, and public projects. Invasive, non-native plants, as determined by a landscape architect or other similar expert, that may displace native vegetation on adjoining undeveloped lands shall not be used. Landscaping with native trees and shrubs shall be encouraged to provide suitable habitat for native wildlife, particularly in proposed open space uses of future development.

Policy 13.4 Encourage long-term sustainability and maintenance of landscaped areas.

Policy 13.4A No net loss of habitat functions or values shall be caused by development where rare and endangered species and wetlands of over 1 acre, in aggregate, are identified during the review of proposed projects. No net loss shall be achieved through avoidance of the resource, or through creation or restoration of habitat of superior or comparable quality, in accordance with guidelines of the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

Policy 13.4B Habitat that is required to be protected, restored, or created as mitigation for a project's impacts shall be monitored and maintained in accord with a County-approved Habitat Management Plan.

Objective 13.2 Minimize impacts to corridors to ensure movement of wildlife.

Objective 13.3 Provide for the integrity and continuity of wildlife environments.

Objective 13.5 Support, where feasible, the continued diversity and sustain ability of the habitat resource through restoration and protection.

Objective 13.7 Identify and preserve heritage and landmark trees and groves where appropriate.

Policy 13.9 Development in the vicinity of significant oak groves of all oak species shall be designed and sited to maximize the long-term preservation of the trees and the integrity of their natural setting. The County shall adopt a regulation to protect native heritage oak trees and significant oak groves. All native oak tree species with a trunk diameter of 36" or greater shall be protected.

3 METHODOLOGY

In order to evaluate the Centennial Site for the presence of any sensitive biological resources, baseline information from databases and reporting for similar projects in the City of Grass Valley and Nevada County was collected and reviewed prior to conducting reconnaissance-level field biological surveys. The database searches, background research, and habitat level field surveys characterized the baseline conditions of the Centennial Site. Baseline information also included previous biological resources survey reporting (ESA, 2006) conducted as part of the Draft EIR (ESA, 2008) developed for a similar development of the Idaho-Maryland Mine that included the Centennial Site.

Based on the baseline conditions of the Centennial Site, an assessment was implemented to determine if any CNPS ranked plants and special-status plant or wildlife species have the potential to use the Centennial Site at any time during their life cycle. The baseline conditions also identified the presence of any sensitive habitat or communities, including "waters of the U.S.," including wetlands, that had been identified and mapped within the Aquatic Resources Delineation Report developed for the Centennial Site (see Greg Matuzak Environmental Consulting LLC, 2020).

3.1 Sensitive Biological Resources Background Review

The following information was used to identify potential sensitive biological resources, including the presence of CNPS ranked plants and special-status plant and wildlife species, within the Centennial Site region that could be found to use the Centennial Site:

- California Department of Fish and Wildlife's California Natural Diversity Database records search of 5-mile buffer around the Centennial Site (CDFW, 2019a);
- The California Native Plant Society's online Inventory of Rare and Endangered Plants of California for the Centennial Site and Nevada County (CNPS, 2019);
- The U.S. Fish and Wildlife Service Information, Planning, and Consultation System (IPaC) for endangered, threatened, and proposed listed species for the Centennial Site (USFWS, 2019);
- National Wetland Inventory map of the Centennial Site (NWI, 2019);
- United States Department of Agriculture (USDA) Soils Mapper of the Centennial Site (USDA, 2019);
- Natural Resources Conservation Service (NRCS) Hydric Soils List for Nevada County (NRCS, 2019);
- Nevada County General Plan (Nevada County, 1996 with subsequent amendments through 2012);

- Draft Environmental Impact Report, including Appendices, for the Idaho-Maryland Mine Project (ESA Associates October 2008);
- Idaho-Maryland Mine Special-Status Plant Survey Report (ESA Associates August 2006);
- Idaho-Maryland Mine Special-Status Wildlife Habitat Evaluation Report (ESA Associates August 2006);
- Centennial Site Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020); and
- Centennial Site Special Status Plant Survey Report (Wendy Boes Botanical Consultant, August 2020).

3.2 Reconnaissance-level Biological Resources Field Surveys

Reconnaissance-level biological resources field surveys were conducted on foot for the entirety of the Centennial Site (56.41 acres) by Greg Matuzak, Principal Biologist and owner of Greg Matuzak Environmental Consulting LLC, and Wendy Boes, a local Nevada County botanist, on December 9th through 12th and 17th and 18th, 2018. Follow up reconnaissance-level biological resources field surveys were conducted by Greg Matuzak for potential special-status wildlife species habitats on December 30th, 2018 and by Wendy Boes for the CNPS ranked plants and special-status plant species habitat on January 3rd, 2019. The purpose of the surveys completed in December 2018 and January 2019 was to identify habitat and vegetation types and to determine the potential for any CNPS ranked plants and special-status plant and wildlife species identified in the desktop analysis and background research to occur within the Centennial Site. Further evaluation of the Centennial Site was conducted on July 1st, 10th, and 14th, 2019 by Ms. Boes who implemented protocol-level botanical surveys within the entirety of the Centennial Site during the time of year when the target special- status plant species with potential to occur within the Centennial Site are known to be in bloom and identification of each is most likely. Wendy Boes most recently served as a US Forest Service botanist with the local Tahoe National Forest and has also been a local botanical expert consultant in the greater project area for many years.

During the site visits and surveys conducted in July 2019, Greg Matuzak also conducted reconnaissance-level wildlife surveys on July 10th and 14th, 2019 to document the presence of such species within the Centennial Site and to document suitable habit for such species within the Centennial Site. Additionally, Mr. Greg Matuzak conducted a follow up review of targeted areas within the central and eastern sections of the Centennial Industrial Site on August 27, 2020 to reevaluate the potential presence of seasonal wetlands not previously mapped as part of the December 2018 and July 2019 wetland assessment fieldrelated surveys (see Greg Matuzak Environmental Consulting LLC, 2020).

The presence of streams and wetlands within the Centennial Site that could be regulated by state and/or federal agencies were identified and mapped simultaneously and independently from the development of this Biological Report. See the stand-alone Aquatic Resources Delineation reporting for the Centennial Site (Greg Matuzak Environmental Consulting LLC, 2020, Appendix G). The entirety of the Centennial Site was surveyed on foot and a list of plant and wildlife species observed during the field surveys was compiled (see Appendix E for species lists). A Photo Log is included in Appendix H, which documents the Centennial Site during the field surveys.

3.3 Centennial Site Characterization

The Centennial site has been disturbed by historic mining and lumber mill practices, public access, and ongoing management for many years which is now considered normal for the Centennial Site. Within the Centennial Site, the dumping of soils, landscape materials, and other miscellaneous items has also occurred for many years and the current circumstances are now considered normal. Areas not subject to this regular type of disturbance are dominated by native habitat and, therefore, are also the normal circumstance.

All vascular plant species identified at the time of the survey were recorded using keys and descriptions in *The Jepson Manual* (Baldwin et al., 2012). Vegetation types were classified by ESA Associates (2006) during the previous environmental review process (hereby incorporated by reference). ESA Associates mapped and classified wildlife habitats/vegetation types using the California Department of Fish and Game's (CDFG) *A Guide to Wildlife Habitats* (Mayer and Laudenslayer, 1988). The classifications and mapping completed by ESA was found to be far more detailed than the existing CDFW California Wildlife Habitat Relationships (CWHR) layers that were evaluated for the Centennial Site, therefore, the ESA Associates vegetation descriptions were used for a more detailed documentation of vegetation types and as a springboard for the descriptions within this Biological Report (see Appendix D for a Vegetation Community Map for the Centennial Site). A list of plant and wildlife species identified within the Centennial Site as part of the development of this Biological Report is located in Appendix E.

4 ENVIRONMENTAL SETTING

4.1 Environmental Setting

The Centennial Site is located in Nevada County, CA in the northern-central Sierra Nevada foothills. The Sierra Nevada foothills lie between the western edge of the Sierra Nevada and the eastern border of the Central Valley. The foothills form a belt 10 to 30 miles wide that ranges from 500 to 5,000 feet in elevation in a series of northwest to north-northwest aligned ridges that decline in elevation from northeast to southwest. Many rapidly flowing rivers and streams run westerly in deeply incised canyons with bedrock channels to the Central Valley and eventually to the Pacific Ocean. Alluvial fans, floodplains, and terraces are not extensive; and all but the largest streams are generally dry during the summer. Dominant vegetation communities include grasslands, oak woodlands, and chaparral.

Vegetation communities within the Centennial Site are typical of the lower Sierra Nevada foothills. However, the terrain within the Centennial Site is not typical of the lower Sierra Nevada foothills that normally vary between flat ridges and valleys to gently and moderately sloping hillsides. The Centennial Site elevation ranges from approximately 2,500 to 2,600 feet above mean sea level (MSL) and much of the Centennial Site has been impacted due to historical mining and lumber mill practices, which has included the placement of large amounts of mine tailings within the Centennial Site and the removal of vegetation, among other disturbances. The Centennial Site is located along the main stem of Wolf Creek and the interior of the site is dominated by mixed hardwood-conifer forests, with areas of montane riparian woodland, mixed chaparral, mixed wetland types, and annual grassland.

Natural hydrological sources for the Centennial Site include precipitation and surface run-off from adjacent lands. Mean annual rainfall in the area is 53.74 inches (NRCS, 2018). During rain events over the previous month prior to the field surveys, very little surface water and no snow was identified. However, evidence of surface moisture was still present in some areas. Water stained leaves and damp surface soil/leaf litter was observed and some mapped wetland features had surface ponding.

The Centennial Site includes a perennial stream, the main stem of Wolf Creek. The main stem of Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Site. In addition, the Centennial Site contains several ephemeral and intermittent streams that connect with the main stem of Wolf Creek within the northwestern section of the Centennial Site. The drainages and streams located within the Centennial Site are described in the Aquatic Resources Delineation Report (Greg Matuzak Environmental Consulting LLC, 2020). Drainage patterns within the Centennial Site drain to the main stem of Wolf Creek located along

the northern boundary of the Centennial Site (see Appendix C for a National Wetland Inventory figure).

4.2 Centennial Site Soil Types

The USDA identifies several soil types within the Centennial Site. USDA soil mapping for the Centennial Site area is included in Appendix B.

The USDA Soil Survey Mapper (USDA, 2019) indicates that the Centennial Site includes 4 soil types: Cut and fill land (Ct), Placer diggings (Pr), Rock outcrop-Dubakella coplex on 5 to 50 percent slopes (RrE), and Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE). These soil types are described in detail below and their presence, as identified by the USDA online mapper, is attached in Appendix B:

- **Cut and fill land (Ct).** This soil type consists of areas that have been altered by activities other than mining such that there are no intact soil characteristics. This soil is not hydric.
- **Placer diggings (Pr).** The Placer diggings series consists of remnant tertiary river deposits associated with hydraulic mining and placer mining operations as well natural deposits within stream channels. Areas with this soil type are 90 to 100 percent rock, cobble or gravel. 50 to 75 percent of these lands have a mixture of rock, cobbles, gravel and soil. This soil contains unnamed hydric inclusions in drainages and depressions.
- **Rock outcrop-Dubakella complex on 5 to 50 percent slopes (RrE).** The Rock outcrop-Dubakella complex consists of well-drained soils on mountains. This complex is made up of 50 percent Dubakella gravelly loam, 40 percent rock outcrop and 10 percent included soils. These soils formed from weathered rocks with a large amount of serpentinitic minerals. Drainage is slow and runoff is very high. These soils are not hydric. A typical profile for this complex consists of dark brown (7.5 YR 3/2) gravelly loam from 0 to 2 inches underlain by a reddish brown (5YR 3/4) gravelly clay loam from 2 to 10 inches. This layer is underlain by a variegated yellowish brown (10YR 4/4) and reddish brown (7.5YR 4/4) very cobbly clay from 11 to 21 inches. This layer underlain by a blue green, hard, fractured and partly weathered serpentinized layer at 21 inches. Several special-status plant species have the potential to occur on the gabbro soils of the Dubakella and Secca-Rock complex soils within the Centennial Site (Boes 2020, see Section 4.4 below).
- **Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE).** This complex consists of moderately well-drained soils on gently sloping to steep mountain terrain. These soils formed from basic igneous and metamorphic rock. Drainage is

slow and runoff is slow to rapid. These soils are not hydric. A typical profile for Secca-Rock outcrop complex consists of brown (5YR 3/4) gravelly silt loam from 0 to 6 inches. This layer is underlain by a reddish brown (5YR 3/4) gravelly silt loam from 6 to 15 inches. This layer is underlain by dark reddish brown (5YR 3/4) cobbly silty clay loam from 15 to 22 inches. From 22 to 36 inches is a strong brown (7.5YR 4/4) cobbly clay, which is underlain by a yellowish brown (10YR 5/6) cobbly clay from 36 to 45 inches. At 45 inches is weathered metabasic rock.

4.3 Centennial Site Vegetation Communities

Vegetation communities within the Centennial Site include the following vegetation community types as described below. Table 1.0 below includes a list of each of the vegetation communities and the acreages of each vegetation community identified and mapped within the Centennial Site (see Appendix D for the Vegetation Community Map).

Montane Hardwood

Montane hardwood habitat is identified within the Centennial Site in small, localized stands. Montane hardwood is characterized here by stands of an overstory of California black oak and occasionally canyon live oak (*Quercus chrysolepis)*. There is often homogeneity in the canopy structure, and canopy closure is variable between seasons as the dominant overstories species is deciduous, ranging from 5-45%. Due to the historic disturbance, there is abundant Himalayan blackberry (*Rubus armenicus)* in the understory along with other nonnatives including bristly dogtail (*Cynosurus echinatus)* and hedgenettle (*Torilis arvensis)*.

Montane Hardwood-Conifer

Montane hardwood-conifer habitat in the Sierra Nevada occurs at elevations between 1,000 and 4,000 feet above MSL and is comprised of a mosaic of hardwoods and conifers. The Centennial Site is likely a midpoint on the gradient between hardwood forest and conifer forest containing both hardwood and conifer tree species, often in a mosaic pattern with small pure stands of conifers interspersed with small stands of hardwoods. Species associated with montane hardwood-conifer include ponderosa pine, California black oak, canyon live oak, madrone and Douglas fir.

Mixed Chaparral

Mixed chaparral is identified within the Centennial Site. Mixed chaparral is primarily associated with the gabbro soils of the Secca and Dubekella complexes that are known to occur within the southwestern section of the site. In the gabbro, this vegetation type is relatively intact and is characterized by whiteleaf manzanita, buck brush (*Ceanothus cuneatus),* Oregon white oak (*Quercus garryana* var. *semota),* chaparral pea

(*Pickeringia montana), and* occasionally scattered foothill pine. McNab cypress (*Hesperocyparis macnabiana)* is occasional in the southwestern portions of the Centennial Site. With the exception of occasional natural and manmade openings within this habitat type, mixed chaparral forms almost continuous stands. Mixed chaparral is also present in heavily disturbed areas, both recent and historic disturbances. In the ruderal habitats there is a scattered formation of chaparral, usually characterized by whiteleaf manzanita with buck brush and coyote brush (*Baccharis pilularis)*.

Annual Grassland

Annual grassland are open vegetation types that are dominated by annual plant species, often nonnative. These species can occur within the understory of other vegetation types like oak woodlands, but where annual grasslands are mapped there is little to no overstory or shrub cover. This vegetation type is common within the Centennial Site where there has been historic disturbance and little to no water source other than rainfall. The fall rainfall will spark germination and plants will grow through the cool months and in spring will grow rapidly and flower, fruit and senesce. Common to the environmental setting of this habitat type are yellow star thistle (*Centaurea solstitalis),* garden burnett (*Poterium sanguisorba),* soft chess (*Bromus hordeaceous),* bisnaga (*Ammi visnaga),* and patches of Himalayan blackberry.

Montane Riparian

A structural gradient generally occurs from neighboring vegetation into montane riparian, resulting in oaks or pines grading in with the more riparian species. This vegetation type is characterized by two different ecological conditions, (1) placer diggings and (2) along the stretch of the main stem of Wolf Creek.

The montane riparian in the placer diggings and areas created from earth movement are characterized by black cottonwood (*Populus tremuloides),* red willow (*Salix laevigata),* arroyo willow *(Salix lasiolepis),* and occasionally ponderosa pine in the overstory. Dense thickets are often resultant with Himalayan blackberry and Baltic rush (*Juncus balticus* ssp. *atar)* in the herbaceous layer.

The montane riparian vegetation along both sides of the main stem of Wolf Creek is dominated by white alder (*Alnus rhombifolia)* with other overstory species from adjacent vegetation types, including California black oak, pine and Douglas fir. The understory of montane riparian along the stream is dominated by Himalayan blackberry.

Wet Meadow

Wet meadows generally contain a single vegetation stratum and are generally dominated by forbs and gramanoids. Shrub and trees are sometimes present but generally make up a small portion of this vegetation type. This is typically a diverse plant

community driven by hydrologic influences. The wet meadows in the Centennial Site are typically created where extreme disturbance has occurred in the past or the presence of placer diggings. These wet meadows are characterized by *Agrostis, Juncus* spp. and Baltic rush.

Freshwater Emergent Marsh Wetlands

Freshwater emergent marsh wetlands are characterized by hydrophyllic plants and generally standing water. All emergent wetlands have soils that are saturated to the extent that the soils are always anaerobic. There are fresh emergent wetlands identified within the Centennial Site. This habitat type within the Centennial Site is dominated by cattails (*Typha* spp.), arroyo willow, and pacific rush (*Juncus effuses* ssp. *pacificus)*.

TABLE 1.0 VEGETATION COMMUNITIES AND ACREAGES

Vegetation Community	Acres within Centennial Site
Montane Hardwood-Conifer	5.29
Montane Hardwood	0.48
Wolf Creek and Montane Riparian	20.07
Mixed Chaparral	16.24
Annual Grassland	9.74
Freshwater Emergent Marsh Wetland	0.58
Wet Meadow	4.01
Total	**56.41**

5 Results

CNPS ranked plants and special-status species were considered for the Centennial Site based on a current review of the CNDDB and database information provided by the United States Fish and Wildlife Service and California Native Plant Society for the Centennial Site as well as the reconnaissance-level biological surveys as outlined in this Biological Report. Table 2.0 below includes the vegetation communities identified within the Centennial Site as well as the potential special-status species that could occur within each of the vegetation communities mapped within the Centennial Site (see Appendix D for a map of the vegetation communities within the Centennial Site).

For the purposes of this Biological Report, special-status species is defined as those species that are:

- listed as threatened or endangered, or proposed or candidates for listing by the USFWS or National Marine Fisheries Service;
- listed as threatened or endangered and candidates for listing by CDFW;
- identified as Fully Protected species or species of special concern by CDFW;
- identified as Medium or High priority species by the Western Bat Working Group; and
- plant species considered to be rare, threatened, or endangered in California by the CNPS and CDFW [California Rare Plant Rank (CRPR) 1 and 2]:

- CRPR 1A: Plants presumed extinct.
- CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere.
- CRPR 2A: Plants extirpated in California, but common elsewhere.
- CRPR 2B: Plants rare, threatened, or endangered in California, but more common elsewhere.

The study area does not contain any mapped CDFW sensitive communities (see Appendix J for a CDFW CNDDB map of the study area and a 5-mile buffer). Therefore, CDFW sensitive communities are not discussed within this reporting effort further given the lack of mapping provided for such sensitive communities by CDFW within and adjacent to the Centennial Site.

TABLE 2.0 SPECIAL-STATUS SPECIES ASSOCIATED WITH VEGETATION COMMUNITIES

Vegetation Community	Associated Special-Status Species
Montane Hardwood-Conifer	Chaparral sedge (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Montane Hardwood	Chaparral sedge (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Wolf Creek and Montane Riparian	Sierra blue grass (Rank 1B.3) Foothill yellow-legged frog (CSC), Western pond turtle (CSC), nesting migratory birds (CDFW)
Mixed Chaparral	Pinehill flannelbush (FE/CR), Stebbins' morning glory (FE/CE), finger rush (Rank 1B.1), Chaparral sedge (Rank 1B.2), Cantelow's lewisia (Rank 1B.2), Red Hills soaproot (Rank 1B.2) Coast horned lizard (CSC), nesting migratory birds (CDFW)
Annual Grassland	Brownish beaked-rush (Rank 2B.2)
Freshwater Emergent Marsh Wetland	Scadden Flat checkerbloom (FT/CT) and Brownish beaked-rush (Rank 2B.2) California red-legged frog (FT, CSC), Western pond turtle (CSC), and California black rail (CT)
Wet Meadow	Brownish beaked-rush (Rank 2B.2) and finger rush (Rank 1B.1)

5.1 Aquatic Resources Delineation Results

A total of 4.97 acres of "waters of the U.S.", including wetlands, and "waters of the State of California", were identified and mapped within the Project Area. The 4.97 acres of wetland-waters includes 4.37 acres of mapped wetlands and 0.60 acres of mapped "other waters of the U.S.," including the main stem of Wolf Creek, as well as several intermittent and ephemeral streams.

The 4.37 acres of wetlands identified and mapped within the Centennial Industrial Site includes:

- 2.88 acres of wet meadow wetlands (14 features mapped);
- 0.31 acres of freshwater emergent marsh wetlands (2 features mapped); and
- 1.18 acres of riparian wetlands (1 feature mapped).

Table 3 includes the list of wetlands delineated and mapped within the Project Area, including the wetland type, wetland identification number which corresponds to the delineation figures shown in Appendix H, and size of each feature.

Table 3. Wetlands Delineated Within Centennial Industrial Site

No.	Wetland Type	Wetland ID Number	Size (Acres)
1	Meadow wetland	WM-4	1.57
2	Meadow wetland	WM-5	0.86
3	Meadow wetland	WM-6	0.003
4	Meadow wetland	WM-7	0.004
5	Meadow wetland	WM-8	0.004
6	Marsh	MA-1	0.21
7	Marsh	MA-2	0.10
8	Meadow wetland	WM-9	0.02
9	Meadow wetland	WM-10	0.001
10	Meadow wetland	WM-11	0.04
11	Meadow wetland	WM-12	0.27
12	Riparian	RI-1	1.18
13	Meadow wetland	WM-13	0.03
14	Meadow wetland	WM-1	0.01
15	Meadow wetland	WM-2	0.006
16	Meadow wetland	WM-3	0.05
17	Meadow wetland	WM-14	0.01
17			**4.37**

The 0.60 acres (3,968 linear feet) of streams identified and mapped within the Centennial Industrial Site includes:

- One (1) perennial stream, the main stem of Wolf Creek, totaling 0.38 acres over 1,262 linear feet;
- Two (2) intermittent streams totaling 0.17 acres over 1,616 linear feet; and
- Five (5) ephemeral streams that only flow during and immediately after precipitation events totaling 0.05 acres over 1,090 linear feet.

Table 4 includes the list of streams delineated and mapped within the Centennial Industrial Site, including the stream type, stream identification number which corresponds to the delineation figures shown in Appendix H, and size of each feature.

Table 4. Streams Delineated Within Centennial Industrial Site

No.	Stream Type	Wetland ID Number	Size (Acres)
1	Perennial Stream	Wolf Creek – 1	0.377
2	Intermittent Stream	I – 1	0.161
3	Intermittent Stream	I – 2	0.006
4	Ephemeral Stream	E – 1	0.002
5	Ephemeral Stream	E – 2	0.005
6	Ephemeral Stream	E – 3	0.015
7	Ephemeral Stream	E – 4	0.018
8	Ephemeral Stream	E – 5	0.011
8			**0.60**

A targeted review of site conditions within the central and eastern sections of the Centennial Industrial Site was conducted on August 27, 2020. The purpose of this review was to reevaluate site conditions for the potential presence of seasonal wetlands not previously mapped as part of the December 2018 and July 2019 field surveys. The additional site review did not identify any additional potential CWA regulated seasonal wetlands given those targeted areas contained a lack of the required indicators of wetland hydrology and hydric soils required by the Corps for such features to be regulated under the CWA. Therefore, no changes or updates to the mapping of "waters of the U.S.,' including wetlands, were made to the mapping of such features within the Centennial Site.

5.2 CNPS Ranked Plants and Special-Status Plant Species

CDFW's California Natural Diversity Database Biogeographic Information and Observation System (BIOS) 9 Quad search included the Grass Valley, Nevada City, North Bloomfield, Chicago Park, Colfax, Rough and Ready, Lake Combie, French Corral and Wolf 7.5-minute USGS quadrangles (CDFW, 2019a). Based on the results of the searches 23 CNPS ranked plants and special-status plant species were identified as occurring within the 9 Quad search. Ten of these plant species were dropped from further consideration due to a lack of suitable

habitat in the analysis area (Centennial Site), the Centennial Site being substantially outside of the known range and distribution for the plant species, or both (see the stand-alone Centennial Site Special Status Plant Survey Report developed by Wendy Boes Botanical Consultant, 2021). The plant species dropped from further consideration include the following:

- Jepson's onion (*Allium jepsonii*)
- Mosquin's clarkia (*Clarkia mosquinii*)
- Ahart's buckwheat (*Eriogonum umbellatum var. ahartii*)
- Jepson's coyote thistle (*Eryngium jepsonii)*
- Minute pocket moss (*Fissidens pauperculus*)
- Yosimite tarplant (*Jensia yosimitana)*
- Inundated bog club-moss (*Lycopodiella inundata)*
- Follett's monardella (*Monardella follettii*)
- Sticky pyrrocoma (*Pyrrocoma lucida*)
- Oval-leaved viburnum (*Viburnum ellipticum)*

The CNPS ranked plants and special-status plant species with at least a low potential to occur within the Centennial Site per the results of the 9 Quad search and CNDDB 5-mile buffer search are evaluated in the CNPS ranked plants and special-status plant table included in Appendix H. The CNPS ranked plants and special-status plant species field surveys were conducted at a time when all potentially occurring CNPS ranked plants and special-status plant species could be identified if they were present, with the exception of Butte County fritillary. A nearby reference population of finger rush was visited on June 24th, 2019 prior to commencing field surveys to ensure this species was still detectable, which was confirmed. No other reference sites were required to be visited given the botanists local knowledge of the other target species as part of the survey effort.

Only one state or federal listed plant species was identified within the Centennial Site: Pine Hill flannelbush (*Fremontodendron decumbens*). Two other unlisted species, neither of which is rare, threatened or endangered were also present: Humboldt lily (*Lilium humboldtii ssp. humboldtii*), and *Sierra Brodiaea (Brodiaea sierra)* which were each documented within the Centennial Site during the biological resource surveys completed in December 2018 and January, July, and August 2019 (see Appendix F). Special-status plant species, Cedar Crest popcornflower (*Plagiobothrys glyptocarpus* var. *modestus*), has a moderate potential to occur within the Centennial Site though it has not been identified within the Centennial Site. Stebbins' morning-glory (*Calystegia stebbinsii*), chaparral sedge *(Carex xerophila)*, and Red Hills soaproot *(Chlorogalum grandiflorum)* each have the potential to occur on the gabbro soils of the Dubakella and Secca-Rock complex soils though none of these species have been identified within the Centennial Site.

A description of the CNPS ranked plants and special-status plant species previously known to occur within 5 miles of the Centennial Site (CNDDB, 2019) are discussed below, as well as the Cedar Crest popcorn flower given the species was determined to have a moderate potential to occur within the Centennial Site though it has not been previously documented within 5 miles of the Centennial Site (see Appendix J for a CNDDB 5-mile buffer figure). A description of CNPS ranked plants and special-status plant species with a low likelihood of occurring within the Centennial Site is located in Appendix I.

Sierra arching sedge (Carex cyrtostachya) – California Native Plant Society List 1B.2

Sierra arching sedge inhabits lower montane mesic coniferous forest, meadows and seeps, marshes and swamps, riparian forests (margin), from 2,000- 4,460 feet. Within the known distributional and elevational range for this species, though nearest known occurrence 16 miles to the north. The blooming period for this species is May through August. This species was recently described so the full extent of its range and distribution are unlikely yet known. Suitable marginal habitat is present within the mesic forests located in the Centennial Site; however, the species was not identified during field surveys conducted in December 2018 or in July and August 2019. Therefore, the potential for this species to occur within the Centennial Site is considered low.

Scadden Flat checkerbloom (Sidalcea stipularis) – Federally and CA State Endangered and California Native Plant Society List 1B.1

Scadden Flat checkerbloom inhabits marshes and swamps between July and August. It is found in wet montane marshes fed by springs, normally between 2,295 and 2,395 feet above MSL. This species blooming period is July through August. Suitable habitat for this species occurs within the perennial marsh wetlands in the Centennial Site. The species has been documented 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. However, this species was not documented during the 2006 surveys that included the Centennial Site. Additionally, the species was not identified during field surveys conducted in December 2018 or in July and August 2019. This species has a low potential to occur within the Centennial Site.

Pine Hill flannelbush (Fremontodendron decumbens) – Federally Endangered and CA State Rare and California Native Plant Society List 1B.2

Pine Hill flannelbush is known to occur in serpentine and gabbro soils in chaparral and cismontane woodlands, at elevations ranging from 1,390 to 2,495 feet. It is known from twelve occurrences in Eldorado, Nevada and Yuba Counties in the foothills of the Sierra Nevada. It is threatened by development and alteration of the fire regime (CNPS 2019a).

Pine Hill flannelbush blooms April to July, though is at its peak in June. It is a branched, spreading shrub that grows to 4 feet tall. The leaves are lobed, and dense star-shaped (stellate) hairs cover the leaves and younger twigs and branches. It has showy orange to

reddish-brown flowers. Pine Hill flannelbush is thought to be fire dependent, with studies resulting in only 2 percent of seed germination in the absence of fire (Boyd 1987 in USFWS 2002). The Centennial Site has highly suitable habitat in the Dubekella and Secca-Rock Outcrop complex soil series, a soil derived from gabbrodiorite parent material.

The known occurrence of Pine Hill flannelbush within the Centennial Site was located in December 2018 and tentatively identified due to its being an evergreen shrubby plant with characteristics (leaf morphology, plant habit, seeds, fruits) that allowed it to be somewhat confidently identified at this time of year. The identification was verified during its blooming period, and the whole of the population that occurs in the study area was mapped in June-July of 2019. Sixty individuals were counted in the study area, all mature, flowering plants. No seedling or juvenile individuals were encountered. They occupied an absolute area of 0.22 acres over approximately 4.5 acres in the southern portion of the study area, with one plant occurring disjunct from main population, in the center of the study area. The population extends beyond the Centennial Site and into adjacent private properties. The population was not mapped or documented beyond the Centennial Site.

A recovery plan has been developed for this species (USFWS 2002). The Recovery Plan states that the only verified location of this plant is near Pine Hill in western El Dorado County, and that the reported occurrences of this plant in Nevada County may be erroneous. It states:

"Although there are some reports of F. californicum ssp. decumbens occurring in some small scattered populations in Yuba or Nevada County, other reports describe these individuals as aberrant F. californicum ssp. californicum (California flannelbush)." (Recovery Plan pp. II-13)

Genetic work has been conducted by Dr. Shannon Still from U.C. Davis that has confirmed that Pine Hill flannelbush is known to occur in Nevada County, but this work is still in press (Bill Wilson, personal communication 2019). During protocol level field surveys conducted for the species within the Centennial Site in 2019, the plants in the population were confirmed to have morphological characteristics, the floral and habit, of the Pine Hill flannelbush. Based on the unpublished genetic results and the supporting morphological characteristics, we are assuming the identification of Pine Hill flannelbush within the Centennial Site with it to be confirmed prior to the implementation of any disturbance.

Seed collection was conducted on August 21, 2019 with Brett Hall[1] from the UC Santa Cruz Arboretum as a part of the UC Santa Cruz Native Plant Program. Six plants on the northern edge of the distributional limit of the population were selected for seed

[1] UCSC Arboretum has a MOU with CDFW permitting collecting of California Rare, Threatened, and Endangered Plants (10-01 M).

collection as there is the greatest potential for these individuals to be impacted. The seed had largely dispersed, but approximately 30-100 seeds were collected per plant, which was approximately 1 to 2 seeds per fruit. The seeds will be cleaned and stored in the seedbank at UC Santa Cruz for either future propagation efforts, or as a part of seed banking efforts. However, the USFWS continues under the assumption that the Pine Hill flannelbush in Nevada County are not the listed entity (USFWS, 2019).

Stebbins' morning glory (Calystegia stebbinsii) – CA State and Federally Endangered and California Native Plant Society List 1B.1

Stebbins' morning glory inhabits chaparral and cismontane woodland. It is found in red clay soils of the pine hill formation on gabbro or serpentine soils in open areas, normally between 980 and 4,330 feet above MSL. The blooming period for this species is April to July. Potential for the occurrence of this species in openings and under chaparral in gabbroic soils within the Centennial Site is considered low. The species is known from a location 4 miles to east of the Centennial Site on gabbroic chaparral on Oceola Ridge. This species was not identified during field surveys conducted in December 2018 or July and August 2019.

Cedar Crest popcorn flower (Plagiobothrys glyptocarpus var. modestus) – California Native Plant Society List 3 (not rare or threatened)

The species is known to occur within cismontane woodland as well as valley and foothill grasslands (mesic), from 2,850-2,855 feet. This species is known from a historic collection potentially from nearby Cedar Ridge. The species is also known from historic collections in Nevada City. Suitable habitat for this species is present within the woodland areas within the Centennial Site. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys; however, the blooming period for this species is April to June. The surveys were not conducted during the blooming period for this species. This species has a moderate potential to occur within the Centennial Site.

Dubious pea (Lathyrus sulphureus var. argillaceus) – California Native Plant Society List 3 (not rare or threatened)

Dubious pea inhabits lower and upper montane coniferous forest and cismontane woodlands, normally between 490 and 3,050 feet above MSL. This species has the potential to occur in forested areas of the Centennial Site. The species is known to occur within 3 miles of the Centennial Site. The species is also known from a location approximately 5 miles to the southwest near Wolf Mountain. Plant list from the 2006 surveys of the Centennial Site includes a *Lathyrus sulfureus*, with no variety designation (ESA, 2006). The blooming period for this species is April to May. The surveys were not conducted during the blooming period for this species. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys. This species has a low potential to occur within the Centennial Site.

Finger rush (Juncus digitatus) – California Native Plant Society List 1B.1

Finger rush inhabits open chaparral habitat surrounded by mixed oak/conifer woodland on low gradient, north-facing, and vernally moist slopes. This species also associates with sandy clay loam soil within substrates underlain by granitic bedrock. This species is found between 2,165 and 2,590 feet above MSL. There is potential for the occurrence of this species in gravelly, seasonally moist openings within the Centennial Site. The species is known less than one mile to the north near the intersection of Idaho-Maryland Road and Brunswick Road. The surveys were not conducted during the blooming period for this species. the blooming period for this species is May to June. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys. This species has a low potential to occur within the Centennial Site.

Brownish beaked-rush (Rhynchospora capitellata) – California Native Plant Society List 2B.2

Brownish beaked-rush inhabits meadows and seeps, marshes and swamps, and it is found in upper and lower montane coniferous forests, normally between 145 and 6,560 feet above MSL. This species blooms from July through August and is normally identified on mesic sites and has been identified within 3 miles west of the Centennial Site in a marshy area along the northwest corner of the Nevada County Fairgrounds along Hwy 20 in 1973. The species was not identified during field surveys conducted in December 2018 or July and August 2019. However, suitable habitat for this species occurs within the perennial marsh wetlands in the Centennial Site. The potential for the species to occur within the Centennial Site is considered low.

Chaparral sedge (Carex xerophila) – California Native Plant Society List 1B.2

Chaparral sedge inhabits openings within chaparral habitat, cismontane woodland, and lower montane coniferous forests. This species is found in areas containing serpentine and gabbroic microhabitats between 1,400 and 2,525 feet above MSL. This species has been identified approximately 4 miles of the Centennial Site on Oceola Ridge in gabbroic chaparral. There is a low potential for occurrence of this species in openings and under chaparral in gabbroic soils within the Centennial Site. The blooming period for this species is March to June. The surveys were not conducted during the blooming period for this species. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys.

Red Hills soaproot (Chlorogalum grandiflorum) – California Native Plant Society List 1B.2

Red Hills soaproot is found in chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, between 800 and 5,545 feet above MSL. The species has potential for occurrence within the Centennial Site in openings and under chaparral in gabbroic soils. (CNDDB 2019); however, it is known over

10 miles south in Bunch Canyon south of Colfax, with no known occurrences to north. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys; however, the blooming period for this species is May to June. The surveys were not conducted during the blooming period for this species. The species was not documented within 5 miles of the Centennial Site. This species has a low potential to occur within the Centennial Site.

Sierra blue grass (Poa sierra) – California Native Plant Society List 1B.3

Sierra blue grass is found in openings in lower montane coniferous forest, between 1,195 and 4,920 feet above MSL and blooms between April and July. There is only marginal suitable habitat for this species in the Centennial Site, primarily in the montane hardwood and montane hardwood-conifer forests, and in the forested areas along the main stem of Wolf Creek. The species was not documented within 5 miles of the Centennial Site (CNDDB 2019); however, it has been documented at Steephollow Creek in a collection from 1964. This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys. This species has a low potential to occur within the Centennial Site.

Cantelow's lewisia (Lewisia cantelovii) – California Native Plant Society List 1B.2

Cantelow's lewisia is found in moist, granitic areas in broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest mesic, sometimes serpentinite seeps between 1,080 and 4,495 feet above MSL. The species blooms between May and October. There is potential for occurrence in any rocky outcrops with seeps within the Centennial Site. There are records for this species in the Middle Yuba and South Yuba river canyons within 7 miles of the Centennial Site. The preferred habitat for this species in the Centennial Site has been disturbed and is of reduced quality. The species has not been previously documented within 5 miles of the Centennial Site (CNDDB, 2019). This species was not identified during field surveys conducted in December 2018 or July and August 2019 surveys. This species has a low potential to occur within the Centennial Site.

Butte County fritillary (Fritillaria eastwoodiae) – California Native Plant Society List 3.2 (not rare or threatened)

Butte County fritillary is found in openings in chaparral, cismontane woodland, and lower montane coniferous forest, sometimes serpentinite between 160 and 4,920 feet above MSL. The species blooms between March and June and there is potential for occurrence in open areas in the Centennial Site. There is a 1979 record for this species on the south side of the South Yuba River canyon approximately 7 miles north of the Centennial Site, and other occurrences on the Washington Ridge. The species was not documented within 5 miles of the Centennial Site (CNDDB, 2019). Surveys were not conducted during the appropriate phenological period for this species; however, fruits would have been

visible for individuals from this genus and they were not observed during 2019 field surveys. The potential for this species to occur within the Centennial Site is considered low.

5.3 CNPS List 4 Species *(not rare or threatened)* Identified within the Centennial Site

Sierra brodiaea (Brodiaea sierra) - Federal Status: not listed; State Status: not listed; CNPS Status: 4.3

Sierra brodiaea is known to occur on serpentinite or gabbroic soils in chaparral, cismontane woodland, land lower montane coniferous forests. It is known from Butte, Nevada and Yuba Counties at elevations ranging between 164 and 3,215 feet above MSL. It is potentially threatened by vehicles, road maintenance, widening, development, illegal dumping, horticultural collecting and hydrological alterations (CNPS 2019). Sierra brodiaea is a perennial bulb that blooms May through August. It is an herbaceous plant, with a broad umbel of purple, fluted flowers. The Centennial Site has highly suitable habitat in the Secca-Rock Outcrop complex soil series, a soil derived from gabbro-diorite parent material. A large population with thousands of individuals covering almost a quarter of the Centennial Site was mapped during 2019 field surveys (see Appendix F).

Humboldt lily (Lilium humboldtii ssp. humboldtii) - Federal Status: not listed; State Status: not listed; CNPS Status: 4.2

Humboldt lily is known to occur in openings in chaparral, cismontane woodland and lower montane coniferous forests. It is known from Amador, Butte, Calaveras, El Dorado, Fresno, Mariposa, Nevada, Placer, Tehama, Tuolumne, and Yuba Counties at elevations ranging between 295 and 4,200 feet above MSL. Its threats include development, urbanization, horticultural collecting, deer browsing, nonnative plants, and road maintenance (CNPS, 2019). Humboldt lily is a perennial bulb that blooms May through August. It can reach 7 to 8 ft in height and has bright orange lily flowers. The Centennial Site has suitable habitat and a single occurrence consisting of 10 individuals in an area less than 110 sq. feet was documented in the Centennial Site (see Appendix F).

5.4 Special-Status Wildlife Species

The CNDDB database 5-mile buffer search revealed six (6) special-status wildlife species that have previously been identified and mapped within 5 miles of the Centennial Site (see Appendix J). The species previously identified within 5 miles of the Centennial Site include:

- California black rail
- Cooper's hawk

- Coast horned lizard
- Western bumble bee
- Foothill yellow-legged frog
- Townsend's big-eared bat

None of these species were identified within the Centennial Site during biological resources surveys conducted in December 2018 and July 2019 surveys. In addition, no USFWS Designated Critical Habitat (DCH) has been mapped by USFWS for any federally listed species within the vicinity of the Centennial Site.

Given the presence of perennial freshwater marsh wetlands within the eastern section of the Centennial Site and the main stem of Wolf Creek along the northern boundary of the Centennial Site, western pond turtle and California red-legged frog are also included as special-status aquatic wildlife species with the potential to occur within the Centennial Site. The following is a description of the special-status wildlife species previously identified within 5 miles of the Centennial Site. In addition, the western pond turtle and California red-legged frog are also evaluated given the presence of perennial streams and marsh wetlands within the Centennial Site. Additionally, two species of bat, the hoary bat (*Lasiurus cinereus*) and the pallid bat (*Antrozous pallidus*) are included in the assessment below given the have a low potential to occur within the Centennial Site; however, neither bat species has been previously identified within 5 miles of the Centennial Site (CDFW 2019a).

Townsend's big-eared bat (Corynorhinus townsendii) – No state or federal listing; CA State Species of Concern

The Townsend's Big-eared bat species inhabits lower montane coniferous and mixed conifer forest habitats where abandoned buildings and structures occur for roosting. This species has been identified within 3 miles southeast of the Centennial Site within an abandoned building at the Empire Mine State Historic Park. The species was not identified during field surveys and only limited suitable roosting sites for this species occurs given the lack of abandoned structures located within the Centennial Site. The existing decant tower, which is located in the northwest portion of the Centennial Site, may contain suitable roosting habitat for this species. The potential for this species to occur within the Centennial Site is considered low.

Coast horned lizard (Phrynosoma blainvillii) – No state or federal listing; CA State Species of Concern

The coast horned lizard occurs in open sandy areas, scattered low bushes, chaparral, manzanita, and oak woodland habitats. It is found in the Sierra Nevada foothills from

Butte County to Kern County and throughout the central and southern California coast. Coast horned lizards forage on the ground in open areas, usually between shrubs and often near ant nests. The species relies on camouflage for protections. Predators and extreme heat are avoided by burrowing into loose soil. Periods of inactivity and winter hibernation are spent burrowed in the soil under surface objects such as logs or rocks, in mammal burrows, or in crevices (Zeiner et al., 2000). They inhabit mostly open country, especially sandy areas, washes, flood plains and wind-blown deposits in a wide variety of habitats and can be found at elevations up to 8,000 feet (2,438 meters) (CaliforniaHerps, 2014).

This species has been documented between 3 and 5 miles of the Centennial Site to the west, northwest, and southwest. There is potential suitable habitat within the sandy and rocky locations within the Centennial Site. As the Centennial Site includes the required open areas of exposed, sandy soils for this species, this species has the potential to occur within the site. No coast horned lizards were observed during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Centennial Site for special-status wildlife species. The potential for this species to occur within the Centennial Site is considered moderate.

Western pond turtle (Emys marmorata) – No state or federal listing; CA State Species of Concern

Western pond turtles associate with permanent ponds, lakes, streams, irrigation ditches, and permanent pools along intermittent streams. They are most commonly associated with permanent or nearly permanent water in a wide variety of habitats. This species requires basking sites such as partial submerged logs, rocks, mats of floating vegetation, or open mud banks. During the spring or early summer, females move overland up to 325 ft to find suitable sites for egg laying. The main stem of Wolf Creek, a perennial stream, and the large marsh wetlands in the eastern section of the Centennial Site containing perennial water/ponding are considered suitable habitat for this species.

This species has not been previously identified within 5 miles of the Centennial Site and was not identified during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Centennial Site for special-status wildlife species. The potential for this species to occur within the Centennial Site is considered high.

Foothill yellow-legged frog (Rana boylii) – Candidate as Threatened under CESA

Foothill yellow-legged frogs inhabit partly shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. The species requires at least some cobble-sized substrate for egg laying. The species requires at least 15 weeks to attain metamorphosis. This species has been identified within 5 miles of the Centennial Site. The main stem of Wolf Creek is considered suitable habitat for this species. This species has not been

previously identified within 5 miles of the Centennial Site and was not identified during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Centennial Site for special-status wildlife species. Protocol-level surveys (Visual Encounter Surveys or VES Surveys per the CDFW protocol) for this species were not implemented within the Centennial Site as part of this reporting. The potential for this species to occur within the Centennial Site is considered very low.

CA red-legged Frog (Rana aurora draytonii) – Federal Threatened and CA State Species of Concern

CA red-legged frog (CRLF) is known in Nevada County in the North Bloomfield USFS Quadrangle within the Rock Creek watershed. CRLF has not been identified within 5 miles of the Centennial Site and designated critical habitat for this federally threatened species has not been mapped for this species within the vicinity of the Centennial Site. Potential suitable reproductive habitat for this species may occur within the large marsh wetlands with perennial water/ponding in the eastern section of the Centennial Site. If suitable breeding locations are located within 1.25 miles of the Centennial Site and connected by barrier-free dispersal habitat that is at least 300 feet in width, then suitable dispersal habitat could be located within the Centennial Site. This species has not been previously identified within 5 miles of the Centennial Site and was not identified during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Centennial Site for special-status wildlife species. Protocol-level surveys for this species were not implemented within the Centennial Site as part of this reporting.

Given that CRLF was not identified during any of the site surveys, and have not been identified in the Grass Valley USGS Quadrangle, the watershed associated with the Centennial Site, or within 5 miles of the Centennial Site, the potential for this species to occur is considered extremely low.

California black rail (Laterallus jamaicensis coturiculus) – CA State Threatened

California black rail inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. The species requires water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat. The species has been identified within 5 miles to the southeast and southwest of the Centennial Site. Suitable habitat for this species occurs within the large marsh wetlands within the eastern section of the Centennial Site where there is permanent ponding of water and dense vegetation. This species was not identified during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Centennial Site for special-status wildlife species. Protocol-level surveys for this species were not implemented within the

Centennial Site as part of this reporting. The potential for this species to occur within the Centennial Site is considered very low.

Cooper's hawk (Accipiter cooperii) – CDFW Watch List, MBTA Protected

Cooper's hawks are forest and woodland birds. These hawks are a regular sight in parks, quiet neighborhoods, over fields, at backyard feeders, and even along busy streets if there are trees present. The species has been documented successfully nesting approximately 5 miles to the northeast of the Centennial Site in 2014. The species is known to occur and nest in Sierra mixed conifer forest. Though this habitat type does not occur within the Centennial Site, the species has the potential to occur and nest within the ponderosa pine and montane hardwood habitats within the Centennial Site. Suitable nesting and foraging habitat occur within the forested areas of the Centennial Site.

This species was not identified during the December 2018 or early January 2019 site visits or during reconnaissance-level biological surveys conducted in July 2019 within the Centennial Site for special-status wildlife species. The potential for this species to occur within the Centennial Site is considered moderate.

Western bumble bee (Bombus occidentalis occidentalis) – Candidate for CESA Listing as Endangered

The western bumble bee is a CESA Candidate for listing as Endangered and is under review by the USFWS; however, the species was last documented within 5 miles of the Centennial Site in 1968 (considered its historical distribution) and is currently only known (current distribution defined by CDFW as known locations where the species has been identified between 2003 – 2017) from a few locations in the Sierra Nevada, none of which are within western Nevada County where the Centennial Site is located (CDFW 2019b). Therefore, it is unlikely the species would occur within the Centennial Site.

Hoary bat (*Lasiurus cinereus*) and Pallid bat (*Antrozous pallidus*)

The hoary bat is considered a Medium Risk species by the Western Bat Working Group and the pallid bat is a CDFW species of special concern. Neither species has been previously identified within 5 miles of the Centennial Site (CDFW 2019a). However, the Centennial Site does provide roosting habitat for both species within the riparian and woodlands located within the Centennial Site. Therefore, if either species is present within the Centennial Site during the proposed disturbance, bat day roosts could be impacted.

Nesting raptors and other migratory bird species - Protected under CA State F&G Code Sections 3503, 3503.5, and 3800

There is a moderate to high potential for nesting raptors and other protected nesting bird species protected under the CDFG Codes 3503, 3503.5, and 3800 to occur within the Centennial Site. The Centennial Site contains suitable nesting habitat for bird species

protected under those CDFG Codes, such as tree nesting species (raptors) and ground nesting species like the spotted towhee (*Pipilo maculatus*) and dark-eyed junco (*Junco hyemalis*).

Critical Deer Habitat

Known migratory deer ranges outlined in the Nevada County General Plan was reviewed for deer migration corridors, critical range, and critical fawning areas. The Centennial Site is not located in any known major deer corridors, known deer holding areas, or critical deer fawning area. Per the Migratory Deer Ranges Nevada County General Plan map, the Centennial Site is located in an area of potential Deer Winter Range. The field surveys did not record any observations of deer. The Centennial Site does not contain any known major deer migration corridors, known deer holding areas, nor critical deer fawning areas.

Protected Oak Resources by the State of California and Nevada County

The Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.18 for Trees. Landmark trees are any native oak tree species (*Quercus* species) with a trunk diameter of 36" or greater at diameter breast height (dbh or 4'6"). Identifies landmark groves as hardwood tree groves with 33+% canopy closure, or groves whose size, visual impact, or association with a historically significant structure or event has caused it to be marked for preservation by the county, state, or federal government. Projects shall be approved only when they do not remove or disturb defined trees or groves, unless a Management Plan is prepared consistent with the Nevada County Land Use and Development Code for such trees. This Biological Report does not include an assessment of or proposed mitigation for potential impacts to such protected oak resources given the Centennial Site does not contain protected oak resources per the Nevada County Land Use and Development Code, which would require such an assessment and Management Plan.

Additionally, the Centennial Area does not contain protected oak resources per the State of California oak woodlands protections set forth in Public Resources Code Section 21083.4. Though the Centennial Area contains several species of native oak trees in very low densities, the conifer and hardwood woodlands within the Centennial Area are dominated by ponderosa pine, incense cedar, Douglas fir, and madrone. The most dominant native oak tree within the Centennial Area is the California black oak and it was not identified in the densities required to grant them protection under State of California law (10% canopy cover requirement) or under the Nevada County Land Use and Development Code (minimum 33% canopy cover). Therefore, protected oak resources are not discussed further in this Biological Report.

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Appendix A

Project Overview Area Figure

Figure. Centennial Industrial Site

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 300 feet

Legend

Centennial Industrial Site Study Area, 56.41 ac.

Appendix B

USDA Soils Map

Map Scale: 1:4,360 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ct	Cut and fill land	1.1	2.2%
Pr	Placer diggings	43.2	76.4%
RrE	Rock outcrop-Dubakella complex, 5 to 50 percent slopes	1.8	3.1%
ScE	Secca-Rock outcrop complex, 2 to 50 percent slopes	10.31	18.4%
Totals for Area of Interest		**56.41**	**100.0%**

Appendix C

National Wetland Inventory (NWI) Map

U.S. Fish and Wildlife Service
National Wetlands Inventory

NWI Centennial Industrial Site Project Area

December 7, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Appendix D

Vegetation Community Map

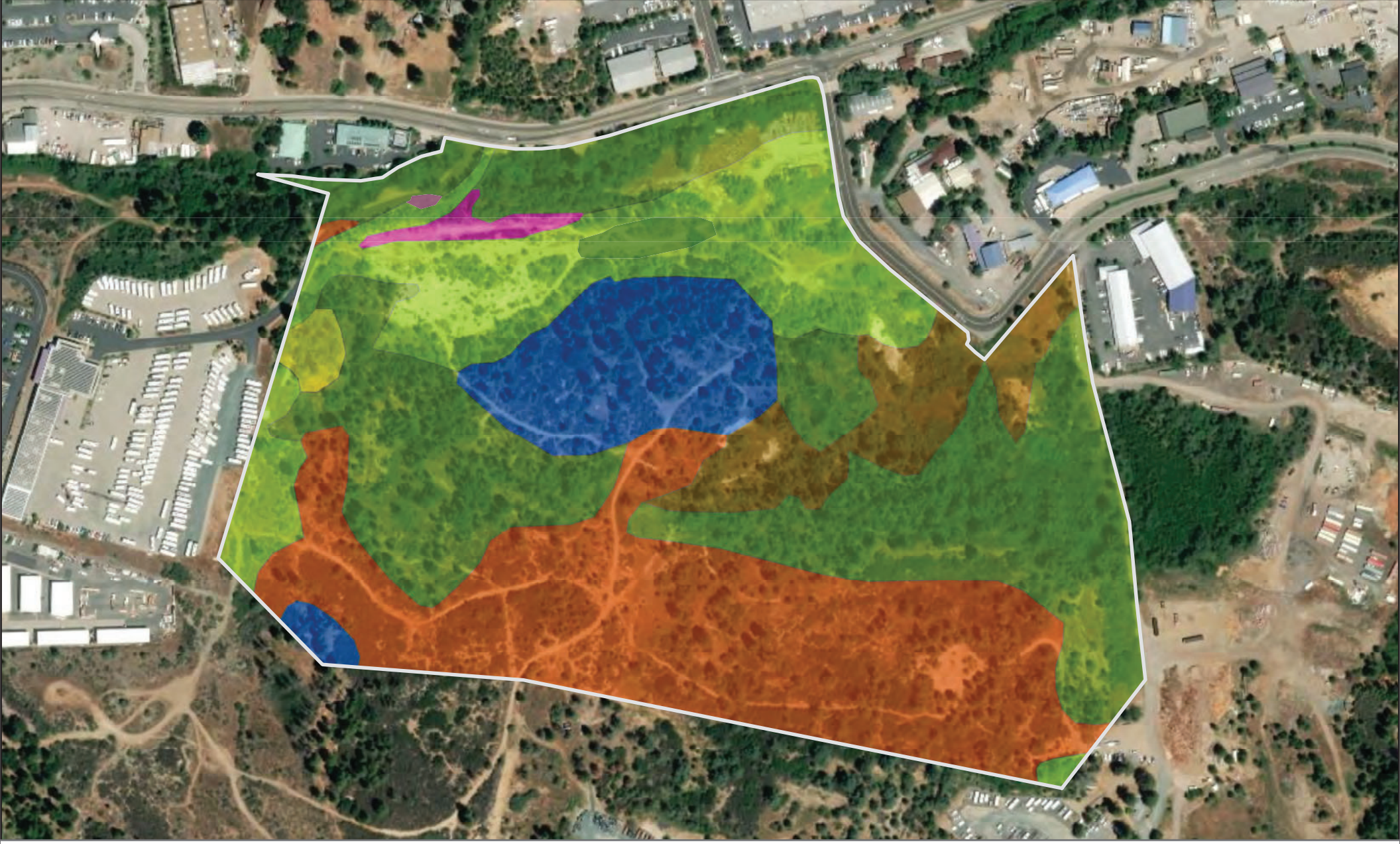


Figure. Vegetation Communities within the Centennial Industrial Site

Legend

- Centennial Industrial Site Study Area

Vegetation Type

- Annual Grassland
- Fresh Emergent Wetland
- Mixed Chaparral
- Montane Hardwood-Conifer
- Montane Hardwood
- Montane Riparian
- Wet Meadow

SCALE: 1 inch = 300 feet

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Appendix E

Plants Observed During Site Surveys

VASCULAR PLANTS OCCURRING IN CENTENNIAL SITE

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Acer macrophyllum	Bigleaf maple	native	Tree	-	FACU	-
Agoseris retrorsa	Spear leaved agoseris	native	perennial herb	-	-	-
Agrostis gigantea	Creeping bentgras	non-native	perennial grass	-	FAC	-
Ailanthus altissima	Tree of heaven	non-native (invasive)	Tree	-	FACU	Moderate
Aira caryophyllea	Silvery hairgrass	non-native (invasive)	annual grass	-	FACU	-
Allium amplectens	Narrow leaved onion	Native	perennial herb (bulb)	-	-	-
Alnus rhombifolia	White alder	Native	Tree	-	FACW	-
Ammi visnaga	Bisnaga	non-native	annual, biennial herb	-	-	-
Anaphalis margaritacea	Pearly everlasting	Native	perennial herb	-	FACU	-
Andropogon virginicus var. virginicus	Broomsedge bluestem	non-native	perennial grass	-	FAC	-
Arbutus menziesii	Madrono	Native	Tree	-	-	-
Arctostaphylos mewukka ssp. mewukka	Indian manzanita	Native	Shrub	-	-	-
Arctostaphylos viscida ssp. viscida	Smooth white leaf manzanita	Native	tree, shrub	-	-	-
Artemisia douglasiana	California mugwort	Native	perennial herb	-	FACW	-
Asclepias sp.	-	-	-	-	-	-
Asclepias speciosa	Showy milkweed	Native	perennial herb	-	FAC	-
Avena sp.	-	-	-	-	-	-
Baccharis pilularis	Coyote brush	Native	Shrub	-	-	-
Berberis aquifolium var. repens	Creeping oregon grape	Native	Shrub	-	FACU	-
Brodiaea minor	Low brodiaea	Native	perennial herb	-	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Brodiaea sierrae	Sierra foothills brodiaea	Native	perennial herb	Rank 4.3	-	-
Bromus hordeaceus	Soft chess	non-native (invasive)	annual grass	-	FACU	Limited
Bromus madritensis	Foxtail chess, foxtail brome	non-native	annual grass	-	FACU	-
Calocedrus decurrens	Incense cedar	Native	Tree	-	-	-
Calycadenia multiglandulosa	Rosin weed	Native	annual herb	-	-	-
Carex feta	Green sheathed sedge	Native	perennial grasslike herb	-	FACW	-
Ceanothus cuneatus	Buck brush	Native	Shrub	-	-	-
Ceanothus integerrimus	Deer brush	Native	Shrub	-	-	-
Ceanothus lemmonii	Lemmon's ceanothus	Native	Shrub	-	-	-
Centaurea solstitialis	Yellow starthistle	non-native (invasive)	annual herb	-	-	High
Centaurium tenuiflorum	Slender centaury	non-native	annual herb	-	FACW	-
Centranthus sp.	-	-	-	-	-	-
Centromadia fitchii	Spikeweed	Native	annual herb	-	FACU	-
Chlorogalum pomeridianum	Amole	Native	perennial herb	-	-	-
Chondrilla juncea	Skeleton weed	non-native (invasive)	perennial herb	-	-	Moderate
Cichorium intybus	Chicory	non-native	perennial herb	-	FACU	-
Cirsium vulgare	Bullthistle	non-native (invasive)	perennial herb	-	FACU	Moderate
Cornus nuttallii	Mountain dogwood	Native	Shrub	-	FACU	-
Cornus sericea	American dogwood	Native	Shrub	-	FACW	-
Cortaderia jubata	Andean pampas grass	non-native (invasive)	perennial grass	-	FACU	High
Crataegus monogyna	Hawthorn	non-native (invasive)	Shrub	-	FAC	Limited
Croton setiger	Turkey-mullein	Native	perennial herb	-	-	-
Cynodon dactylon	Bermuda grass	non-native (invasive)	perennial grass	-	FACU	Moderate
Cynosurus echinatus	Dogtail grass	non-native (invasive)	annual grass	-	-	Moderate
Cyperus eragrostis	Tall cyperus	Native	perennial grasslike herb	-	FACW	-
Dactylis glomerata	Orchardgrass	non-native (invasive)	perennial grass	-	FACU	Limited

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Danthonia californica	California oatgrass	Native	perennial grass	-	FAC	-
Deschampsia elongata	Hairgrass	Native	perennial grass	-	FACW	-
Elymus caput-medusae	Medusa head	non-native	annual grass	-	-	-
Elymus elymoides	Squirrel tail grass	Native	perennial grass	-	FACU	-
Elymus hispidus	Intermediate wheatgrass	non-native	perennial grass	-	-	-
Epilobium sp.	-	-	-	-	-	-
Epipactis gigantea	Stream orchid	Native	perennial herb	-	OBL	-
Eriodictyon californicum	Yerba santa	Native	Shrub	-	-	-
Eriophyllum lanatum	Wooly sunflower	Native	perennial herb	-	-	-
Euthamia occidentalis	Western goldenrod	Native	perennial herb	-	FACW	-
Festuca arundinacea	Reed fescue	non-native (invasive)	perennial grass	-	FAC	Moderate
Festuca idahoensis	Blue fescue	Native	perennial grass	-	FACU	-
Festuca microstachys	Small fescue	Native	annual grass	-	-	-
Ficus sp.	-	-	-	-	-	-
Frangula californica ssp. tomentella	Hoary coffeeberry	Native	Shrub	-	-	-
Frangula rubra	Red buckthorn	Native	Shrub	-	-	-
Fremontodendron decumbens	Pine hill flannelbush	Native	Shrub	FE, SR, Rank 1B.2	-	-
Galium porrigens	Climbing bedstraw	Native	vine, shrub	-	-	-
Gamochaeta sp.	-	-	-	-	-	-
Garrya fremontii	Fremont's silk tassel	Native	Shrub	-	-	-
Grindelia camporum	Gumweed	Native	perennial herb	-	FACW	-
Grindelia sp.	-	-	-	-	-	-
Hedera helix	English ivy	non-native (invasive)	vine, shrub	-	FACU	-

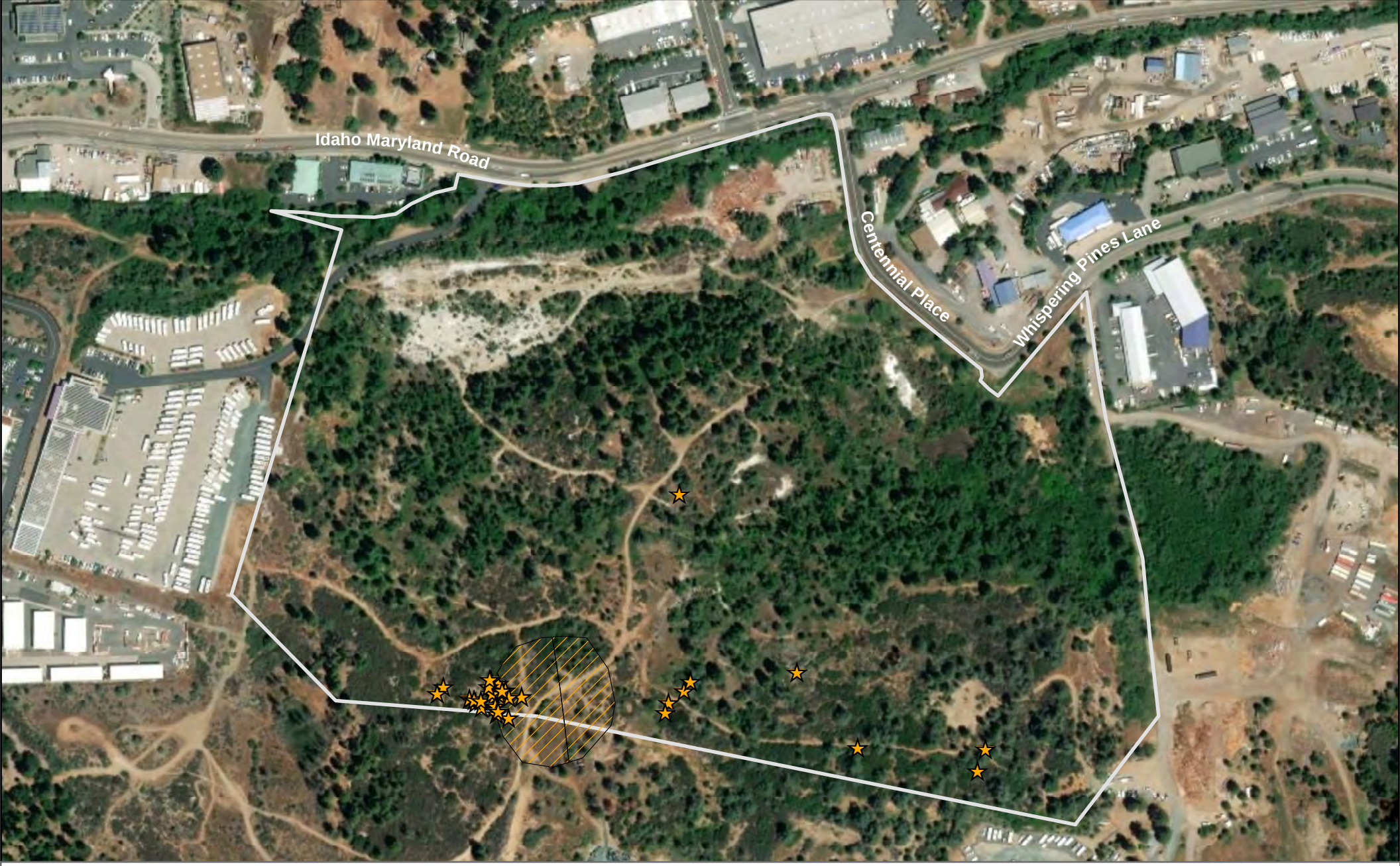
Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Hemizonella minima	Opposite leaved tarweed	Native	annual herb	-	-	-
Hesperocyparis macnabiana	Macnab cypress	Native	tree, shrub	-	-	-
Hirschfeldia incana	Mustard	non-native (invasive)	perennial herb	-	-	Moderate
Holcus lanatus	Common velvetgrass	non-native (invasive)	perennial grass	-	FAC	Moderate
Hypericum perforatum ssp. perforatum	Klamathweed	non-native	perennial herb	-	FACU	-
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	-	FACU	Moderate
Juncus articulatus ssp. articulatus	Jointed rush	Native	perennial grasslike herb	-	OBL	-
Juncus balticus ssp. ater	Baltic rush	Native	perennial grasslike herb	-	FACW	-
Juncus confusus	Colorado rush	Native	perennial grasslike herb	-	FAC	-
Juncus effusus ssp. pacificus	Pacific rush	Native	perennial grasslike herb	-	FACW	-
Juncus trilocularis	-	Native	annual grasslike herb	-	-	-
Lactuca serriola	Prickly lettuce	non-native (invasive)	annual herb	-	FACU	-
Lathyrus latifolius	Sweet pea	non-native	perennial herb	-	-	-
Leontodon saxatilis	Hawkbit	non-native	annual herb	-	FACU	-
Leucanthemum vulgare	Oxe eye daisy	non-native (invasive)	perennial herb	-	FACU	Moderate
Lilium humboldtii ssp. humboldtii	Humboldt lily	Native	perennial herb	Rank 4.2	-	-
Lonicera hispidula	Pink honeysuckle	Native	vine, shrub	-	FACU	-
Lonicera interrupta	Chaparral honeysuckle	Native	vine, shrub	-	-	-
Lotus corniculatus	Bird's foot trefoil	non-native (invasive)	perennial herb	-	FAC	-
Lysimachia arvensis	Scarlet pimpernel	non-native	annual herb	-	FAC	-
Madia gracilis	Gumweed	Native	annual herb	-	-	-
Melica californica	California melic	Native	perennial grass	-	-	-
Melilotus albus	White sweetclover	non-native (invasive)	annual, biennial herb	-	-	-
Muhlenbergia rigens	Deergrass	Native	perennial grass	-	UPL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Panicum sp.	-	-	-	-	-	-
Parthenocissus sp.	-	-	-	-	-	-
Penstemon heterophyllus	Foothill penstemon	Native	perennial herb	-	-	-
Pickeringia montana	Chaparral pea	Native	Shrub	-	-	-
Pinus ponderosa	Yellow pine	Native	Tree	-	FACU	-
Pinus sabiniana	Bull pine	Native	Tree	-	-	-
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	-	FACU	Limited
Polygala cornuta	Sierra milkwort	Native	perennial herb	-	FACW	-
Polypogon sp.	-	-	-	-	-	-
Populus fremontii ssp. fremontii	Cottonwood	Native	Tree	-	FAC	-
Poterium sanguisorba	Garden burnet	non-native	perennial herb	-	UPL	-
Prunella vulgaris	Self heal	Native	perennial herb	-	FACU	-
Prunus subcordata	Sierra plum	Native	tree, shrub	-	-	-
Pyracantha sp.	-	-	-	-	-	-
Quercus garryana var. semota	Oregon white oak	Native	Tree	-	FACU	-
Rhamnus crocea	Redberry	Native	Shrub	-	-	-
Rosa canina	Dog rose	non-native	Shrub	-	-	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	Shrub	-	FACU	High
Rubus leucodermis	White bark raspberry	Native	Shrub	-	FACU	-
Rumex crispus	Curly dock	non-native (invasive)	perennial herb	-	FAC	Limited
Salix exigua	Narrowleaf willow	Native	tree, shrub	-	FACW	-
Salix laevigata	Polished willow	Native	Tree	-	FACW	-
Salix lasiolepis	Arroyo willow	Native	tree, shrub	-	FACW	-
Salvia sonomensis	Sonoma sage	Native	perennial herb	-	-	-
Schoenoplectus acutus var. occidentalis	Tule	Native	perennial grasslike herb	-	OBL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Scutellaria tuberosa	Dannie's scullcap	Native	perennial herb	-	-	-
Solidago sp.	-	-	-	-	-	-
Toxicodendron diversilobum	Poison oak	Native	vine, shrub	-	FAC	-
Tragopogon dubius	Goat's beard	non-native (invasive)	perennial herb	-	-	-
Trichostema lanceolatum	Vinegarweed	Native	annual herb	-	FACU	-
Trifolium hirtum	Rose clover	non-native (invasive)	annual herb	-	-	Limited
Trifolium sp.	-	-	-	-	-	-
Triteleia hyacinthina	Wild hyacinth	Native	perennial herb	-	FAC	-
Typha domingensis	Cattail	Native	perennial herb	-	OBL	-
Verbascum blattaria	Moth mullein	non-native	perennial herb	-	UPL	-
Verbascum thapsus	Woolly mullein	non-native (invasive)	perennial herb	-	FACU	Limited
Vitis californica	California wild grape	Native	vine, shrub	-	FACU	-
Wyethia angustifolia	Narrow leaved mule ears	Native	perennial herb	-	FACU	-
Wyethia bolanderi	Bolander's wyethia	Native	perennial herb	-	-	-

Appendix F

Pine Hill Flannelbush and CNPS List 4 Species Locations Figures



Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Figure. Pine Hill Flannelbush Occurrences Within the Centennial Industrial Site

SCALE: 1 inch = 300 feet

Legend

- Pine HIll flannelbush (individuals or clusters)
- CNDDB mapped extant of Pine Hill flannelbush*
- **Centennial Industrial Site Study Area**

***The mapped extent from digitization of 1999 paper map by Karen Callahan is likely cause for part of discrepency.**

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Figure. CRPR 4 Plants: Sierra brodiaea and Humboldt lily Occurrences Within the Centennial Industrial Site

SCALE: 1 inch = 300 feet

Legend

Scientific

- Sierra brodieae
- Humboldt LIly
- **Centennial Industrial Site Study Area**

Note: each point may represent multiple individuals

Appendix G

Aquatic Resources Delineation Results

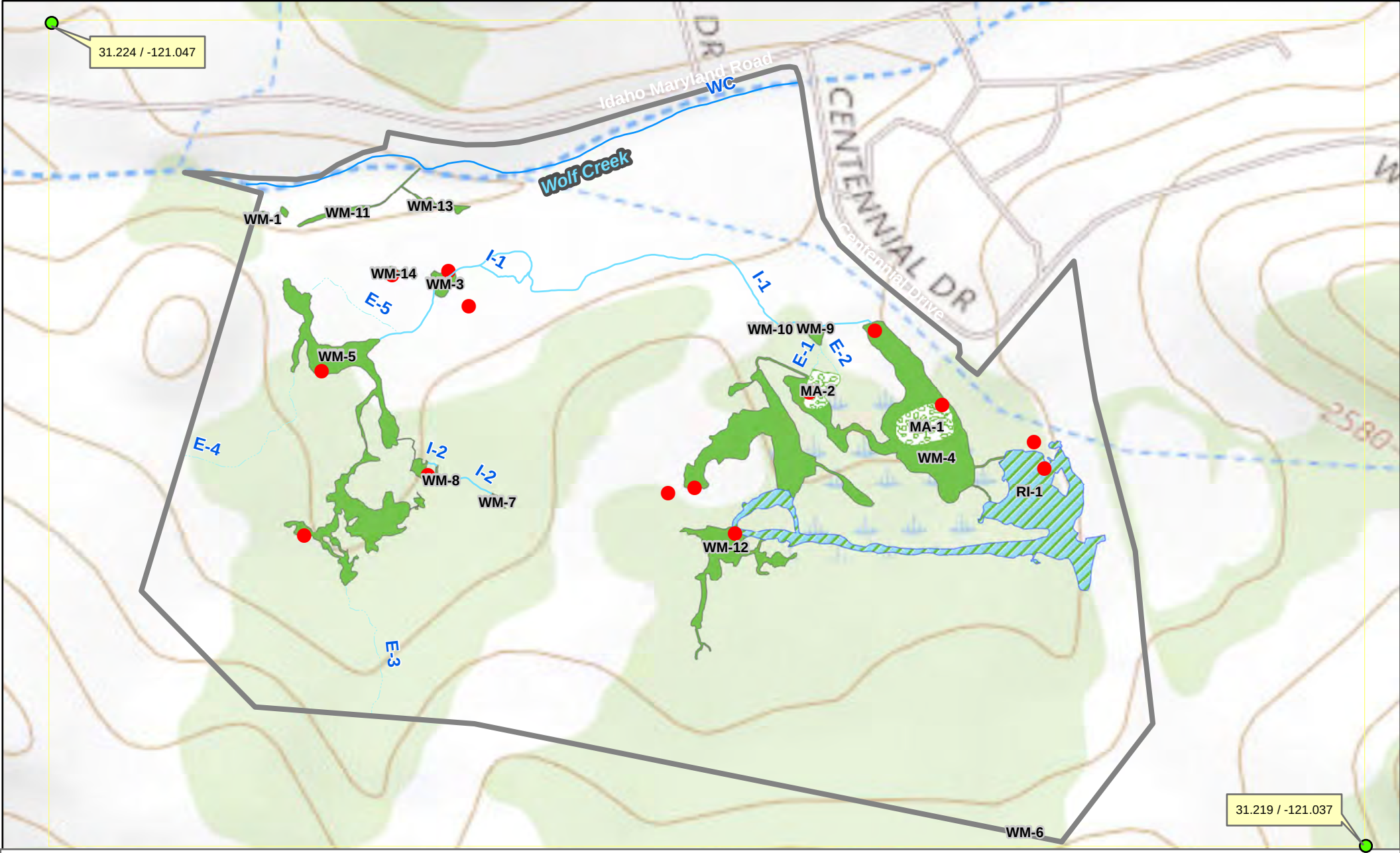


Figure. Centennial Industrial Site Study Area, Aquatic Resource Overview, USGS basemap.

Grass Valley, CA (APNs 009-550-037-000, 009-550-036-000, 009-550-032-000 & 009-550-038-000)
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 275 feet

0 55 110 220 330 440
Feet

This delineation has been conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual and the Western Mountains Regional Supplement (2010). The identification of ordinary high water mark (OHWM) was based on A Guide to Ordinary High Water Mark (OHWM) for Non-Perennial Streams in the Western Mountains (2014).

Created August 31, 2020.

Legend

= Study Area, 56.4 ac.

Streams
=Ephemeral, 1,090 ft., 0.05 ac.
=Intermittant, 1,616 ft., 0.17 ac.
=Perennial,1,262 ft., 0.38 ac.

= Data point

Wetlands
= Marsh (MA), 0.31 acres
= Meadow (WM), 2.88 acres
= Riparian (RI), 1.18 acres

Appendix H

Photo Log

Photos of Field Surveys of the Centennial Industrial Site

Photo 1. Spring within the western section of the Centennial Industrial Site.

Photo 2. Annual grassland area within the northwestern section of the Centennial Industrial Site.

Photo 3. Mapped drainage with adjacent annual grassland in the northern/northwestern section of the Centennial Industrial Site.

Photo 4. Roadside wet meadow wetlands in the western section of the Centennial Industrial Site.

Photo 5. Wet meadow wetland and ephemeral drainage within the northwestern section of the Centennial Industrial Site.

Photo 6. Chaparral and annual grasslands in the western section of the Centennial Industrial Site.

Photo 7. Wetlands, woodlands, and annual grasslands in the central section of the Centennial Industrial Site.

Photo 8. Marsh wetland habitat for California red-legged frog, California black rail, and western pond turtle in the eastern section of the Centennial Industrial Site.

Photo 9. Ponded marsh wetland habitat for California red-legged frog, California black rail, and western pond turtle in the eastern section of the Centennial Industrial Site.

Photo 10. Wet meadow wetland area in the eastern section of the Centennial Industrial Site.

Photo 11. Large montane riparian area in the eastern section of the Centennial Industrial Site.

Photo 12. Edge of large montane riparian area in the eastern section of the Centennial Industrial Site.

Photo 13. Disturbed area in the western section of the Centennial Industrial Site.

Photo 14. Large area of montane riparian wetlands within the eastern section of the Centennial Industrial Site.

Photo 15. Mixed chaparral and montane hardwood-conifer vegetation communities within the southwestern section of the Centennial Industrial Site.

Photo 16. Mixed chaparral vegetation community within the southern section of the Centennial Industrial Site.

Photo 17. Mixed chaparral and montane hardwood-conifer vegetation communities within the southwestern section of the Centennial Industrial Site. Photo looking north.

Photo 18. Mixed chaparral and montane hardwood-conifer vegetation communities within the southwestern section of the Centennial Industrial Site. Photo looking northeast.

Appendix I

CNPS Ranked Plants and Species Table for Special-Status Plant and Wildlife Species

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Stebbins' morning-glory *Calystegia stebbinsii*	--/--/1.B2	Gabbroic or serpentinite soils. Openings in chaparral, cismontane woodland, lower montane coniferous forest, from 980-4,330 feet.	Apr- Jul	**Low.** Potential for occurrence in openings and under chaparral in gabbroic soils. Known 4 miles to east on gabbroic chaparral on Oceola Ridge. Was not observed during targeted 2019 field surveys.
Sierra arching sedge *Carex cyrtostachya*	--/--/1B.2	Lower montane mesic coniferous forest, meadows and seeps, marshes and swamps, Riparian forests (margin), from 2,000-4,460 feet.	May -Aug	**Low.** Potential for occurrence in mesic forests. Within the known distributional and elevational range for this species, though nearest known occurrence 16 miles to the north. This species was recently described so the full extent of its range and distribution are unlikely yet known. Marginal habitat present in study area, and it was not observed during 2019 field surveys.
Chaparral sedge *Carex xerophila*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 1,400 – 2,525 feet.	Mar- Jun	**Low.** Potential for occurrence in openings and under chaparral in gabbroic soils. Known 4 miles away on Oceola Ridge in gabbroic chaparral. Was not observed during 2019 field surveys.
Red Hills soaproot *Chlorogalum grandiflorum*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 800 – 5,545 feet.	May-Jun	**Low.** Potential for occurrence in openings and under chaparral in gabbroic soils. Known over 10 miles south in Bunch Canyon south of Colfax, with no known occurrences to north. Was not observed during 2019 field surveys.
Pine Hill flannelbush *Fremontodendron decumbens*	FE/CR/1B.2	Chaparral, cismontane woodland on serpentinite and gabbroic substrates, from 1,390 – 2,495 feet.	Apr- July	**High.** Potential for occurrence in openings and under chaparral in gabbroic soils in Idaho Maryland study area. Known from study area from CNDDB Occurrence #14. Field surveys in 2019 expanded boundaries of known occurrence.

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Butte County fritillary *Fritillaria eastwoodiae*	--/--/3.2	Openings in chaparral, cismontane woodland, and lower montane coniferous forest, sometimes serpentinite, from 160-4,920 feet.	Mar-Jun	**Low.** Potential for occurrence in open areas in the study area. There is a 1979 record for this species on the south side of the South Yuba River canyon approximately 7 miles north of the study area, and other occurrences on the Washington Ridge. Surveys were not conducted during the appropriate phenological period for this species (April-May), but fruits would have been visible for individuals from this genus and they were not observed during 2019 field surveys.
Finger rush *Juncus digitatus*	--/--/1B.1	Seasonal wet areas, cismontane woodland openings, openings in lower montane coniferous forest, xeric vernal pools, from 2,165-2,590 feet.	Apr-Jun	**Low.** Potential for the occurrence in gravelly, seasonally moist openings. Known less than one mile to the north near the intersection of Idaho Maryland and Brunswick. Was not observed during 2019 field surveys.
Dubious pea *Lathyrus sulphureus* var. *argillaceus*	--/--/3	Cismontane woodland, Lower montane coniferous forest, Upper montane coniferous forest, from 490-3,050 feet.	Apr-May	**Low.** Potential to occur in forested areas. Known within 3 miles of study areas from a 1926 collection. Also known to SW 5 miles away near Wolf Mountain. Plant list from 2006 surveys have a *Lathyrus sulfureus* with no variety designation, but not observed during 2019 surveys.
Cantelow's lewisia *Lewisia cantelovii*	--/--/1B.2	Moist, granitic areas in broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest mesic, sometimes serpentinite seeps, from 1,080-4,495 feet.	May-Oct	**Low.** Potential for occurrence in any rocky outcrops with seeps on the parcel. There are records for this species in the Middle Yuba and South Yuba river canyons within 7 miles of the study area. The preferred habitat for this species in the study area has been disturbed and is of reduced quality. Was not observed during 2019 field surveys.
Cedar Crest popcornflower *Plagiobothrys glyptocarpus* var. *modestus*	--/--/3	Cismontane woodland, valley and foothill grasslands (mesic), from 2,850-2.855 feet.	Apr-Jun	**Moderate.** Known from historic collection potentially from nearby Cedar Ridge. Also known from historic collections in Nevada City. Suitable habitat for this species is present. Was not observed during 2019 field surveys.

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Sierra blue grass *Poa sierrae*	--/--/1B.3	Openings in lower montane coniferous forest, 1,195-4,920 feet.	Apr-Jul	**Low.** There is only marginal suitable habitat for this species in the study area, primarily in the ponderosa pine forest, and in the forested areas along Wolf Creek. Known from Steephollow Creek from a collection from 1964. Was not observed during 2019 field surveys.
Brownish beaked-rush *Rhynchospora capitellata*	--/--/2B.2	Wet areas (marshes, swamps, meadows, and seeps) in montane coniferous forest, from 145-6,560 feet.	Jul-Aug	**Low.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.
Scadden Flat checkerbloom *Sidalcea stipularis*	--/CE/1B.1	Marshes and swamps (montane freshwater), from 2,295-2,395 feet.	Jul-Aug	**Low.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.

[1]Status explanations:

FE = Federally Endangered
CR = State Rare
CE = State Endangered
-- = no listing.

California Native Plant Society Rare Plant Rank (formerly known as CNPS lists)
1B = Rank 1B species: rare, threatened, or endangered in California and elsewhere.
2B = Rank 2B species: rare, threatened, or endangered in California but more common elsewhere.
3 = Rank 3 species are taxonomically problematic and lack the necessary information to assign them to one of the other ranks.
4 = Rank 4 plants are of limited distribution or infrequent throughout a broader area in California; should be monitored regularly.
Source: CNPS 2019; CNDDB 2019; USFWS 2019, and Calflora 2019.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Amphibians			
California red-legged frog *Rana draytonii*	FT/SSC	Found in permanent and semi-permanent aquatic habitats, such as creeks and ponds, with emergent and submergent vegetation. May aestivate in rodent burrows or cracks during dry periods. Along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats within the eastern section of the Centennial Site contain marginal suitable habitat for the species.
Foothill yellow-legged frog *Rana boylii*	SCT/SCC	Perennial rocky (pebble or cobble) streams with cool, clear water in a variety of habitats from valley and foothill oak woodland, riparian forest, ponderosa pine, mixed conifer, coastal scrub, and mixed chaparral at elevations ranging from 0 to 6,370 feet. Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet south to Kern County	**Very Low**; however, the main stem of Wolf Creek within the northern section of the Centennial Site contains marginal suitable habitat for the species.
Reptiles			
Western pond turtle *Emys marmorata*	--/SSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation, below 6,000 feet in elevation. Populations extend throughout the coast and central valley of California.	**High.** Potential for occurrence in areas near water, including Wolf Creek and perennial aquatic resources such as the freshwater emergent marsh habitats within the eastern section of the Centennial Site.
Coast horned lizard *Phrynosoma blainvillii*	--/SSC	Associated with open patches of sandy soils in washes, chaparral, scrub, and grasslands.	**Moderate**. Potential for occurrence in areas with appropriate habitat within the Centennial Site, including open chaparral habitats.
Mammals			
Townsend's big-eared bat *Corynorhinus townsendii*	--/SSC	Associated with lower montane coniferous and mixed conifer forest habitats where abandoned buildings and structures occur for roosting.	**Low.** Potential for occurrence in areas containing abandoned structures, including the existing decant structure in the northwestern section of the Centennial Site.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Birds			
California black rail *Laterallus jamaicensis coturiculus*	--/CT	California black rail inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. The species requires water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats within the eastern section of the Centennial Site contain marginal suitable habitat for the species.
Cooper's hawk *Accipiter cooperii*	MBTA/CDFW Watch List	Cooper's hawks are forest and woodland birds. These hawks are a regular sight in parks, quiet neighborhoods, over fields, at backyard feeders, and even along busy streets if there are trees present.	**Moderate**; however, the woodland habitats within the Centennial Site contain marginal suitable habitat for the species.
Invertebrates			
Western bumble bee *Bombus occidentalis*	--/--	Western bumble bee was documented approximately 3 miles northeast of Nevada City (4+ miles from the Centennial Site) in 1968. It is known from a single collection on May 20th of that year. This species is of conservation concern and is listed as S1, Critically Imperiled, by NatureServe and is listed on the CNDDB.	**Very Low.** Unlikely to occur in the Centennial Site or surrounding region.

[1]Status explanations:

-- = no listing.

Federal

BCC = federal Bird of Conservation Concern

FPT = federal proposed threatened under the federal Endangered Species FT
= listed as threatened under the federal Endangered Species Act.

State

FP = state fully protected

SCT = state candidate for listing as threatened under the California Endangered Species SE
= listed as endangered under the California Endangered Species Act.

SSC = state species of special concern

ST = listed as threatened under the California Endangered Species Act.

Source: CNDDB 2019 and USFWS 2019

Appendix J

CNDDB 5-Mile Buffer Figure

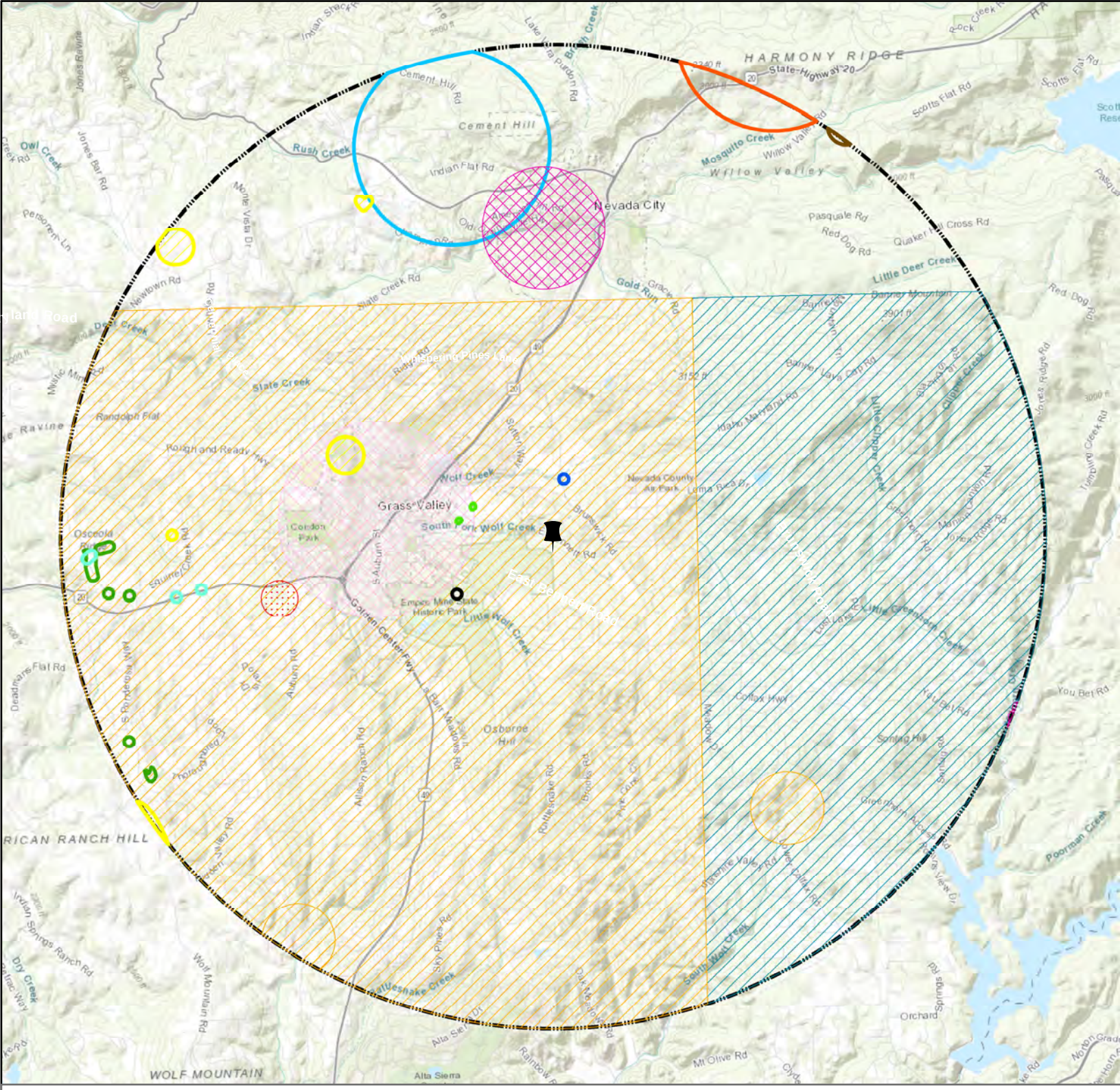


Figure. Known Occurrences of Special Status Species within 5 Miles of the Centennial Site

Legend

FiveMileProjectBuffer

Project Area

Common Name, Scientific Name, FESA, CESA, CNPS

- Brandegee's clarkia, Clarkia biloba ssp. brandegeeae, none, none, 4.2
- California black rail, Laterallus jamaicensis coturniculus, none, Threatened
- Cooper's hawk, Accipiter cooperii, none, none
- Pine Hill flannelbush, Fremontodendron decumbens, Endangered, Rare, 1B.2
- Scadden Flat checkerbloom, Sidalcea stipularis, none, Endangered, 1B.1
- Stebbins' morning-glory, Calystegia stebbinsii, Endangered, Endangered, 1B.1
- Townsend's big-eared bat, Corynorhinus townsendii, none, none
- brownish beaked-rush, Rynchospora capitellata, none, none, 2B.2
- chaparral sedge, Carex xerophila, none, none, 1B.2
- coast horned lizard, Phrynosoma blainvillii, none, none
- dubious pea, Lathyrus sulphureus var. argillaceus, none, none, 3
- finger rush, Juncus digitatus, none, none, 1B1
- foothill yellow-legged frog, Rana boylii, none, Candidate Threatened
- western bumble bee, Bombus occidentalis, none, none

0 1 2 Miles

1 in = 1 miles

Appendix K

USFWS iPac Report

IPaC **U.S. Fish & Wildlife Service**

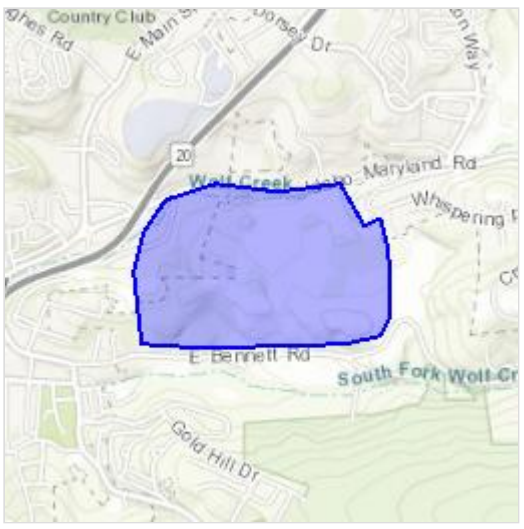
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Nevada County, California



Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

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Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Flowering Plants

NAME	STATUS
Pine Hill Flannelbush Fremontodendron californicum ssp. decumbens No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4818	Endangered
Stebbins' Morning-glory Calystegia stebbinsii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3991	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

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Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Cassin's Finch Carpodacus cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Lewis's Woodpecker Melanerpes lewis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Olive-sided Flycatcher Contopus cooperi This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Rufous Hummingbird selasphorus rufus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8002	Breeds elsewhere
Willow Flycatcher Empidonax traillii This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3482	Breeds May 20 to Aug 31

Probability of Presence Summary

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The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

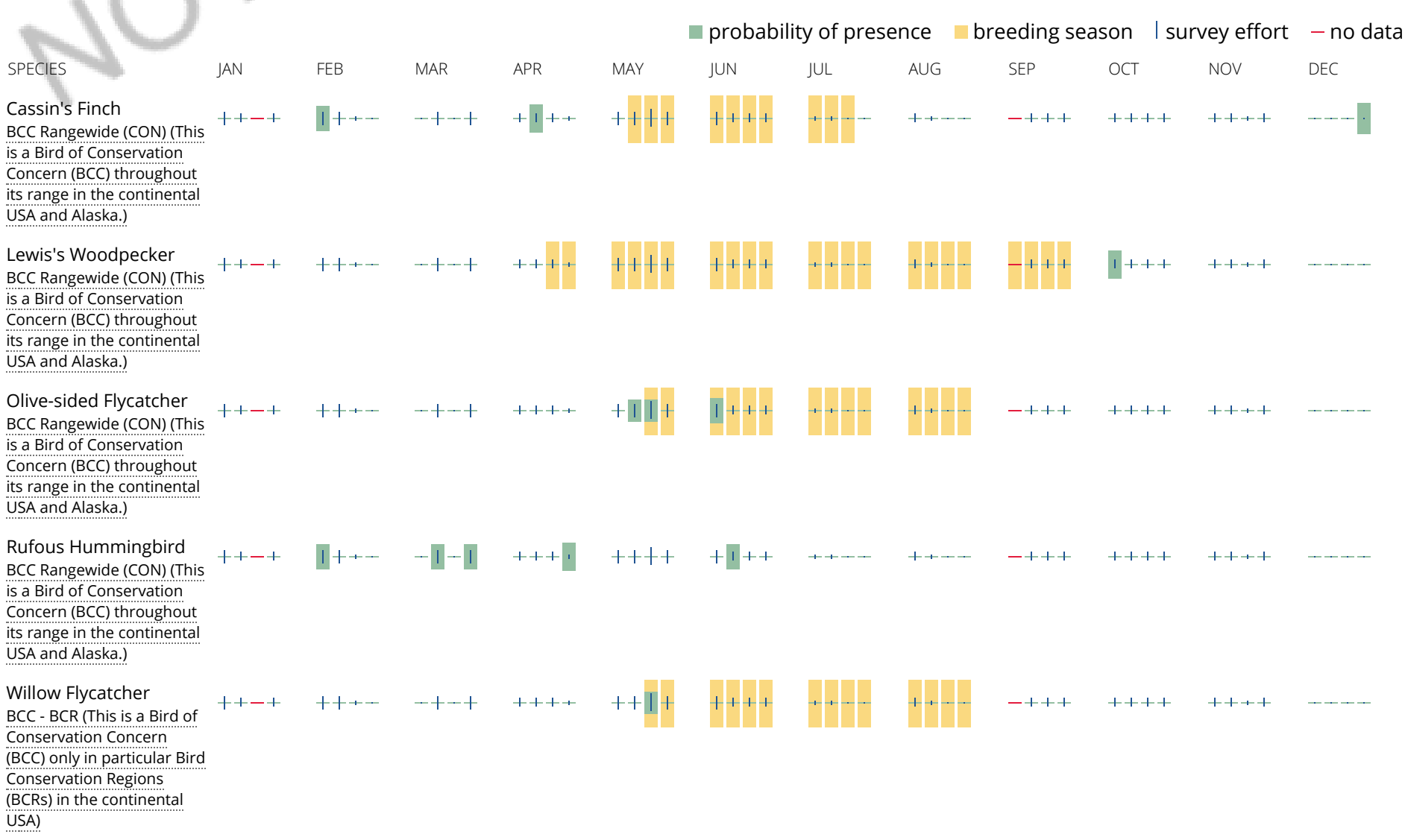
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

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Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in

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knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1A

FRESHWATER FORESTED/SHRUB WETLAND

PFOC

RIVERINE

R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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APPENDIX G
DRAINAGE STUDY

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President

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Engineering • Surveying • Planning

RISE GRASS VALLEY INC.

HYDROLOGY & HYDRAULIC CALCULATIONS

for

Preliminary Drainage Analysis
&
Detention Basin Sizing
for
Centennial & Brunswick Sites

October 2019

PRELIMINARY DRAINAGE ANALYSIS
&
DETENTION BASIN SIZING
For
Centennial Industrial Site & Brunswick Industrial Site

Executive Summary

The following Preliminary Drainage Analysis has been prepared by Nevada City Engineering, Inc. ("NCE") as supporting documentation for the Preliminary Grading Plans related to the Use Permit Application by Rise Grass Valley Inc. ("Rise") in anticipation of the re-opening of portions of the former Idaho Maryland Mine, located in unincorporated territory of Nevada County, CA. Rise Grass Valley Inc. plans to re-open mining operations from a new facility to be located on the site of the former New Brunswick Shaft, located southwest of the intersection of Brunswick Road and East Bennett Road. Rise plans to use materials generated from underground tunneling and ore processing as engineered fill which will be placed and compacted in areas of the Centennial and Brunswick Industrial Sites. When operations are completed it is planned that the engineered fill areas will be redeveloped as industrial park facilities, ultimately adding lasting economic benefit to western Nevada County. It should be noted that final development as an industrial park facility is not part of the Use Permit Application by Rise. During the active period of mining operations, water from the underground mine will be treated on site before being discharged to South Fork Wolf Creek. This Drainage and Detention Study anticipates a peak flow rate of 2,500 gallons per minute (gpm) or 5.6 cubic feet per second (cfs) from the dewatering operation. The detention basin for the Brunswick Site is sized to detain storm flows to compensate for the quantity of treated mine water discharged to South Fork Wolf Creek, in addition to compensating for increased runoff from ultimate development of the site. The hydrologic calculations and detention studies for both sites anticipate runoff at full development. Therefore, when mining operations are completed and the sites are developed as industrial parks, all potential increases in runoff due to increases in impervious surfaces (pavement and buildings) will already be accounted for. Moreover, the drainage calculations and detention basins are specifically designed to respond to the drainage requirements of the County of Nevada and consist of Hydrologic Calculations and a Detention Study. Detailed hydraulic calculations, other than for the reservoir routing analysis contained in the Detention Study, have been omitted at this time as additional storm drain pipes that will convey site drainage flows to the detention basins will ultimately be designed to flow at less than their total capacity. Therefore, the overall system will function hydraulically as intended.

Post project storm-water discharge from both the Centennial and Brunswick Sites, including, in the case of the Brunswick Site, the treated mine water discharge of 5.6 cfs will be equal to or less than the estimated pre-project storm-water discharge levels. Therefore, with the construction of the storm-water detention ponds, the project will have no impact or increase of flows in creeks during storm events. Following is a Summary Table of Pre- and Post-Development Storm-Water flows from the location of the Brunswick Site.

Summary Table of Pre- and Post-Development Storm-Water Flows, Brunswick Site:

Storm Event	Pre-Development current	Post Development with detention and 5.6 cfs mine water discharge
2 year	79 cfs	36 cfs
10 year	140 cfs	84 cfs
25 year	195 cfs	158 cfs
100 year	227 cfs	207 cfs

Hydrologic Calculations

For the drainage basins identified on the attached Hydrology Maps as Drainage Areas >A-1= and >A-2', and >B-1' through >B-3', hydrologic calculations were developed utilizing the unit hydrograph method as contained in the Pond Pack Version 8i computer program. In accordance with the requirements of the County of Nevada's Use Permit Application process, values for the 10-year and 100-year frequency storms were developed using the County of Nevada's Design Storm Depth tables for a 24 hour storm as contained in County of Nevada, Department of Transportation Standard Drawings D-13 and D-14. Depths for a Mean Annual Precipitation of 56" were used (6.80" for Q-10, and 9.64" for Q-100). At the request of Rise Grass Valley Inc., NCE has also included analyses for the 2-year, and 25-year storms at the Brunswick site. Design storm depths for these events were attained from information published on the National Oceanic and Atmospheric Administration (NOAA) "Hydrometeorological Design Studies Center, Precipitation Frequency Data Server" website for the specific location of the Brunswick Site. For the Brunswick Site the depths were 4.73" for the 2-year storm and 8.59" for the 25-year storm.

To develop the storm hydrographs for each storm event at each site, Runoff Curve Numbers consistent with County of Nevada Standard Drawing D-16 were generated for each drainage subarea based on existing land use and vegetative conditions for the pre-development analyses. Similarly, post-development curve numbers were generated based on anticipated ultimate development for each site. Governing Times of Concentration for each drainage area were developed in accordance with County of Nevada Standard Drawing D-9 as a further input into the program.

The layouts of the storm drain systems are designed to capture flows from newly developed portions of the sites (Drainage Areas >A-1' and 'B-1' and 'B-2') routing them into and through the proposed detention basins and into proposed 60" diameter outlet riser structures. They are also designed to bypass flows from certain undeveloped and/or unchanged portions of the sites' upstream areas, along with flows from some off-site upstream tributary areas, which do not change from historic pre-development conditions. These consist of Drainage Areas 'A-2' and 'B-3'.

Detention Study

Input for the Detention Study was prepared by Nevada City Engineering, Inc. utilizing the hydrology developed as described above. The storm flows collected by the proposed on-site storm drain systems were then routed through the proposed detention basins into 60" diameter CSP (corrugated steel pipe) outlet riser structures. The results indicated reductions of peak flows ranging from 8.9% to 54.4%. The specifics of these reductions are summarized on Page 7 of the Detention Study. The total drainage areas mitigated by the proposed detention basins consist of 66.86 acres for the Centennial Site, and 126.69 acres for the Brunswick Site, in their post-development conditions. Consequently, the impact of the detention basins is to reduce the flow emanating from the developed areas of the sites to less than pre-development levels. The drainage systems draining off-site areas for which the pre- and post-development flows do not change are designed to bypass the detention basins resulting in no net impact to downstream properties.

Grading Process

Grading Plans at 1"=100' scale for both sites are included with the Use Permit Submittal. The Grading Plans demonstrate, in addition to the layout of the Brunswick Site and processing facilities, the completed engineered fill operation grading and the related drainage systems which are analyzed in this report. On-site fills are proposed to be constructed at a slope ratio of 3:1. Under this scenario, due to the relatively mild gradient, mid slope benches will not be required. Where slope banks are great enough in height to require mid-slope interceptor ditches, "J" Ditches as indicated on the detail included on Page 14 of this study will be provided. These will eliminate any likelihood of erosion occurring on the slope faces. Additionally, the 3:1 slopes have a softer, more natural look which will make the proposed ultimate development of the engineered fill areas into industrial parks more aesthetically pleasing than benched slopes. These flatter slopes will also enhance the viability of landscaping and vegetative efforts on those slopes.

The proposed detention basins at each site are intentionally located at the downstream toe of each fill site. This is done so that they may be constructed and made functional relatively early in the process of the fill operations. Therefore, as the fill areas rise throughout the anticipated duration of this portion of the mining operation, flows will be directed to these facilities via the drainage pipes which proceed downhill from the surface of the fill, allowing the flows to be directed to the detention basins. These pipes in the proposed 3:1 slope, at any given point in the process of placing the fills, will be extended up slope from the detention basins to the then current surface. Interceptor ditches and catchment sumps will be formed at the surface, as indicated on the Grading Plans, and will be replaced periodically as the fill operation progresses and the surface elevation rises. By this strategy, site drainage will continually be positively controlled throughout the process of the engineered fill placement operation.

SMARA (Surface Mining and Reclamation Act) Coordination

The Nevada County drainage requirements indicate that new storm drain systems and channels shall be designed to convey the 10- and 100-year, 24 hour storm event. Furthermore, SMARA states that erosion control methods shall be designed for the 20-year, 1 hour storm and shall control erosion and sedimentation during operations as well as after reclamation is complete (see

CCR Title 14, Section 3706). The 2-, 10-, 25-, and 100-year, 24 hour storm events were analyzed in this report, which more than satisfies the Nevada County requirements. Since the 100-year, 24 hour event is greater than the SMARA required 20-year, 1 hour event, the 100-year, 24 hour results will provide a greater factor of safety in the drainage design.

Summary

In summation, the proposed grading will result in significant areas which will be ready for final development as industrial parks, while the proposed drainage systems fully mitigate any impacts of development of the properties, resulting in downstream flows which range from 8.9% to 54.4% less than pre-development levels depending on the design storm. These mitigated flows will be released, through control outlet structures, in the case of the Centennial Site, to the main branch of Wolf Creek, and in the case of the Brunswick Site, to South Fork Wolf Creek.

Detailed Calculations

1. Develop Times of Concentration

   a. Subarea A-1 (Centennial Site):
   Pre-Development: L = 3,080 lf, So = 2,590-2,490/3,080 = 0.0325
   Tc = 3,080 lf/4.3 ft/sec/60 sec/min = 11.94 min. **Use 12.0 min.**
   Post-Development: L = 2,600 lf, So = 2,590-2,495/2,600 = 0.0365
   Tc = 2,600 lf/4.4 ft/sec/60 sec/min = 9.85 min. **Use 10.0 min.**

   b. Subarea A-2 (Centennial Site):
   Pre- and Post-Development: L = 2,130 lf, So = 2,744-2,548/2,130 = 0.0920
   Tc = sheet flow: 200 lf @ 12.0%, avg. grass, tc = 12.7 min.
   channel flow: So = 2,720-2,548/1,930 = 0.0891
   tc = 1,930 lf/7.14 ft/sec/60 sec/min = 4.5 min.
   Total Tc = 17.2 min.
   For sizing culvert extension from existing log pond

   c. Subarea B-1 (Brunswick Site):
   Pre-Development: L = 3,955 lf, So = 2,946-2,716/3,955 = 0.0582
   Tc = 3,955 lf/5.3 ft/sec/60 sec/min = 12.43 min.
   Post-Development: L = 3,806 lf, So = 2,946-2,725/3,806 = 0.0581
   Tc = 3,806 lf/5.3 ft/sec/60 sec/min = 11.97 min. **Use 12.0 min., both scenarios**

   d. Subarea B-2 (Brunswick Site):
   Pre-Development: L = 1,370 lf, So = 2,852-2,716/1,370 = 0.0993
   Tc = sheet flow: 300 lf @ 18.0%, avg. grass, tc = 13.0 min.
   channel flow: So = 2,798-2,716/1,070 = 0.0766
   tc = 1,070 lf/6.40 ft/sec/60 sec/min = 2.8 min.
   Total Tc = 15.8 min.

Post-Development: L = 1,340 lf, So = 2,852-2,725/1,340 = 0.0948
Tc = sheet flow: 300 lf @ 18.0%, avg. grass, tc = 13.0 min.
channel flow: So = 2,798-2,725/1,040 = 0.0702
tc = 1,040 lf/6.0 ft/sec/60 sec/min = 2.9 min.
Total Tc = 15.9 min.
For conservatism and consistency use 12.0 min. per Subarea B-1

e. Subarea B-3 (Brunswick Site):
Pre- and Post-Development: L = 3,500 lf, So = 2,866-2,738/3,500 = 0.0366
Tc = sheet flow: 500 lf @ 12.0%, avg. grass, tc = 16.0 min.
channel flow: So = 2,806-2,738/3,000 = 0.0227
tc = 3,000 lf/3.50 ft/sec/60 sec/min = 14.3 min.
Total Tc = 30.3 min.
For checking capacity of existing 48" culvert across/under site

2. Develop CN Values

a. Centennial Site:
Pre-Development:
69.96 ac./69.96 ac. = 100% Wood or Forest Land, Good Cover, Soil Type 'D'
CN = 77.0
Post-Development:

38.11 ac./66.86 ac. =	57% Industrial/Commercial/Business, Soil Type 'D':	0.57 x 93	53.01
28.75 ac./66.86 ac. =	43% Wood or Forest Land, Good Cover, Soil Type 'D':	0.43 x 77 =	33.11
	Total		**86.12**

b. Brunswick Site:
Pre-Development
Subarea B-1:

76.10 ac./89.36 ac. =	85% Wood or Forest Land, Good Cover, Soil Type 'D':	0.85 x 77 =	65.45
8.26 ac./89.36 ac. =	9% Open Space, Fair Condition, Soil Type 'D':	0.09 x 84 =	7.56
5.00 ac./89.36 ac. =	6% Industrial/Commercial/Business, Soil Type 'D':	0.06 x 93 =	5.58
	Total		**78.59**

Subarea B-2:

12.45 ac./34.33 ac. =	36% Wood or Forest Land, Good Cover, Soil Type 'D':	0.36 x 77 =	27.72
15.00 ac./34.33 ac. =	44% Open Space, Fair Condition, Soil Type 'D':	0.44 x 84 =	36.96
6.88 ac./34.33 ac. =	20% Industrial/Commercial/Business, Soil Type 'D':	0.20 x 93 =	18.60
	Total		**83.28**

Post-Development:
Subarea B-1:

56.90 ac./98.55 ac. =	58% Wood or Forest Land, Good Cover, Soil Type 'D':	0.58 x 77 =	44.66
18.15 ac./98.55 ac. =	18% Open Space, Fair Condition, Soil Type 'D':	0.18 x 84 =	15.12
23.50 ac./98.55 ac. =	24% Industrial/Commercial/Business, Soil Type 'D':	0.24 x 93 =	22.32
	Total		**82.10**

Subarea B-2:

4.48 ac./28.14 ac. =	16% Wood or Forest Land, Good Cover, Soil Type 'D':	0.16 x 77 =	12.32
8.30 ac./28.14 ac. =	30% Open Space, Fair Condition, Soil Type 'D':	0.30 x 84 =	25.20
15.36 ac./28.14 ac. =	54% Industrial/Commercial/Business, Soil Type 'D':	0.54 x 93 =	50.22
	Total		**87.74**

3. Input Storm Depth Values

   a. Centennial Site
      10-yr, 24 hr storm: 6.80 inches+
      100-yr, 24 hr storm: 9.64 inches+
   b. Brunswick Site
      2-yr, 24 hr storm: 4.73 inches*
      10-yr, 24 hr storm: 6.80 inches+
      25-yr, 24 hr storm: 8.59 inches*
      100-yr, 24 hr storm: 9.64 inches+
      * Values obtained from NOAA, "Hydrometeorological Design Studies Center, Precipitation Frequency Data Server"
      + Values obtained from County of Nevada Standard Drawings D-13 & D-14

4. Summary of Flow Values – Centennial Site

	Pre-Dev:	Post-Dev:	Target Outflow:	After Detention
10-yr. storm:	72.44 cfs	89.68 cfs	72.44 cfs	45.14 cfs
100-yr. storm:	121.02 cfs	137.41 cfs	121.02 cfs	75.75 cfs

5. Summary of Flow Values - Brunswick Site

	Pre-Dev:	Post-Dev:	Target Outflow:	After Detention:
2-yr. storm:	78.92 cfs	93.31 cfs	78.92-5.57 = 73.35 cfs	30.74 cfs
10-yr. storm:	139.98 cfs	157.48 cfs	139.98-5.57 = 134.41 cfs	78.63 cfs
25-yr. storm:	194.52 cfs	213.78 cfs	194.52-5.57 = 188.95 cfs	152.78 cfs
100-yr. storm:	226.76 cfs	247.08 cfs	226.76-5.57 = 221.19 cfs	201.21 cfs

6. Size Extension of Drainage Culvert from Subarea A-2

	Slope	soil	veg.	surface	Total
C =	0.15	+ 0.12 +	0.06	+ 0.12 =	0.45

A = 28.06 ac. Tc = 17.2 min. I_{-100} = 2.98 in./hr.
Q = CIA = 0.45 x 2.98 x 28.06 = 37.6 cfs
So = 2,534–2,500/1,040 = 0.0327

$d = [Qn / K'So^{½}]^{3/8} = [37.6(0.012)/0.463*(0.0327)^{½}]^{3/8}$ = 1.88 ft.
Use 30" pipe for extra margin of safety
* K' from King's Handbook of Hydraulics, 6th Edition, for pipe flowing at D/d = 0.82

7. Verify Size of Existing 48" Culvert Draining Subarea B-3

	Slope	soil	veg.	surface	Total
C =	0.07	+ 0.11 +	0.04	+ 0.07 =	0.29

A = 167.60 ac. Tc = 30.3 min. I_{-100} = 2.28 in./hr.
Q = CIA = 0.29 x 2.28 x 167.6 = 110.8 cfs
So = 2,740–2,710/1,645 = 0.0182
$K' = Qn/d^{8/3}So^{½} = 110.8(0.024)/4.0^{8/3}(0.0182)^{½}$ = 0.4889
From King's Handbook of Hydraulics, 6th Edition, for K' = 0.4889, D/d = 0.0883
So, 48" pipe will flow at a depth of 0.0883 x 4.0 = 3.5 ft.
Therefore, 48"pipe is OK.

8. Size outfall culvert for Centennial Site

So = 2,495–2,490/170 = 0.0294, Q_{100} = 121 cfs
$d = [Qn / K'So^{½}]^{3/8} = [121(0.024)/0.463*(0.0294)^{½}]^{3/8}$ = 3.85 ft.
Therefore, use 48" pipe
* K' from King's Handbook of Hydraulics, 6th Edition, for pipe flowing at D/d = 0.82

$K' = Qn/d^{8/3}So^{½} = 121(0.024)/4.0^{8/3}(0.0294)^{½}$ = 0.4201
From King's Handbook of Hydraulics, 6th Edition, for K' = 0.4201, D/d = 0.7468
So, 48" pipe will flow at a depth of 0.7468 x 4.0 = 2.98 ft.

9. Size outfall culvert for Brunswick Site

So = 2,725–2,710/160 = 0.0938, Q_{100} = 227 cfs
$d = [Qn / K'So^{½}]^{3/8} = [227(0.024)/0.463*(0.0938)^{½}]^{3/8}$ = 3.93 ft.
Therefore, use 48" pipe
* K' from King's Handbook of Hydraulics, 6th Edition, for pipe flowing at D/d = 0.82

$K' = Qn/d^{8/3}So^{½} = 227(0.024)/4.0^{8/3}(0.0938)^{½}$ = 0.5095
From King's Handbook of Hydraulics, 6th edition, for K' = 0.5095, D/d = 0.07803
So, 48" pipe will flow at a depth of 0.7803 x 4.0 = 3.12 ft.

10. Size Treated Mine Water Outfall to South Fork Wolf Creek, Brunswick Site

$K' = Qn/d^{8/3}So^{1/2} = 5.57(0.012)/1.00^{8/3}(0.0385)^{1/2} = 0.3406$
From King's Handbook of Hydraulics, 6th Edition, for K' = 0.3406, D/d = 0.6371
So, 12" treated mine water outfall pipe will flow at a depth of 0.6371 x 1.0 = 0.64 ft.

Check Velocity at Outfall:
At D/d = 0.6371, Ca = 0.5281, $A = Ca(d^2) = 0.5281(1.0^2) = 0.53$ ft²
V = Q/A = 5.57/0.53 = 10.51 ft./sec.

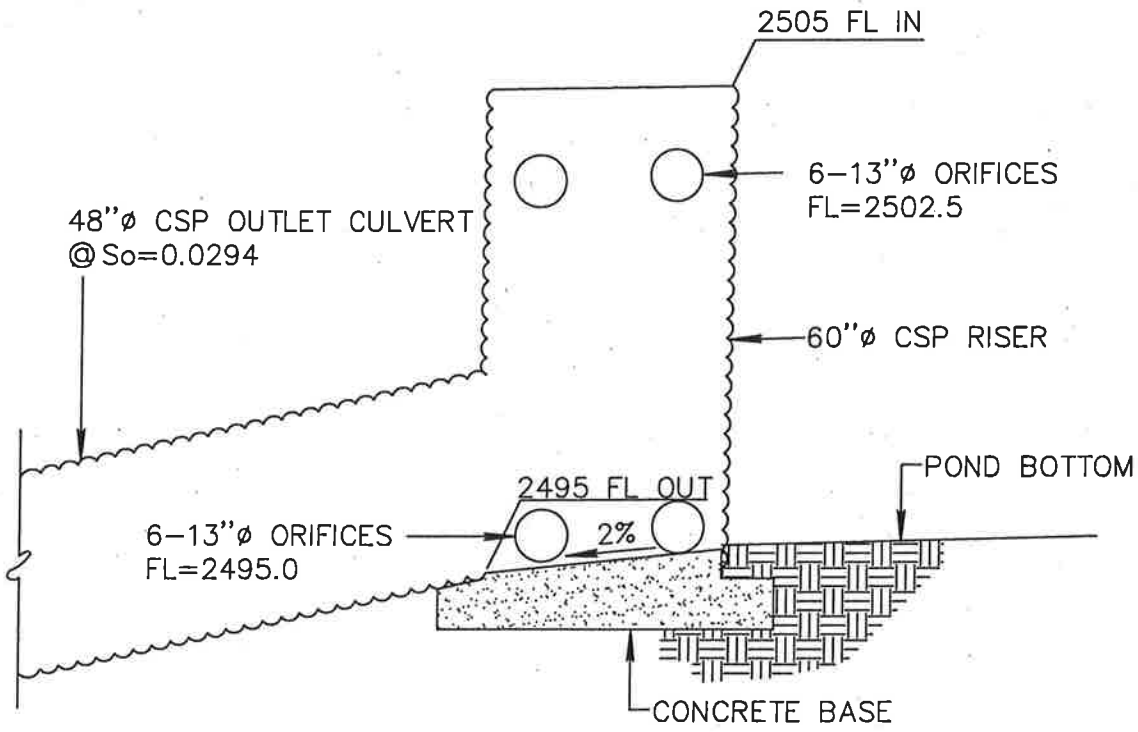
Determine Length of Outfall Apron:
$L = 0.37VoD^{1/2} = 0.37(10.51)1.0^{1/2} = 3.89$ ft.
Therefore, for conservatism, use L=5.0 ft.
Note: The existing flow line and portions of the banks of South Fork Wolf Creek are currently lined with miscellaneous rocks which will act as a stabilizing structure for both the flow line and the banks. Due to the small amount of flow being released into the South Fork Wolf Creek, it should not be necessary to install any additional armoring of either the channel bottom or its banks.

Glossary of Terminology and Technical Abbreviations

A - Area
ac. - acres
C - Coefficient of Runoff for use in the Rational Formula
Ca - Coefficient for determining the cross sectional area of flow in a circular conduit (pipe)
cfs - flow rate in cubic feet per second
CN - Soil Conservaton Service Curve Number
D - Depth of flow in a circular conduit (pipe)
d - diameter of a circular conduit (pipe)
ft. - feet
hr. - hour
I - Intensity (normally in inches per hour)
in. - inches
K' - Conveyance factor related to Manning's equation
L - Length
lf. - linear feet
n - Manning's "n" value
V - Velocity
Vo - Velocity at outlet
So - Slope of the flow line of a pipe or open channel
Tc - Time of Concentration
Q - Flow rate (normally in cfs)
Q_{10} - Flow rate for the statistical frequency of occurrence (10-year for instance)

DETAILS

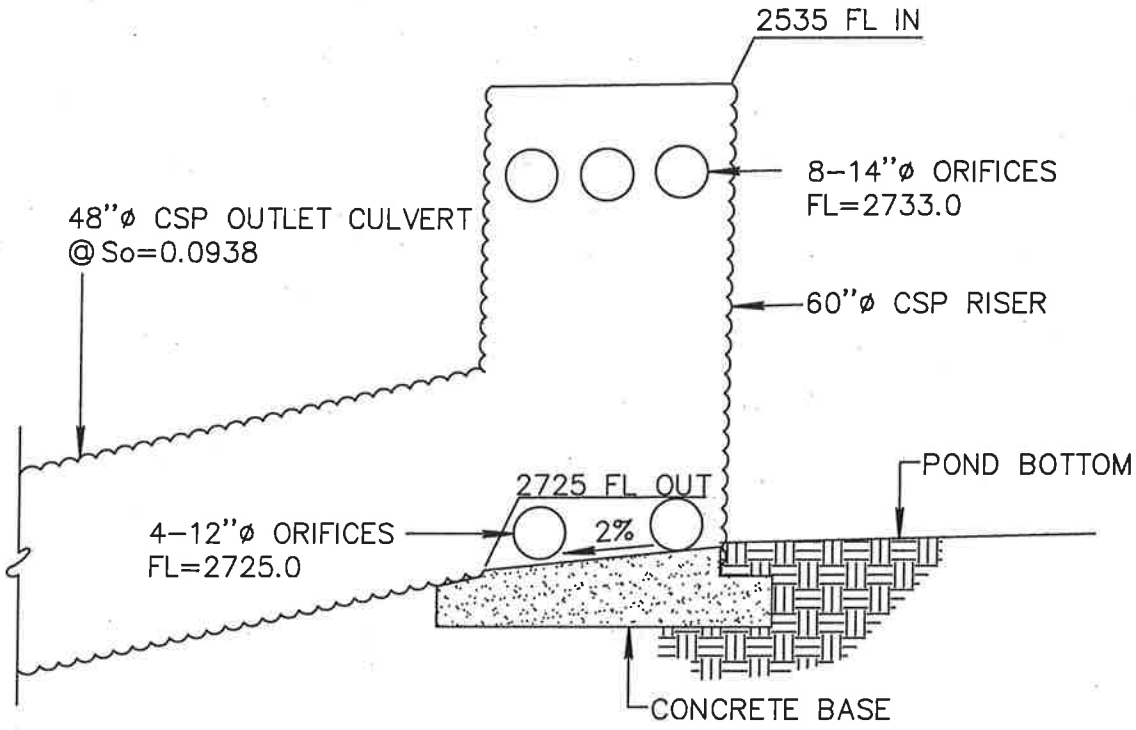
SCALE: 1" = 4'



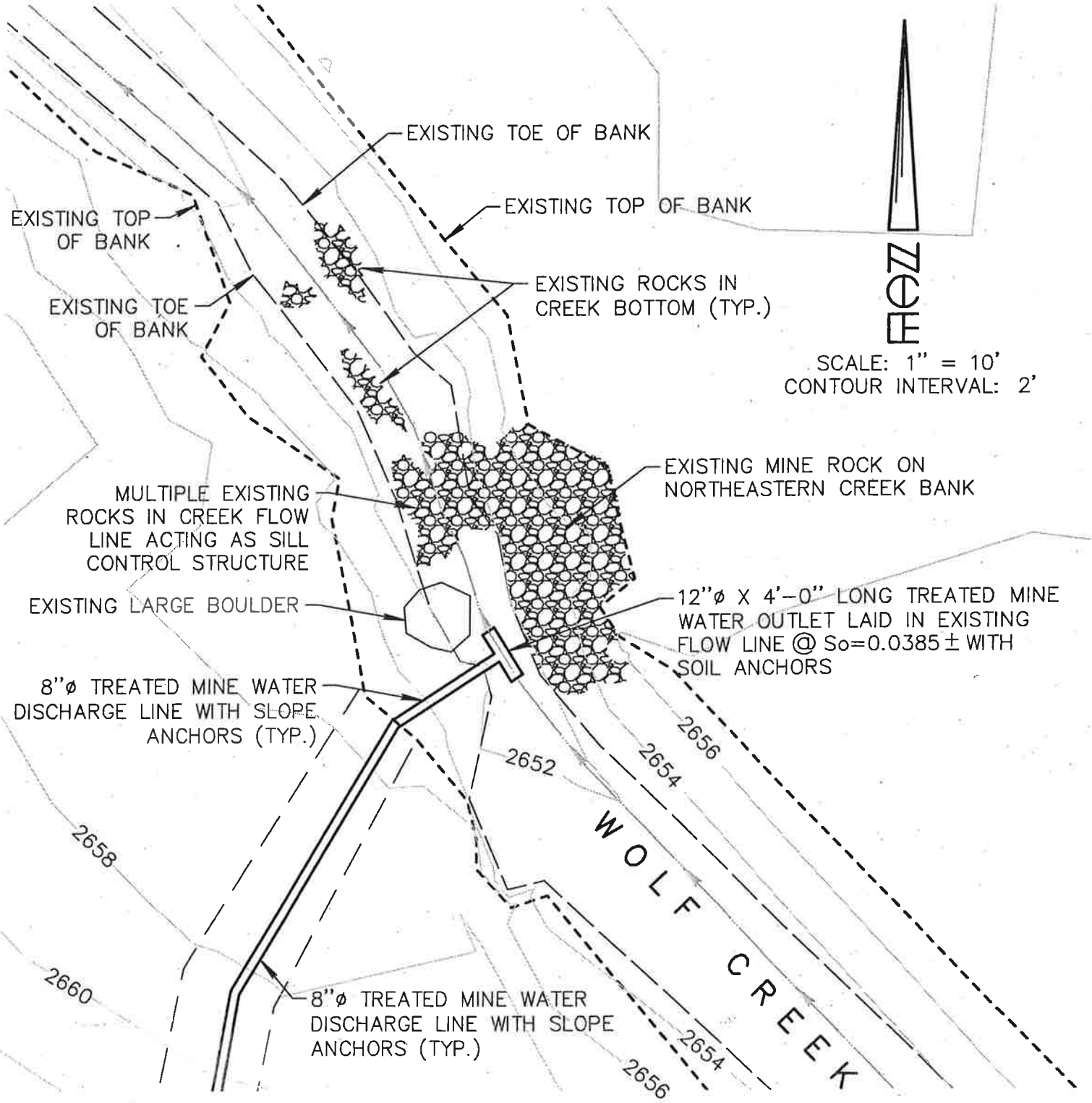
DETENTION POND OUTLET STRUCTURE
CENTENNIAL SITE

NORTH

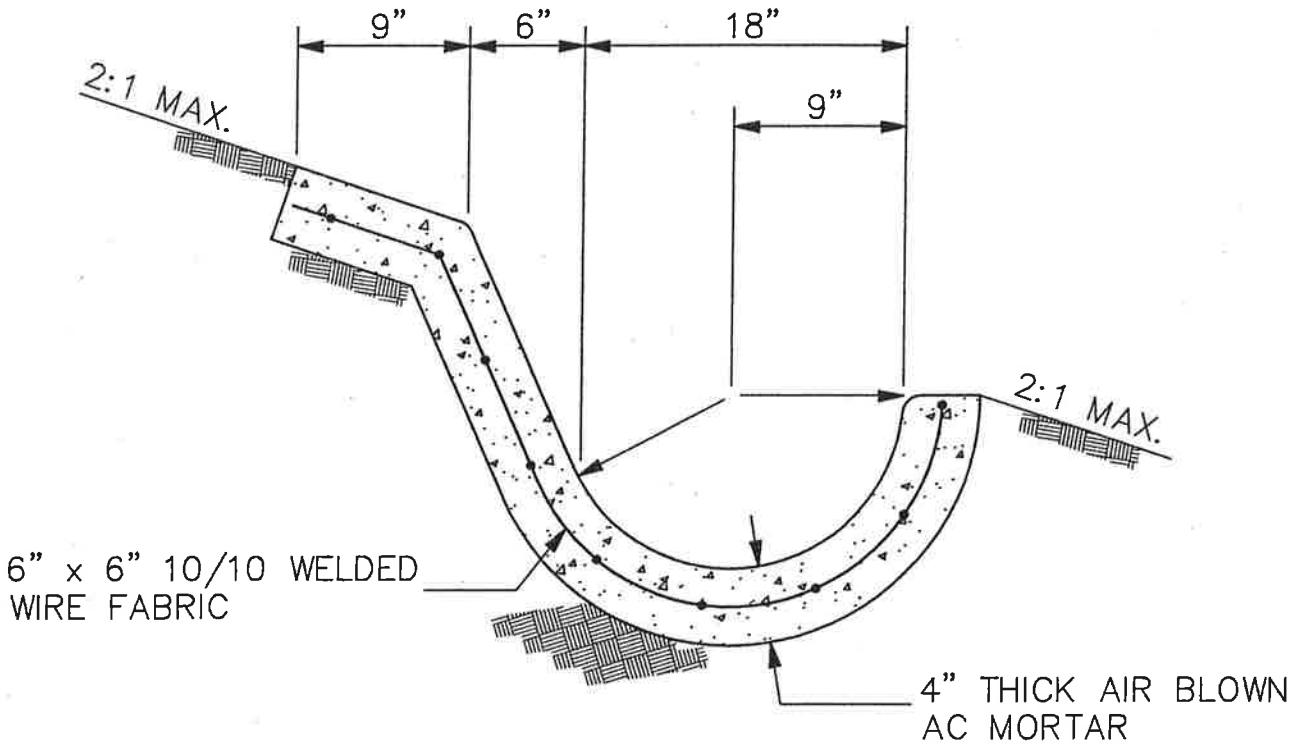
SCALE: 1" = 4'



DETENTION POND OUTLET STRUCTURE
BRUNSWICK SITE



TREATED MINE WATER OUTFALL to SOUTH FORK WOLF CREEK



CONCRETE 'J' DRAIN

SCALE: 1" = 1'

HYDROLOGY & HYDRAULIC CALCULATIONS
for
Reservoir Routing & Detention Basin Sizing

Brunswick Site

Project Summary	
Title	New Brunswick Site
Engineer	RMR
Company	Nevada City Engineering, Inc.
Date	9/10/2019

Notes

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User Notifications

Message Id	15
Scenario	Post-Development 25
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.500 .
Source	Warning
Message Id	67
Scenario	Post-Development 25
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	Post-Development 25
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information
Message Id	15
Scenario	Post-Development 10
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.500 .
Source	Warning

User Notifications

Message Id	67
Scenario	Post-Development 10
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	Post-Development 10
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information
Message Id	15
Scenario	Post-Development 100
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.500 .
Source	Warning
Message Id	67
Scenario	Post-Development 100
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	Post-Development 100
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information

User Notifications

Message Id	15
Scenario	Post-Development 2
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Kr (reverse flow entrance loss coefficient) was not specified. Kr was set to same value as Ke= 0.500 .
Source	Warning
Message Id	67
Scenario	Post-Development 2
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Flow direction set to reverse for one ore more structures in composite outlet structure Composite Outlet Structure - 1. To eliminate this warning, edit outlet data and select forward only. If reverse flow analysis is required, then the tailwater conditions must be set to interconnected pond.
Source	Warning
Message Id	17
Scenario	Post-Development 2
Element Type	Composite Outlet Structure
Element Id	36
Label	Composite Outlet Structure - 1
Time	(N/A)
Message	Riser orifice equation controls at one or more headwater elevations for outlet structure.
Source	Information

Brunswick Site

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
CM-1	Pre-Development 2	2	18.803	8.000	53.72
CM-1	Post-Development 2	2	23.297	8.000	69.03
CM-1	Pre-Development 10	10	32.332	8.000	97.35
CM-1	Post-Development 10	10	38.790	8.000	118.73
CM-1	Post-Development 25	25	52.660	8.000	162.57
CM-1	Pre-Development 25	25	44.603	8.000	136.61
CM-1	Pre-Development 100	100	51.946	8.000	159.89
CM-1	Post-Development 100	100	60.912	7.950	188.38
CM-2	Pre-Development 2	2	8.421	8.000	25.20
CM-2	Post-Development 2	2	7.900	8.000	24.28
CM-2	Pre-Development 10	10	13.872	8.000	42.63
CM-2	Post-Development 10	10	12.528	7.950	38.79
CM-2	Post-Development 25	25	16.600	7.950	51.36
CM-2	Pre-Development 25	25	18.732	8.000	57.90
CM-2	Pre-Development 100	100	21.619	7.950	66.93
CM-2	Post-Development 100	100	19.005	7.950	58.70

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Pre-Development 2	2	27.223	8.000	78.92
O-1	Post-Development 2	2	29.649	9.200	30.74
O-1	Pre-Development 10	10	46.204	8.000	139.98
O-1	Post-Development 10	10	48.566	8.400	78.63
O-1	Post-Development 25	25	64.988	8.200	152.78
O-1	Pre-Development 25	25	63.336	8.000	194.52
O-1	Pre-Development 100	100	73.565	8.000	226.76
O-1	Post-Development 100	100	74.702	8.150	201.21

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-1 (IN)	Post-Development 2	2	31.197	8.000	93.31	(N/A)	(N/A)

Brunswick Site

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-1 (OUT)	Post-Development 2	2	29.649	9.200	30.74	2,731.72	5.883
PO-1 (IN)	Post-Development 10	10	51.318	8.000	157.48	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 10	10	48.566	8.400	78.63	2,734.52	9.262
PO-1 (IN)	Post-Development 25	25	69.260	8.000	213.78	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 25	25	64.988	8.200	152.78	2,736.04	11.340
PO-1 (IN)	Post-Development 100	100	79.918	7.950	247.08	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 100	100	74.702	8.150	201.21	2,736.60	12.148

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time-Depth Curve: Brunswick NC 10-yr	
Label	Brunswick NC 10-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
0.500	0.1	0.1	0.1	0.1	0.1
1.000	0.1	0.2	0.2	0.2	0.2
1.500	0.2	0.3	0.3	0.3	0.3
2.000	0.3	0.4	0.4	0.4	0.4
2.500	0.4	0.5	0.5	0.5	0.5
3.000	0.6	0.6	0.6	0.6	0.6
3.500	0.7	0.7	0.7	0.7	0.8
4.000	0.8	0.8	0.8	0.9	0.9
4.500	0.9	0.9	1.0	1.0	1.0
5.000	1.1	1.1	1.1	1.2	1.2
5.500	1.2	1.3	1.3	1.3	1.4
6.000	1.4	1.4	1.5	1.5	1.6
6.500	1.6	1.7	1.7	1.7	1.8
7.000	1.8	1.9	1.9	2.0	2.0
7.500	2.1	2.3	2.4	2.6	2.7
8.000	2.9	3.0	3.1	3.1	3.2
8.500	3.3	3.3	3.4	3.4	3.5
9.000	3.5	3.6	3.6	3.7	3.7
9.500	3.7	3.8	3.8	3.9	3.9
10.000	3.9	4.0	4.0	4.0	4.1
10.500	4.1	4.1	4.2	4.2	4.2
11.000	4.2	4.3	4.3	4.3	4.4
11.500	4.4	4.4	4.4	4.5	4.5
12.000	4.5	4.5	4.6	4.6	4.6
12.500	4.6	4.7	4.7	4.7	4.7
13.000	4.8	4.8	4.8	4.8	4.9
13.500	4.9	4.9	4.9	5.0	5.0
14.000	5.0	5.0	5.1	5.1	5.1
14.500	5.1	5.1	5.2	5.2	5.2
15.000	5.2	5.3	5.3	5.3	5.3
15.500	5.3	5.4	5.4	5.4	5.4
16.000	5.4	5.5	5.5	5.5	5.5

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	5.6	5.6	5.6	5.6	5.6
17.000	5.7	5.7	5.7	5.7	5.7
17.500	5.8	5.8	5.8	5.8	5.8
18.000	5.8	5.9	5.9	5.9	5.9
18.500	5.9	6.0	6.0	6.0	6.0
19.000	6.0	6.0	6.1	6.1	6.1
19.500	6.1	6.1	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.3	6.3
20.500	6.3	6.3	6.3	6.3	6.4
21.000	6.4	6.4	6.4	6.4	6.4
21.500	6.4	6.5	6.5	6.5	6.5
22.000	6.5	6.5	6.6	6.6	6.6
22.500	6.6	6.6	6.6	6.6	6.7
23.000	6.7	6.7	6.7	6.7	6.7
23.500	6.7	6.7	6.8	6.8	6.8
24.000	6.8	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time-Depth Curve: Brunswick NC 10-yr	
Label	Brunswick NC 10-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
0.500	0.1	0.1	0.1	0.1	0.1
1.000	0.1	0.2	0.2	0.2	0.2
1.500	0.2	0.3	0.3	0.3	0.3
2.000	0.3	0.4	0.4	0.4	0.4
2.500	0.4	0.5	0.5	0.5	0.5
3.000	0.6	0.6	0.6	0.6	0.6
3.500	0.7	0.7	0.7	0.7	0.8
4.000	0.8	0.8	0.8	0.9	0.9
4.500	0.9	0.9	1.0	1.0	1.0
5.000	1.1	1.1	1.1	1.2	1.2
5.500	1.2	1.3	1.3	1.3	1.4
6.000	1.4	1.4	1.5	1.5	1.6
6.500	1.6	1.7	1.7	1.7	1.8
7.000	1.8	1.9	1.9	2.0	2.0
7.500	2.1	2.3	2.4	2.6	2.7
8.000	2.9	3.0	3.1	3.1	3.2
8.500	3.3	3.3	3.4	3.4	3.5
9.000	3.5	3.6	3.6	3.7	3.7
9.500	3.7	3.8	3.8	3.9	3.9
10.000	3.9	4.0	4.0	4.0	4.1
10.500	4.1	4.1	4.2	4.2	4.2
11.000	4.2	4.3	4.3	4.3	4.4
11.500	4.4	4.4	4.4	4.5	4.5
12.000	4.5	4.5	4.6	4.6	4.6
12.500	4.6	4.7	4.7	4.7	4.7
13.000	4.8	4.8	4.8	4.8	4.9
13.500	4.9	4.9	4.9	5.0	5.0
14.000	5.0	5.0	5.1	5.1	5.1
14.500	5.1	5.1	5.2	5.2	5.2
15.000	5.2	5.3	5.3	5.3	5.3
15.500	5.3	5.4	5.4	5.4	5.4
16.000	5.4	5.5	5.5	5.5	5.5

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	5.6	5.6	5.6	5.6	5.6
17.000	5.7	5.7	5.7	5.7	5.7
17.500	5.8	5.8	5.8	5.8	5.8
18.000	5.8	5.9	5.9	5.9	5.9
18.500	5.9	6.0	6.0	6.0	6.0
19.000	6.0	6.0	6.1	6.1	6.1
19.500	6.1	6.1	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.3	6.3
20.500	6.3	6.3	6.3	6.3	6.4
21.000	6.4	6.4	6.4	6.4	6.4
21.500	6.4	6.5	6.5	6.5	6.5
22.000	6.5	6.5	6.6	6.6	6.6
22.500	6.6	6.6	6.6	6.6	6.7
23.000	6.7	6.7	6.7	6.7	6.7
23.500	6.7	6.7	6.8	6.8	6.8
24.000	6.8	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time-Depth Curve: Brunswick NC 25-yr	
Label	Brunswick NC 25-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.1	0.1
0.500	0.1	0.1	0.1	0.1	0.2
1.000	0.2	0.2	0.2	0.2	0.3
1.500	0.3	0.3	0.4	0.4	0.4
2.000	0.4	0.5	0.5	0.5	0.5
2.500	0.6	0.6	0.6	0.6	0.7
3.000	0.7	0.7	0.8	0.8	0.8
3.500	0.8	0.9	0.9	0.9	1.0
4.000	1.0	1.0	1.1	1.1	1.1
4.500	1.2	1.2	1.2	1.3	1.3
5.000	1.3	1.4	1.4	1.5	1.5
5.500	1.5	1.6	1.6	1.7	1.7
6.000	1.8	1.8	1.9	1.9	2.0
6.500	2.0	2.1	2.1	2.2	2.2
7.000	2.3	2.4	2.4	2.5	2.6
7.500	2.7	2.8	3.0	3.3	3.5
8.000	3.7	3.8	3.9	4.0	4.1
8.500	4.1	4.2	4.3	4.3	4.4
9.000	4.5	4.5	4.6	4.6	4.7
9.500	4.7	4.8	4.8	4.9	4.9
10.000	5.0	5.0	5.0	5.1	5.1
10.500	5.2	5.2	5.2	5.3	5.3
11.000	5.4	5.4	5.4	5.5	5.5
11.500	5.5	5.6	5.6	5.6	5.7
12.000	5.7	5.7	5.8	5.8	5.8
12.500	5.9	5.9	5.9	6.0	6.0
13.000	6.0	6.1	6.1	6.1	6.1
13.500	6.2	6.2	6.2	6.3	6.3
14.000	6.3	6.4	6.4	6.4	6.4
14.500	6.5	6.5	6.5	6.6	6.6
15.000	6.6	6.6	6.7	6.7	6.7
15.500	6.7	6.8	6.8	6.8	6.9
16.000	6.9	6.9	6.9	7.0	7.0

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	7.0	7.0	7.1	7.1	7.1
17.000	7.1	7.2	7.2	7.2	7.2
17.500	7.3	7.3	7.3	7.3	7.4
18.000	7.4	7.4	7.4	7.5	7.5
18.500	7.5	7.5	7.6	7.6	7.6
19.000	7.6	7.6	7.7	7.7	7.7
19.500	7.7	7.8	7.8	7.8	7.8
20.000	7.8	7.9	7.9	7.9	7.9
20.500	7.9	8.0	8.0	8.0	8.0
21.000	8.0	8.1	8.1	8.1	8.1
21.500	8.1	8.2	8.2	8.2	8.2
22.000	8.2	8.3	8.3	8.3	8.3
22.500	8.3	8.4	8.4	8.4	8.4
23.000	8.4	8.4	8.5	8.5	8.5
23.500	8.5	8.5	8.5	8.6	8.6
24.000	8.6	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time-Depth Curve: Brunswick NC 25-yr	
Label	Brunswick NC 25-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.1	0.1
0.500	0.1	0.1	0.1	0.1	0.2
1.000	0.2	0.2	0.2	0.2	0.3
1.500	0.3	0.3	0.4	0.4	0.4
2.000	0.4	0.5	0.5	0.5	0.5
2.500	0.6	0.6	0.6	0.6	0.7
3.000	0.7	0.7	0.8	0.8	0.8
3.500	0.8	0.9	0.9	0.9	1.0
4.000	1.0	1.0	1.1	1.1	1.1
4.500	1.2	1.2	1.2	1.3	1.3
5.000	1.3	1.4	1.4	1.5	1.5
5.500	1.5	1.6	1.6	1.7	1.7
6.000	1.8	1.8	1.9	1.9	2.0
6.500	2.0	2.1	2.1	2.2	2.2
7.000	2.3	2.4	2.4	2.5	2.6
7.500	2.7	2.8	3.0	3.3	3.5
8.000	3.7	3.8	3.9	4.0	4.1
8.500	4.1	4.2	4.3	4.3	4.4
9.000	4.5	4.5	4.6	4.6	4.7
9.500	4.7	4.8	4.8	4.9	4.9
10.000	5.0	5.0	5.0	5.1	5.1
10.500	5.2	5.2	5.2	5.3	5.3
11.000	5.4	5.4	5.4	5.5	5.5
11.500	5.5	5.6	5.6	5.6	5.7
12.000	5.7	5.7	5.8	5.8	5.8
12.500	5.9	5.9	5.9	6.0	6.0
13.000	6.0	6.1	6.1	6.1	6.1
13.500	6.2	6.2	6.2	6.3	6.3
14.000	6.3	6.4	6.4	6.4	6.4
14.500	6.5	6.5	6.5	6.6	6.6
15.000	6.6	6.6	6.7	6.7	6.7
15.500	6.7	6.8	6.8	6.8	6.9
16.000	6.9	6.9	6.9	7.0	7.0

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	7.0	7.0	7.1	7.1	7.1
17.000	7.1	7.2	7.2	7.2	7.2
17.500	7.3	7.3	7.3	7.3	7.4
18.000	7.4	7.4	7.4	7.5	7.5
18.500	7.5	7.5	7.6	7.6	7.6
19.000	7.6	7.6	7.7	7.7	7.7
19.500	7.7	7.8	7.8	7.8	7.8
20.000	7.8	7.9	7.9	7.9	7.9
20.500	7.9	8.0	8.0	8.0	8.0
21.000	8.0	8.1	8.1	8.1	8.1
21.500	8.1	8.2	8.2	8.2	8.2
22.000	8.2	8.3	8.3	8.3	8.3
22.500	8.3	8.4	8.4	8.4	8.4
23.000	8.4	8.4	8.5	8.5	8.5
23.500	8.5	8.5	8.5	8.6	8.6
24.000	8.6	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time-Depth Curve: Brunswick NC 2-yr	
Label	Brunswick NC 2-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.1	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.2
1.500	0.2	0.2	0.2	0.2	0.2
2.000	0.2	0.3	0.3	0.3	0.3
2.500	0.3	0.3	0.3	0.4	0.4
3.000	0.4	0.4	0.4	0.4	0.4
3.500	0.5	0.5	0.5	0.5	0.5
4.000	0.5	0.6	0.6	0.6	0.6
4.500	0.6	0.7	0.7	0.7	0.7
5.000	0.7	0.8	0.8	0.8	0.8
5.500	0.9	0.9	0.9	0.9	0.9
6.000	1.0	1.0	1.0	1.1	1.1
6.500	1.1	1.1	1.2	1.2	1.2
7.000	1.3	1.3	1.3	1.4	1.4
7.500	1.5	1.6	1.7	1.8	1.9
8.000	2.0	2.1	2.1	2.2	2.2
8.500	2.3	2.3	2.4	2.4	2.4
9.000	2.5	2.5	2.5	2.5	2.6
9.500	2.6	2.6	2.7	2.7	2.7
10.000	2.7	2.8	2.8	2.8	2.8
10.500	2.8	2.9	2.9	2.9	2.9
11.000	3.0	3.0	3.0	3.0	3.0
11.500	3.1	3.1	3.1	3.1	3.1
12.000	3.1	3.2	3.2	3.2	3.2
12.500	3.2	3.2	3.3	3.3	3.3
13.000	3.3	3.3	3.4	3.4	3.4
13.500	3.4	3.4	3.4	3.4	3.5
14.000	3.5	3.5	3.5	3.5	3.5
14.500	3.6	3.6	3.6	3.6	3.6
15.000	3.6	3.7	3.7	3.7	3.7
15.500	3.7	3.7	3.7	3.8	3.8
16.000	3.8	3.8	3.8	3.8	3.8
16.500	3.9	3.9	3.9	3.9	3.9

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.9	3.9	4.0	4.0	4.0
17.500	4.0	4.0	4.0	4.0	4.1
18.000	4.1	4.1	4.1	4.1	4.1
18.500	4.1	4.1	4.2	4.2	4.2
19.000	4.2	4.2	4.2	4.2	4.2
19.500	4.3	4.3	4.3	4.3	4.3
20.000	4.3	4.3	4.3	4.4	4.4
20.500	4.4	4.4	4.4	4.4	4.4
21.000	4.4	4.4	4.5	4.5	4.5
21.500	4.5	4.5	4.5	4.5	4.5
22.000	4.5	4.5	4.6	4.6	4.6
22.500	4.6	4.6	4.6	4.6	4.6
23.000	4.6	4.6	4.7	4.7	4.7
23.500	4.7	4.7	4.7	4.7	4.7
24.000	4.7	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time-Depth Curve: Brunswick NC 2-yr	
Label	Brunswick NC 2-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.1	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.2
1.500	0.2	0.2	0.2	0.2	0.2
2.000	0.2	0.3	0.3	0.3	0.3
2.500	0.3	0.3	0.3	0.4	0.4
3.000	0.4	0.4	0.4	0.4	0.4
3.500	0.5	0.5	0.5	0.5	0.5
4.000	0.5	0.6	0.6	0.6	0.6
4.500	0.6	0.7	0.7	0.7	0.7
5.000	0.7	0.8	0.8	0.8	0.8
5.500	0.9	0.9	0.9	0.9	0.9
6.000	1.0	1.0	1.0	1.1	1.1
6.500	1.1	1.1	1.2	1.2	1.2
7.000	1.3	1.3	1.3	1.4	1.4
7.500	1.5	1.6	1.7	1.8	1.9
8.000	2.0	2.1	2.1	2.2	2.2
8.500	2.3	2.3	2.4	2.4	2.4
9.000	2.5	2.5	2.5	2.5	2.6
9.500	2.6	2.6	2.7	2.7	2.7
10.000	2.7	2.8	2.8	2.8	2.8
10.500	2.8	2.9	2.9	2.9	2.9
11.000	3.0	3.0	3.0	3.0	3.0
11.500	3.1	3.1	3.1	3.1	3.1
12.000	3.1	3.2	3.2	3.2	3.2
12.500	3.2	3.2	3.3	3.3	3.3
13.000	3.3	3.3	3.4	3.4	3.4
13.500	3.4	3.4	3.4	3.4	3.5
14.000	3.5	3.5	3.5	3.5	3.5
14.500	3.6	3.6	3.6	3.6	3.6
15.000	3.6	3.7	3.7	3.7	3.7
15.500	3.7	3.7	3.7	3.8	3.8
16.000	3.8	3.8	3.8	3.8	3.8
16.500	3.9	3.9	3.9	3.9	3.9

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.000	3.9	3.9	4.0	4.0	4.0
17.500	4.0	4.0	4.0	4.0	4.1
18.000	4.1	4.1	4.1	4.1	4.1
18.500	4.1	4.1	4.2	4.2	4.2
19.000	4.2	4.2	4.2	4.2	4.2
19.500	4.3	4.3	4.3	4.3	4.3
20.000	4.3	4.3	4.3	4.4	4.4
20.500	4.4	4.4	4.4	4.4	4.4
21.000	4.4	4.4	4.5	4.5	4.5
21.500	4.5	4.5	4.5	4.5	4.5
22.000	4.5	4.5	4.6	4.6	4.6
22.500	4.6	4.6	4.6	4.6	4.6
23.000	4.6	4.6	4.7	4.7	4.7
23.500	4.7	4.7	4.7	4.7	4.7
24.000	4.7	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time-Depth Curve: Brunswik NC 100-yr	
Label	Brunswik NC 100-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.1	0.1
0.500	0.1	0.1	0.1	0.2	0.2
1.000	0.2	0.2	0.2	0.3	0.3
1.500	0.3	0.4	0.4	0.4	0.5
2.000	0.5	0.5	0.5	0.6	0.6
2.500	0.6	0.7	0.7	0.7	0.8
3.000	0.8	0.8	0.9	0.9	0.9
3.500	0.9	1.0	1.0	1.0	1.1
4.000	1.1	1.2	1.2	1.2	1.3
4.500	1.3	1.3	1.4	1.4	1.5
5.000	1.5	1.5	1.6	1.6	1.7
5.500	1.7	1.8	1.8	1.9	1.9
6.000	2.0	2.0	2.1	2.2	2.2
6.500	2.3	2.3	2.4	2.5	2.5
7.000	2.6	2.7	2.7	2.8	2.9
7.500	3.0	3.2	3.4	3.7	3.9
8.000	4.1	4.2	4.4	4.5	4.5
8.500	4.6	4.7	4.8	4.9	4.9
9.000	5.0	5.1	5.1	5.2	5.2
9.500	5.3	5.4	5.4	5.5	5.5
10.000	5.6	5.6	5.7	5.7	5.7
10.500	5.8	5.8	5.9	5.9	6.0
11.000	6.0	6.1	6.1	6.1	6.2
11.500	6.2	6.3	6.3	6.3	6.4
12.000	6.4	6.4	6.5	6.5	6.5
12.500	6.6	6.6	6.7	6.7	6.7
13.000	6.8	6.8	6.8	6.9	6.9
13.500	6.9	7.0	7.0	7.0	7.1
14.000	7.1	7.1	7.2	7.2	7.2
14.500	7.3	7.3	7.3	7.4	7.4
15.000	7.4	7.4	7.5	7.5	7.5
15.500	7.6	7.6	7.6	7.7	7.7
16.000	7.7	7.8	7.8	7.8	7.8

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	7.9	7.9	7.9	8.0	8.0
17.000	8.0	8.0	8.1	8.1	8.1
17.500	8.2	8.2	8.2	8.2	8.3
18.000	8.3	8.3	8.3	8.4	8.4
18.500	8.4	8.4	8.5	8.5	8.5
19.000	8.6	8.6	8.6	8.6	8.7
19.500	8.7	8.7	8.7	8.7	8.8
20.000	8.8	8.8	8.8	8.9	8.9
20.500	8.9	8.9	9.0	9.0	9.0
21.000	9.0	9.1	9.1	9.1	9.1
21.500	9.1	9.2	9.2	9.2	9.2
22.000	9.2	9.3	9.3	9.3	9.3
22.500	9.4	9.4	9.4	9.4	9.4
23.000	9.5	9.5	9.5	9.5	9.5
23.500	9.5	9.6	9.6	9.6	9.6
24.000	9.6	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time-Depth Curve: Brunswik NC 100-yr	
Label	Brunswik NC 100-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.1	0.1
0.500	0.1	0.1	0.1	0.2	0.2
1.000	0.2	0.2	0.2	0.3	0.3
1.500	0.3	0.4	0.4	0.4	0.5
2.000	0.5	0.5	0.5	0.6	0.6
2.500	0.6	0.7	0.7	0.7	0.8
3.000	0.8	0.8	0.9	0.9	0.9
3.500	0.9	1.0	1.0	1.0	1.1
4.000	1.1	1.2	1.2	1.2	1.3
4.500	1.3	1.3	1.4	1.4	1.5
5.000	1.5	1.5	1.6	1.6	1.7
5.500	1.7	1.8	1.8	1.9	1.9
6.000	2.0	2.0	2.1	2.2	2.2
6.500	2.3	2.3	2.4	2.5	2.5
7.000	2.6	2.7	2.7	2.8	2.9
7.500	3.0	3.2	3.4	3.7	3.9
8.000	4.1	4.2	4.4	4.5	4.5
8.500	4.6	4.7	4.8	4.9	4.9
9.000	5.0	5.1	5.1	5.2	5.2
9.500	5.3	5.4	5.4	5.5	5.5
10.000	5.6	5.6	5.7	5.7	5.7
10.500	5.8	5.8	5.9	5.9	6.0
11.000	6.0	6.1	6.1	6.1	6.2
11.500	6.2	6.3	6.3	6.3	6.4
12.000	6.4	6.4	6.5	6.5	6.5
12.500	6.6	6.6	6.7	6.7	6.7
13.000	6.8	6.8	6.8	6.9	6.9
13.500	6.9	7.0	7.0	7.0	7.1
14.000	7.1	7.1	7.2	7.2	7.2
14.500	7.3	7.3	7.3	7.4	7.4
15.000	7.4	7.4	7.5	7.5	7.5
15.500	7.6	7.6	7.6	7.7	7.7
16.000	7.7	7.8	7.8	7.8	7.8

Brunswick Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	7.9	7.9	7.9	8.0	8.0
17.000	8.0	8.0	8.1	8.1	8.1
17.500	8.2	8.2	8.2	8.2	8.3
18.000	8.3	8.3	8.3	8.4	8.4
18.500	8.4	8.4	8.5	8.5	8.5
19.000	8.6	8.6	8.6	8.6	8.7
19.500	8.7	8.7	8.7	8.7	8.8
20.000	8.8	8.8	8.8	8.9	8.9
20.500	8.9	8.9	9.0	9.0	9.0
21.000	9.0	9.1	9.1	9.1	9.1
21.500	9.1	9.2	9.2	9.2	9.2
22.000	9.2	9.3	9.3	9.3	9.3
22.500	9.4	9.4	9.4	9.4	9.4
23.000	9.5	9.5	9.5	9.5	9.5
23.500	9.5	9.6	9.6	9.6	9.6
24.000	9.6	(N/A)	(N/A)	(N/A)	(N/A)

Unit Hydrograph Method (Computational Notes)
Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

Column (5)	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
	If (Pa(t) is > 0.2Sp) then use:
	
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)

Column (6)	Rip(t) = Incremental pervious runoff for time step t Rip(t) = Rap(t) - Rap(t-1) Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Ril(t) R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	69.03 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	69.03 ft^3/s

Drainage Area	
SCS CN (Composite)	82.100
Area (User Defined)	98.600 acres
Maximum Retention (Pervious)	2.2 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.8 in
Runoff Volume (Pervious)	23.401 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	23.297 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

SCS Unit Hydrograph Parameters	
Unit peak, qp	558.59 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
3.350	0.00	0.01	0.04	0.10	0.18
3.600	0.28	0.39	0.51	0.63	0.75
3.850	0.88	1.01	1.14	1.27	1.40
4.100	1.52	1.64	1.77	1.89	2.02
4.350	2.15	2.29	2.43	2.57	2.72
4.600	2.87	3.02	3.17	3.33	3.49
4.850	3.66	3.83	4.01	4.20	4.39
5.100	4.59	4.81	5.03	5.25	5.46
5.350	5.67	5.88	6.09	6.30	6.50
5.600	6.67	6.83	7.01	7.21	7.43
5.850	7.66	7.91	8.17	8.44	8.76
6.100	9.17	9.60	10.02	10.39	10.73
6.350	11.05	11.35	11.62	11.88	12.05
6.600	12.06	11.99	11.98	12.09	12.30
6.850	12.58	12.93	13.32	13.79	14.30
7.100	14.88	15.52	16.23	16.99	17.84
7.350	18.74	19.73	20.78	22.00	24.80
7.600	31.84	41.16	49.56	55.80	60.55
7.850	64.11	66.68	68.33	69.03	67.85
8.100	62.82	55.95	49.68	45.03	41.29
8.350	38.23	35.57	33.33	31.36	29.96
8.600	29.43	29.45	29.36	28.97	28.38
8.850	27.73	27.02	26.32	25.62	24.95
9.100	24.28	23.66	23.04	22.47	21.91
9.350	21.38	20.88	20.43	19.99	19.68
9.600	19.60	19.66	19.68	19.61	19.50
9.850	19.36	19.20	19.03	18.86	18.67
10.100	18.44	18.20	17.98	17.78	17.61
10.350	17.46	17.34	17.23	17.13	17.07
10.600	17.09	17.17	17.19	17.16	17.08
10.850	16.98	16.87	16.75	16.63	16.50
11.100	16.38	16.25	16.12	16.00	15.87
11.350	15.74	15.60	15.47	15.34	15.20

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.600	15.01	14.81	14.63	14.50	14.39
11.850	14.31	14.23	14.17	14.13	14.10
12.100	14.08	14.08	14.09	14.13	14.18
12.350	14.25	14.33	14.42	14.53	14.58
12.600	14.47	14.26	14.06	13.94	13.85
12.850	13.78	13.74	13.71	13.68	13.70
13.100	13.82	13.98	14.06	14.04	13.99
13.350	13.92	13.82	13.72	13.63	13.55
13.600	13.48	13.41	13.33	13.27	13.23
13.850	13.19	13.16	13.12	13.10	13.09
14.100	13.11	13.13	13.15	13.15	13.14
14.350	13.12	13.10	13.08	13.06	13.04
14.600	13.02	13.00	12.98	12.95	12.92
14.850	12.90	12.87	12.85	12.84	12.82
15.100	12.80	12.78	12.76	12.74	12.71
15.350	12.69	12.66	12.63	12.60	12.58
15.600	12.56	12.53	12.51	12.49	12.47
15.850	12.46	12.43	12.41	12.38	12.35
16.100	12.32	12.30	12.28	12.25	12.23
16.350	12.20	12.18	12.15	12.13	12.11
16.600	12.08	12.06	12.03	12.01	11.98
16.850	11.96	11.93	11.91	11.89	11.86
17.100	11.83	11.81	11.79	11.76	11.72
17.350	11.69	11.67	11.64	11.62	11.61
17.600	11.58	11.55	11.53	11.51	11.48
17.850	11.45	11.42	11.38	11.36	11.33
18.100	11.31	11.28	11.25	11.23	11.21
18.350	11.19	11.17	11.14	11.10	11.07
18.600	11.04	11.02	10.99	10.96	10.93
18.850	10.91	10.88	10.85	10.83	10.80
19.100	10.77	10.75	10.72	10.70	10.67
19.350	10.64	10.61	10.59	10.56	10.53
19.600	10.50	10.48	10.45	10.42	10.38
19.850	10.35	10.32	10.30	10.27	10.25
20.100	10.23	10.20	10.17	10.14	10.12
20.350	10.08	10.05	10.01	9.98	9.96
20.600	9.93	9.90	9.87	9.85	9.83
20.850	9.81	9.78	9.75	9.71	9.68
21.100	9.65	9.62	9.59	9.56	9.53
21.350	9.50	9.47	9.44	9.42	9.39
21.600	9.36	9.33	9.30	9.28	9.25
21.850	9.21	9.19	9.16	9.13	9.10

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
22.100	9.07	9.04	9.01	8.98	8.94
22.350	8.91	8.88	8.85	8.83	8.81
22.600	8.78	8.75	8.72	8.69	8.66
22.850	8.63	8.59	8.56	8.53	8.50
23.100	8.47	8.44	8.41	8.38	8.36
23.350	8.34	8.31	8.28	8.24	8.20
23.600	8.17	8.14	8.11	8.08	8.05
23.850	8.02	7.99	7.96	7.94	(N/A)

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	53.72 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	53.72 ft³/s

Drainage Area	
SCS CN (Composite)	78.600
Area (User Defined)	89.400 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.5 in
Runoff Volume (Pervious)	18.893 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	18.803 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

SCS Unit Hydrograph Parameters	
Unit peak, qp	506.47 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 2 years
Label: CM-1 Storm Event: Brunswick NC 2-yr

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
4.000	0.00	0.01	0.03	0.09	0.16
4.250	0.25	0.34	0.44	0.54	0.65
4.500	0.76	0.87	0.98	1.09	1.21
4.750	1.33	1.46	1.58	1.71	1.85
5.000	1.99	2.13	2.28	2.44	2.61
5.250	2.77	2.93	3.10	3.26	3.43
5.500	3.59	3.75	3.90	4.04	4.19
5.750	4.35	4.53	4.71	4.91	5.11
6.000	5.33	5.57	5.87	6.20	6.51
6.250	6.80	7.07	7.33	7.57	7.80
6.500	8.02	8.18	8.23	8.23	8.26
6.750	8.37	8.56	8.79	9.07	9.38
7.000	9.75	10.15	10.61	11.10	11.66
7.250	12.25	12.91	13.62	14.39	15.21
7.500	16.17	18.32	23.65	30.75	37.24
7.750	42.19	46.06	49.06	51.33	52.90
8.000	53.72	53.04	49.30	44.06	39.25
8.250	35.68	32.79	30.44	28.37	26.64
8.500	25.10	24.02	23.63	23.68	23.63
8.750	23.35	22.90	22.41	21.86	21.31
9.000	20.76	20.24	19.72	19.23	18.74
9.250	18.29	17.84	17.43	17.04	16.67
9.500	16.33	16.09	16.03	16.09	16.11
9.750	16.07	15.99	15.88	15.76	15.63
10.000	15.49	15.35	15.17	14.98	14.80
10.250	14.65	14.52	14.40	14.30	14.22
10.500	14.14	14.10	14.13	14.19	14.22
10.750	14.20	14.14	14.06	13.98	13.88
11.000	13.79	13.69	13.59	13.49	13.39
11.250	13.29	13.19	13.08	12.98	12.87
11.500	12.77	12.65	12.50	12.34	12.20
11.750	12.09	12.00	11.93	11.87	11.83
12.000	11.79	11.78	11.76	11.76	11.78

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
12.250	11.81	11.86	11.92	11.99	12.07
12.500	12.16	12.21	12.12	11.94	11.79
12.750	11.68	11.61	11.56	11.53	11.50
13.000	11.48	11.50	11.60	11.74	11.81
13.250	11.80	11.76	11.70	11.62	11.54
13.500	11.47	11.40	11.34	11.29	11.23
13.750	11.18	11.14	11.12	11.09	11.06
14.000	11.04	11.04	11.06	11.08	11.09
14.250	11.10	11.09	11.08	11.06	11.05
14.500	11.04	11.02	11.00	10.99	10.97
14.750	10.95	10.93	10.91	10.89	10.88
15.000	10.87	10.86	10.84	10.82	10.81
15.250	10.79	10.77	10.75	10.73	10.71
15.500	10.69	10.67	10.65	10.63	10.62
15.750	10.60	10.59	10.58	10.56	10.54
16.000	10.51	10.49	10.47	10.45	10.43
16.250	10.41	10.40	10.38	10.36	10.34
16.500	10.32	10.30	10.28	10.26	10.24
16.750	10.23	10.21	10.18	10.16	10.15
17.000	10.13	10.11	10.09	10.07	10.05
17.250	10.02	10.00	9.97	9.95	9.93
17.500	9.92	9.90	9.88	9.86	9.84
17.750	9.82	9.80	9.78	9.75	9.73
18.000	9.70	9.68	9.66	9.64	9.62
18.250	9.60	9.58	9.57	9.55	9.52
18.500	9.50	9.47	9.45	9.43	9.40
18.750	9.38	9.36	9.34	9.32	9.29
19.000	9.27	9.25	9.23	9.21	9.18
19.250	9.16	9.14	9.12	9.09	9.07
19.500	9.05	9.03	9.00	8.98	8.96
19.750	8.93	8.90	8.88	8.85	8.83
20.000	8.82	8.80	8.78	8.75	8.73
20.250	8.71	8.69	8.66	8.63	8.60
20.500	8.58	8.56	8.53	8.51	8.48
20.750	8.46	8.45	8.43	8.40	8.38
21.000	8.35	8.32	8.30	8.27	8.25
21.250	8.22	8.20	8.18	8.15	8.13
21.500	8.10	8.08	8.06	8.03	8.01
21.750	7.98	7.96	7.93	7.91	7.89
22.000	7.86	7.84	7.81	7.79	7.77
22.250	7.74	7.71	7.68	7.65	7.63
22.500	7.61	7.59	7.57	7.54	7.52

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
22.750	7.50	7.47	7.44	7.41	7.38
23.000	7.35	7.33	7.30	7.28	7.25
23.250	7.23	7.21	7.19	7.17	7.14
23.500	7.11	7.08	7.05	7.03	7.00
23.750	6.98	6.95	6.93	6.90	6.88
24.000	6.86	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	118.73 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	118.73 ft^3/s

Drainage Area	
SCS CN (Composite)	82.100
Area (User Defined)	98.600 acres
Maximum Retention (Pervious)	2.2 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.7 in
Runoff Volume (Pervious)	38.948 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	38.790 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	558.59 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 10 years
Label: CM-1 Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.450	0.00	0.01	0.05	0.14	0.29
2.700	0.46	0.65	0.84	1.04	1.24
2.950	1.43	1.62	1.81	1.99	2.16
3.200	2.33	2.51	2.69	2.87	3.06
3.450	3.25	3.45	3.65	3.89	4.14
3.700	4.40	4.64	4.88	5.11	5.35
3.950	5.59	5.82	6.04	6.24	6.43
4.200	6.63	6.84	7.06	7.29	7.53
4.450	7.77	8.02	8.27	8.53	8.80
4.700	9.07	9.35	9.63	9.93	10.24
4.950	10.56	10.89	11.23	11.61	12.00
5.200	12.40	12.78	13.15	13.51	13.87
5.450	14.22	14.57	14.89	15.15	15.38
5.700	15.65	15.97	16.33	16.72	17.13
5.950	17.56	18.04	18.59	19.31	20.10
6.200	20.84	21.48	22.05	22.56	23.03
6.450	23.45	23.83	24.06	23.95	23.70
6.700	23.57	23.68	23.98	24.42	24.98
6.950	25.63	26.41	27.28	28.28	29.36
7.200	30.58	31.87	33.33	34.87	36.55
7.450	38.33	40.42	45.33	57.82	74.25
7.700	88.81	99.28	106.96	112.45	116.17
7.950	118.26	118.73	116.05	106.94	94.87
8.200	83.92	75.80	69.28	63.98	59.36
8.450	55.51	52.12	49.70	48.74	48.69
8.700	48.46	47.74	46.71	45.58	44.36
8.950	43.15	41.95	40.80	39.67	38.61
9.200	37.56	36.60	35.64	34.76	33.92
9.450	33.15	32.42	31.89	31.73	31.80
9.700	31.81	31.69	31.47	31.23	30.95
9.950	30.66	30.36	30.04	29.65	29.25
10.200	28.87	28.54	28.25	27.99	27.78

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.450	27.59	27.41	27.30	27.32	27.43
10.700	27.45	27.38	27.24	27.07	26.88
10.950	26.68	26.47	26.26	26.05	25.84
11.200	25.62	25.41	25.19	24.98	24.75
11.450	24.54	24.32	24.08	23.77	23.45
11.700	23.16	22.94	22.76	22.62	22.49
11.950	22.39	22.31	22.26	22.23	22.21
12.200	22.23	22.27	22.35	22.45	22.57
12.450	22.70	22.86	22.94	22.75	22.41
12.700	22.10	21.90	21.75	21.64	21.57
12.950	21.51	21.47	21.49	21.67	21.91
13.200	22.03	22.00	21.91	21.79	21.64
13.450	21.48	21.33	21.19	21.07	20.95
13.700	20.84	20.73	20.66	20.60	20.54
13.950	20.48	20.44	20.42	20.44	20.47
14.200	20.49	20.49	20.46	20.43	20.40
14.450	20.37	20.33	20.29	20.25	20.22
14.700	20.18	20.14	20.09	20.04	20.00
14.950	19.97	19.94	19.91	19.87	19.83
15.200	19.79	19.76	19.72	19.67	19.62
15.450	19.57	19.53	19.49	19.45	19.41
15.700	19.37	19.34	19.31	19.28	19.24
15.950	19.19	19.14	19.09	19.05	19.01
16.200	18.97	18.92	18.88	18.85	18.81
16.450	18.76	18.72	18.68	18.64	18.60
16.700	18.56	18.52	18.48	18.43	18.39
16.950	18.36	18.31	18.27	18.23	18.19
17.200	18.15	18.10	18.04	17.99	17.95
17.450	17.91	17.88	17.85	17.81	17.76
17.700	17.72	17.69	17.64	17.59	17.54
17.950	17.49	17.44	17.40	17.36	17.31
18.200	17.27	17.23	17.20	17.17	17.13
18.450	17.08	17.03	16.98	16.93	16.89
18.700	16.84	16.80	16.75	16.72	16.67
18.950	16.62	16.58	16.54	16.50	16.45
19.200	16.41	16.37	16.32	16.28	16.23
19.450	16.19	16.15	16.10	16.06	16.02
19.700	15.97	15.92	15.87	15.81	15.77
19.950	15.73	15.70	15.66	15.62	15.57
20.200	15.53	15.49	15.44	15.39	15.34
20.450	15.28	15.24	15.19	15.15	15.10
20.700	15.06	15.02	14.98	14.95	14.91

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.950	14.86	14.80	14.75	14.70	14.66
21.200	14.61	14.56	14.52	14.48	14.43
21.450	14.38	14.34	14.30	14.25	14.20
21.700	14.16	14.12	14.07	14.02	13.98
21.950	13.94	13.89	13.84	13.80	13.76
22.200	13.71	13.66	13.60	13.54	13.50
22.450	13.46	13.42	13.39	13.34	13.29
22.700	13.25	13.21	13.16	13.11	13.05
22.950	13.00	12.95	12.91	12.86	12.81
23.200	12.76	12.73	12.69	12.65	12.61
23.450	12.56	12.50	12.45	12.40	12.36
23.700	12.31	12.26	12.21	12.17	12.12
23.950	12.08	12.04	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	97.35 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	97.35 ft³/s

Drainage Area	
SCS CN (Composite)	78.600
Area (User Defined)	89.400 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.4 in
Runoff Volume (Pervious)	32.471 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	32.332 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	506.47 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.950	0.00	0.01	0.04	0.11	0.21
3.200	0.33	0.47	0.61	0.75	0.90
3.450	1.05	1.21	1.37	1.54	1.72
3.700	1.91	2.09	2.28	2.46	2.65
3.950	2.84	3.02	3.21	3.38	3.54
4.200	3.71	3.89	4.07	4.26	4.45
4.450	4.65	4.85	5.06	5.27	5.49
4.700	5.71	5.93	6.16	6.40	6.65
4.950	6.91	7.17	7.45	7.75	8.06
5.200	8.38	8.68	8.99	9.29	9.58
5.450	9.87	10.16	10.44	10.67	10.88
5.700	11.12	11.39	11.70	12.02	12.37
5.950	12.73	13.12	13.57	14.15	14.78
6.200	15.38	15.90	16.38	16.81	17.22
6.450	17.59	17.93	18.15	18.12	17.98
6.700	17.93	18.05	18.33	18.71	19.19
6.950	19.74	20.38	21.10	21.92	22.81
7.200	23.81	24.88	26.08	27.35	28.74
7.450	30.21	31.93	35.91	45.97	59.26
7.700	71.15	79.85	86.38	91.18	94.55
7.950	96.62	97.35	95.45	88.19	78.42
8.200	69.51	62.91	57.60	53.28	49.51
8.450	46.35	43.57	41.60	40.83	40.83
8.700	40.67	40.10	39.26	38.35	37.34
8.950	36.36	35.37	34.42	33.49	32.61
9.200	31.75	30.95	30.16	29.43	28.73
9.450	28.09	27.49	27.05	26.92	27.00
9.700	27.01	26.92	26.75	26.55	26.32
9.950	26.09	25.84	25.58	25.26	24.93
10.200	24.61	24.34	24.10	23.89	23.71
10.450	23.56	23.41	23.32	23.35	23.45
10.700	23.48	23.42	23.31	23.17	23.01

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.950	22.85	22.68	22.51	22.33	22.15
11.200	21.97	21.80	21.61	21.43	21.25
11.450	21.07	20.88	20.68	20.42	20.15
11.700	19.91	19.72	19.57	19.45	19.35
11.950	19.26	19.20	19.16	19.14	19.13
12.200	19.14	19.19	19.26	19.35	19.45
12.450	19.57	19.71	19.78	19.63	19.34
12.700	19.07	18.90	18.77	18.69	18.62
12.950	18.58	18.54	18.57	18.72	18.93
13.200	19.04	19.02	18.94	18.84	18.71
13.450	18.58	18.45	18.34	18.24	18.14
13.700	18.04	17.95	17.89	17.84	17.79
13.950	17.74	17.71	17.70	17.72	17.75
14.200	17.77	17.76	17.75	17.72	17.70
14.450	17.67	17.64	17.61	17.58	17.55
14.700	17.52	17.48	17.44	17.40	17.37
14.950	17.34	17.32	17.30	17.27	17.23
15.200	17.20	17.18	17.14	17.10	17.06
15.450	17.02	16.99	16.96	16.92	16.89
15.700	16.86	16.83	16.81	16.78	16.75
15.950	16.71	16.67	16.63	16.59	16.56
16.200	16.53	16.49	16.46	16.43	16.39
16.450	16.36	16.32	16.29	16.26	16.22
16.700	16.19	16.15	16.12	16.08	16.05
16.950	16.02	15.98	15.94	15.91	15.88
17.200	15.84	15.80	15.76	15.71	15.68
17.450	15.65	15.62	15.59	15.56	15.52
17.700	15.49	15.46	15.42	15.38	15.33
17.950	15.29	15.25	15.22	15.18	15.14
18.200	15.10	15.07	15.05	15.02	14.98
18.450	14.94	14.90	14.85	14.81	14.78
18.700	14.74	14.70	14.67	14.63	14.59
18.950	14.55	14.52	14.49	14.45	14.41
19.200	14.37	14.34	14.30	14.26	14.22
19.450	14.19	14.15	14.11	14.07	14.04
19.700	14.00	13.96	13.91	13.86	13.82
19.950	13.79	13.76	13.73	13.70	13.66
20.200	13.62	13.59	13.55	13.50	13.45
20.450	13.41	13.37	13.33	13.29	13.25
20.700	13.21	13.18	13.15	13.12	13.09
20.950	13.04	12.99	12.95	12.91	12.87
21.200	12.83	12.79	12.75	12.72	12.68

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.450	12.63	12.60	12.56	12.52	12.48
21.700	12.44	12.40	12.36	12.32	12.28
21.950	12.25	12.21	12.17	12.13	12.09
22.200	12.05	12.01	11.96	11.91	11.87
22.450	11.83	11.80	11.77	11.73	11.69
22.700	11.65	11.62	11.58	11.53	11.48
22.950	11.43	11.39	11.35	11.31	11.27
23.200	11.23	11.20	11.17	11.14	11.10
23.450	11.05	11.00	10.96	10.91	10.88
23.700	10.83	10.79	10.75	10.71	10.67
23.950	10.63	10.61	(N/A)	(N/A)	(N/A)

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	162.74 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	162.57 ft^3/s

Drainage Area	
SCS CN (Composite)	82.100
Area (User Defined)	98.600 acres
Maximum Retention (Pervious)	2.2 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.4 in
Runoff Volume (Pervious)	52.864 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	52.660 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	558.59 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 25 years
Label: CM-1 Storm Event: Brunswick NC 25-yr

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.000	0.00	0.00	0.03	0.12	0.29
2.250	0.54	0.82	1.13	1.44	1.75
2.500	2.06	2.37	2.67	2.96	3.24
2.750	3.52	3.80	4.07	4.34	4.60
3.000	4.86	5.11	5.34	5.55	5.77
3.250	6.00	6.24	6.48	6.75	7.02
3.500	7.30	7.60	7.95	8.33	8.71
3.750	9.07	9.41	9.74	10.07	10.40
4.000	10.72	11.02	11.29	11.53	11.79
4.250	12.06	12.36	12.67	12.99	13.33
4.500	13.67	14.02	14.38	14.74	15.11
4.750	15.49	15.89	16.29	16.73	17.17
5.000	17.62	18.09	18.62	19.17	19.72
5.250	20.24	20.76	21.24	21.72	22.19
5.500	22.65	23.07	23.40	23.68	24.02
5.750	24.43	24.91	25.43	25.98	26.56
6.000	27.21	27.96	28.97	30.07	31.09
6.250	31.96	32.72	33.39	34.00	34.54
6.500	35.02	35.27	35.04	34.59	34.33
6.750	34.42	34.79	35.35	36.10	36.97
7.000	38.02	39.20	40.56	42.03	43.69
7.250	45.45	47.44	49.53	51.83	54.24
7.500	57.08	63.86	81.21	103.97	123.97
7.750	138.13	148.31	155.41	160.02	162.40
8.000	162.57	158.48	145.72	129.01	113.91
8.250	102.72	93.75	86.46	80.13	74.85
8.500	70.21	66.90	65.54	65.42	65.06
8.750	64.06	62.62	61.08	59.40	57.75
9.000	56.11	54.54	53.01	51.56	50.14
9.250	48.83	47.54	46.34	45.20	44.15
9.500	43.17	42.44	42.21	42.30	42.29
9.750	42.11	41.82	41.47	41.09	40.70

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.000	40.28	39.85	39.32	38.78	38.26
10.250	37.82	37.42	37.07	36.77	36.52
10.500	36.27	36.11	36.14	36.26	36.29
10.750	36.19	35.99	35.77	35.50	35.23
11.000	34.95	34.66	34.37	34.09	33.80
11.250	33.51	33.21	32.92	32.62	32.33
11.500	32.04	31.71	31.30	30.87	30.49
11.750	30.19	29.95	29.76	29.59	29.45
12.000	29.34	29.27	29.22	29.20	29.21
12.250	29.27	29.37	29.50	29.65	29.81
12.500	30.02	30.11	29.87	29.42	29.01
12.750	28.73	28.53	28.39	28.29	28.21
13.000	28.15	28.17	28.40	28.71	28.86
13.250	28.83	28.70	28.54	28.34	28.13
13.500	27.92	27.75	27.58	27.43	27.27
13.750	27.13	27.03	26.95	26.86	26.78
14.000	26.73	26.71	26.73	26.77	26.79
14.250	26.78	26.75	26.70	26.66	26.61
14.500	26.56	26.50	26.45	26.41	26.35
14.750	26.29	26.22	26.16	26.10	26.06
15.000	26.02	25.98	25.92	25.87	25.82
15.250	25.77	25.71	25.65	25.58	25.52
15.500	25.46	25.41	25.35	25.29	25.24
15.750	25.20	25.16	25.11	25.06	25.00
16.000	24.93	24.87	24.81	24.76	24.70
16.250	24.64	24.59	24.54	24.48	24.42
16.500	24.37	24.32	24.26	24.20	24.14
16.750	24.10	24.04	23.98	23.92	23.87
17.000	23.81	23.75	23.70	23.65	23.59
17.250	23.53	23.46	23.39	23.33	23.28
17.500	23.24	23.19	23.14	23.08	23.03
17.750	22.97	22.92	22.85	22.78	22.71
18.000	22.65	22.60	22.54	22.48	22.42
18.250	22.37	22.33	22.29	22.23	22.17
18.500	22.10	22.03	21.97	21.91	21.85
18.750	21.79	21.74	21.68	21.62	21.56
19.000	21.50	21.45	21.39	21.33	21.27
19.250	21.22	21.16	21.10	21.04	20.99
19.500	20.93	20.87	20.81	20.76	20.70
19.750	20.63	20.56	20.49	20.43	20.38
20.000	20.33	20.29	20.23	20.17	20.11
20.250	20.06	20.00	19.93	19.86	19.79

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.500	19.73	19.67	19.61	19.55	19.49
20.750	19.44	19.40	19.35	19.29	19.23
21.000	19.16	19.09	19.02	18.97	18.91
21.250	18.84	18.78	18.73	18.67	18.61
21.500	18.55	18.50	18.43	18.37	18.31
21.750	18.26	18.20	18.13	18.08	18.02
22.000	17.96	17.90	17.84	17.78	17.72
22.250	17.65	17.58	17.51	17.45	17.40
22.500	17.35	17.30	17.24	17.18	17.12
22.750	17.07	17.01	16.94	16.87	16.79
23.000	16.73	16.67	16.61	16.55	16.49
23.250	16.44	16.39	16.35	16.29	16.22
23.500	16.15	16.08	16.01	15.96	15.89
23.750	15.83	15.77	15.72	15.65	15.59
24.000	15.55	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	136.61 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	136.61 ft³/s

Drainage Area	
SCS CN (Composite)	78.600
Area (User Defined)	89.400 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.0 in
Runoff Volume (Pervious)	44.784 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	44.603 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	506.47 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 25 years
Label: CM-1 Storm Event: Brunswick NC 25-yr

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.400	0.00	0.00	0.02	0.10	0.24
2.650	0.42	0.63	0.86	1.08	1.31
2.900	1.54	1.76	1.98	2.20	2.40
3.150	2.60	2.80	3.00	3.20	3.41
3.400	3.63	3.85	4.08	4.32	4.59
3.650	4.88	5.17	5.46	5.73	6.00
3.900	6.27	6.55	6.81	7.07	7.30
4.150	7.52	7.75	7.99	8.24	8.50
4.400	8.78	9.06	9.34	9.64	9.94
4.650	10.24	10.55	10.87	11.20	11.54
4.900	11.90	12.27	12.65	13.04	13.48
5.150	13.93	14.39	14.82	15.25	15.67
5.400	16.08	16.48	16.88	17.25	17.55
5.650	17.81	18.12	18.49	18.90	19.35
5.900	19.82	20.32	20.86	21.50	22.33
6.150	23.24	24.09	24.82	25.48	26.07
6.400	26.61	27.09	27.53	27.78	27.66
6.650	27.36	27.21	27.33	27.68	28.18
6.900	28.83	29.58	30.47	31.48	32.62
7.150	33.86	35.26	36.75	38.43	40.20
7.400	42.14	44.18	46.58	52.24	66.62
7.650	85.54	102.29	114.33	123.15	129.45
7.900	133.70	136.09	136.61	133.51	123.01
8.150	109.11	96.51	87.16	79.66	73.56
8.400	68.25	63.82	59.91	57.13	56.02
8.650	55.96	55.69	54.87	53.68	52.38
8.900	50.97	49.59	48.20	46.88	45.58
9.150	44.36	43.16	42.05	40.95	39.94
9.400	38.97	38.08	37.25	36.63	36.44
9.650	36.53	36.54	36.40	36.15	35.87
9.900	35.54	35.22	34.87	34.50	34.05
10.150	33.59	33.16	32.78	32.44	32.15

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.400	31.90	31.69	31.48	31.35	31.38
10.650	31.49	31.53	31.44	31.28	31.09
10.900	30.87	30.64	30.40	30.16	29.91
11.150	29.67	29.42	29.18	28.92	28.68
11.400	28.42	28.17	27.92	27.64	27.29
11.650	26.92	26.59	26.33	26.13	25.97
11.900	25.82	25.70	25.61	25.56	25.52
12.150	25.50	25.52	25.57	25.66	25.78
12.400	25.91	26.06	26.25	26.33	26.12
12.650	25.73	25.37	25.14	24.97	24.84
12.900	24.76	24.69	24.64	24.67	24.87
13.150	25.14	25.28	25.25	25.15	25.01
13.400	24.83	24.65	24.48	24.33	24.18
13.650	24.05	23.91	23.80	23.71	23.64
13.900	23.57	23.50	23.45	23.44	23.46
14.150	23.50	23.52	23.51	23.48	23.45
14.400	23.41	23.38	23.33	23.28	23.24
14.650	23.20	23.16	23.11	23.05	22.99
14.900	22.95	22.91	22.88	22.84	22.80
15.150	22.75	22.71	22.67	22.62	22.57
15.400	22.51	22.46	22.41	22.37	22.32
15.650	22.27	22.22	22.19	22.15	22.12
15.900	22.07	22.02	21.96	21.91	21.86
16.150	21.81	21.76	21.71	21.67	21.63
16.400	21.58	21.53	21.48	21.44	21.39
16.650	21.34	21.29	21.25	21.20	21.15
16.900	21.10	21.06	21.01	20.96	20.91
17.150	20.87	20.82	20.76	20.70	20.64
17.400	20.59	20.55	20.51	20.48	20.43
17.650	20.38	20.33	20.29	20.24	20.18
17.900	20.12	20.06	20.01	19.97	19.91
18.150	19.86	19.81	19.77	19.73	19.70
18.400	19.65	19.59	19.53	19.47	19.42
18.650	19.37	19.32	19.27	19.22	19.18
18.900	19.12	19.07	19.02	18.98	18.92
19.150	18.87	18.82	18.78	18.72	18.67
19.400	18.62	18.58	18.52	18.47	18.42
19.650	18.38	18.32	18.26	18.20	18.14
19.900	18.09	18.04	18.00	17.96	17.91
20.150	17.86	17.81	17.77	17.71	17.66
20.400	17.59	17.53	17.48	17.43	17.37
20.650	17.32	17.27	17.23	17.19	17.15

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
20.900	17.10	17.04	16.98	16.92	16.86
21.150	16.81	16.76	16.70	16.65	16.61
21.400	16.55	16.50	16.45	16.40	16.34
21.650	16.29	16.24	16.19	16.14	16.08
21.900	16.03	15.98	15.93	15.87	15.82
22.150	15.78	15.72	15.66	15.60	15.53
22.400	15.48	15.43	15.39	15.35	15.30
22.650	15.25	15.20	15.15	15.10	15.04
22.900	14.97	14.91	14.85	14.80	14.75
23.150	14.69	14.64	14.59	14.55	14.51
23.400	14.46	14.40	14.34	14.27	14.22
23.650	14.17	14.11	14.06	14.00	13.96
23.900	13.90	13.85	13.81	(N/A)	(N/A)

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	188.66 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	188.38 ft³/s

Drainage Area	
SCS CN (Composite)	82.100
Area (User Defined)	98.600 acres
Maximum Retention (Pervious)	2.2 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	7.4 in
Runoff Volume (Pervious)	61.143 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	60.912 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	558.59 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-1 Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	98.600 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
1.850	0.00	0.01	0.08	0.25	0.51
2.100	0.84	1.20	1.57	1.95	2.34
2.350	2.73	3.11	3.48	3.85	4.22
2.600	4.56	4.89	5.21	5.53	5.85
2.850	6.16	6.47	6.77	7.07	7.35
3.100	7.60	7.84	8.08	8.34	8.61
3.350	8.90	9.20	9.52	9.85	10.20
3.600	10.62	11.07	11.53	11.96	12.36
3.850	12.74	13.13	13.52	13.89	14.23
4.100	14.53	14.81	15.10	15.41	15.75
4.350	16.10	16.47	16.86	17.25	17.65
4.600	18.07	18.49	18.92	19.35	19.81
4.850	20.29	20.79	21.30	21.82	22.37
5.100	22.99	23.63	24.27	24.88	25.47
5.350	26.03	26.58	27.11	27.64	28.11
5.600	28.48	28.78	29.15	29.62	30.17
5.850	30.76	31.39	32.05	32.79	33.66
6.100	34.84	36.13	37.32	38.31	39.18
6.350	39.95	40.64	41.24	41.77	42.03
6.600	41.72	41.14	40.80	40.87	41.28
6.850	41.91	42.76	43.76	44.97	46.34
7.100	47.90	49.59	51.51	53.55	55.85
7.350	58.27	60.92	63.70	66.98	74.87
7.600	95.09	121.58	144.77	161.09	172.73
7.850	180.75	185.86	188.38	188.34	183.40
8.100	168.48	149.05	131.51	118.50	108.09
8.350	99.63	92.29	86.18	80.80	76.96
8.600	75.38	75.21	74.77	73.60	71.93
8.850	70.14	68.19	66.29	64.38	62.58
9.100	60.80	59.13	57.49	55.97	54.48
9.350	53.11	51.79	50.58	49.45	48.61
9.600	48.33	48.43	48.41	48.20	47.86

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.850	47.46	47.01	46.55	46.07	45.57
10.100	44.96	44.34	43.74	43.23	42.77
10.350	42.37	42.02	41.73	41.44	41.25
10.600	41.28	41.42	41.45	41.33	41.10
10.850	40.83	40.53	40.22	39.89	39.56
11.100	39.23	38.90	38.56	38.23	37.89
11.350	37.56	37.21	36.88	36.54	36.17
11.600	35.70	35.20	34.76	34.42	34.15
11.850	33.92	33.73	33.56	33.44	33.36
12.100	33.30	33.27	33.28	33.35	33.46
12.350	33.60	33.77	33.96	34.19	34.30
12.600	34.02	33.50	33.03	32.72	32.49
12.850	32.32	32.20	32.12	32.04	32.07
13.100	32.33	32.68	32.85	32.81	32.66
13.350	32.48	32.25	32.00	31.77	31.57
13.600	31.38	31.20	31.02	30.86	30.74
13.850	30.65	30.55	30.46	30.39	30.37
14.100	30.40	30.44	30.46	30.45	30.41
14.350	30.36	30.30	30.25	30.19	30.13
14.600	30.07	30.01	29.95	29.88	29.80
14.850	29.73	29.66	29.61	29.56	29.51
15.100	29.45	29.39	29.33	29.28	29.21
15.350	29.14	29.06	28.98	28.92	28.86
15.600	28.79	28.73	28.66	28.61	28.57
15.850	28.52	28.46	28.39	28.31	28.23
16.100	28.17	28.11	28.04	27.97	27.91
16.350	27.85	27.79	27.72	27.66	27.60
16.600	27.53	27.46	27.40	27.34	27.28
16.850	27.21	27.15	27.09	27.02	26.95
17.100	26.89	26.83	26.76	26.69	26.61
17.350	26.53	26.46	26.41	26.36	26.31
17.600	26.24	26.18	26.11	26.06	25.99
17.850	25.91	25.83	25.76	25.69	25.63
18.100	25.56	25.49	25.42	25.37	25.32
18.350	25.27	25.20	25.13	25.05	24.97
18.600	24.90	24.84	24.77	24.70	24.64
18.850	24.58	24.51	24.44	24.37	24.31
19.100	24.25	24.18	24.11	24.05	23.98
19.350	23.91	23.85	23.79	23.72	23.65
19.600	23.58	23.52	23.45	23.38	23.29
19.850	23.21	23.14	23.09	23.04	22.98
20.100	22.92	22.85	22.79	22.73	22.66

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.350	22.58	22.50	22.42	22.35	22.28
20.600	22.21	22.14	22.08	22.02	21.97
20.850	21.92	21.85	21.78	21.69	21.61
21.100	21.54	21.48	21.41	21.34	21.27
21.350	21.21	21.14	21.07	21.00	20.94
21.600	20.87	20.80	20.73	20.67	20.60
21.850	20.53	20.46	20.40	20.33	20.26
22.100	20.19	20.13	20.06	19.99	19.90
22.350	19.82	19.75	19.69	19.64	19.58
22.600	19.52	19.45	19.38	19.32	19.25
22.850	19.17	19.09	19.01	18.94	18.87
23.100	18.80	18.73	18.66	18.60	18.55
23.350	18.50	18.43	18.36	18.27	18.19
23.600	18.12	18.06	17.99	17.91	17.84
23.850	17.78	17.71	17.64	17.60	(N/A)

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	159.95 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	159.89 ft^3/s

Drainage Area	
SCS CN (Composite)	78.600
Area (User Defined)	89.400 acres
Maximum Retention (Pervious)	2.7 in
Maximum Retention (Pervious, 20 percent)	0.5 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	7.0 in
Runoff Volume (Pervious)	52.151 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	51.946 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	506.47 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	89.400 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
2.200	0.00	0.01	0.05	0.16	0.36
2.450	0.61	0.88	1.17	1.45	1.73
2.700	2.01	2.29	2.56	2.83	3.10
2.950	3.36	3.62	3.87	4.10	4.32
3.200	4.54	4.77	5.01	5.25	5.51
3.450	5.78	6.05	6.33	6.66	7.02
3.700	7.38	7.73	8.06	8.38	8.70
3.950	9.02	9.34	9.63	9.90	10.15
4.200	10.41	10.69	10.98	11.28	11.61
4.450	11.93	12.27	12.61	12.97	13.32
4.700	13.69	14.06	14.45	14.85	15.28
4.950	15.71	16.15	16.62	17.13	17.67
5.200	18.21	18.72	19.22	19.71	20.18
5.450	20.65	21.11	21.53	21.87	22.15
5.700	22.50	22.92	23.40	23.91	24.46
5.950	25.04	25.68	26.42	27.41	28.48
6.200	29.48	30.33	31.09	31.77	32.38
6.450	32.93	33.42	33.69	33.50	33.10
6.700	32.89	33.00	33.38	33.95	34.69
6.950	35.56	36.60	37.77	39.11	40.56
7.200	42.19	43.93	45.89	47.96	50.22
7.450	52.60	55.40	62.05	79.01	101.28
7.700	120.92	134.93	145.08	152.25	156.98
7.950	159.53	159.89	156.05	143.62	127.26
8.200	112.45	101.47	92.67	85.51	79.29
8.450	74.10	69.53	66.28	64.96	64.86
8.700	64.53	63.55	62.15	60.63	58.98
8.950	57.36	55.74	54.20	52.68	51.26
9.200	49.85	48.56	47.28	46.10	44.98
9.450	43.94	42.97	42.25	42.03	42.12
9.700	42.12	41.95	41.66	41.32	40.95
9.950	40.56	40.15	39.72	39.20	38.67

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
10.200	38.16	37.72	37.32	36.99	36.69
10.450	36.44	36.20	36.04	36.07	36.20
10.700	36.24	36.13	35.94	35.72	35.46
10.950	35.19	34.91	34.63	34.35	34.07
11.200	33.77	33.49	33.20	32.91	32.61
11.450	32.33	32.03	31.71	31.30	30.88
11.700	30.50	30.20	29.96	29.77	29.60
11.950	29.46	29.36	29.29	29.24	29.22
12.200	29.24	29.30	29.40	29.53	29.68
12.450	29.85	30.06	30.15	29.91	29.46
12.700	29.05	28.78	28.58	28.44	28.34
12.950	28.26	28.20	28.23	28.46	28.77
13.200	28.92	28.89	28.77	28.61	28.40
13.450	28.19	27.99	27.82	27.65	27.50
13.700	27.34	27.21	27.10	27.02	26.94
13.950	26.86	26.81	26.79	26.81	26.85
14.200	26.87	26.86	26.83	26.79	26.74
14.450	26.70	26.65	26.60	26.55	26.50
14.700	26.45	26.39	26.32	26.26	26.20
14.950	26.16	26.12	26.08	26.03	25.97
15.200	25.92	25.88	25.82	25.76	25.69
15.450	25.63	25.57	25.52	25.46	25.41
15.700	25.35	25.31	25.27	25.23	25.18
15.950	25.12	25.05	24.98	24.93	24.88
16.200	24.82	24.76	24.71	24.66	24.60
16.450	24.54	24.49	24.44	24.38	24.32
16.700	24.27	24.22	24.16	24.10	24.05
16.950	24.00	23.94	23.88	23.83	23.78
17.200	23.72	23.66	23.59	23.52	23.46
17.450	23.41	23.37	23.33	23.27	23.21
17.700	23.16	23.11	23.05	22.98	22.91
17.950	22.85	22.79	22.73	22.67	22.61
18.200	22.56	22.51	22.47	22.42	22.37
18.450	22.31	22.23	22.17	22.11	22.05
18.700	21.99	21.93	21.87	21.82	21.76
18.950	21.70	21.64	21.59	21.53	21.47
19.200	21.41	21.36	21.30	21.24	21.18
19.450	21.13	21.07	21.01	20.95	20.90
19.700	20.84	20.77	20.70	20.63	20.57
19.950	20.52	20.47	20.43	20.37	20.31
20.200	20.25	20.20	20.14	20.08	20.00
20.450	19.93	19.87	19.81	19.75	19.69

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.700	19.63	19.58	19.54	19.49	19.44
20.950	19.37	19.30	19.23	19.17	19.11
21.200	19.05	18.98	18.93	18.87	18.81
21.450	18.75	18.69	18.64	18.57	18.51
21.700	18.45	18.40	18.34	18.27	18.21
21.950	18.16	18.10	18.04	17.98	17.92
22.200	17.86	17.79	17.72	17.65	17.58
22.450	17.53	17.49	17.44	17.38	17.32
22.700	17.26	17.21	17.15	17.08	17.00
22.950	16.93	16.87	16.81	16.75	16.68
23.200	16.62	16.57	16.53	16.48	16.42
23.450	16.35	16.28	16.21	16.15	16.09
23.700	16.03	15.96	15.90	15.85	15.78
23.950	15.72	15.68	(N/A)	(N/A)	(N/A)

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	24.28 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	24.28 ft³/s

Drainage Area	
SCS CN (Composite)	87.740
Area (User Defined)	28.100 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.4 in
Runoff Volume (Pervious)	7.932 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	7.900 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

SCS Unit Hydrograph Parameters	
Unit peak, qp	159.19 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.300	0.00	0.00	0.01	0.03	0.07
2.550	0.11	0.15	0.19	0.23	0.27
2.800	0.31	0.35	0.39	0.43	0.47
3.050	0.51	0.55	0.58	0.62	0.65
3.300	0.69	0.72	0.76	0.80	0.84
3.550	0.89	0.94	0.99	1.04	1.10
3.800	1.14	1.19	1.24	1.29	1.34
4.050	1.38	1.42	1.46	1.50	1.54
4.300	1.59	1.64	1.68	1.73	1.79
4.550	1.84	1.89	1.95	2.00	2.06
4.800	2.12	2.18	2.24	2.31	2.37
5.050	2.44	2.52	2.60	2.68	2.76
5.300	2.84	2.91	2.99	3.06	3.13
5.550	3.19	3.24	3.29	3.34	3.41
5.800	3.48	3.56	3.64	3.73	3.83
6.050	3.94	4.09	4.25	4.40	4.53
6.300	4.65	4.75	4.84	4.93	5.01
6.550	5.05	5.02	4.96	4.93	4.95
6.800	5.01	5.10	5.21	5.35	5.50
7.050	5.68	5.88	6.10	6.35	6.62
7.300	6.91	7.23	7.57	7.94	8.36
7.550	9.37	11.94	15.31	18.29	20.42
7.800	21.97	23.07	23.81	24.21	24.28
8.050	23.70	21.83	19.35	17.10	15.44
8.300	14.10	13.02	12.07	11.28	10.59
8.550	10.10	9.90	9.88	9.83	9.69
8.800	9.47	9.24	8.99	8.75	8.50
9.050	8.27	8.04	7.82	7.61	7.41
9.300	7.22	7.04	6.86	6.71	6.56
9.550	6.45	6.42	6.43	6.43	6.41
9.800	6.36	6.31	6.25	6.20	6.13
10.050	6.07	5.99	5.91	5.83	5.76
10.300	5.70	5.65	5.61	5.57	5.53

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.550	5.51	5.51	5.53	5.54	5.52
10.800	5.50	5.46	5.42	5.38	5.34
11.050	5.30	5.25	5.21	5.17	5.12
11.300	5.08	5.03	4.99	4.94	4.90
11.550	4.85	4.79	4.72	4.67	4.62
11.800	4.58	4.56	4.53	4.51	4.49
12.050	4.48	4.47	4.47	4.47	4.48
12.300	4.50	4.52	4.54	4.57	4.60
12.550	4.62	4.58	4.51	4.45	4.41
12.800	4.38	4.35	4.34	4.33	4.32
13.050	4.32	4.36	4.41	4.43	4.42
13.300	4.40	4.38	4.35	4.32	4.29
13.550	4.26	4.24	4.21	4.19	4.17
13.800	4.15	4.14	4.13	4.11	4.11
14.050	4.10	4.11	4.11	4.12	4.12
14.300	4.11	4.10	4.10	4.09	4.08
14.550	4.08	4.07	4.06	4.05	4.04
14.800	4.03	4.02	4.02	4.01	4.00
15.050	4.00	3.99	3.98	3.97	3.97
15.300	3.96	3.95	3.94	3.93	3.92
15.550	3.91	3.90	3.89	3.89	3.88
15.800	3.87	3.87	3.86	3.85	3.84
16.050	3.83	3.82	3.81	3.81	3.80
16.300	3.79	3.78	3.77	3.76	3.75
16.550	3.75	3.74	3.73	3.72	3.71
16.800	3.71	3.70	3.69	3.68	3.67
17.050	3.66	3.65	3.65	3.64	3.63
17.300	3.62	3.61	3.60	3.59	3.58
17.550	3.58	3.57	3.56	3.55	3.54
17.800	3.54	3.53	3.51	3.50	3.50
18.050	3.49	3.48	3.47	3.46	3.45
18.300	3.45	3.44	3.43	3.42	3.41
18.550	3.40	3.39	3.38	3.37	3.36
18.800	3.36	3.35	3.34	3.33	3.32
19.050	3.31	3.30	3.29	3.29	3.28
19.300	3.27	3.26	3.25	3.24	3.23
19.550	3.22	3.22	3.21	3.20	3.19
19.800	3.18	3.17	3.16	3.15	3.14
20.050	3.14	3.13	3.12	3.11	3.10
20.300	3.09	3.08	3.07	3.06	3.05
20.550	3.04	3.03	3.02	3.01	3.01
20.800	3.00	2.99	2.98	2.97	2.96

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 2 years
Label: CM-2 Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.050	2.95	2.94	2.93	2.92	2.91
21.300	2.91	2.90	2.89	2.88	2.87
21.550	2.86	2.85	2.84	2.83	2.82
21.800	2.82	2.81	2.80	2.79	2.78
22.050	2.77	2.76	2.75	2.74	2.73
22.300	2.72	2.71	2.70	2.69	2.68
22.550	2.68	2.67	2.66	2.65	2.64
22.800	2.63	2.62	2.61	2.60	2.59
23.050	2.58	2.57	2.56	2.55	2.54
23.300	2.54	2.53	2.52	2.51	2.50
23.550	2.49	2.48	2.47	2.46	2.45
23.800	2.44	2.43	2.42	2.41	2.41

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	25.20 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	25.20 ft^3/s

Drainage Area	
SCS CN (Composite)	83.300
Area (User Defined)	34.300 acres
Maximum Retention (Pervious)	2.0 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.0 in
Runoff Volume (Pervious)	8.457 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	8.421 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

SCS Unit Hydrograph Parameters	
Unit peak, qp	194.32 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 2 years
Label: CM-2 Storm Event: Brunswick NC 2-yr

Storm Event	Brunswick NC 2-yr
Return Event	2 years
Duration	24.000 hours
Depth	4.7 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
3.100	0.00	0.00	0.01	0.03	0.05
3.350	0.09	0.12	0.16	0.20	0.24
3.600	0.28	0.33	0.37	0.42	0.47
3.850	0.51	0.56	0.61	0.66	0.70
4.100	0.75	0.79	0.84	0.88	0.93
4.350	0.98	1.03	1.08	1.13	1.19
4.600	1.24	1.30	1.35	1.41	1.47
4.850	1.53	1.60	1.66	1.73	1.80
5.100	1.88	1.96	2.04	2.12	2.20
5.350	2.27	2.35	2.43	2.50	2.57
5.600	2.63	2.69	2.75	2.83	2.91
5.850	2.99	3.08	3.17	3.27	3.39
6.100	3.54	3.70	3.86	3.99	4.11
6.350	4.23	4.33	4.43	4.52	4.58
6.600	4.58	4.55	4.54	4.57	4.65
6.850	4.75	4.87	5.01	5.18	5.37
7.100	5.58	5.81	6.07	6.35	6.66
7.350	6.99	7.35	7.73	8.18	9.20
7.600	11.79	15.22	18.30	20.56	22.26
7.850	23.53	24.43	24.99	25.20	24.74
8.100	22.87	20.35	18.05	16.35	14.98
8.350	13.86	12.88	12.07	11.35	10.83
8.600	10.64	10.64	10.60	10.46	10.24
8.850	10.01	9.75	9.49	9.23	8.99
9.100	8.75	8.52	8.29	8.09	7.88
9.350	7.69	7.51	7.34	7.19	7.07
9.600	7.04	7.06	7.07	7.04	7.00
9.850	6.95	6.89	6.83	6.77	6.70
10.100	6.61	6.53	6.45	6.38	6.31
10.350	6.26	6.21	6.17	6.14	6.11
10.600	6.12	6.15	6.16	6.14	6.11
10.850	6.08	6.04	5.99	5.95	5.90
11.100	5.86	5.81	5.76	5.72	5.67

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 2 years
Label: CM-2 Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
11.350	5.62	5.58	5.53	5.48	5.43
11.600	5.36	5.29	5.23	5.18	5.14
11.850	5.11	5.08	5.06	5.04	5.03
12.100	5.03	5.02	5.03	5.04	5.06
12.350	5.08	5.11	5.14	5.18	5.20
12.600	5.16	5.08	5.01	4.97	4.94
12.850	4.91	4.90	4.89	4.88	4.88
13.100	4.92	4.98	5.01	5.00	4.98
13.350	4.96	4.92	4.89	4.85	4.82
13.600	4.80	4.77	4.75	4.72	4.71
13.850	4.69	4.68	4.67	4.66	4.66
14.100	4.66	4.67	4.68	4.68	4.67
14.350	4.67	4.66	4.65	4.64	4.64
14.600	4.63	4.62	4.61	4.60	4.59
14.850	4.58	4.57	4.57	4.56	4.56
15.100	4.55	4.54	4.53	4.52	4.52
15.350	4.51	4.50	4.48	4.48	4.47
15.600	4.46	4.45	4.44	4.43	4.43
15.850	4.42	4.41	4.40	4.39	4.38
16.100	4.37	4.37	4.36	4.35	4.34
16.350	4.33	4.32	4.31	4.30	4.30
16.600	4.29	4.28	4.27	4.26	4.25
16.850	4.24	4.23	4.22	4.21	4.20
17.100	4.20	4.19	4.18	4.17	4.16
17.350	4.14	4.14	4.13	4.12	4.11
17.600	4.10	4.09	4.09	4.08	4.07
17.850	4.06	4.05	4.03	4.02	4.02
18.100	4.01	3.99	3.99	3.98	3.97
18.350	3.96	3.95	3.94	3.93	3.92
18.600	3.91	3.90	3.89	3.88	3.87
18.850	3.86	3.85	3.84	3.83	3.82
19.100	3.81	3.80	3.79	3.79	3.78
19.350	3.76	3.76	3.75	3.74	3.73
19.600	3.72	3.71	3.70	3.69	3.67
19.850	3.66	3.65	3.64	3.63	3.63
20.100	3.62	3.61	3.60	3.59	3.58
20.350	3.57	3.55	3.54	3.53	3.52
20.600	3.51	3.50	3.49	3.48	3.47
20.850	3.47	3.46	3.45	3.43	3.42
21.100	3.41	3.40	3.39	3.38	3.37
21.350	3.36	3.35	3.34	3.33	3.32
21.600	3.31	3.30	3.29	3.28	3.27

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.850	3.26	3.25	3.24	3.23	3.22
22.100	3.21	3.20	3.19	3.17	3.16
22.350	3.15	3.14	3.13	3.12	3.11
22.600	3.10	3.09	3.08	3.07	3.06
22.850	3.05	3.04	3.02	3.01	3.00
23.100	2.99	2.98	2.97	2.96	2.95
23.350	2.94	2.93	2.92	2.91	2.90
23.600	2.89	2.88	2.86	2.85	2.84
23.850	2.83	2.82	2.81	2.80	(N/A)

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	38.83 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	38.79 ft^3/s

Drainage Area	
SCS CN (Composite)	87.740
Area (User Defined)	28.100 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.4 in
Runoff Volume (Pervious)	12.574 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	12.528 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	159.19 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
1.700	0.00	0.00	0.01	0.04	0.10
1.950	0.16	0.23	0.31	0.39	0.47
2.200	0.56	0.64	0.72	0.80	0.88
2.450	0.96	1.04	1.11	1.18	1.25
2.700	1.32	1.38	1.45	1.51	1.57
2.950	1.63	1.69	1.75	1.80	1.85
3.200	1.89	1.95	2.00	2.06	2.12
3.450	2.19	2.26	2.33	2.42	2.51
3.700	2.61	2.70	2.78	2.86	2.94
3.950	3.02	3.10	3.17	3.23	3.28
4.200	3.34	3.40	3.47	3.54	3.62
4.450	3.70	3.78	3.86	3.95	4.03
4.700	4.12	4.21	4.30	4.40	4.50
4.950	4.61	4.72	4.83	4.96	5.09
5.200	5.22	5.35	5.47	5.58	5.69
5.450	5.80	5.91	6.01	6.08	6.13
5.700	6.21	6.30	6.41	6.53	6.66
5.950	6.80	6.95	7.13	7.37	7.64
6.200	7.88	8.09	8.26	8.42	8.56
6.450	8.68	8.78	8.83	8.76	8.63
6.700	8.56	8.56	8.64	8.77	8.95
6.950	9.15	9.40	9.68	10.00	10.34
7.200	10.74	11.16	11.63	12.12	12.67
7.450	13.24	13.91	15.54	19.72	25.19
7.700	29.96	33.30	35.67	37.29	38.31
7.950	38.79	38.75	37.70	34.61	30.60
8.200	26.98	24.30	22.16	20.41	18.90
8.450	17.65	16.54	15.75	15.42	15.38
8.700	15.29	15.05	14.70	14.33	13.93
8.950	13.54	13.15	12.78	12.42	12.07
9.200	11.74	11.43	11.12	10.84	10.57
9.450	10.32	10.09	9.91	9.86	9.88

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.700	9.87	9.83	9.76	9.67	9.58
9.950	9.49	9.39	9.29	9.16	9.03
10.200	8.91	8.81	8.71	8.63	8.56
10.450	8.50	8.44	8.40	8.40	8.43
10.700	8.44	8.41	8.37	8.31	8.25
10.950	8.18	8.12	8.05	7.98	7.91
11.200	7.84	7.78	7.71	7.64	7.57
11.450	7.50	7.43	7.35	7.26	7.16
11.700	7.07	7.00	6.94	6.90	6.86
11.950	6.82	6.80	6.78	6.77	6.76
12.200	6.76	6.78	6.80	6.83	6.86
12.450	6.90	6.95	6.97	6.91	6.80
12.700	6.71	6.65	6.60	6.56	6.54
12.950	6.52	6.51	6.51	6.56	6.64
13.200	6.67	6.66	6.63	6.59	6.55
13.450	6.50	6.45	6.41	6.37	6.33
13.700	6.30	6.26	6.24	6.22	6.20
13.950	6.18	6.17	6.16	6.17	6.18
14.200	6.18	6.18	6.17	6.16	6.15
14.450	6.14	6.12	6.11	6.10	6.09
14.700	6.07	6.06	6.04	6.03	6.02
14.950	6.00	5.99	5.99	5.97	5.96
15.200	5.95	5.94	5.92	5.91	5.89
15.450	5.88	5.86	5.85	5.84	5.82
15.700	5.81	5.80	5.79	5.78	5.77
15.950	5.75	5.74	5.72	5.71	5.70
16.200	5.68	5.67	5.66	5.64	5.63
16.450	5.62	5.60	5.59	5.58	5.56
16.700	5.55	5.54	5.53	5.51	5.50
16.950	5.49	5.47	5.46	5.45	5.44
17.200	5.42	5.41	5.39	5.37	5.36
17.450	5.35	5.34	5.33	5.32	5.30
17.700	5.29	5.28	5.26	5.25	5.23
17.950	5.22	5.20	5.19	5.18	5.16
18.200	5.15	5.14	5.13	5.12	5.10
18.450	5.09	5.07	5.06	5.04	5.03
18.700	5.02	5.00	4.99	4.98	4.96
18.950	4.95	4.93	4.92	4.91	4.89
19.200	4.88	4.87	4.85	4.84	4.83
19.450	4.81	4.80	4.79	4.77	4.76
19.700	4.75	4.73	4.71	4.70	4.68
19.950	4.67	4.66	4.65	4.64	4.62

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.200	4.61	4.60	4.58	4.57	4.55
20.450	4.54	4.52	4.51	4.49	4.48
20.700	4.47	4.46	4.45	4.43	4.42
20.950	4.41	4.39	4.37	4.36	4.35
21.200	4.33	4.32	4.30	4.29	4.28
21.450	4.26	4.25	4.24	4.22	4.21
21.700	4.19	4.18	4.17	4.15	4.14
21.950	4.13	4.11	4.10	4.08	4.07
22.200	4.06	4.04	4.03	4.01	3.99
22.450	3.98	3.97	3.96	3.95	3.93
22.700	3.92	3.91	3.89	3.88	3.86
22.950	3.84	3.83	3.82	3.80	3.79
23.200	3.77	3.76	3.75	3.74	3.73
23.450	3.71	3.69	3.68	3.66	3.65
23.700	3.64	3.62	3.61	3.60	3.58
23.950	3.57	3.56	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	42.63 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	42.63 ft³/s

Drainage Area	
SCS CN (Composite)	83.300
Area (User Defined)	34.300 acres
Maximum Retention (Pervious)	2.0 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.9 in
Runoff Volume (Pervious)	13.927 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	13.872 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	194.32 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 10 years
Label: CM-2 Storm Event: Brunswick NC 10-yr

Storm Event	Brunswick NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.300	0.00	0.00	0.02	0.06	0.12
2.550	0.19	0.26	0.34	0.41	0.48
2.800	0.56	0.63	0.70	0.77	0.84
3.050	0.90	0.97	1.03	1.09	1.15
3.300	1.21	1.28	1.35	1.42	1.49
3.550	1.56	1.65	1.74	1.84	1.93
3.800	2.02	2.10	2.19	2.27	2.36
4.050	2.44	2.51	2.58	2.64	2.72
4.300	2.80	2.88	2.96	3.05	3.14
4.550	3.23	3.33	3.42	3.52	3.62
4.800	3.72	3.83	3.94	4.06	4.18
5.050	4.30	4.43	4.58	4.72	4.86
5.300	4.99	5.12	5.25	5.37	5.50
5.550	5.61	5.70	5.78	5.87	5.99
5.800	6.12	6.25	6.40	6.55	6.72
6.050	6.92	7.18	7.47	7.74	7.96
6.300	8.17	8.35	8.51	8.66	8.80
6.550	8.87	8.82	8.72	8.67	8.70
6.800	8.81	8.96	9.16	9.39	9.67
7.050	9.98	10.34	10.72	11.16	11.62
7.300	12.15	12.70	13.30	13.94	14.69
7.550	16.46	20.96	26.89	32.12	35.87
7.800	38.59	40.52	41.81	42.51	42.63
8.050	41.62	38.33	33.97	30.03	27.11
8.300	24.76	22.85	21.20	19.81	18.59
8.550	17.73	17.38	17.35	17.27	17.01
8.800	16.63	16.23	15.79	15.36	14.93
9.050	14.51	14.11	13.73	13.35	13.01
9.300	12.67	12.35	12.05	11.78	11.52
9.550	11.32	11.27	11.29	11.29	11.25
9.800	11.17	11.08	10.98	10.88	10.77
10.050	10.65	10.51	10.37	10.24	10.12

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
10.300	10.01	9.92	9.84	9.78	9.71
10.550	9.67	9.68	9.71	9.72	9.70
10.800	9.65	9.59	9.52	9.45	9.37
11.050	9.30	9.22	9.15	9.07	8.99
11.300	8.91	8.84	8.76	8.68	8.60
11.550	8.52	8.41	8.29	8.19	8.11
11.800	8.05	8.00	7.95	7.91	7.89
12.050	7.87	7.86	7.85	7.85	7.87
12.300	7.90	7.93	7.97	8.02	8.08
12.550	8.10	8.04	7.92	7.81	7.73
12.800	7.68	7.64	7.62	7.60	7.58
13.050	7.59	7.65	7.73	7.77	7.77
13.300	7.73	7.69	7.64	7.58	7.53
13.550	7.48	7.43	7.39	7.35	7.32
13.800	7.29	7.27	7.24	7.22	7.21
14.050	7.20	7.21	7.22	7.23	7.22
14.300	7.22	7.20	7.19	7.18	7.17
14.550	7.15	7.14	7.13	7.11	7.10
14.800	7.08	7.06	7.05	7.04	7.03
15.050	7.01	7.00	6.99	6.97	6.96
15.300	6.95	6.93	6.91	6.89	6.88
15.550	6.87	6.85	6.84	6.82	6.81
15.800	6.80	6.79	6.77	6.76	6.74
16.050	6.72	6.71	6.69	6.68	6.66
16.300	6.65	6.64	6.62	6.61	6.59
16.550	6.58	6.56	6.55	6.53	6.52
16.800	6.50	6.49	6.47	6.46	6.44
17.050	6.43	6.41	6.40	6.39	6.37
17.300	6.35	6.33	6.32	6.30	6.29
17.550	6.28	6.27	6.25	6.23	6.22
17.800	6.21	6.19	6.17	6.15	6.14
18.050	6.12	6.11	6.09	6.07	6.06
18.300	6.05	6.04	6.02	6.01	5.99
18.550	5.97	5.95	5.94	5.92	5.91
18.800	5.89	5.88	5.86	5.84	5.83
19.050	5.82	5.80	5.78	5.77	5.75
19.300	5.74	5.72	5.71	5.69	5.68
19.550	5.66	5.64	5.63	5.61	5.60
19.800	5.58	5.56	5.54	5.53	5.52
20.050	5.50	5.49	5.47	5.46	5.44
20.300	5.43	5.41	5.39	5.37	5.35
20.550	5.34	5.32	5.30	5.29	5.28

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
20.800	5.26	5.25	5.24	5.22	5.20
21.050	5.18	5.16	5.15	5.13	5.11
21.300	5.10	5.08	5.07	5.05	5.04
21.550	5.02	5.00	4.99	4.97	4.96
21.800	4.94	4.92	4.91	4.89	4.88
22.050	4.86	4.84	4.83	4.81	4.79
22.300	4.77	4.76	4.74	4.72	4.71
22.550	4.70	4.68	4.67	4.65	4.64
22.800	4.62	4.60	4.58	4.56	4.55
23.050	4.53	4.51	4.50	4.48	4.47
23.300	4.45	4.44	4.43	4.41	4.39
23.550	4.37	4.35	4.34	4.32	4.30
23.800	4.29	4.27	4.25	4.24	4.23

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	51.37 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	51.36 ft³/s

Drainage Area	
SCS CN (Composite)	87.740
Area (User Defined)	28.100 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	7.1 in
Runoff Volume (Pervious)	16.660 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	16.600 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	159.19 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 25 years
Label: CM-2 Storm Event: Brunswick NC 25-yr

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.450	0.00	0.01	0.05	0.13	0.22
1.700	0.33	0.45	0.56	0.68	0.79
1.950	0.90	1.02	1.13	1.25	1.37
2.200	1.49	1.61	1.72	1.84	1.94
2.450	2.05	2.15	2.25	2.34	2.42
2.700	2.50	2.59	2.67	2.75	2.83
2.950	2.90	2.98	3.05	3.11	3.16
3.200	3.22	3.28	3.35	3.42	3.51
3.450	3.59	3.68	3.78	3.90	4.04
3.700	4.17	4.29	4.41	4.51	4.62
3.950	4.72	4.82	4.91	4.98	5.05
4.200	5.12	5.20	5.28	5.38	5.48
4.450	5.58	5.68	5.79	5.90	6.01
4.700	6.12	6.24	6.36	6.49	6.62
4.950	6.76	6.90	7.05	7.22	7.39
5.200	7.57	7.73	7.89	8.04	8.18
5.450	8.32	8.46	8.58	8.66	8.73
5.700	8.82	8.93	9.07	9.23	9.39
5.950	9.57	9.76	10.00	10.32	10.67
6.200	11.00	11.26	11.49	11.69	11.86
6.450	12.01	12.14	12.19	12.07	11.88
6.700	11.76	11.76	11.85	12.01	12.23
6.950	12.50	12.82	13.18	13.60	14.06
7.200	14.58	15.13	15.75	16.40	17.12
7.450	17.87	18.75	20.91	26.48	33.76
7.700	40.08	44.46	47.53	49.58	50.82
7.950	51.36	51.21	49.75	45.61	40.27
8.200	35.47	31.92	29.07	26.76	24.76
8.450	23.10	21.64	20.60	20.16	20.10
8.700	19.97	19.64	19.19	18.70	18.17
8.950	17.65	17.13	16.65	16.17	15.71
9.200	15.27	14.86	14.46	14.09	13.74

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.450	13.41	13.11	12.88	12.80	12.82
9.700	12.82	12.76	12.66	12.55	12.43
9.950	12.31	12.17	12.04	11.88	11.71
10.200	11.55	11.41	11.28	11.18	11.08
10.450	11.00	10.92	10.87	10.88	10.91
10.700	10.92	10.88	10.82	10.75	10.67
10.950	10.58	10.49	10.41	10.32	10.23
11.200	10.14	10.05	9.96	9.87	9.77
11.450	9.69	9.59	9.49	9.37	9.24
11.700	9.12	9.03	8.96	8.90	8.85
11.950	8.80	8.77	8.75	8.73	8.72
12.200	8.72	8.74	8.77	8.80	8.84
12.450	8.89	8.95	8.98	8.90	8.77
12.700	8.64	8.56	8.50	8.46	8.42
12.950	8.40	8.38	8.39	8.45	8.54
13.200	8.59	8.57	8.54	8.49	8.42
13.450	8.36	8.30	8.25	8.19	8.15
13.700	8.10	8.06	8.03	8.00	7.97
13.950	7.95	7.93	7.92	7.93	7.94
14.200	7.94	7.94	7.93	7.92	7.90
14.450	7.89	7.87	7.85	7.84	7.82
14.700	7.80	7.79	7.76	7.74	7.73
14.950	7.71	7.70	7.69	7.67	7.65
15.200	7.64	7.62	7.60	7.58	7.56
15.450	7.54	7.53	7.51	7.49	7.47
15.700	7.46	7.44	7.43	7.42	7.40
15.950	7.38	7.36	7.34	7.32	7.31
16.200	7.29	7.27	7.25	7.24	7.22
16.450	7.20	7.19	7.17	7.15	7.14
16.700	7.12	7.10	7.09	7.07	7.05
16.950	7.03	7.02	7.00	6.98	6.97
17.200	6.95	6.93	6.91	6.89	6.87
17.450	6.85	6.84	6.83	6.81	6.79
17.700	6.78	6.76	6.74	6.72	6.70
17.950	6.68	6.66	6.65	6.63	6.61
18.200	6.59	6.58	6.57	6.55	6.53
18.450	6.52	6.49	6.47	6.46	6.44
18.700	6.42	6.40	6.39	6.37	6.35
18.950	6.33	6.32	6.30	6.28	6.26
19.200	6.25	6.23	6.21	6.19	6.18
19.450	6.16	6.14	6.12	6.11	6.09
19.700	6.07	6.05	6.03	6.01	5.99

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
19.950	5.98	5.96	5.95	5.93	5.91
20.200	5.90	5.88	5.86	5.84	5.82
20.450	5.80	5.78	5.77	5.75	5.73
20.700	5.71	5.70	5.68	5.67	5.65
20.950	5.63	5.61	5.59	5.57	5.56
21.200	5.54	5.52	5.50	5.48	5.47
21.450	5.45	5.43	5.41	5.40	5.38
21.700	5.36	5.34	5.33	5.31	5.29
21.950	5.27	5.26	5.24	5.22	5.20
22.200	5.19	5.16	5.14	5.12	5.10
22.450	5.09	5.07	5.06	5.04	5.02
22.700	5.01	4.99	4.97	4.95	4.93
22.950	4.91	4.89	4.87	4.86	4.84
23.200	4.82	4.81	4.79	4.78	4.76
23.450	4.74	4.72	4.70	4.68	4.66
23.700	4.64	4.63	4.61	4.59	4.57
23.950	4.56	4.54	(N/A)	(N/A)	(N/A)

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	57.99 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	57.90 ft³/s

Drainage Area	
SCS CN (Composite)	83.300
Area (User Defined)	34.300 acres
Maximum Retention (Pervious)	2.0 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.6 in
Runoff Volume (Pervious)	18.804 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	18.732 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	194.32 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Storm Event	Brunswick NC 25-yr
Return Event	25 years
Duration	24.000 hours
Depth	8.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
1.900	0.00	0.00	0.03	0.08	0.16
2.150	0.26	0.37	0.49	0.60	0.72
2.400	0.83	0.95	1.06	1.17	1.28
2.650	1.38	1.48	1.58	1.68	1.77
2.900	1.87	1.96	2.05	2.14	2.22
3.150	2.29	2.37	2.45	2.53	2.62
3.400	2.71	2.81	2.91	3.02	3.15
3.650	3.29	3.43	3.56	3.68	3.80
3.900	3.92	4.03	4.15	4.25	4.35
4.150	4.43	4.52	4.62	4.72	4.83
4.400	4.95	5.07	5.19	5.31	5.44
4.650	5.57	5.70	5.83	5.98	6.12
4.900	6.28	6.43	6.59	6.76	6.95
5.150	7.15	7.35	7.53	7.71	7.89
5.400	8.06	8.22	8.38	8.53	8.64
5.650	8.74	8.85	9.00	9.17	9.35
5.900	9.55	9.75	9.98	10.25	10.61
6.150	11.00	11.37	11.67	11.94	12.18
6.400	12.39	12.58	12.75	12.83	12.73
6.650	12.56	12.46	12.49	12.61	12.81
6.900	13.07	13.38	13.75	14.17	14.65
7.150	15.17	15.77	16.39	17.10	17.84
7.400	18.66	19.52	20.52	22.95	29.15
7.650	37.29	44.42	49.44	53.03	55.51
7.900	57.10	57.90	57.90	56.40	51.83
8.150	45.86	40.47	36.47	33.27	30.67
8.400	28.42	26.54	24.88	23.70	23.22
8.650	23.17	23.04	22.68	22.16	21.61
8.900	21.01	20.43	19.84	19.29	18.74
9.150	18.23	17.72	17.26	16.80	16.37
9.400	15.97	15.60	15.25	14.99	14.91
9.650	14.93	14.93	14.87	14.76	14.64

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.900	14.50	14.36	14.21	14.06	13.87
10.150	13.68	13.49	13.34	13.20	13.07
10.400	12.97	12.88	12.79	12.73	12.74
10.650	12.78	12.79	12.75	12.68	12.60
10.900	12.51	12.41	12.31	12.21	12.11
11.150	12.01	11.90	11.80	11.70	11.59
11.400	11.49	11.38	11.28	11.16	11.02
11.650	10.87	10.73	10.63	10.54	10.47
11.900	10.41	10.36	10.32	10.30	10.28
12.150	10.27	10.28	10.30	10.33	10.38
12.400	10.43	10.49	10.56	10.59	10.50
12.650	10.35	10.20	10.10	10.03	9.98
12.900	9.95	9.92	9.90	9.90	9.99
13.150	10.09	10.15	10.13	10.09	10.03
13.400	9.96	9.88	9.81	9.75	9.69
13.650	9.64	9.58	9.53	9.50	9.47
13.900	9.44	9.41	9.39	9.38	9.39
14.150	9.40	9.41	9.41	9.39	9.38
14.400	9.36	9.35	9.33	9.31	9.29
14.650	9.27	9.25	9.23	9.21	9.18
14.900	9.17	9.15	9.13	9.12	9.10
15.150	9.08	9.06	9.05	9.03	9.00
15.400	8.98	8.96	8.94	8.92	8.90
15.650	8.88	8.86	8.84	8.83	8.81
15.900	8.79	8.77	8.75	8.73	8.71
16.150	8.69	8.67	8.65	8.63	8.61
16.400	8.59	8.57	8.55	8.53	8.51
16.650	8.49	8.47	8.45	8.43	8.41
16.900	8.39	8.37	8.35	8.33	8.31
17.150	8.29	8.27	8.25	8.23	8.20
17.400	8.18	8.16	8.15	8.13	8.11
17.650	8.09	8.07	8.06	8.03	8.01
17.900	7.99	7.96	7.94	7.92	7.90
18.150	7.88	7.86	7.84	7.83	7.81
18.400	7.79	7.77	7.74	7.72	7.70
18.650	7.68	7.66	7.64	7.62	7.60
18.900	7.58	7.56	7.54	7.52	7.50
19.150	7.48	7.46	7.44	7.42	7.39
19.400	7.37	7.36	7.33	7.31	7.29
19.650	7.27	7.25	7.23	7.20	7.18
19.900	7.16	7.14	7.12	7.11	7.09
20.150	7.07	7.05	7.03	7.01	6.98

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
20.400	6.96	6.93	6.91	6.89	6.87
20.650	6.85	6.83	6.81	6.79	6.78
20.900	6.76	6.73	6.71	6.68	6.66
21.150	6.64	6.62	6.60	6.58	6.56
21.400	6.54	6.52	6.50	6.48	6.46
21.650	6.43	6.41	6.39	6.37	6.35
21.900	6.33	6.31	6.29	6.27	6.25
22.150	6.23	6.21	6.18	6.16	6.13
22.400	6.11	6.09	6.07	6.06	6.04
22.650	6.02	6.00	5.98	5.95	5.93
22.900	5.90	5.88	5.86	5.84	5.82
23.150	5.79	5.77	5.75	5.74	5.72
23.400	5.70	5.68	5.65	5.63	5.61
23.650	5.59	5.56	5.54	5.52	5.50
23.900	5.48	5.46	5.44	(N/A)	(N/A)

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.947 hours
Flow (Peak, Computed)	58.70 ft^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	58.70 ft^3/s

Drainage Area	
SCS CN (Composite)	87.740
Area (User Defined)	28.100 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.1 in
Runoff Volume (Pervious)	19.072 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	19.005 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	159.19 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-2 Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	28.100 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.300	0.00	0.00	0.02	0.09	0.20
1.550	0.33	0.48	0.62	0.76	0.89
1.800	1.03	1.17	1.30	1.44	1.57
2.050	1.70	1.84	1.99	2.13	2.26
2.300	2.39	2.52	2.65	2.76	2.88
2.550	2.99	3.09	3.19	3.28	3.37
2.800	3.46	3.55	3.63	3.72	3.80
3.050	3.88	3.94	4.00	4.06	4.13
3.300	4.20	4.29	4.38	4.48	4.58
3.550	4.69	4.83	4.99	5.14	5.28
3.800	5.41	5.53	5.65	5.77	5.88
4.050	5.98	6.06	6.14	6.21	6.30
4.300	6.39	6.50	6.61	6.72	6.84
4.550	6.96	7.08	7.21	7.34	7.47
4.800	7.61	7.75	7.90	8.06	8.22
5.050	8.39	8.58	8.78	8.98	9.16
5.300	9.34	9.51	9.67	9.82	9.98
5.550	10.11	10.20	10.27	10.37	10.50
5.800	10.65	10.83	11.01	11.21	11.43
6.050	11.70	12.07	12.47	12.84	13.14
6.300	13.40	13.62	13.82	13.98	14.12
6.550	14.17	14.02	13.80	13.65	13.64
6.800	13.74	13.92	14.17	14.47	14.83
7.050	15.25	15.72	16.24	16.83	17.46
7.300	18.17	18.91	19.72	20.58	21.58
7.550	24.05	30.44	38.78	46.00	50.99
7.800	54.45	56.75	58.13	58.70	58.48
8.050	56.77	52.02	45.91	40.42	36.35
8.300	33.10	30.46	28.18	26.28	24.61
8.550	23.42	22.92	22.85	22.69	22.32
8.800	21.80	21.24	20.63	20.04	19.46
9.050	18.90	18.35	17.84	17.33	16.87

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.300	16.41	15.99	15.58	15.21	14.86
9.550	14.61	14.52	14.54	14.53	14.46
9.800	14.35	14.23	14.09	13.95	13.80
10.050	13.64	13.46	13.26	13.08	12.93
10.300	12.78	12.66	12.55	12.46	12.37
10.550	12.31	12.32	12.36	12.36	12.32
10.800	12.25	12.17	12.07	11.98	11.88
11.050	11.78	11.68	11.58	11.47	11.37
11.300	11.27	11.17	11.06	10.96	10.86
11.550	10.74	10.60	10.45	10.32	10.22
11.800	10.13	10.07	10.00	9.95	9.92
12.050	9.89	9.87	9.86	9.86	9.88
12.300	9.91	9.95	10.00	10.06	10.12
12.550	10.15	10.07	9.91	9.77	9.68
12.800	9.61	9.56	9.52	9.49	9.47
13.050	9.48	9.55	9.65	9.70	9.69
13.300	9.65	9.59	9.52	9.45	9.38
13.550	9.32	9.26	9.21	9.15	9.10
13.800	9.07	9.04	9.01	8.98	8.96
14.050	8.95	8.96	8.97	8.97	8.97
14.300	8.96	8.94	8.92	8.91	8.89
14.550	8.87	8.85	8.83	8.81	8.79
14.800	8.77	8.75	8.73	8.71	8.69
15.050	8.68	8.66	8.64	8.62	8.61
15.300	8.59	8.56	8.54	8.52	8.50
15.550	8.48	8.46	8.44	8.42	8.40
15.800	8.39	8.37	8.35	8.33	8.31
16.050	8.29	8.27	8.25	8.23	8.21
16.300	8.19	8.17	8.15	8.13	8.11
16.550	8.09	8.07	8.05	8.03	8.02
16.800	8.00	7.97	7.96	7.94	7.92
17.050	7.90	7.88	7.86	7.84	7.82
17.300	7.79	7.77	7.75	7.73	7.72
17.550	7.70	7.68	7.66	7.64	7.63
17.800	7.61	7.58	7.56	7.54	7.52
18.050	7.50	7.48	7.46	7.44	7.42
18.300	7.40	7.39	7.37	7.35	7.32
18.550	7.30	7.28	7.26	7.24	7.22
18.800	7.20	7.18	7.16	7.14	7.12
19.050	7.10	7.08	7.06	7.04	7.03
19.300	7.01	6.98	6.96	6.95	6.93
19.550	6.91	6.89	6.87	6.85	6.82

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-2 Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
19.800	6.80	6.78	6.76	6.74	6.72
20.050	6.71	6.69	6.67	6.65	6.63
20.300	6.61	6.59	6.56	6.54	6.52
20.550	6.50	6.48	6.46	6.44	6.42
20.800	6.41	6.39	6.37	6.35	6.33
21.050	6.30	6.28	6.26	6.24	6.22
21.300	6.20	6.18	6.16	6.14	6.12
21.550	6.10	6.08	6.06	6.04	6.02
21.800	6.00	5.98	5.96	5.94	5.92
22.050	5.90	5.88	5.86	5.84	5.82
22.300	5.80	5.77	5.75	5.73	5.72
22.550	5.70	5.68	5.66	5.64	5.63
22.800	5.60	5.58	5.56	5.53	5.51
23.050	5.49	5.47	5.45	5.43	5.41
23.300	5.40	5.38	5.36	5.34	5.32
23.550	5.29	5.27	5.25	5.23	5.21
23.800	5.19	5.17	5.15	5.13	5.12

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	7.973 hours
Flow (Peak, Computed)	67.01 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	66.93 ft³/s

Drainage Area	
SCS CN (Composite)	83.300
Area (User Defined)	34.300 acres
Maximum Retention (Pervious)	2.0 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	7.6 in
Runoff Volume (Pervious)	21.700 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	21.619 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Brunswick Site

Subsection: Unit Hydrograph Summary
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	194.32 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Storm Event	Brunswik NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	34.300 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.750	0.00	0.01	0.05	0.13	0.24
2.000	0.36	0.49	0.63	0.77	0.91
2.250	1.05	1.20	1.34	1.47	1.61
2.500	1.74	1.87	1.99	2.11	2.22
2.750	2.33	2.44	2.55	2.66	2.77
3.000	2.87	2.97	3.05	3.14	3.22
3.250	3.31	3.40	3.50	3.61	3.73
3.500	3.84	3.97	4.12	4.29	4.45
3.750	4.61	4.75	4.89	5.03	5.16
4.000	5.30	5.42	5.52	5.62	5.72
4.250	5.82	5.94	6.07	6.20	6.33
4.500	6.47	6.62	6.76	6.91	7.06
4.750	7.22	7.38	7.55	7.73	7.91
5.000	8.09	8.29	8.51	8.74	8.96
5.250	9.18	9.39	9.59	9.78	9.97
5.500	10.15	10.32	10.44	10.54	10.67
5.750	10.83	11.03	11.23	11.45	11.69
6.000	11.95	12.26	12.68	13.14	13.56
6.250	13.91	14.22	14.48	14.73	14.94
6.500	15.12	15.20	15.08	14.86	14.73
6.750	14.75	14.89	15.11	15.41	15.76
7.000	16.18	16.67	17.22	17.82	18.50
7.250	19.22	20.04	20.89	21.83	22.82
7.500	23.98	26.79	33.99	43.43	51.67
7.750	57.44	61.53	64.33	66.09	66.93
8.000	66.87	65.07	59.74	52.82	46.58
8.250	41.95	38.25	35.25	32.64	30.47
8.500	28.56	27.20	26.63	26.57	26.41
8.750	25.99	25.40	24.76	24.07	23.39
9.000	22.72	22.07	21.44	20.85	20.27
9.250	19.73	19.21	18.72	18.25	17.83
9.500	17.42	17.13	17.03	17.06	17.05

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table) | Return Event: 100 years
Label: CM-2 | Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.750	16.98	16.85	16.71	16.55	16.39
10.000	16.22	16.04	15.83	15.61	15.40
10.250	15.21	15.05	14.91	14.79	14.68
10.500	14.58	14.51	14.52	14.57	14.58
10.750	14.53	14.45	14.36	14.25	14.14
11.000	14.02	13.91	13.79	13.68	13.56
11.250	13.44	13.32	13.20	13.08	12.96
11.500	12.84	12.71	12.54	12.37	12.21
11.750	12.09	12.00	11.92	11.85	11.79
12.000	11.75	11.72	11.70	11.68	11.69
12.250	11.71	11.75	11.80	11.86	11.92
12.500	12.01	12.04	11.94	11.76	11.60
12.750	11.49	11.40	11.35	11.30	11.27
13.000	11.25	11.26	11.35	11.47	11.53
13.250	11.51	11.46	11.40	11.31	11.23
13.500	11.15	11.08	11.01	10.95	10.88
13.750	10.83	10.78	10.75	10.72	10.68
14.000	10.66	10.65	10.66	10.67	10.68
14.250	10.68	10.66	10.65	10.63	10.61
14.500	10.59	10.56	10.54	10.52	10.50
14.750	10.48	10.45	10.42	10.40	10.38
15.000	10.36	10.35	10.32	10.30	10.28
15.250	10.26	10.24	10.21	10.19	10.16
15.500	10.14	10.11	10.09	10.07	10.05
15.750	10.03	10.01	9.99	9.97	9.95
16.000	9.92	9.89	9.87	9.85	9.82
16.250	9.80	9.78	9.76	9.73	9.71
16.500	9.69	9.67	9.64	9.62	9.60
16.750	9.58	9.55	9.53	9.51	9.49
17.000	9.46	9.44	9.42	9.40	9.37
17.250	9.35	9.32	9.29	9.27	9.25
17.500	9.23	9.21	9.19	9.17	9.14
17.750	9.12	9.10	9.07	9.05	9.02
18.000	8.99	8.97	8.95	8.92	8.90
18.250	8.88	8.86	8.85	8.82	8.80
18.500	8.77	8.74	8.72	8.70	8.67
18.750	8.65	8.62	8.60	8.58	8.55
19.000	8.53	8.51	8.49	8.46	8.44
19.250	8.42	8.39	8.37	8.35	8.32
19.500	8.30	8.28	8.25	8.23	8.21
19.750	8.18	8.15	8.12	8.10	8.08
20.000	8.06	8.04	8.02	8.00	7.97

Brunswick Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-2

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.250	7.95	7.93	7.90	7.87	7.84
20.500	7.82	7.80	7.77	7.75	7.72
20.750	7.70	7.69	7.67	7.64	7.62
21.000	7.59	7.56	7.54	7.51	7.49
21.250	7.46	7.44	7.42	7.40	7.37
21.500	7.35	7.33	7.30	7.28	7.25
21.750	7.23	7.21	7.18	7.16	7.14
22.000	7.11	7.09	7.06	7.04	7.02
22.250	6.99	6.96	6.93	6.91	6.89
22.500	6.87	6.85	6.83	6.80	6.78
22.750	6.76	6.73	6.71	6.68	6.65
23.000	6.62	6.60	6.57	6.55	6.53
23.250	6.51	6.49	6.47	6.45	6.42
23.500	6.39	6.36	6.34	6.31	6.29
23.750	6.26	6.24	6.22	6.19	6.17
24.000	6.15	(N/A)	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	29.649	9.200	30.74
Flow (In)	O-1	29.649	9.200	30.74

Brunswick Site

Subsection: Addition Summary
Label: O-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	18.803	8.000	53.72
Flow (From)	CM-2	8.421	8.000	25.20
Flow (In)	O-1	27.223	8.000	78.92

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	48.566	8.400	78.63
Flow (In)	O-1	48.566	8.400	78.63

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	32.332	8.000	97.35
Flow (From)	CM-2	13.872	8.000	42.63
Flow (In)	O-1	46.204	8.000	139.98

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	64.988	8.200	152.78
Flow (In)	O-1	64.988	8.200	152.78

Brunswick Site

Subsection: Addition Summary
Label: O-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	44.603	8.000	136.61
Flow (From)	CM-2	18.732	8.000	57.90
Flow (In)	O-1	63.336	8.000	194.52

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	74.702	8.150	201.21
Flow (In)	O-1	74.702	8.150	201.21

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	51.946	8.000	159.89
Flow (From)	CM-2	21.619	7.950	66.93
Flow (In)	O-1	73.565	8.000	226.76

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.750	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.750	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
2.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
2.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
2.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
2.750	2,725.01	2,725.01	2,725.01	2,725.01	2,725.01
3.000	2,725.02	2,725.02	2,725.02	2,725.03	2,725.03
3.250	2,725.03	2,725.04	2,725.04	2,725.04	2,725.05
3.500	2,725.05	2,725.06	2,725.06	2,725.07	2,725.08
3.750	2,725.09	2,725.10	2,725.11	2,725.12	2,725.13
4.000	2,725.15	2,725.16	2,725.18	2,725.19	2,725.21
4.250	2,725.23	2,725.25	2,725.27	2,725.29	2,725.31
4.500	2,725.33	2,725.35	2,725.38	2,725.40	2,725.43
4.750	2,725.46	2,725.48	2,725.51	2,725.54	2,725.57
5.000	2,725.60	2,725.63	2,725.65	2,725.68	2,725.72
5.250	2,725.75	2,725.78	2,725.81	2,725.84	2,725.88
5.500	2,725.91	2,725.94	2,725.98	2,726.01	2,726.04
5.750	2,726.07	2,726.11	2,726.14	2,726.17	2,726.21
6.000	2,726.24	2,726.28	2,726.31	2,726.35	2,726.39
6.250	2,726.43	2,726.48	2,726.52	2,726.56	2,726.61
6.500	2,726.65	2,726.69	2,726.74	2,726.78	2,726.82
6.750	2,726.86	2,726.89	2,726.93	2,726.97	2,727.01
7.000	2,727.05	2,727.09	2,727.14	2,727.19	2,727.24
7.250	2,727.29	2,727.35	2,727.42	2,727.48	2,727.55
7.500	2,727.63	2,727.72	2,727.83	2,728.00	2,728.22
7.750	2,728.48	2,728.75	2,729.05	2,729.34	2,729.64
8.000	2,729.93	2,730.21	2,730.47	2,730.68	2,730.85
8.250	2,730.99	2,731.11	2,731.20	2,731.28	2,731.34
8.500	2,731.40	2,731.44	2,731.48	2,731.51	2,731.55
8.750	2,731.58	2,731.61	2,731.63	2,731.66	2,731.68
9.000	2,731.69	2,731.70	2,731.71	2,731.71	2,731.72
9.250	2,731.71	2,731.71	2,731.70	2,731.69	2,731.68
9.500	2,731.67	2,731.65	2,731.63	2,731.62	2,731.60
9.750	2,731.58	2,731.57	2,731.55	2,731.53	2,731.52
10.000	2,731.50	2,731.48	2,731.46	2,731.44	2,731.41

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	2,731.39	2,731.36	2,731.34	2,731.32	2,731.29
10.500	2,731.26	2,731.24	2,731.21	2,731.19	2,731.16
10.750	2,731.14	2,731.12	2,731.09	2,731.07	2,731.04
11.000	2,731.02	2,730.99	2,730.97	2,730.94	2,730.91
11.250	2,730.89	2,730.86	2,730.83	2,730.80	2,730.77
11.500	2,730.74	2,730.71	2,730.68	2,730.65	2,730.62
11.750	2,730.59	2,730.56	2,730.53	2,730.50	2,730.46
12.000	2,730.43	2,730.40	2,730.37	2,730.34	2,730.31
12.250	2,730.28	2,730.25	2,730.22	2,730.19	2,730.16
12.500	2,730.14	2,730.11	2,730.09	2,730.06	2,730.03
12.750	2,730.01	2,729.98	2,729.95	2,729.92	2,729.90
13.000	2,729.87	2,729.84	2,729.82	2,729.79	2,729.77
13.250	2,729.74	2,729.72	2,729.70	2,729.68	2,729.65
13.500	2,729.63	2,729.60	2,729.58	2,729.56	2,729.53
13.750	2,729.51	2,729.49	2,729.46	2,729.44	2,729.41
14.000	2,729.39	2,729.37	2,729.34	2,729.32	2,729.30
14.250	2,729.28	2,729.26	2,729.24	2,729.22	2,729.20
14.500	2,729.18	2,729.16	2,729.14	2,729.12	2,729.10
14.750	2,729.08	2,729.06	2,729.04	2,729.03	2,729.01
15.000	2,728.99	2,728.97	2,728.95	2,728.93	2,728.92
15.250	2,728.90	2,728.88	2,728.87	2,728.85	2,728.83
15.500	2,728.82	2,728.80	2,728.78	2,728.77	2,728.75
15.750	2,728.74	2,728.72	2,728.70	2,728.69	2,728.67
16.000	2,728.66	2,728.65	2,728.63	2,728.62	2,728.60
16.250	2,728.59	2,728.57	2,728.56	2,728.55	2,728.53
16.500	2,728.52	2,728.51	2,728.49	2,728.48	2,728.46
16.750	2,728.45	2,728.44	2,728.43	2,728.41	2,728.40
17.000	2,728.39	2,728.37	2,728.36	2,728.35	2,728.34
17.250	2,728.32	2,728.31	2,728.30	2,728.29	2,728.28
17.500	2,728.27	2,728.25	2,728.24	2,728.23	2,728.22
17.750	2,728.21	2,728.20	2,728.19	2,728.18	2,728.17
18.000	2,728.15	2,728.14	2,728.13	2,728.12	2,728.11
18.250	2,728.10	2,728.09	2,728.08	2,728.07	2,728.06
18.500	2,728.05	2,728.04	2,728.03	2,728.02	2,728.01
18.750	2,728.00	2,727.99	2,727.98	2,727.97	2,727.96
19.000	2,727.95	2,727.94	2,727.93	2,727.92	2,727.91
19.250	2,727.90	2,727.89	2,727.88	2,727.87	2,727.87
19.500	2,727.86	2,727.85	2,727.84	2,727.83	2,727.82
19.750	2,727.81	2,727.80	2,727.79	2,727.78	2,727.78
20.000	2,727.77	2,727.76	2,727.75	2,727.74	2,727.73
20.250	2,727.72	2,727.72	2,727.71	2,727.70	2,727.69

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	2,727.68	2,727.67	2,727.66	2,727.66	2,727.65
20.750	2,727.64	2,727.63	2,727.62	2,727.61	2,727.61
21.000	2,727.60	2,727.59	2,727.58	2,727.57	2,727.57
21.250	2,727.56	2,727.55	2,727.54	2,727.53	2,727.53
21.500	2,727.52	2,727.51	2,727.50	2,727.49	2,727.49
21.750	2,727.48	2,727.47	2,727.46	2,727.45	2,727.45
22.000	2,727.44	2,727.43	2,727.42	2,727.41	2,727.41
22.250	2,727.40	2,727.39	2,727.38	2,727.38	2,727.37
22.500	2,727.36	2,727.35	2,727.34	2,727.34	2,727.33
22.750	2,727.32	2,727.31	2,727.31	2,727.30	2,727.29
23.000	2,727.28	2,727.28	2,727.27	2,727.26	2,727.26
23.250	2,727.25	2,727.24	2,727.23	2,727.23	2,727.22
23.500	2,727.21	2,727.20	2,727.20	2,727.19	2,727.18
23.750	2,727.18	2,727.17	2,727.16	2,727.15	2,727.15
24.000	2,727.14	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.750	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.750	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
2.000	2,725.00	2,725.00	2,725.01	2,725.01	2,725.01
2.250	2,725.02	2,725.02	2,725.02	2,725.03	2,725.03
2.500	2,725.04	2,725.05	2,725.05	2,725.06	2,725.07
2.750	2,725.08	2,725.09	2,725.11	2,725.12	2,725.14
3.000	2,725.16	2,725.18	2,725.20	2,725.22	2,725.24
3.250	2,725.26	2,725.29	2,725.31	2,725.34	2,725.37
3.500	2,725.40	2,725.43	2,725.46	2,725.50	2,725.53
3.750	2,725.56	2,725.60	2,725.63	2,725.67	2,725.71
4.000	2,725.74	2,725.78	2,725.82	2,725.85	2,725.89
4.250	2,725.93	2,725.97	2,726.00	2,726.04	2,726.08
4.500	2,726.11	2,726.15	2,726.19	2,726.23	2,726.27
4.750	2,726.31	2,726.35	2,726.39	2,726.43	2,726.47
5.000	2,726.51	2,726.56	2,726.60	2,726.64	2,726.69
5.250	2,726.74	2,726.78	2,726.83	2,726.88	2,726.93
5.500	2,726.99	2,727.04	2,727.09	2,727.14	2,727.19
5.750	2,727.24	2,727.29	2,727.34	2,727.40	2,727.45
6.000	2,727.51	2,727.57	2,727.63	2,727.69	2,727.75
6.250	2,727.82	2,727.89	2,727.97	2,728.04	2,728.11
6.500	2,728.18	2,728.26	2,728.33	2,728.40	2,728.46
6.750	2,728.53	2,728.59	2,728.65	2,728.71	2,728.78
7.000	2,728.85	2,728.92	2,729.00	2,729.08	2,729.16
7.250	2,729.25	2,729.35	2,729.45	2,729.56	2,729.68
7.500	2,729.80	2,729.94	2,730.13	2,730.38	2,730.71
7.750	2,731.10	2,731.52	2,731.95	2,732.39	2,732.82
8.000	2,733.24	2,733.62	2,733.93	2,734.16	2,734.32
8.250	2,734.42	2,734.48	2,734.51	2,734.52	2,734.51
8.500	2,734.49	2,734.46	2,734.42	2,734.39	2,734.36
8.750	2,734.33	2,734.30	2,734.26	2,734.23	2,734.20
9.000	2,734.16	2,734.12	2,734.09	2,734.05	2,734.01
9.250	2,733.97	2,733.93	2,733.89	2,733.85	2,733.82
9.500	2,733.78	2,733.75	2,733.72	2,733.69	2,733.66
9.750	2,733.64	2,733.62	2,733.60	2,733.58	2,733.57
10.000	2,733.55	2,733.53	2,733.52	2,733.50	2,733.49

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	2,733.47	2,733.45	2,733.44	2,733.42	2,733.40
10.500	2,733.38	2,733.37	2,733.35	2,733.34	2,733.32
10.750	2,733.31	2,733.29	2,733.28	2,733.27	2,733.25
11.000	2,733.24	2,733.23	2,733.21	2,733.20	2,733.19
11.250	2,733.17	2,733.16	2,733.14	2,733.13	2,733.11
11.500	2,733.10	2,733.08	2,733.07	2,733.05	2,733.03
11.750	2,733.02	2,733.00	2,732.98	2,732.96	2,732.94
12.000	2,732.93	2,732.91	2,732.89	2,732.87	2,732.85
12.250	2,732.83	2,732.82	2,732.80	2,732.78	2,732.77
12.500	2,732.75	2,732.74	2,732.72	2,732.71	2,732.69
12.750	2,732.67	2,732.66	2,732.64	2,732.62	2,732.60
13.000	2,732.58	2,732.56	2,732.54	2,732.52	2,732.51
13.250	2,732.49	2,732.48	2,732.46	2,732.44	2,732.42
13.500	2,732.41	2,732.39	2,732.37	2,732.35	2,732.33
13.750	2,732.31	2,732.29	2,732.27	2,732.25	2,732.23
14.000	2,732.21	2,732.19	2,732.17	2,732.15	2,732.13
14.250	2,732.11	2,732.09	2,732.07	2,732.05	2,732.03
14.500	2,732.01	2,731.99	2,731.97	2,731.95	2,731.93
14.750	2,731.91	2,731.90	2,731.88	2,731.86	2,731.84
15.000	2,731.82	2,731.80	2,731.78	2,731.76	2,731.74
15.250	2,731.72	2,731.70	2,731.68	2,731.67	2,731.65
15.500	2,731.63	2,731.61	2,731.59	2,731.57	2,731.55
15.750	2,731.53	2,731.51	2,731.50	2,731.48	2,731.46
16.000	2,731.44	2,731.42	2,731.40	2,731.38	2,731.36
16.250	2,731.34	2,731.32	2,731.30	2,731.28	2,731.27
16.500	2,731.25	2,731.23	2,731.21	2,731.19	2,731.17
16.750	2,731.15	2,731.13	2,731.11	2,731.10	2,731.08
17.000	2,731.06	2,731.04	2,731.02	2,731.00	2,730.98
17.250	2,730.96	2,730.95	2,730.93	2,730.91	2,730.89
17.500	2,730.87	2,730.85	2,730.83	2,730.81	2,730.79
17.750	2,730.78	2,730.76	2,730.74	2,730.72	2,730.70
18.000	2,730.68	2,730.66	2,730.64	2,730.63	2,730.61
18.250	2,730.59	2,730.57	2,730.55	2,730.53	2,730.52
18.500	2,730.50	2,730.48	2,730.46	2,730.44	2,730.42
18.750	2,730.40	2,730.38	2,730.37	2,730.35	2,730.33
19.000	2,730.31	2,730.29	2,730.27	2,730.25	2,730.24
19.250	2,730.22	2,730.20	2,730.18	2,730.16	2,730.15
19.500	2,730.13	2,730.11	2,730.09	2,730.07	2,730.06
19.750	2,730.04	2,730.02	2,730.00	2,729.98	2,729.96
20.000	2,729.95	2,729.93	2,729.91	2,729.89	2,729.87
20.250	2,729.86	2,729.84	2,729.82	2,729.80	2,729.78

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	2,729.77	2,729.75	2,729.73	2,729.71	2,729.69
20.750	2,729.68	2,729.66	2,729.64	2,729.62	2,729.61
21.000	2,729.59	2,729.57	2,729.55	2,729.54	2,729.52
21.250	2,729.50	2,729.48	2,729.47	2,729.45	2,729.43
21.500	2,729.41	2,729.40	2,729.38	2,729.36	2,729.34
21.750	2,729.32	2,729.31	2,729.29	2,729.27	2,729.26
22.000	2,729.24	2,729.22	2,729.20	2,729.19	2,729.17
22.250	2,729.15	2,729.14	2,729.12	2,729.10	2,729.09
22.500	2,729.07	2,729.05	2,729.04	2,729.02	2,729.00
22.750	2,728.99	2,728.97	2,728.95	2,728.93	2,728.92
23.000	2,728.90	2,728.88	2,728.87	2,728.85	2,728.83
23.250	2,728.82	2,728.80	2,728.78	2,728.77	2,728.75
23.500	2,728.73	2,728.72	2,728.70	2,728.69	2,728.67
23.750	2,728.65	2,728.64	2,728.62	2,728.60	2,728.59
24.000	2,728.57	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.750	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.750	2,725.01	2,725.01	2,725.01	2,725.02	2,725.02
2.000	2,725.03	2,725.03	2,725.04	2,725.05	2,725.06
2.250	2,725.07	2,725.08	2,725.10	2,725.12	2,725.14
2.500	2,725.16	2,725.19	2,725.21	2,725.24	2,725.27
2.750	2,725.31	2,725.34	2,725.38	2,725.42	2,725.45
3.000	2,725.50	2,725.54	2,725.58	2,725.62	2,725.66
3.250	2,725.70	2,725.74	2,725.78	2,725.82	2,725.86
3.500	2,725.91	2,725.95	2,725.99	2,726.04	2,726.08
3.750	2,726.13	2,726.17	2,726.22	2,726.27	2,726.31
4.000	2,726.36	2,726.41	2,726.46	2,726.51	2,726.56
4.250	2,726.60	2,726.65	2,726.70	2,726.75	2,726.80
4.500	2,726.85	2,726.90	2,726.95	2,727.00	2,727.05
4.750	2,727.11	2,727.16	2,727.21	2,727.27	2,727.33
5.000	2,727.38	2,727.44	2,727.50	2,727.56	2,727.63
5.250	2,727.69	2,727.76	2,727.83	2,727.90	2,727.97
5.500	2,728.04	2,728.11	2,728.18	2,728.25	2,728.32
5.750	2,728.39	2,728.46	2,728.54	2,728.61	2,728.68
6.000	2,728.76	2,728.84	2,728.92	2,729.01	2,729.10
6.250	2,729.19	2,729.29	2,729.39	2,729.49	2,729.59
6.500	2,729.69	2,729.79	2,729.89	2,729.98	2,730.07
6.750	2,730.15	2,730.24	2,730.33	2,730.41	2,730.51
7.000	2,730.60	2,730.70	2,730.80	2,730.91	2,731.02
7.250	2,731.14	2,731.27	2,731.40	2,731.54	2,731.70
7.500	2,731.86	2,732.04	2,732.27	2,732.59	2,733.00
7.750	2,733.46	2,733.92	2,734.36	2,734.77	2,735.14
8.000	2,735.48	2,735.74	2,735.93	2,736.02	2,736.04
8.250	2,736.02	2,735.96	2,735.88	2,735.80	2,735.71
8.500	2,735.62	2,735.54	2,735.46	2,735.38	2,735.32
8.750	2,735.26	2,735.21	2,735.16	2,735.11	2,735.06
9.000	2,735.01	2,734.96	2,734.90	2,734.85	2,734.79
9.250	2,734.73	2,734.67	2,734.60	2,734.54	2,734.48
9.500	2,734.42	2,734.36	2,734.30	2,734.25	2,734.21
9.750	2,734.17	2,734.13	2,734.10	2,734.07	2,734.04
10.000	2,734.01	2,733.98	2,733.95	2,733.93	2,733.90

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	2,733.88	2,733.85	2,733.83	2,733.81	2,733.79
10.500	2,733.77	2,733.75	2,733.74	2,733.72	2,733.71
10.750	2,733.70	2,733.69	2,733.68	2,733.67	2,733.66
11.000	2,733.65	2,733.64	2,733.63	2,733.62	2,733.61
11.250	2,733.60	2,733.59	2,733.58	2,733.57	2,733.56
11.500	2,733.55	2,733.54	2,733.53	2,733.52	2,733.51
11.750	2,733.50	2,733.49	2,733.47	2,733.46	2,733.45
12.000	2,733.44	2,733.42	2,733.41	2,733.40	2,733.39
12.250	2,733.38	2,733.37	2,733.36	2,733.35	2,733.35
12.500	2,733.34	2,733.34	2,733.34	2,733.33	2,733.32
12.750	2,733.31	2,733.31	2,733.30	2,733.29	2,733.28
13.000	2,733.27	2,733.26	2,733.25	2,733.25	2,733.24
13.250	2,733.24	2,733.24	2,733.23	2,733.23	2,733.22
13.500	2,733.21	2,733.21	2,733.20	2,733.19	2,733.19
13.750	2,733.18	2,733.17	2,733.16	2,733.15	2,733.15
14.000	2,733.14	2,733.13	2,733.12	2,733.12	2,733.11
14.250	2,733.11	2,733.10	2,733.09	2,733.09	2,733.08
14.500	2,733.08	2,733.07	2,733.07	2,733.06	2,733.06
14.750	2,733.05	2,733.05	2,733.04	2,733.04	2,733.03
15.000	2,733.03	2,733.02	2,733.02	2,733.01	2,733.01
15.250	2,733.01	2,733.00	2,733.00	2,732.99	2,732.99
15.500	2,732.98	2,732.97	2,732.97	2,732.96	2,732.96
15.750	2,732.95	2,732.94	2,732.94	2,732.93	2,732.92
16.000	2,732.92	2,732.91	2,732.90	2,732.89	2,732.88
16.250	2,732.88	2,732.87	2,732.86	2,732.85	2,732.84
16.500	2,732.83	2,732.82	2,732.81	2,732.80	2,732.79
16.750	2,732.78	2,732.77	2,732.76	2,732.75	2,732.74
17.000	2,732.73	2,732.72	2,732.71	2,732.70	2,732.69
17.250	2,732.68	2,732.67	2,732.66	2,732.64	2,732.63
17.500	2,732.62	2,732.61	2,732.59	2,732.58	2,732.57
17.750	2,732.56	2,732.54	2,732.53	2,732.52	2,732.51
18.000	2,732.49	2,732.48	2,732.46	2,732.45	2,732.44
18.250	2,732.42	2,732.41	2,732.39	2,732.38	2,732.36
18.500	2,732.35	2,732.33	2,732.32	2,732.30	2,732.29
18.750	2,732.27	2,732.26	2,732.24	2,732.22	2,732.21
19.000	2,732.19	2,732.18	2,732.16	2,732.14	2,732.13
19.250	2,732.11	2,732.09	2,732.08	2,732.06	2,732.04
19.500	2,732.03	2,732.01	2,731.99	2,731.98	2,731.96
19.750	2,731.94	2,731.92	2,731.90	2,731.89	2,731.87
20.000	2,731.85	2,731.83	2,731.81	2,731.80	2,731.78
20.250	2,731.76	2,731.74	2,731.72	2,731.70	2,731.68

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	2,731.66	2,731.65	2,731.63	2,731.61	2,731.59
20.750	2,731.57	2,731.55	2,731.53	2,731.51	2,731.49
21.000	2,731.47	2,731.45	2,731.43	2,731.41	2,731.39
21.250	2,731.37	2,731.35	2,731.33	2,731.31	2,731.29
21.500	2,731.27	2,731.25	2,731.23	2,731.21	2,731.19
21.750	2,731.17	2,731.14	2,731.12	2,731.10	2,731.08
22.000	2,731.06	2,731.04	2,731.02	2,731.00	2,730.98
22.250	2,730.96	2,730.93	2,730.91	2,730.89	2,730.87
22.500	2,730.85	2,730.82	2,730.80	2,730.78	2,730.76
22.750	2,730.74	2,730.72	2,730.69	2,730.67	2,730.65
23.000	2,730.63	2,730.61	2,730.58	2,730.56	2,730.54
23.250	2,730.52	2,730.50	2,730.47	2,730.45	2,730.43
23.500	2,730.41	2,730.38	2,730.36	2,730.34	2,730.31
23.750	2,730.29	2,730.27	2,730.25	2,730.22	2,730.20
24.000	2,730.18	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.500	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
0.750	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.000	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.250	2,725.00	2,725.00	2,725.00	2,725.00	2,725.00
1.500	2,725.00	2,725.00	2,725.01	2,725.01	2,725.01
1.750	2,725.02	2,725.02	2,725.03	2,725.04	2,725.05
2.000	2,725.05	2,725.07	2,725.08	2,725.10	2,725.12
2.250	2,725.14	2,725.17	2,725.19	2,725.23	2,725.26
2.500	2,725.30	2,725.34	2,725.38	2,725.42	2,725.47
2.750	2,725.51	2,725.56	2,725.60	2,725.65	2,725.70
3.000	2,725.75	2,725.80	2,725.84	2,725.89	2,725.94
3.250	2,725.99	2,726.03	2,726.08	2,726.13	2,726.17
3.500	2,726.22	2,726.27	2,726.32	2,726.37	2,726.42
3.750	2,726.48	2,726.53	2,726.58	2,726.64	2,726.69
4.000	2,726.75	2,726.80	2,726.86	2,726.92	2,726.97
4.250	2,727.03	2,727.08	2,727.14	2,727.20	2,727.25
4.500	2,727.31	2,727.37	2,727.43	2,727.49	2,727.55
4.750	2,727.61	2,727.68	2,727.74	2,727.81	2,727.87
5.000	2,727.94	2,728.01	2,728.08	2,728.15	2,728.23
5.250	2,728.30	2,728.38	2,728.46	2,728.54	2,728.62
5.500	2,728.70	2,728.79	2,728.87	2,728.95	2,729.04
5.750	2,729.12	2,729.20	2,729.29	2,729.37	2,729.46
6.000	2,729.55	2,729.64	2,729.74	2,729.84	2,729.95
6.250	2,730.05	2,730.16	2,730.28	2,730.39	2,730.51
6.500	2,730.62	2,730.74	2,730.85	2,730.96	2,731.06
6.750	2,731.16	2,731.26	2,731.36	2,731.46	2,731.57
7.000	2,731.67	2,731.78	2,731.90	2,732.03	2,732.15
7.250	2,732.29	2,732.43	2,732.58	2,732.74	2,732.91
7.500	2,733.09	2,733.28	2,733.52	2,733.83	2,734.20
7.750	2,734.61	2,735.03	2,735.43	2,735.78	2,736.08
8.000	2,736.31	2,736.48	2,736.58	2,736.60	2,736.56
8.250	2,736.47	2,736.37	2,736.25	2,736.14	2,736.02
8.500	2,735.91	2,735.81	2,735.71	2,735.63	2,735.56
8.750	2,735.51	2,735.45	2,735.40	2,735.35	2,735.30
9.000	2,735.25	2,735.19	2,735.14	2,735.09	2,735.04
9.250	2,734.99	2,734.94	2,734.89	2,734.83	2,734.78
9.500	2,734.72	2,734.66	2,734.61	2,734.55	2,734.50
9.750	2,734.46	2,734.41	2,734.37	2,734.34	2,734.30
10.000	2,734.27	2,734.23	2,734.20	2,734.17	2,734.14

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	2,734.11	2,734.09	2,734.06	2,734.04	2,734.01
10.500	2,733.99	2,733.97	2,733.95	2,733.93	2,733.92
10.750	2,733.90	2,733.89	2,733.88	2,733.87	2,733.86
11.000	2,733.84	2,733.83	2,733.82	2,733.81	2,733.80
11.250	2,733.79	2,733.77	2,733.76	2,733.75	2,733.74
11.500	2,733.73	2,733.71	2,733.70	2,733.69	2,733.68
11.750	2,733.66	2,733.65	2,733.64	2,733.62	2,733.61
12.000	2,733.60	2,733.59	2,733.58	2,733.57	2,733.57
12.250	2,733.56	2,733.56	2,733.55	2,733.55	2,733.55
12.500	2,733.54	2,733.54	2,733.54	2,733.54	2,733.54
12.750	2,733.53	2,733.53	2,733.52	2,733.52	2,733.51
13.000	2,733.51	2,733.50	2,733.50	2,733.50	2,733.49
13.250	2,733.49	2,733.49	2,733.49	2,733.49	2,733.49
13.500	2,733.48	2,733.48	2,733.47	2,733.46	2,733.46
13.750	2,733.45	2,733.44	2,733.44	2,733.43	2,733.42
14.000	2,733.42	2,733.41	2,733.40	2,733.40	2,733.39
14.250	2,733.39	2,733.38	2,733.38	2,733.37	2,733.37
14.500	2,733.36	2,733.36	2,733.35	2,733.35	2,733.34
14.750	2,733.34	2,733.33	2,733.33	2,733.32	2,733.32
15.000	2,733.31	2,733.31	2,733.30	2,733.30	2,733.29
15.250	2,733.29	2,733.28	2,733.28	2,733.27	2,733.27
15.500	2,733.26	2,733.26	2,733.25	2,733.25	2,733.24
15.750	2,733.24	2,733.23	2,733.23	2,733.22	2,733.22
16.000	2,733.21	2,733.21	2,733.20	2,733.20	2,733.19
16.250	2,733.19	2,733.18	2,733.18	2,733.17	2,733.17
16.500	2,733.16	2,733.16	2,733.15	2,733.14	2,733.14
16.750	2,733.13	2,733.13	2,733.12	2,733.12	2,733.11
17.000	2,733.11	2,733.10	2,733.10	2,733.09	2,733.09
17.250	2,733.08	2,733.08	2,733.07	2,733.07	2,733.06
17.500	2,733.06	2,733.05	2,733.05	2,733.04	2,733.04
17.750	2,733.03	2,733.03	2,733.02	2,733.02	2,733.01
18.000	2,733.01	2,733.00	2,733.00	2,732.99	2,732.98
18.250	2,732.98	2,732.97	2,732.96	2,732.96	2,732.95
18.500	2,732.94	2,732.94	2,732.93	2,732.92	2,732.91
18.750	2,732.90	2,732.90	2,732.89	2,732.88	2,732.87
19.000	2,732.86	2,732.85	2,732.84	2,732.83	2,732.82
19.250	2,732.81	2,732.80	2,732.79	2,732.78	2,732.76
19.500	2,732.75	2,732.74	2,732.73	2,732.72	2,732.71
19.750	2,732.69	2,732.68	2,732.67	2,732.65	2,732.64
20.000	2,732.63	2,732.61	2,732.60	2,732.59	2,732.57
20.250	2,732.56	2,732.55	2,732.53	2,732.52	2,732.50

Brunswick Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	2,732.49	2,732.47	2,732.46	2,732.44	2,732.42
20.750	2,732.41	2,732.39	2,732.38	2,732.36	2,732.34
21.000	2,732.33	2,732.31	2,732.29	2,732.27	2,732.26
21.250	2,732.24	2,732.22	2,732.20	2,732.19	2,732.17
21.500	2,732.15	2,732.13	2,732.11	2,732.10	2,732.08
21.750	2,732.06	2,732.04	2,732.02	2,732.00	2,731.98
22.000	2,731.96	2,731.94	2,731.92	2,731.90	2,731.88
22.250	2,731.86	2,731.84	2,731.82	2,731.80	2,731.78
22.500	2,731.76	2,731.74	2,731.72	2,731.70	2,731.68
22.750	2,731.66	2,731.64	2,731.61	2,731.59	2,731.57
23.000	2,731.55	2,731.53	2,731.51	2,731.48	2,731.46
23.250	2,731.44	2,731.42	2,731.39	2,731.37	2,731.35
23.500	2,731.33	2,731.30	2,731.28	2,731.26	2,731.23
23.750	2,731.21	2,731.19	2,731.17	2,731.14	2,731.12
24.000	2,731.10	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000
2.250	0.000	0.000	0.000	0.000	0.000
2.500	0.000	0.001	0.001	0.002	0.003
2.750	0.004	0.005	0.006	0.007	0.009
3.000	0.011	0.013	0.014	0.017	0.019
3.250	0.021	0.023	0.026	0.029	0.031
3.500	0.035	0.038	0.042	0.047	0.052
3.750	0.058	0.065	0.072	0.080	0.088
4.000	0.097	0.107	0.117	0.128	0.139
4.250	0.151	0.164	0.177	0.190	0.204
4.500	0.219	0.235	0.251	0.268	0.286
4.750	0.304	0.323	0.342	0.361	0.380
5.000	0.400	0.420	0.440	0.461	0.483
5.250	0.504	0.527	0.549	0.572	0.595
5.500	0.619	0.643	0.667	0.691	0.714
5.750	0.737	0.761	0.785	0.809	0.834
6.000	0.860	0.886	0.913	0.942	0.972
6.250	1.004	1.036	1.068	1.100	1.133
6.500	1.166	1.200	1.233	1.264	1.294
6.750	1.324	1.353	1.383	1.413	1.445
7.000	1.477	1.510	1.546	1.585	1.626
7.250	1.670	1.717	1.768	1.823	1.881
7.500	1.943	2.015	2.114	2.256	2.441
7.750	2.666	2.913	3.180	3.457	3.740
8.000	4.026	4.303	4.560	4.778	4.958
8.250	5.106	5.226	5.326	5.410	5.479
8.500	5.536	5.582	5.623	5.662	5.699
8.750	5.734	5.767	5.795	5.820	5.840
9.000	5.856	5.869	5.877	5.882	5.883
9.250	5.881	5.876	5.868	5.858	5.845
9.500	5.829	5.812	5.794	5.775	5.758
9.750	5.740	5.722	5.704	5.685	5.666
10.000	5.645	5.624	5.601	5.578	5.553

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	5.528	5.502	5.476	5.449	5.422
10.500	5.394	5.367	5.340	5.313	5.287
10.750	5.262	5.236	5.211	5.185	5.159
11.000	5.132	5.105	5.078	5.049	5.021
11.250	4.992	4.963	4.934	4.905	4.875
11.500	4.845	4.815	4.784	4.752	4.721
11.750	4.688	4.656	4.624	4.591	4.558
12.000	4.525	4.492	4.460	4.429	4.397
12.250	4.367	4.337	4.308	4.280	4.253
12.500	4.227	4.202	4.177	4.151	4.125
12.750	4.098	4.071	4.043	4.016	3.989
13.000	3.962	3.936	3.910	3.886	3.863
13.250	3.840	3.818	3.796	3.773	3.751
13.500	3.728	3.706	3.683	3.660	3.638
13.750	3.615	3.592	3.569	3.546	3.524
14.000	3.501	3.479	3.458	3.437	3.416
14.250	3.396	3.377	3.357	3.338	3.319
14.500	3.301	3.283	3.264	3.247	3.229
14.750	3.212	3.194	3.177	3.160	3.144
15.000	3.127	3.110	3.094	3.077	3.061
15.250	3.045	3.029	3.014	2.999	2.984
15.500	2.969	2.954	2.939	2.925	2.910
15.750	2.896	2.882	2.869	2.855	2.842
16.000	2.829	2.815	2.802	2.790	2.777
16.250	2.764	2.752	2.739	2.727	2.715
16.500	2.703	2.691	2.679	2.667	2.655
16.750	2.643	2.632	2.620	2.609	2.598
17.000	2.587	2.576	2.565	2.554	2.543
17.250	2.533	2.522	2.512	2.501	2.491
17.500	2.481	2.471	2.461	2.451	2.442
17.750	2.432	2.423	2.413	2.404	2.394
18.000	2.385	2.376	2.367	2.358	2.349
18.250	2.340	2.331	2.322	2.313	2.305
18.500	2.296	2.288	2.279	2.271	2.262
18.750	2.254	2.245	2.237	2.228	2.220
19.000	2.211	2.203	2.195	2.187	2.179
19.250	2.171	2.163	2.155	2.147	2.139
19.500	2.131	2.124	2.116	2.108	2.101
19.750	2.093	2.086	2.078	2.071	2.064
20.000	2.056	2.049	2.042	2.035	2.028
20.250	2.021	2.013	2.006	1.999	1.992

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	1.985	1.978	1.972	1.965	1.958
20.750	1.951	1.944	1.937	1.931	1.924
21.000	1.917	1.911	1.904	1.897	1.891
21.250	1.884	1.877	1.871	1.864	1.858
21.500	1.851	1.845	1.838	1.832	1.825
21.750	1.818	1.812	1.805	1.799	1.792
22.000	1.786	1.779	1.773	1.767	1.760
22.250	1.754	1.748	1.741	1.735	1.729
22.500	1.723	1.716	1.710	1.704	1.698
22.750	1.692	1.686	1.680	1.674	1.668
23.000	1.662	1.656	1.650	1.644	1.638
23.250	1.632	1.627	1.621	1.615	1.609
23.500	1.603	1.598	1.592	1.586	1.580
23.750	1.574	1.569	1.563	1.557	1.552
24.000	1.546	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.001
2.000	0.002	0.003	0.004	0.006	0.008
2.250	0.010	0.013	0.016	0.019	0.022
2.500	0.026	0.030	0.035	0.040	0.046
2.750	0.053	0.061	0.070	0.080	0.091
3.000	0.103	0.115	0.129	0.143	0.158
3.250	0.174	0.190	0.208	0.226	0.245
3.500	0.265	0.286	0.307	0.331	0.354
3.750	0.377	0.401	0.426	0.450	0.476
4.000	0.501	0.527	0.553	0.580	0.606
4.250	0.633	0.660	0.687	0.713	0.740
4.500	0.767	0.794	0.822	0.850	0.879
4.750	0.908	0.938	0.968	0.999	1.031
5.000	1.063	1.094	1.127	1.161	1.196
5.250	1.232	1.269	1.307	1.346	1.385
5.500	1.425	1.465	1.505	1.545	1.585
5.750	1.626	1.667	1.710	1.754	1.799
6.000	1.844	1.891	1.939	1.991	2.046
6.250	2.103	2.163	2.224	2.285	2.347
6.500	2.410	2.473	2.535	2.595	2.653
6.750	2.709	2.764	2.820	2.877	2.938
7.000	3.001	3.067	3.138	3.211	3.289
7.250	3.373	3.464	3.562	3.665	3.776
7.500	3.896	4.034	4.216	4.475	4.814
7.750	5.218	5.666	6.143	6.638	7.142
8.000	7.642	8.109	8.501	8.794	8.996
8.250	9.129	9.209	9.250	9.262	9.250
8.500	9.220	9.178	9.131	9.086	9.045
8.750	9.006	8.966	8.925	8.883	8.838
9.000	8.792	8.745	8.697	8.648	8.600
9.250	8.550	8.501	8.452	8.405	8.359
9.500	8.314	8.272	8.232	8.197	8.166
9.750	8.138	8.113	8.089	8.067	8.045
10.000	8.025	8.005	7.986	7.967	7.947

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	7.927	7.906	7.884	7.863	7.841
10.500	7.820	7.799	7.779	7.761	7.744
10.750	7.728	7.712	7.696	7.680	7.663
11.000	7.647	7.630	7.613	7.596	7.579
11.250	7.562	7.544	7.527	7.509	7.491
11.500	7.472	7.454	7.435	7.416	7.396
11.750	7.375	7.355	7.334	7.313	7.291
12.000	7.269	7.246	7.224	7.202	7.180
12.250	7.159	7.138	7.118	7.098	7.080
12.500	7.062	7.046	7.029	7.011	6.991
12.750	6.971	6.949	6.927	6.905	6.883
13.000	6.861	6.839	6.818	6.798	6.779
13.250	6.760	6.741	6.722	6.702	6.682
13.500	6.661	6.639	6.617	6.595	6.572
13.750	6.549	6.526	6.503	6.479	6.456
14.000	6.432	6.409	6.386	6.364	6.341
14.250	6.320	6.298	6.277	6.255	6.234
14.500	6.212	6.191	6.169	6.147	6.126
14.750	6.104	6.083	6.061	6.040	6.018
15.000	5.997	5.975	5.954	5.933	5.912
15.250	5.891	5.870	5.849	5.829	5.808
15.500	5.787	5.766	5.746	5.725	5.704
15.750	5.684	5.663	5.643	5.622	5.601
16.000	5.580	5.559	5.539	5.518	5.497
16.250	5.477	5.456	5.436	5.415	5.395
16.500	5.375	5.355	5.334	5.314	5.294
16.750	5.274	5.254	5.234	5.214	5.195
17.000	5.175	5.155	5.136	5.116	5.096
17.250	5.076	5.056	5.036	5.016	4.996
17.500	4.976	4.956	4.936	4.917	4.897
17.750	4.878	4.858	4.839	4.820	4.800
18.000	4.781	4.762	4.743	4.723	4.704
18.250	4.685	4.666	4.647	4.629	4.610
18.500	4.591	4.572	4.553	4.533	4.514
18.750	4.495	4.476	4.458	4.439	4.420
19.000	4.401	4.383	4.364	4.346	4.327
19.250	4.309	4.290	4.272	4.254	4.236
19.500	4.218	4.200	4.182	4.164	4.146
19.750	4.128	4.110	4.093	4.074	4.056
20.000	4.038	4.020	4.002	3.984	3.966
20.250	3.949	3.931	3.913	3.896	3.878

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	3.861	3.844	3.826	3.809	3.792
20.750	3.774	3.757	3.741	3.724	3.707
21.000	3.690	3.673	3.657	3.640	3.623
21.250	3.607	3.590	3.573	3.556	3.539
21.500	3.522	3.505	3.489	3.472	3.456
21.750	3.439	3.423	3.407	3.390	3.374
22.000	3.358	3.342	3.326	3.310	3.295
22.250	3.279	3.263	3.247	3.232	3.216
22.500	3.200	3.185	3.170	3.154	3.139
22.750	3.123	3.108	3.092	3.077	3.061
23.000	3.045	3.030	3.015	2.999	2.984
23.250	2.969	2.954	2.939	2.924	2.910
23.500	2.895	2.880	2.866	2.851	2.837
23.750	2.822	2.808	2.793	2.779	2.765
24.000	2.751	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.001	0.001	0.002
1.750	0.004	0.006	0.008	0.011	0.014
2.000	0.018	0.022	0.027	0.032	0.038
2.250	0.045	0.054	0.065	0.077	0.090
2.500	0.105	0.122	0.140	0.159	0.180
2.750	0.202	0.225	0.250	0.276	0.303
3.000	0.331	0.359	0.386	0.414	0.442
3.250	0.471	0.499	0.528	0.557	0.587
3.500	0.617	0.648	0.679	0.710	0.742
3.750	0.775	0.809	0.843	0.878	0.914
4.000	0.950	0.986	1.023	1.059	1.095
4.250	1.131	1.167	1.204	1.241	1.279
4.500	1.318	1.357	1.397	1.438	1.478
4.750	1.520	1.562	1.605	1.649	1.695
5.000	1.742	1.790	1.840	1.889	1.941
5.250	1.994	2.049	2.106	2.164	2.224
5.500	2.283	2.343	2.404	2.465	2.527
5.750	2.589	2.653	2.718	2.783	2.850
6.000	2.919	2.992	3.068	3.148	3.231
6.250	3.317	3.407	3.500	3.596	3.690
6.500	3.786	3.883	3.978	4.071	4.159
6.750	4.244	4.330	4.417	4.507	4.600
7.000	4.695	4.796	4.902	5.015	5.135
7.250	5.261	5.396	5.542	5.697	5.861
7.500	6.040	6.242	6.506	6.877	7.361
7.750	7.918	8.492	9.048	9.582	10.088
8.000	10.543	10.912	11.172	11.309	11.340
8.250	11.301	11.219	11.114	10.995	10.870
8.500	10.746	10.626	10.515	10.416	10.330
8.750	10.252	10.179	10.108	10.039	9.972
9.000	9.905	9.836	9.764	9.689	9.611
9.250	9.532	9.451	9.370	9.288	9.205
9.500	9.124	9.047	8.976	8.912	8.855
9.750	8.804	8.757	8.713	8.672	8.633
10.000	8.597	8.561	8.527	8.494	8.462

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	8.431	8.402	8.374	8.347	8.322
10.500	8.299	8.277	8.258	8.241	8.226
10.750	8.213	8.201	8.189	8.177	8.165
11.000	8.153	8.140	8.128	8.116	8.104
11.250	8.091	8.079	8.066	8.054	8.041
11.500	8.028	8.016	8.003	7.989	7.974
11.750	7.960	7.945	7.929	7.914	7.898
12.000	7.883	7.868	7.854	7.840	7.826
12.250	7.814	7.803	7.793	7.784	7.777
12.500	7.771	7.766	7.761	7.754	7.746
12.750	7.736	7.725	7.714	7.704	7.693
13.000	7.682	7.672	7.663	7.656	7.651
13.250	7.646	7.641	7.635	7.629	7.622
13.500	7.615	7.606	7.598	7.589	7.579
13.750	7.570	7.560	7.550	7.541	7.531
14.000	7.522	7.513	7.505	7.497	7.489
14.250	7.483	7.476	7.469	7.463	7.457
14.500	7.451	7.445	7.438	7.433	7.427
14.750	7.421	7.415	7.409	7.403	7.397
15.000	7.391	7.386	7.380	7.374	7.369
15.250	7.363	7.358	7.352	7.346	7.340
15.500	7.333	7.326	7.319	7.312	7.305
15.750	7.297	7.289	7.281	7.273	7.264
16.000	7.256	7.247	7.238	7.228	7.219
16.250	7.209	7.199	7.189	7.179	7.168
16.500	7.158	7.147	7.136	7.124	7.113
16.750	7.101	7.090	7.078	7.066	7.053
17.000	7.041	7.028	7.016	7.003	6.990
17.250	6.976	6.963	6.949	6.935	6.921
17.500	6.907	6.893	6.879	6.864	6.850
17.750	6.835	6.820	6.805	6.790	6.775
18.000	6.759	6.743	6.727	6.710	6.694
18.250	6.677	6.661	6.644	6.627	6.610
18.500	6.593	6.576	6.559	6.541	6.524
18.750	6.506	6.489	6.471	6.453	6.435
19.000	6.417	6.399	6.380	6.362	6.343
19.250	6.325	6.306	6.288	6.269	6.250
19.500	6.231	6.212	6.193	6.173	6.153
19.750	6.134	6.114	6.093	6.073	6.053
20.000	6.033	6.012	5.992	5.972	5.952
20.250	5.931	5.911	5.890	5.870	5.849

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	5.828	5.807	5.786	5.765	5.744
20.750	5.723	5.702	5.681	5.660	5.639
21.000	5.617	5.596	5.574	5.552	5.530
21.250	5.508	5.486	5.464	5.442	5.420
21.500	5.398	5.376	5.354	5.332	5.310
21.750	5.288	5.266	5.244	5.222	5.200
22.000	5.178	5.155	5.133	5.111	5.088
22.250	5.066	5.043	5.020	4.997	4.974
22.500	4.951	4.929	4.906	4.883	4.861
22.750	4.838	4.816	4.793	4.770	4.748
23.000	4.725	4.702	4.680	4.657	4.635
23.250	4.612	4.590	4.566	4.544	4.521
23.500	4.498	4.475	4.452	4.429	4.406
23.750	4.383	4.361	4.338	4.315	4.293
24.000	4.270	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.001	0.002	0.003	0.006	0.008
1.750	0.012	0.015	0.019	0.024	0.030
2.000	0.036	0.043	0.053	0.064	0.077
2.250	0.092	0.109	0.128	0.149	0.171
2.500	0.196	0.222	0.250	0.279	0.310
2.750	0.342	0.374	0.406	0.438	0.472
3.000	0.505	0.539	0.573	0.607	0.642
3.250	0.676	0.710	0.743	0.777	0.812
3.500	0.846	0.882	0.918	0.956	0.995
3.750	1.035	1.075	1.115	1.156	1.198
4.000	1.241	1.284	1.328	1.372	1.416
4.250	1.460	1.503	1.547	1.592	1.638
4.500	1.685	1.732	1.781	1.831	1.880
4.750	1.930	1.982	2.035	2.089	2.145
5.000	2.203	2.262	2.321	2.383	2.447
5.250	2.513	2.581	2.652	2.723	2.794
5.500	2.867	2.942	3.018	3.095	3.171
5.750	3.247	3.324	3.404	3.486	3.571
6.000	3.656	3.744	3.836	3.934	4.038
6.250	4.145	4.255	4.368	4.484	4.602
6.500	4.719	4.837	4.954	5.068	5.176
6.750	5.281	5.387	5.495	5.606	5.719
7.000	5.836	5.960	6.090	6.229	6.372
7.250	6.526	6.692	6.867	7.053	7.254
7.500	7.465	7.696	7.990	8.376	8.847
7.750	9.374	9.929	10.476	10.967	11.386
8.000	11.721	11.973	12.118	12.148	12.084
8.250	11.960	11.804	11.638	11.472	11.310
8.500	11.153	11.003	10.869	10.757	10.665
8.750	10.587	10.514	10.442	10.371	10.299
9.000	10.229	10.158	10.089	10.020	9.953
9.250	9.887	9.818	9.746	9.672	9.597
9.500	9.520	9.444	9.370	9.301	9.236
9.750	9.175	9.119	9.067	9.018	8.972
10.000	8.929	8.887	8.847	8.809	8.771

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	8.734	8.699	8.665	8.634	8.603
10.500	8.574	8.547	8.523	8.501	8.483
10.750	8.466	8.451	8.435	8.421	8.406
11.000	8.391	8.376	8.362	8.347	8.332
11.250	8.317	8.303	8.288	8.273	8.258
11.500	8.243	8.228	8.212	8.196	8.180
11.750	8.163	8.147	8.131	8.116	8.102
12.000	8.088	8.076	8.065	8.054	8.045
12.250	8.037	8.031	8.026	8.022	8.019
12.500	8.018	8.018	8.017	8.015	8.010
12.750	8.004	7.997	7.990	7.983	7.976
13.000	7.970	7.964	7.960	7.957	7.956
13.250	7.955	7.954	7.952	7.949	7.945
13.500	7.940	7.934	7.927	7.919	7.912
13.750	7.903	7.894	7.886	7.877	7.868
14.000	7.859	7.851	7.843	7.835	7.829
14.250	7.822	7.816	7.810	7.804	7.797
14.500	7.791	7.785	7.779	7.773	7.767
14.750	7.761	7.755	7.749	7.743	7.737
15.000	7.731	7.725	7.719	7.713	7.707
15.250	7.701	7.695	7.689	7.683	7.677
15.500	7.671	7.664	7.658	7.652	7.646
15.750	7.640	7.634	7.628	7.622	7.616
16.000	7.610	7.604	7.598	7.592	7.585
16.250	7.579	7.573	7.567	7.561	7.555
16.500	7.549	7.542	7.536	7.530	7.524
16.750	7.518	7.512	7.506	7.500	7.494
17.000	7.487	7.481	7.475	7.469	7.463
17.250	7.457	7.451	7.444	7.438	7.432
17.500	7.426	7.419	7.413	7.407	7.401
17.750	7.395	7.389	7.383	7.377	7.370
18.000	7.364	7.358	7.351	7.344	7.337
18.250	7.330	7.322	7.314	7.306	7.298
18.500	7.289	7.280	7.271	7.262	7.252
18.750	7.242	7.232	7.221	7.210	7.199
19.000	7.188	7.177	7.165	7.153	7.141
19.250	7.128	7.116	7.103	7.090	7.077
19.500	7.063	7.050	7.036	7.022	7.008
19.750	6.993	6.979	6.964	6.948	6.933
20.000	6.917	6.902	6.886	6.870	6.854
20.250	6.838	6.822	6.805	6.788	6.771

Brunswick Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	6.753	6.735	6.717	6.699	6.681
20.750	6.662	6.644	6.625	6.606	6.587
21.000	6.568	6.549	6.529	6.510	6.490
21.250	6.470	6.450	6.430	6.410	6.390
21.500	6.370	6.349	6.329	6.308	6.287
21.750	6.266	6.245	6.224	6.203	6.181
22.000	6.159	6.137	6.115	6.093	6.070
22.250	6.048	6.025	6.003	5.980	5.957
22.500	5.934	5.911	5.888	5.865	5.842
22.750	5.819	5.796	5.773	5.750	5.726
23.000	5.703	5.679	5.656	5.632	5.607
23.250	5.583	5.558	5.534	5.510	5.485
23.500	5.461	5.436	5.412	5.387	5.362
23.750	5.338	5.313	5.288	5.263	5.239
24.000	5.214	(N/A)	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Elevation-Area Volume Curve
Label: PO-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
2,725.00	0.0	0.650	0.000	0.000	0.000
2,726.00	0.0	0.720	2.054	0.685	0.685
2,728.00	0.0	0.850	2.352	1.568	2.253
2,730.00	0.0	0.990	2.757	1.838	4.091
2,732.00	0.0	1.120	3.163	2.109	6.200
2,734.00	0.0	1.270	3.583	2.388	8.588
2,736.00	0.0	1.420	4.033	2.689	11.277
2,738.00	0.0	1.590	4.513	3.008	14.285
2,740.00	0.0	1.750	5.008	3.339	17.624

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Brunswick Site

Subsection: Elevation-Area Volume Curve
Label: PO-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
2,725.00	0.0	0.650	0.000	0.000	0.000
2,726.00	0.0	0.720	2.054	0.685	0.685
2,728.00	0.0	0.850	2.352	1.568	2.253
2,730.00	0.0	0.990	2.757	1.838	4.091
2,732.00	0.0	1.120	3.163	2.109	6.200
2,734.00	0.0	1.270	3.583	2.388	8.588
2,736.00	0.0	1.420	4.033	2.689	11.277
2,738.00	0.0	1.590	4.513	3.008	14.285
2,740.00	0.0	1.750	5.008	3.339	17.624

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Brunswick Site

Subsection: Elevation-Area Volume Curve
Label: PO-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
2,725.00	0.0	0.650	0.000	0.000	0.000
2,726.00	0.0	0.720	2.054	0.685	0.685
2,728.00	0.0	0.850	2.352	1.568	2.253
2,730.00	0.0	0.990	2.757	1.838	4.091
2,732.00	0.0	1.120	3.163	2.109	6.200
2,734.00	0.0	1.270	3.583	2.388	8.588
2,736.00	0.0	1.420	4.033	2.689	11.277
2,738.00	0.0	1.590	4.513	3.008	14.285
2,740.00	0.0	1.750	5.008	3.339	17.624

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Brunswick Site

Subsection: Elevation-Area Volume Curve
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
2,725.00	0.0	0.650	0.000	0.000	0.000
2,726.00	0.0	0.720	2.054	0.685	0.685
2,728.00	0.0	0.850	2.352	1.568	2.253
2,730.00	0.0	0.990	2.757	1.838	4.091
2,732.00	0.0	1.120	3.163	2.109	6.200
2,734.00	0.0	1.270	3.583	2.388	8.588
2,736.00	0.0	1.420	4.033	2.689	11.277
2,738.00	0.0	1.590	4.513	3.008	14.285
2,740.00	0.0	1.750	5.008	3.339	17.624

Subsection: Volume Equations
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	2,725.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	2,740.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	2,735.00	2,740.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	2,725.00	2,740.00
Culvert-Circular	Culvert - 1	Forward	TW	2,725.00	2,740.00
Orifice-Circular	Orifice - 2	Forward	TW	2,733.00	2,740.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Brunswick Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	48.0 in
Length	160.00 ft
Length (Computed Barrel)	160.70 ft
Slope (Computed)	0.094 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.089
T2 ratio (HW/D)	1.250
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	2,729.36 ft	T1 Flow	87.96 ft³/s
T2 Elevation	2,730.00 ft	T2 Flow	100.53 ft³/s

Brunswick Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	2,735.00 ft
Diameter	60.0 in
Orifice Area	19.6 ft²
Orifice Coefficient	0.600
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	4
Elevation	2,725.00 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	8
Elevation	2,733.00 ft
Orifice Diameter	14.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft

Convergence Tolerances	
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Brunswick Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 256.26 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,725.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
2,725.50	1.06	2,725.45	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,726.00	4.36	2,725.92	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,726.50	7.78	2,726.23	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,727.00	10.94	2,726.48	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,727.50	13.80	2,726.67	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,728.00	16.38	2,726.83	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,728.50	18.74	2,726.97	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,729.00	20.91	2,727.08	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,729.50	22.95	2,727.19	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,730.00	24.88	2,727.29	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,730.50	26.71	2,727.38	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,731.00	28.43	2,727.46	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,731.50	30.06	2,727.54	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,732.00	31.64	2,727.61	Free Outfall	Free Outfall	0.00	0.03	(N/A)	0.00
2,732.50	33.17	2,727.68	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,733.00	34.65	2,727.75	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,733.50	36.05	2,727.81	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,734.00	37.40	2,727.87	Free Outfall	Free Outfall	0.00	0.03	(N/A)	0.00
2,734.50	38.73	2,727.93	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,735.00	40.03	2,727.98	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,735.50	56.24	2,728.64	Free Outfall	Free Outfall	0.00	0.03	(N/A)	0.00
2,736.00	84.99	2,729.71	Free Outfall	Free Outfall	0.00	0.06	(N/A)	0.00
2,736.50	121.71	2,731.13	Free Outfall	Free Outfall	0.00	0.09	(N/A)	0.00
2,737.00	160.57	2,733.76	Free Outfall	Free Outfall	0.00	0.07	(N/A)	0.00
2,737.50	174.14	2,734.85	Free Outfall	Free Outfall	0.00	0.11	(N/A)	0.00
2,738.00	185.85	2,735.86	Free Outfall	Free Outfall	0.00	0.05	(N/A)	0.00
2,738.50	196.41	2,736.83	Free Outfall	Free Outfall	0.00	0.07	(N/A)	0.00
2,739.00	205.96	2,737.75	Free Outfall	Free Outfall	0.00	0.07	(N/A)	0.00
2,739.50	214.61	2,738.63	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,740.00	222.54	2,739.46	Free Outfall	Free Outfall	0.00	0.09	(N/A)	0.00

Message

WS below an invert; no flow.

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 256.26 ft³/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .100ft Dcr= .296ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .208ft Dcr= .604ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .283ft Dcr= .810ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .341ft Dcr= .964ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .388ft Dcr= 1.087ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .427ft Dcr= 1.187ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .461ft Dcr= 1.273ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .492ft Dcr= 1.347ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .519ft Dcr= 1.413ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .545ft Dcr= 1.474ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .568ft Dcr= 1.529ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .590ft Dcr= 1.580ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .610ft Dcr= 1.626ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .630ft Dcr= 1.670ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .649ft Dcr= 1.712ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .666ft Dcr= 1.751ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .683ft Dcr= 1.788ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .700ft Dcr= 1.823ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .715ft Dcr= 1.856ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .731ft Dcr= 1.889ft CRIT.DEPTH Hev= .00ft

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 256.26 ft^3/s
Upstream ID = Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .921ft Dcr= 2.257ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.277ft Dcr= 2.795ft CRIT.DEPTH Hev= .00ft
INLET CONTROL... Submerged: HW =6.13
INLET CONTROL... Submerged: HW =8.76
INLET CONTROL... Submerged: HW =9.85
INLET CONTROL... Submerged: HW =10.86
INLET CONTROL... Submerged: HW =11.83
INLET CONTROL... Submerged: HW =12.75
INLET CONTROL... Submerged: HW =13.63
INLET CONTROL... Submerged: HW =14.46

Brunswick Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,725.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
2,725.50	0.00	0.00	0.00	2,725.45	0.00	0.00	(N/A)	0.00
2,726.00	0.00	0.00	0.00	2,725.92	0.00	0.00	(N/A)	0.00
2,726.50	0.00	0.00	0.00	2,726.23	0.00	0.00	(N/A)	0.00
2,727.00	0.00	0.00	0.00	2,726.48	0.00	0.00	(N/A)	0.00
2,727.50	0.00	0.00	0.00	2,726.67	0.00	0.00	(N/A)	0.00
2,728.00	0.00	0.00	0.00	2,726.83	0.00	0.00	(N/A)	0.00
2,728.50	0.00	0.00	0.00	2,726.97	0.00	0.00	(N/A)	0.00
2,729.00	0.00	0.00	0.00	2,727.08	0.00	0.00	(N/A)	0.00
2,729.50	0.00	0.00	0.00	2,727.19	0.00	0.00	(N/A)	0.00
2,730.00	0.00	0.00	0.00	2,727.29	0.00	0.00	(N/A)	0.00
2,730.50	0.00	0.00	0.00	2,727.38	0.00	0.00	(N/A)	0.00
2,731.00	0.00	0.00	0.00	2,727.46	0.00	0.00	(N/A)	0.00
2,731.50	0.00	0.00	0.00	2,727.54	0.00	0.00	(N/A)	0.00
2,732.00	0.00	0.00	0.00	2,727.61	0.00	0.00	(N/A)	0.00
2,732.50	0.00	0.00	0.00	2,727.68	0.00	0.00	(N/A)	0.00
2,733.00	0.00	0.00	0.00	2,727.75	0.00	0.00	(N/A)	0.00
2,733.50	0.00	0.00	0.00	2,727.81	0.00	0.00	(N/A)	0.00
2,734.00	0.00	0.00	0.00	2,727.87	0.00	0.00	(N/A)	0.00
2,734.50	0.00	0.00	0.00	2,727.93	0.00	0.00	(N/A)	0.00
2,735.00	0.00	0.00	0.00	2,727.98	0.00	0.00	(N/A)	0.00
2,735.50	16.66	2,735.50	Free Outfall	2,728.64	0.00	0.00	(N/A)	0.00
2,736.00	47.12	2,736.00	Free Outfall	2,729.71	0.00	0.00	(N/A)	0.00
2,736.50	86.57	2,736.50	Free Outfall	2,731.13	0.00	0.00	(N/A)	0.00
2,737.00	133.29	2,737.00	Free Outfall	2,733.76	0.00	0.00	(N/A)	0.00
2,737.50	149.42	2,737.50	Free Outfall	2,734.85	0.00	0.00	(N/A)	0.00
2,738.00	163.69	2,738.00	2,735.86	2,735.86	0.00	0.00	(N/A)	0.00
2,738.50	176.80	2,738.50	2,736.83	2,736.83	0.00	0.00	(N/A)	0.00
2,739.00	189.01	2,739.00	2,737.75	2,737.75	0.00	0.00	(N/A)	0.00
2,739.50	200.47	2,739.50	2,738.63	2,738.63	0.00	0.00	(N/A)	0.00
2,740.00	211.32	2,740.00	2,739.46	2,739.46	0.00	0.00	(N/A)	0.00

Message

WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.5ft
Weir: H =1ft
Weir: H =1.5ft
Weir: H =2ft
Orifice: H =2.50; Riser orifice equation controlling.
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.00
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=4.00
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=4.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=5.00

Brunswick Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,725.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
2,725.50	1.06	2,725.50	2,725.44	2,725.45	0.00	0.00	(N/A)	0.00
2,726.00	4.37	2,726.00	2,725.92	2,725.92	0.00	0.00	(N/A)	0.00
2,726.50	7.79	2,726.50	2,726.23	2,726.23	0.00	0.00	(N/A)	0.00
2,727.00	10.94	2,727.00	2,726.48	2,726.48	0.00	0.00	(N/A)	0.00
2,727.50	13.79	2,727.50	2,726.67	2,726.67	0.00	0.00	(N/A)	0.00
2,728.00	16.37	2,728.00	2,726.83	2,726.83	0.00	0.00	(N/A)	0.00
2,728.50	18.73	2,728.50	2,726.97	2,726.97	0.00	0.00	(N/A)	0.00
2,729.00	20.93	2,729.00	2,727.08	2,727.08	0.00	0.00	(N/A)	0.00
2,729.50	22.97	2,729.50	2,727.19	2,727.19	0.00	0.00	(N/A)	0.00
2,730.00	24.89	2,730.00	2,727.29	2,727.29	0.00	0.00	(N/A)	0.00
2,730.50	26.70	2,730.50	2,727.38	2,727.38	0.00	0.00	(N/A)	0.00
2,731.00	28.43	2,731.00	2,727.46	2,727.46	0.00	0.00	(N/A)	0.00
2,731.50	30.08	2,731.50	2,727.54	2,727.54	0.00	0.00	(N/A)	0.00
2,732.00	31.66	2,732.00	2,727.61	2,727.61	0.00	0.00	(N/A)	0.00
2,732.50	33.18	2,732.50	2,727.68	2,727.68	0.00	0.00	(N/A)	0.00
2,733.00	34.65	2,733.00	2,727.75	2,727.75	0.00	0.00	(N/A)	0.00
2,733.50	36.06	2,733.50	2,727.81	2,727.81	0.00	0.00	(N/A)	0.00
2,734.00	37.43	2,734.00	2,727.87	2,727.87	0.00	0.00	(N/A)	0.00
2,734.50	38.76	2,734.50	2,727.93	2,727.93	0.00	0.00	(N/A)	0.00
2,735.00	40.05	2,735.00	2,727.98	2,727.98	0.00	0.00	(N/A)	0.00
2,735.50	39.61	2,735.50	2,728.64	2,728.64	0.00	0.00	(N/A)	0.00
2,736.00	37.92	2,736.00	2,729.71	2,729.71	0.00	0.00	(N/A)	0.00
2,736.50	35.05	2,736.50	2,731.13	2,731.13	0.00	0.00	(N/A)	0.00
2,737.00	27.22	2,737.00	2,733.76	2,733.76	0.00	0.00	(N/A)	0.00
2,737.50	24.61	2,737.50	2,734.85	2,734.85	0.00	0.00	(N/A)	0.00
2,738.00	22.11	2,738.00	2,735.86	2,735.86	0.00	0.00	(N/A)	0.00
2,738.50	19.54	2,738.50	2,736.83	2,736.83	0.00	0.00	(N/A)	0.00
2,739.00	16.88	2,739.00	2,737.75	2,737.75	0.00	0.00	(N/A)	0.00
2,739.50	14.13	2,739.50	2,738.63	2,738.63	0.00	0.00	(N/A)	0.00
2,740.00	11.13	2,740.00	2,739.46	2,739.46	0.00	0.00	(N/A)	0.00

Message

WS below an invert; no flow.
BACKWATER CONTROL.. Vh= .055ft
hwDi= .445ft Lbw= .0ft Hev= .00ft

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
H =.08
H =.27
H =.52
H =.83
H =1.17
H =1.53
H =1.92
H =2.31
H =2.71
H =3.12
H =3.54
H =3.96
H =4.39
H =4.82
H =5.25
H =5.69
H =6.13
H =6.57
H =7.02
H =6.86
H =6.29
H =5.37
H =3.24
H =2.65
H =2.14
H =1.67
H =1.25
H =.87
H =.54

Brunswick Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,725.00	0.00	(N/A)	0.00
2,725.50	0.00	(N/A)	0.00
2,726.00	0.00	(N/A)	0.00
2,726.50	0.00	(N/A)	0.00
2,727.00	0.00	(N/A)	0.00
2,727.50	0.00	(N/A)	0.00
2,728.00	0.00	(N/A)	0.00
2,728.50	0.00	(N/A)	0.00
2,729.00	0.00	(N/A)	0.00
2,729.50	0.00	(N/A)	0.00
2,730.00	0.00	(N/A)	0.00
2,730.50	0.00	(N/A)	0.00
2,731.00	0.00	(N/A)	0.00
2,731.50	0.00	(N/A)	0.00
2,732.00	0.00	(N/A)	0.00
2,732.50	0.00	(N/A)	0.00
2,733.00	0.00	(N/A)	0.00
2,733.50	6.75	(N/A)	0.00
2,734.00	23.58	(N/A)	0.00
2,734.50	39.41	(N/A)	0.00
2,735.00	48.99	(N/A)	0.00
2,735.50	56.99	(N/A)	0.00
2,736.00	63.99	(N/A)	0.00
2,736.50	70.30	(N/A)	0.00
2,737.00	76.08	(N/A)	0.00
2,737.50	81.46	(N/A)	0.00
2,738.00	86.50	(N/A)	0.00
2,738.50	91.27	(N/A)	0.00
2,739.00	95.80	(N/A)	0.00
2,739.50	100.12	(N/A)	0.00
2,740.00	104.27	(N/A)	0.00

Computation Messages

WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .133ft
Dcr= .367ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .296ft
Dcr= .705ft CRIT.DEPTH Hev= .00ft
H =.92
H =1.42
H =1.92
H =2.42
H =2.92
H =3.42
H =3.92
H =4.42
H =4.92
H =5.42
H =5.92
H =6.42

Brunswick Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,725.00	0.00	(N/A)	0.00
2,725.50	1.06	(N/A)	0.00
2,726.00	4.36	(N/A)	0.00
2,726.50	7.78	(N/A)	0.00
2,727.00	10.94	(N/A)	0.00
2,727.50	13.80	(N/A)	0.00
2,728.00	16.38	(N/A)	0.00
2,728.50	18.74	(N/A)	0.00
2,729.00	20.91	(N/A)	0.00
2,729.50	22.95	(N/A)	0.00
2,730.00	24.88	(N/A)	0.00
2,730.50	26.71	(N/A)	0.00
2,731.00	28.43	(N/A)	0.00
2,731.50	30.06	(N/A)	0.00
2,732.00	31.64	(N/A)	0.00
2,732.50	33.17	(N/A)	0.00
2,733.00	34.65	(N/A)	0.00
2,733.50	42.81	(N/A)	0.00
2,734.00	60.98	(N/A)	0.00
2,734.50	78.14	(N/A)	0.00
2,735.00	89.03	(N/A)	0.00
2,735.50	113.23	(N/A)	0.00
2,736.00	148.98	(N/A)	0.00
2,736.50	192.01	(N/A)	0.00
2,737.00	236.66	(N/A)	0.00
2,737.50	255.60	(N/A)	0.00
2,738.00	272.35	(N/A)	0.00
2,738.50	287.68	(N/A)	0.00
2,739.00	301.76	(N/A)	0.00
2,739.50	314.73	(N/A)	0.00
2,740.00	326.81	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)

Composite Outflow Summary

Contributing Structures
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	2,725.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	2,740.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	2,735.00	2,740.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	2,725.00	2,740.00
Culvert-Circular	Culvert - 1	Forward	TW	2,725.00	2,740.00
Orifice-Circular	Orifice - 2	Forward	TW	2,733.00	2,740.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Brunswick Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	48.0 in
Length	160.00 ft
Length (Computed Barrel)	160.70 ft
Slope (Computed)	0.094 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.089
T2 ratio (HW/D)	1.250
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	2,729.36 ft	T1 Flow	87.96 ft³/s
T2 Elevation	2,730.00 ft	T2 Flow	100.53 ft³/s

Brunswick Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	2,735.00 ft
Diameter	60.0 in
Orifice Area	19.6 ft²
Orifice Coefficient	0.600
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	4
Elevation	2,725.00 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	8
Elevation	2,733.00 ft
Orifice Diameter	14.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft

Convergence Tolerances	
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

Brunswick Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,725.00	0.00	(N/A)	0.00
2,725.50	1.06	(N/A)	0.00
2,726.00	4.36	(N/A)	0.00
2,726.50	7.78	(N/A)	0.00
2,727.00	10.94	(N/A)	0.00
2,727.50	13.80	(N/A)	0.00
2,728.00	16.38	(N/A)	0.00
2,728.50	18.74	(N/A)	0.00
2,729.00	20.91	(N/A)	0.00
2,729.50	22.95	(N/A)	0.00
2,730.00	24.88	(N/A)	0.00
2,730.50	26.71	(N/A)	0.00
2,731.00	28.43	(N/A)	0.00
2,731.50	30.06	(N/A)	0.00
2,732.00	31.64	(N/A)	0.00
2,732.50	33.17	(N/A)	0.00
2,733.00	34.65	(N/A)	0.00
2,733.50	42.81	(N/A)	0.00
2,734.00	60.98	(N/A)	0.00
2,734.50	78.14	(N/A)	0.00
2,735.00	89.03	(N/A)	0.00
2,735.50	113.23	(N/A)	0.00
2,736.00	148.98	(N/A)	0.00
2,736.50	192.01	(N/A)	0.00
2,737.00	236.66	(N/A)	0.00
2,737.50	255.60	(N/A)	0.00
2,738.00	272.35	(N/A)	0.00
2,738.50	287.68	(N/A)	0.00
2,739.00	301.76	(N/A)	0.00
2,739.50	314.73	(N/A)	0.00
2,740.00	326.81	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Composite Outflow Summary

Contributing Structures
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Brunswick Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Brunswick Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Requested Pond Water Surface Elevations	
Minimum (Headwater)	2,725.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	2,740.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	2,735.00	2,740.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	2,725.00	2,740.00
Culvert-Circular	Culvert - 1	Forward	TW	2,725.00	2,740.00
Orifice-Circular	Orifice - 2	Forward	TW	2,733.00	2,740.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	48.0 in
Length	160.00 ft
Length (Computed Barrel)	160.70 ft
Slope (Computed)	0.094 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.089
T2 ratio (HW/D)	1.250
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	2,729.36 ft	T1 Flow	87.96 ft³/s
T2 Elevation	2,730.00 ft	T2 Flow	100.53 ft³/s

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	2,735.00 ft
Diameter	60.0 in
Orifice Area	19.6 ft²
Orifice Coefficient	0.600
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	4
Elevation	2,725.00 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	8
Elevation	2,733.00 ft
Orifice Diameter	14.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft

Convergence Tolerances	
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

Brunswick Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,725.00	0.00	(N/A)	0.00
2,725.50	1.06	(N/A)	0.00
2,726.00	4.36	(N/A)	0.00
2,726.50	7.78	(N/A)	0.00
2,727.00	10.94	(N/A)	0.00
2,727.50	13.80	(N/A)	0.00
2,728.00	16.38	(N/A)	0.00
2,728.50	18.74	(N/A)	0.00
2,729.00	20.91	(N/A)	0.00
2,729.50	22.95	(N/A)	0.00
2,730.00	24.88	(N/A)	0.00
2,730.50	26.71	(N/A)	0.00
2,731.00	28.43	(N/A)	0.00
2,731.50	30.06	(N/A)	0.00
2,732.00	31.64	(N/A)	0.00
2,732.50	33.17	(N/A)	0.00
2,733.00	34.65	(N/A)	0.00
2,733.50	42.81	(N/A)	0.00
2,734.00	60.98	(N/A)	0.00
2,734.50	78.14	(N/A)	0.00
2,735.00	89.03	(N/A)	0.00
2,735.50	113.23	(N/A)	0.00
2,736.00	148.98	(N/A)	0.00
2,736.50	192.01	(N/A)	0.00
2,737.00	236.66	(N/A)	0.00
2,737.50	255.60	(N/A)	0.00
2,738.00	272.35	(N/A)	0.00
2,738.50	287.68	(N/A)	0.00
2,739.00	301.76	(N/A)	0.00
2,739.50	314.73	(N/A)	0.00
2,740.00	326.81	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Composite Outflow Summary

Contributing Structures
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	2,725.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	2,740.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Stand Pipe	Riser - 1	Forward	Culvert - 1	2,735.00	2,740.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	2,725.00	2,740.00
Culvert-Circular	Culvert - 1	Forward	TW	2,725.00	2,740.00
Orifice-Circular	Orifice - 2	Forward	TW	2,733.00	2,740.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	48.0 in
Length	160.00 ft
Length (Computed Barrel)	160.70 ft
Slope (Computed)	0.094 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.089
T2 ratio (HW/D)	1.250
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	2,729.36 ft	T1 Flow	87.96 ft³/s
T2 Elevation	2,730.00 ft	T2 Flow	100.53 ft³/s

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	2,735.00 ft
Diameter	60.0 in
Orifice Area	19.6 ft²
Orifice Coefficient	0.600
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	4
Elevation	2,725.00 ft
Orifice Diameter	12.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	8
Elevation	2,733.00 ft
Orifice Diameter	14.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft

Convergence Tolerances	
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Brunswick Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,725.00	0.00	(N/A)	0.00
2,725.50	1.06	(N/A)	0.00
2,726.00	4.36	(N/A)	0.00
2,726.50	7.78	(N/A)	0.00
2,727.00	10.94	(N/A)	0.00
2,727.50	13.80	(N/A)	0.00
2,728.00	16.38	(N/A)	0.00
2,728.50	18.74	(N/A)	0.00
2,729.00	20.91	(N/A)	0.00
2,729.50	22.95	(N/A)	0.00
2,730.00	24.88	(N/A)	0.00
2,730.50	26.71	(N/A)	0.00
2,731.00	28.43	(N/A)	0.00
2,731.50	30.06	(N/A)	0.00
2,732.00	31.64	(N/A)	0.00
2,732.50	33.17	(N/A)	0.00
2,733.00	34.65	(N/A)	0.00
2,733.50	42.81	(N/A)	0.00
2,734.00	60.98	(N/A)	0.00
2,734.50	78.14	(N/A)	0.00
2,735.00	89.03	(N/A)	0.00
2,735.50	113.23	(N/A)	0.00
2,736.00	148.98	(N/A)	0.00
2,736.50	192.01	(N/A)	0.00
2,737.00	236.66	(N/A)	0.00
2,737.50	255.60	(N/A)	0.00
2,738.00	272.35	(N/A)	0.00
2,738.50	287.68	(N/A)	0.00
2,739.00	301.76	(N/A)	0.00
2,739.50	314.73	(N/A)	0.00
2,740.00	326.81	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Composite Outflow Summary

Contributing Structures
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1 (no Q: Riser - 1,Orifice - 2)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Orifice - 1,Culvert - 1,Orifice - 2 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2
Riser - 1,Orifice - 1,Culvert - 1,Orifice - 2

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Peak Discharge	30.74 ft³/s
Time to Peak	9.200 hours
Hydrograph Volume	29.649 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.450	0.00	0.00	0.00	0.00	0.01
2.700	0.01	0.01	0.02	0.02	0.02
2.950	0.03	0.03	0.04	0.05	0.05
3.200	0.06	0.07	0.08	0.08	0.09
3.450	0.10	0.11	0.12	0.14	0.15
3.700	0.17	0.19	0.21	0.23	0.26
3.950	0.29	0.32	0.35	0.38	0.41
4.200	0.45	0.49	0.53	0.57	0.61
4.450	0.66	0.71	0.75	0.81	0.86
4.700	0.91	0.97	1.03	1.15	1.33
4.950	1.51	1.70	1.89	2.09	2.28
5.200	2.48	2.69	2.90	3.11	3.32
5.450	3.54	3.76	3.98	4.20	4.42
5.700	4.64	4.86	5.08	5.31	5.54
5.950	5.77	6.01	6.25	6.51	6.77
6.200	7.05	7.34	7.63	7.91	8.18
6.450	8.46	8.73	9.01	9.28	9.54
6.700	9.78	10.02	10.26	10.50	10.75
6.950	11.00	11.23	11.48	11.73	12.01
7.200	12.30	12.62	12.95	13.32	13.70
7.450	14.08	14.47	14.92	15.53	16.40
7.700	17.42	18.63	19.84	21.11	22.31
7.950	23.50	24.63	25.66	26.59	27.32
8.200	27.92	28.40	28.77	29.08	29.34
8.450	29.55	29.72	29.86	29.98	30.10
8.700	30.21	30.31	30.40	30.49	30.56
8.950	30.61	30.66	30.70	30.72	30.74
9.200	30.74	30.73	30.72	30.70	30.67
9.450	30.63	30.58	30.53	30.48	30.43
9.700	30.38	30.33	30.28	30.22	30.17
9.950	30.11	30.05	29.99	29.92	29.85
10.200	29.77	29.70	29.62	29.54	29.46
10.450	29.37	29.29	29.21	29.12	29.04
10.700	28.96	28.89	28.81	28.73	28.65
10.950	28.57	28.49	28.40	28.31	28.22
11.200	28.13	28.03	27.94	27.84	27.74
11.450	27.64	27.55	27.45	27.34	27.24

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.700	27.13	27.02	26.92	26.81	26.70
11.950	26.58	26.46	26.34	26.23	26.11
12.200	26.00	25.89	25.78	25.68	25.58
12.450	25.48	25.38	25.29	25.20	25.10
12.700	25.01	24.91	24.80	24.70	24.59
12.950	24.48	24.38	24.27	24.17	24.08
13.200	23.99	23.90	23.81	23.72	23.63
13.450	23.54	23.45	23.36	23.27	23.18
13.700	23.08	22.99	22.90	22.80	22.70
13.950	22.60	22.51	22.41	22.32	22.23
14.200	22.14	22.05	21.97	21.88	21.80
14.450	21.72	21.64	21.56	21.48	21.40
14.700	21.32	21.24	21.17	21.09	21.02
14.950	20.94	20.87	20.79	20.71	20.63
15.200	20.55	20.48	20.40	20.33	20.25
15.450	20.18	20.11	20.04	19.97	19.90
15.700	19.83	19.76	19.70	19.63	19.56
15.950	19.50	19.43	19.37	19.31	19.24
16.200	19.18	19.12	19.06	19.00	18.94
16.450	18.88	18.82	18.76	18.70	18.64
16.700	18.57	18.51	18.45	18.39	18.33
16.950	18.26	18.21	18.15	18.09	18.03
17.200	17.97	17.91	17.86	17.80	17.75
17.450	17.69	17.64	17.58	17.53	17.47
17.700	17.42	17.37	17.32	17.27	17.21
17.950	17.16	17.11	17.06	17.01	16.96
18.200	16.91	16.86	16.81	16.77	16.72
18.450	16.67	16.62	16.58	16.53	16.48
18.700	16.44	16.39	16.34	16.29	16.23
18.950	16.18	16.13	16.08	16.03	15.98
19.200	15.93	15.88	15.83	15.78	15.74
19.450	15.69	15.64	15.59	15.55	15.50
19.700	15.45	15.41	15.36	15.31	15.27
19.950	15.22	15.18	15.13	15.09	15.04
20.200	15.00	14.95	14.91	14.87	14.82
20.450	14.78	14.74	14.69	14.65	14.61
20.700	14.56	14.52	14.48	14.43	14.39
20.950	14.35	14.31	14.27	14.22	14.18
21.200	14.14	14.10	14.06	14.02	13.97
21.450	13.93	13.89	13.85	13.81	13.76
21.700	13.72	13.67	13.62	13.58	13.53
21.950	13.49	13.44	13.40	13.35	13.31

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
22.200	13.26	13.22	13.17	13.13	13.08
22.450	13.04	13.00	12.95	12.91	12.87
22.700	12.82	12.78	12.74	12.69	12.65
22.950	12.61	12.57	12.52	12.48	12.44
23.200	12.40	12.35	12.31	12.27	12.23
23.450	12.19	12.15	12.10	12.06	12.02
23.700	11.98	11.94	11.90	11.85	11.81
23.950	11.77	11.73	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Peak Discharge	78.63 ft³/s
Time to Peak	8.400 hours
Hydrograph Volume	48.566 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.850	0.00	0.00	0.00	0.01	0.01
2.100	0.01	0.02	0.03	0.03	0.04
2.350	0.05	0.06	0.07	0.08	0.10
2.600	0.11	0.13	0.15	0.17	0.20
2.850	0.23	0.26	0.30	0.33	0.37
3.100	0.42	0.46	0.51	0.56	0.61
3.350	0.67	0.73	0.79	0.85	0.91
3.600	0.98	1.05	1.26	1.48	1.71
3.850	1.94	2.18	2.42	2.66	2.90
4.100	3.15	3.39	3.64	3.89	4.13
4.350	4.38	4.63	4.88	5.14	5.40
4.600	5.66	5.92	6.19	6.46	6.73
4.850	7.01	7.30	7.58	7.87	8.13
5.100	8.41	8.69	8.98	9.27	9.58
5.350	9.89	10.20	10.52	10.85	11.15
5.600	11.43	11.72	12.01	12.31	12.60
5.850	12.91	13.22	13.53	13.85	14.14
6.100	14.45	14.77	15.11	15.47	15.83
6.350	16.21	16.56	16.90	17.25	17.59
6.600	17.93	18.25	18.56	18.85	19.12
6.850	19.39	19.67	19.96	20.26	20.58
7.100	20.92	21.24	21.58	21.95	22.34
7.350	22.77	23.19	23.64	24.11	24.66
7.600	25.34	26.28	27.44	28.75	30.11
7.850	31.48	32.82	34.11	38.52	47.10
8.100	58.49	66.51	71.91	75.41	77.54
8.350	78.44	78.63	78.44	77.83	76.71
8.600	75.46	74.28	73.20	72.16	71.11
8.850	70.02	68.88	67.69	66.46	65.20
9.100	63.91	62.60	61.28	59.88	58.46
9.350	57.07	55.71	54.38	53.09	51.85
9.600	50.70	49.67	48.77	47.96	47.21
9.850	46.51	45.86	45.23	44.63	44.06
10.100	43.49	42.93	42.60	42.33	42.05
10.350	41.76	41.48	41.19	40.91	40.63
10.600	40.37	40.12	39.89	39.67	39.46
10.850	39.24	39.03	38.81	38.59	38.36

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.100	38.14	37.91	37.67	37.44	37.20
11.350	36.96	36.72	36.47	36.22	35.97
11.600	35.72	35.45	35.18	34.90	34.64
11.850	34.59	34.54	34.48	34.43	34.37
12.100	34.32	34.26	34.21	34.16	34.10
12.350	34.05	34.00	33.96	33.91	33.87
12.600	33.83	33.78	33.74	33.68	33.63
12.850	33.57	33.52	33.46	33.41	33.35
13.100	33.30	33.25	33.20	33.15	33.10
13.350	33.05	33.00	32.94	32.88	32.83
13.600	32.77	32.71	32.65	32.59	32.52
13.850	32.46	32.40	32.33	32.27	32.21
14.100	32.15	32.09	32.03	31.97	31.91
14.350	31.85	31.79	31.73	31.67	31.61
14.600	31.55	31.49	31.43	31.37	31.31
14.850	31.25	31.18	31.12	31.06	31.00
15.100	30.94	30.88	30.82	30.76	30.70
15.350	30.64	30.58	30.52	30.46	30.40
15.600	30.34	30.28	30.22	30.16	30.10
15.850	30.04	29.98	29.92	29.86	29.79
16.100	29.73	29.67	29.60	29.54	29.48
16.350	29.42	29.36	29.29	29.23	29.17
16.600	29.11	29.05	28.98	28.92	28.86
16.850	28.80	28.74	28.68	28.62	28.56
17.100	28.50	28.43	28.37	28.30	28.24
17.350	28.17	28.11	28.04	27.98	27.91
17.600	27.85	27.78	27.72	27.65	27.59
17.850	27.53	27.46	27.40	27.33	27.27
18.100	27.21	27.14	27.08	27.01	26.95
18.350	26.89	26.83	26.76	26.70	26.63
18.600	26.56	26.49	26.42	26.35	26.29
18.850	26.22	26.15	26.08	26.02	25.95
19.100	25.88	25.81	25.75	25.68	25.61
19.350	25.55	25.48	25.41	25.35	25.28
19.600	25.22	25.15	25.08	25.02	24.95
19.850	24.89	24.82	24.75	24.67	24.60
20.100	24.53	24.46	24.39	24.32	24.25
20.350	24.19	24.12	24.05	23.98	23.91
20.600	23.84	23.77	23.70	23.63	23.57
20.850	23.50	23.43	23.36	23.30	23.23
21.100	23.16	23.09	23.03	22.96	22.89
21.350	22.81	22.74	22.67	22.60	22.52

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.600	22.45	22.38	22.31	22.24	22.17
21.850	22.10	22.03	21.96	21.89	21.82
22.100	21.75	21.68	21.61	21.54	21.47
22.350	21.40	21.33	21.26	21.19	21.13
22.600	21.06	20.99	20.92	20.85	20.77
22.850	20.70	20.63	20.55	20.48	20.40
23.100	20.33	20.26	20.19	20.11	20.04
23.350	19.97	19.90	19.83	19.76	19.69
23.600	19.61	19.54	19.47	19.40	19.33
23.850	19.26	19.19	19.12	19.05	(N/A)

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Peak Discharge	152.78 ft³/s
Time to Peak	8.200 hours
Hydrograph Volume	64.988 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.550	0.00	0.00	0.00	0.01	0.01
1.800	0.02	0.03	0.04	0.05	0.06
2.050	0.07	0.09	0.10	0.12	0.15
2.300	0.18	0.21	0.25	0.29	0.34
2.550	0.39	0.45	0.51	0.58	0.65
2.800	0.72	0.80	0.88	0.97	1.06
3.050	1.30	1.57	1.84	2.10	2.37
3.300	2.64	2.91	3.19	3.46	3.74
3.550	4.02	4.31	4.61	4.91	5.22
3.800	5.53	5.86	6.18	6.51	6.84
4.050	7.18	7.51	7.84	8.14	8.44
4.300	8.74	9.04	9.35	9.66	9.98
4.550	10.30	10.62	10.95	11.24	11.54
4.800	11.85	12.16	12.47	12.80	13.13
5.050	13.47	13.82	14.13	14.46	14.79
5.300	15.13	15.48	15.84	16.21	16.55
5.550	16.88	17.21	17.55	17.88	18.22
5.800	18.56	18.89	19.21	19.54	19.87
6.050	20.22	20.58	20.96	21.33	21.71
6.300	22.10	22.50	22.91	23.30	23.68
6.550	24.06	24.44	24.80	25.13	25.44
6.800	25.76	26.07	26.40	26.73	27.05
7.050	27.38	27.73	28.11	28.49	28.88
7.300	29.30	29.74	30.20	30.68	31.18
7.550	31.76	32.47	33.45	34.71	42.21
7.800	58.22	73.28	83.92	95.94	112.05
8.050	130.47	143.69	150.93	152.78	150.41
8.300	146.09	140.73	134.69	128.34	121.96
8.550	115.80	111.08	107.60	104.54	101.78
8.800	99.18	96.67	94.21	91.78	89.39
9.050	88.07	86.90	85.67	84.41	83.10
9.300	81.77	80.42	79.06	77.43	75.29
9.550	73.26	71.37	69.67	68.15	66.78
9.800	65.51	64.34	63.23	62.19	61.21
10.050	60.20	59.22	58.27	57.35	56.46
10.300	55.61	54.81	54.04	53.32	52.65
10.550	52.02	51.45	50.95	50.53	50.14

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.800	49.78	49.43	49.08	48.73	48.38
11.050	48.02	47.67	47.31	46.95	46.59
11.300	46.22	45.85	45.48	45.11	44.74
11.550	44.36	43.98	43.57	43.15	42.77
11.800	42.57	42.36	42.16	41.95	41.75
12.050	41.55	41.35	41.17	40.99	40.83
12.300	40.68	40.55	40.43	40.33	40.25
12.550	40.19	40.12	40.03	39.91	39.78
12.800	39.64	39.49	39.35	39.20	39.06
13.050	38.92	38.80	38.71	38.64	38.57
13.300	38.50	38.43	38.35	38.25	38.15
13.550	38.04	37.92	37.80	37.68	37.55
13.800	37.41	37.28	37.15	37.03	36.90
14.050	36.78	36.66	36.56	36.46	36.36
14.300	36.27	36.18	36.10	36.01	35.93
14.550	35.85	35.76	35.68	35.60	35.52
14.800	35.44	35.36	35.28	35.20	35.12
15.050	35.04	34.97	34.89	34.81	34.74
15.300	34.66	34.64	34.62	34.60	34.59
15.550	34.57	34.55	34.54	34.52	34.50
15.800	34.48	34.46	34.44	34.42	34.40
16.050	34.37	34.35	34.33	34.31	34.28
16.300	34.26	34.23	34.21	34.18	34.15
16.550	34.13	34.10	34.07	34.04	34.01
16.800	33.98	33.95	33.92	33.89	33.86
17.050	33.83	33.80	33.76	33.73	33.70
17.300	33.66	33.63	33.59	33.56	33.52
17.550	33.49	33.45	33.42	33.38	33.34
17.800	33.30	33.27	33.23	33.19	33.15
18.050	33.10	33.06	33.02	32.97	32.93
18.300	32.88	32.84	32.80	32.75	32.70
18.550	32.66	32.61	32.57	32.52	32.47
18.800	32.42	32.38	32.33	32.28	32.23
19.050	32.18	32.13	32.08	32.03	31.98
19.300	31.93	31.88	31.83	31.78	31.72
19.550	31.67	31.62	31.56	31.51	31.45
19.800	31.40	31.34	31.28	31.22	31.17
20.050	31.11	31.05	30.99	30.93	30.88
20.300	30.82	30.76	30.70	30.64	30.58
20.550	30.52	30.46	30.40	30.34	30.28
20.800	30.22	30.16	30.10	30.03	29.97
21.050	29.90	29.84	29.77	29.70	29.64

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.300	29.57	29.50	29.44	29.37	29.30
21.550	29.24	29.17	29.10	29.03	28.97
21.800	28.90	28.83	28.76	28.69	28.63
22.050	28.56	28.49	28.42	28.35	28.27
22.300	28.20	28.12	28.05	27.97	27.90
22.550	27.82	27.75	27.67	27.60	27.52
22.800	27.45	27.37	27.30	27.22	27.15
23.050	27.07	27.00	26.92	26.85	26.77
23.300	26.69	26.61	26.53	26.45	26.36
23.550	26.28	26.20	26.12	26.03	25.95
23.800	25.87	25.79	25.70	25.62	25.54

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Peak Discharge	201.21 ft³/s
Time to Peak	8.150 hours
Hydrograph Volume	74.702 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.450	0.00	0.00	0.01	0.01	0.02
1.700	0.03	0.04	0.05	0.06	0.08
1.950	0.10	0.12	0.14	0.17	0.21
2.200	0.25	0.30	0.35	0.41	0.48
2.450	0.55	0.63	0.71	0.80	0.89
2.700	0.99	1.15	1.45	1.76	2.07
2.950	2.38	2.70	3.01	3.33	3.65
3.200	3.97	4.29	4.60	4.92	5.24
3.450	5.56	5.89	6.22	6.55	6.90
3.700	7.26	7.62	7.97	8.31	8.65
3.950	8.99	9.35	9.70	10.06	10.42
4.200	10.77	11.11	11.42	11.74	12.06
4.450	12.39	12.73	13.06	13.41	13.76
4.700	14.07	14.39	14.71	15.04	15.38
4.950	15.72	16.08	16.43	16.76	17.10
5.200	17.45	17.81	18.18	18.55	18.92
5.450	19.27	19.62	19.98	20.35	20.71
5.700	21.06	21.40	21.74	22.09	22.44
5.950	22.80	23.16	23.51	23.88	24.27
6.200	24.68	25.08	25.48	25.89	26.31
6.450	26.74	27.13	27.52	27.91	28.28
6.700	28.62	28.95	29.27	29.60	29.93
6.950	30.27	30.60	30.96	31.33	31.72
7.200	32.11	32.53	32.97	33.42	33.89
7.450	34.39	36.12	39.24	43.61	54.86
7.700	67.94	80.49	90.27	109.69	133.30
7.950	155.58	175.66	190.56	199.36	201.21
8.200	197.28	189.79	180.62	170.73	160.75
8.450	151.02	142.72	135.12	128.29	122.55
8.700	117.82	113.79	111.04	108.51	105.99
8.950	103.47	100.96	98.46	95.97	93.52
9.200	91.11	88.89	87.78	86.61	85.40
9.450	84.17	82.91	81.66	80.43	79.28
9.700	78.21	76.64	75.16	73.78	72.49
9.950	71.27	70.11	69.01	67.94	66.91
10.200	65.90	64.91	63.97	63.06	62.20
10.450	61.39	60.58	59.80	59.10	58.49

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.700	57.95	57.48	57.03	56.59	56.16
10.950	55.73	55.31	54.88	54.46	54.03
11.200	53.60	53.17	52.75	52.31	51.88
11.450	51.45	51.01	50.58	50.13	49.66
11.700	49.17	48.68	48.20	47.74	47.30
11.950	46.89	46.50	46.13	45.80	45.50
12.200	45.23	45.00	44.81	44.66	44.54
12.450	44.47	44.44	44.43	44.41	44.34
12.700	44.20	44.02	43.82	43.61	43.40
12.950	43.21	43.02	42.85	42.77	42.73
13.200	42.72	42.71	42.69	42.66	42.62
13.450	42.57	42.50	42.42	42.33	42.23
13.700	42.13	42.01	41.90	41.78	41.67
13.950	41.55	41.43	41.32	41.21	41.11
14.200	41.02	40.93	40.85	40.77	40.69
14.450	40.61	40.53	40.45	40.36	40.28
14.700	40.20	40.12	40.04	39.96	39.88
14.950	39.79	39.71	39.63	39.55	39.47
15.200	39.39	39.31	39.23	39.15	39.07
15.450	38.99	38.91	38.82	38.74	38.66
15.700	38.57	38.49	38.41	38.33	38.25
15.950	38.17	38.09	38.01	37.92	37.84
16.200	37.76	37.67	37.59	37.51	37.43
16.450	37.34	37.26	37.18	37.09	37.01
16.700	36.93	36.84	36.76	36.68	36.60
16.950	36.51	36.43	36.35	36.26	36.18
17.200	36.10	36.01	35.93	35.84	35.76
17.450	35.67	35.59	35.50	35.42	35.34
17.700	35.25	35.17	35.09	35.01	34.92
17.950	34.84	34.75	34.66	34.63	34.62
18.200	34.60	34.58	34.56	34.54	34.52
18.450	34.50	34.48	34.46	34.43	34.41
18.700	34.39	34.36	34.34	34.31	34.28
18.950	34.26	34.23	34.20	34.17	34.14
19.200	34.11	34.08	34.05	34.02	33.98
19.450	33.95	33.92	33.88	33.85	33.81
19.700	33.78	33.74	33.70	33.67	33.63
19.950	33.59	33.55	33.51	33.47	33.43
20.200	33.39	33.35	33.31	33.26	33.22
20.450	33.18	33.13	33.08	33.04	32.99
20.700	32.94	32.89	32.84	32.79	32.74
20.950	32.69	32.64	32.59	32.53	32.48

Brunswick Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.200	32.43	32.37	32.32	32.27	32.21
21.450	32.16	32.10	32.05	31.99	31.93
21.700	31.88	31.82	31.76	31.71	31.65
21.950	31.59	31.52	31.46	31.40	31.34
22.200	31.27	31.21	31.14	31.08	31.01
22.450	30.95	30.88	30.82	30.75	30.69
22.700	30.62	30.55	30.49	30.42	30.35
22.950	30.29	30.22	30.15	30.08	30.01
23.200	29.94	29.86	29.79	29.71	29.64
23.450	29.57	29.49	29.42	29.34	29.27
23.700	29.19	29.12	29.04	28.97	28.89
23.950	28.81	28.74	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2,725.00	0.00	0.000	0.650	0.00	0.00	0.00
2,725.50	1.06	0.334	0.685	0.00	1.06	162.53
2,726.00	4.36	0.685	0.720	0.00	4.36	335.76
2,726.50	7.78	1.053	0.751	0.00	7.78	517.22
2,727.00	10.94	1.436	0.784	0.00	10.94	706.11
2,727.50	13.80	1.836	0.816	0.00	13.80	902.57
2,728.00	16.38	2.253	0.850	0.00	16.38	1,106.79
2,728.50	18.74	2.686	0.884	0.00	18.74	1,318.95
2,729.00	20.91	3.137	0.919	0.00	20.91	1,539.23
2,729.50	22.95	3.605	0.954	0.00	22.95	1,767.85
2,730.00	24.88	4.091	0.990	0.00	24.88	2,004.99
2,730.50	26.71	4.594	1.022	0.00	26.71	2,250.23
2,731.00	28.43	5.113	1.054	0.00	28.43	2,503.10
2,731.50	30.06	5.648	1.087	0.00	30.06	2,763.75
2,732.00	31.64	6.200	1.120	0.00	31.64	3,032.34
2,732.50	33.17	6.769	1.157	0.00	33.17	3,309.33
2,733.00	34.65	7.357	1.194	0.00	34.65	3,595.19
2,733.50	42.81	7.963	1.232	0.00	42.81	3,896.82
2,734.00	60.98	8.588	1.270	0.00	60.98	4,217.68
2,734.50	78.14	9.232	1.307	0.00	78.14	4,546.61
2,735.00	89.03	9.895	1.344	0.00	89.03	4,878.22
2,735.50	113.23	10.576	1.382	0.00	113.23	5,232.22
2,736.00	148.98	11.277	1.420	0.00	148.98	5,606.96
2,736.50	192.01	11.997	1.462	0.00	192.01	5,998.65
2,737.00	236.66	12.739	1.504	0.00	236.66	6,402.10
2,737.50	255.60	13.501	1.547	0.00	255.60	6,790.13
2,738.00	272.35	14.285	1.590	0.00	272.35	7,186.40
2,738.50	287.68	15.090	1.629	0.00	287.68	7,591.25
2,739.00	301.76	15.915	1.669	0.00	301.76	8,004.42

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
2,739.50	314.73	16.759	1.709	0.00	314.73	8,426.16
2,740.00	326.81	17.624	1.750	0.00	326.81	8,856.80

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2,725.00	0.00	0.000	0.650	0.00	0.00	0.00
2,725.50	1.06	0.334	0.685	0.00	1.06	162.53
2,726.00	4.36	0.685	0.720	0.00	4.36	335.76
2,726.50	7.78	1.053	0.751	0.00	7.78	517.22
2,727.00	10.94	1.436	0.784	0.00	10.94	706.11
2,727.50	13.80	1.836	0.816	0.00	13.80	902.57
2,728.00	16.38	2.253	0.850	0.00	16.38	1,106.79
2,728.50	18.74	2.686	0.884	0.00	18.74	1,318.95
2,729.00	20.91	3.137	0.919	0.00	20.91	1,539.23
2,729.50	22.95	3.605	0.954	0.00	22.95	1,767.85
2,730.00	24.88	4.091	0.990	0.00	24.88	2,004.99
2,730.50	26.71	4.594	1.022	0.00	26.71	2,250.23
2,731.00	28.43	5.113	1.054	0.00	28.43	2,503.10
2,731.50	30.06	5.648	1.087	0.00	30.06	2,763.75
2,732.00	31.64	6.200	1.120	0.00	31.64	3,032.34
2,732.50	33.17	6.769	1.157	0.00	33.17	3,309.33
2,733.00	34.65	7.357	1.194	0.00	34.65	3,595.19
2,733.50	42.81	7.963	1.232	0.00	42.81	3,896.82
2,734.00	60.98	8.588	1.270	0.00	60.98	4,217.68
2,734.50	78.14	9.232	1.307	0.00	78.14	4,546.61
2,735.00	89.03	9.895	1.344	0.00	89.03	4,878.22
2,735.50	113.23	10.576	1.382	0.00	113.23	5,232.22
2,736.00	148.98	11.277	1.420	0.00	148.98	5,606.96
2,736.50	192.01	11.997	1.462	0.00	192.01	5,998.65
2,737.00	236.66	12.739	1.504	0.00	236.66	6,402.10
2,737.50	255.60	13.501	1.547	0.00	255.60	6,790.13
2,738.00	272.35	14.285	1.590	0.00	272.35	7,186.40
2,738.50	287.68	15.090	1.629	0.00	287.68	7,591.25
2,739.00	301.76	15.915	1.669	0.00	301.76	8,004.42

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
2,739.50	314.73	16.759	1.709	0.00	314.73	8,426.16
2,740.00	326.81	17.624	1.750	0.00	326.81	8,856.80

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2,725.00	0.00	0.000	0.650	0.00	0.00	0.00
2,725.50	1.06	0.334	0.685	0.00	1.06	162.53
2,726.00	4.36	0.685	0.720	0.00	4.36	335.76
2,726.50	7.78	1.053	0.751	0.00	7.78	517.22
2,727.00	10.94	1.436	0.784	0.00	10.94	706.11
2,727.50	13.80	1.836	0.816	0.00	13.80	902.57
2,728.00	16.38	2.253	0.850	0.00	16.38	1,106.79
2,728.50	18.74	2.686	0.884	0.00	18.74	1,318.95
2,729.00	20.91	3.137	0.919	0.00	20.91	1,539.23
2,729.50	22.95	3.605	0.954	0.00	22.95	1,767.85
2,730.00	24.88	4.091	0.990	0.00	24.88	2,004.99
2,730.50	26.71	4.594	1.022	0.00	26.71	2,250.23
2,731.00	28.43	5.113	1.054	0.00	28.43	2,503.10
2,731.50	30.06	5.648	1.087	0.00	30.06	2,763.75
2,732.00	31.64	6.200	1.120	0.00	31.64	3,032.34
2,732.50	33.17	6.769	1.157	0.00	33.17	3,309.33
2,733.00	34.65	7.357	1.194	0.00	34.65	3,595.19
2,733.50	42.81	7.963	1.232	0.00	42.81	3,896.82
2,734.00	60.98	8.588	1.270	0.00	60.98	4,217.68
2,734.50	78.14	9.232	1.307	0.00	78.14	4,546.61
2,735.00	89.03	9.895	1.344	0.00	89.03	4,878.22
2,735.50	113.23	10.576	1.382	0.00	113.23	5,232.22
2,736.00	148.98	11.277	1.420	0.00	148.98	5,606.96
2,736.50	192.01	11.997	1.462	0.00	192.01	5,998.65
2,737.00	236.66	12.739	1.504	0.00	236.66	6,402.10
2,737.50	255.60	13.501	1.547	0.00	255.60	6,790.13
2,738.00	272.35	14.285	1.590	0.00	272.35	7,186.40
2,738.50	287.68	15.090	1.629	0.00	287.68	7,591.25
2,739.00	301.76	15.915	1.669	0.00	301.76	8,004.42

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
2,739.50	314.73	16.759	1.709	0.00	314.73	8,426.16
2,740.00	326.81	17.624	1.750	0.00	326.81	8,856.80

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2,725.00	0.00	0.000	0.650	0.00	0.00	0.00
2,725.50	1.06	0.334	0.685	0.00	1.06	162.53
2,726.00	4.36	0.685	0.720	0.00	4.36	335.76
2,726.50	7.78	1.053	0.751	0.00	7.78	517.22
2,727.00	10.94	1.436	0.784	0.00	10.94	706.11
2,727.50	13.80	1.836	0.816	0.00	13.80	902.57
2,728.00	16.38	2.253	0.850	0.00	16.38	1,106.79
2,728.50	18.74	2.686	0.884	0.00	18.74	1,318.95
2,729.00	20.91	3.137	0.919	0.00	20.91	1,539.23
2,729.50	22.95	3.605	0.954	0.00	22.95	1,767.85
2,730.00	24.88	4.091	0.990	0.00	24.88	2,004.99
2,730.50	26.71	4.594	1.022	0.00	26.71	2,250.23
2,731.00	28.43	5.113	1.054	0.00	28.43	2,503.10
2,731.50	30.06	5.648	1.087	0.00	30.06	2,763.75
2,732.00	31.64	6.200	1.120	0.00	31.64	3,032.34
2,732.50	33.17	6.769	1.157	0.00	33.17	3,309.33
2,733.00	34.65	7.357	1.194	0.00	34.65	3,595.19
2,733.50	42.81	7.963	1.232	0.00	42.81	3,896.82
2,734.00	60.98	8.588	1.270	0.00	60.98	4,217.68
2,734.50	78.14	9.232	1.307	0.00	78.14	4,546.61
2,735.00	89.03	9.895	1.344	0.00	89.03	4,878.22
2,735.50	113.23	10.576	1.382	0.00	113.23	5,232.22
2,736.00	148.98	11.277	1.420	0.00	148.98	5,606.96
2,736.50	192.01	11.997	1.462	0.00	192.01	5,998.65
2,737.00	236.66	12.739	1.504	0.00	236.66	6,402.10
2,737.50	255.60	13.501	1.547	0.00	255.60	6,790.13
2,738.00	272.35	14.285	1.590	0.00	272.35	7,186.40
2,738.50	287.68	15.090	1.629	0.00	287.68	7,591.25
2,739.00	301.76	15.915	1.669	0.00	301.76	8,004.42

Brunswick Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
2,739.50	314.73	16.759	1.709	0.00	314.73	8,426.16
2,740.00	326.81	17.624	1.750	0.00	326.81	8,856.80

Brunswick Site

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	93.31 ft³/s	Time to Peak (Flow, In)	8.000 hours
Flow (Peak Outlet)	30.74 ft³/s	Time to Peak (Flow, Outlet)	9.200 hours

Elevation (Water Surface, Peak)	2,731.72 ft
Volume (Peak)	5.883 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	31.197 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	29.649 ac-ft
Volume (Retained)	1.499 ac-ft
Volume (Unrouted)	-0.049 ac-ft
Error (Mass Balance)	0.2 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	157.48 ft³/s	Time to Peak (Flow, In)	8.000 hours
Flow (Peak Outlet)	78.63 ft³/s	Time to Peak (Flow, Outlet)	8.400 hours

Elevation (Water Surface, Peak)	2,734.52 ft
Volume (Peak)	9.262 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	51.318 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	48.566 ac-ft
Volume (Retained)	2.674 ac-ft
Volume (Unrouted)	-0.078 ac-ft
Error (Mass Balance)	0.2 %

Brunswick Site

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	213.78 ft³/s	Time to Peak (Flow, In)	8.000 hours
Flow (Peak Outlet)	152.78 ft³/s	Time to Peak (Flow, Outlet)	8.200 hours

Elevation (Water Surface, Peak)	2,736.04 ft
Volume (Peak)	11.340 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	69.260 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	64.988 ac-ft
Volume (Retained)	4.166 ac-ft
Volume (Unrouted)	-0.106 ac-ft
Error (Mass Balance)	0.2 %

Brunswick Site

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,725.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	247.08 ft³/s	Time to Peak (Flow, In)	7.950 hours
Flow (Peak Outlet)	201.21 ft³/s	Time to Peak (Flow, Outlet)	8.150 hours

Elevation (Water Surface, Peak)	2,736.60 ft
Volume (Peak)	12.148 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	79.918 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	74.702 ac-ft
Volume (Retained)	5.097 ac-ft
Volume (Unrouted)	-0.118 ac-ft
Error (Mass Balance)	0.1 %

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

Peak Discharge	30.74 ft³/s
Time to Peak	9.200 hours
Hydrograph Volume	29.649 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.450	0.00	0.00	0.00	0.00	0.01
2.700	0.01	0.01	0.02	0.02	0.02
2.950	0.03	0.03	0.04	0.05	0.05
3.200	0.06	0.07	0.08	0.08	0.09
3.450	0.10	0.11	0.12	0.14	0.15
3.700	0.17	0.19	0.21	0.23	0.26
3.950	0.29	0.32	0.35	0.38	0.41
4.200	0.45	0.49	0.53	0.57	0.61
4.450	0.66	0.71	0.75	0.81	0.86
4.700	0.91	0.97	1.03	1.15	1.33
4.950	1.51	1.70	1.89	2.09	2.28
5.200	2.48	2.69	2.90	3.11	3.32
5.450	3.54	3.76	3.98	4.20	4.42
5.700	4.64	4.86	5.08	5.31	5.54
5.950	5.77	6.01	6.25	6.51	6.77
6.200	7.05	7.34	7.63	7.91	8.18
6.450	8.46	8.73	9.01	9.28	9.54
6.700	9.78	10.02	10.26	10.50	10.75
6.950	11.00	11.23	11.48	11.73	12.01
7.200	12.30	12.62	12.95	13.32	13.70
7.450	14.08	14.47	14.92	15.53	16.40
7.700	17.42	18.63	19.84	21.11	22.31
7.950	23.50	24.63	25.66	26.59	27.32
8.200	27.92	28.40	28.77	29.08	29.34
8.450	29.55	29.72	29.86	29.98	30.10
8.700	30.21	30.31	30.40	30.49	30.56
8.950	30.61	30.66	30.70	30.72	30.74
9.200	30.74	30.73	30.72	30.70	30.67
9.450	30.63	30.58	30.53	30.48	30.43
9.700	30.38	30.33	30.28	30.22	30.17
9.950	30.11	30.05	29.99	29.92	29.85
10.200	29.77	29.70	29.62	29.54	29.46
10.450	29.37	29.29	29.21	29.12	29.04
10.700	28.96	28.89	28.81	28.73	28.65
10.950	28.57	28.49	28.40	28.31	28.22
11.200	28.13	28.03	27.94	27.84	27.74
11.450	27.64	27.55	27.45	27.34	27.24

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.700	27.13	27.02	26.92	26.81	26.70
11.950	26.58	26.46	26.34	26.23	26.11
12.200	26.00	25.89	25.78	25.68	25.58
12.450	25.48	25.38	25.29	25.20	25.10
12.700	25.01	24.91	24.80	24.70	24.59
12.950	24.48	24.38	24.27	24.17	24.08
13.200	23.99	23.90	23.81	23.72	23.63
13.450	23.54	23.45	23.36	23.27	23.18
13.700	23.08	22.99	22.90	22.80	22.70
13.950	22.60	22.51	22.41	22.32	22.23
14.200	22.14	22.05	21.97	21.88	21.80
14.450	21.72	21.64	21.56	21.48	21.40
14.700	21.32	21.24	21.17	21.09	21.02
14.950	20.94	20.87	20.79	20.71	20.63
15.200	20.55	20.48	20.40	20.33	20.25
15.450	20.18	20.11	20.04	19.97	19.90
15.700	19.83	19.76	19.70	19.63	19.56
15.950	19.50	19.43	19.37	19.31	19.24
16.200	19.18	19.12	19.06	19.00	18.94
16.450	18.88	18.82	18.76	18.70	18.64
16.700	18.57	18.51	18.45	18.39	18.33
16.950	18.26	18.21	18.15	18.09	18.03
17.200	17.97	17.91	17.86	17.80	17.75
17.450	17.69	17.64	17.58	17.53	17.47
17.700	17.42	17.37	17.32	17.27	17.21
17.950	17.16	17.11	17.06	17.01	16.96
18.200	16.91	16.86	16.81	16.77	16.72
18.450	16.67	16.62	16.58	16.53	16.48
18.700	16.44	16.39	16.34	16.29	16.23
18.950	16.18	16.13	16.08	16.03	15.98
19.200	15.93	15.88	15.83	15.78	15.74
19.450	15.69	15.64	15.59	15.55	15.50
19.700	15.45	15.41	15.36	15.31	15.27
19.950	15.22	15.18	15.13	15.09	15.04
20.200	15.00	14.95	14.91	14.87	14.82
20.450	14.78	14.74	14.69	14.65	14.61
20.700	14.56	14.52	14.48	14.43	14.39
20.950	14.35	14.31	14.27	14.22	14.18
21.200	14.14	14.10	14.06	14.02	13.97
21.450	13.93	13.89	13.85	13.81	13.76
21.700	13.72	13.67	13.62	13.58	13.53
21.950	13.49	13.44	13.40	13.35	13.31

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 2 years
Storm Event: Brunswick NC 2-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
22.200	13.26	13.22	13.17	13.13	13.08
22.450	13.04	13.00	12.95	12.91	12.87
22.700	12.82	12.78	12.74	12.69	12.65
22.950	12.61	12.57	12.52	12.48	12.44
23.200	12.40	12.35	12.31	12.27	12.23
23.450	12.19	12.15	12.10	12.06	12.02
23.700	11.98	11.94	11.90	11.85	11.81
23.950	11.77	11.73	(N/A)	(N/A)	(N/A)

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

Peak Discharge	78.63 ft³/s
Time to Peak	8.400 hours
Hydrograph Volume	48.566 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.850	0.00	0.00	0.00	0.01	0.01
2.100	0.01	0.02	0.03	0.03	0.04
2.350	0.05	0.06	0.07	0.08	0.10
2.600	0.11	0.13	0.15	0.17	0.20
2.850	0.23	0.26	0.30	0.33	0.37
3.100	0.42	0.46	0.51	0.56	0.61
3.350	0.67	0.73	0.79	0.85	0.91
3.600	0.98	1.05	1.26	1.48	1.71
3.850	1.94	2.18	2.42	2.66	2.90
4.100	3.15	3.39	3.64	3.89	4.13
4.350	4.38	4.63	4.88	5.14	5.40
4.600	5.66	5.92	6.19	6.46	6.73
4.850	7.01	7.30	7.58	7.87	8.13
5.100	8.41	8.69	8.98	9.27	9.58
5.350	9.89	10.20	10.52	10.85	11.15
5.600	11.43	11.72	12.01	12.31	12.60
5.850	12.91	13.22	13.53	13.85	14.14
6.100	14.45	14.77	15.11	15.47	15.83
6.350	16.21	16.56	16.90	17.25	17.59
6.600	17.93	18.25	18.56	18.85	19.12
6.850	19.39	19.67	19.96	20.26	20.58
7.100	20.92	21.24	21.58	21.95	22.34
7.350	22.77	23.19	23.64	24.11	24.66
7.600	25.34	26.28	27.44	28.75	30.11
7.850	31.48	32.82	34.11	38.52	47.10
8.100	58.49	66.51	71.91	75.41	77.54
8.350	78.44	78.63	78.44	77.83	76.71
8.600	75.46	74.28	73.20	72.16	71.11
8.850	70.02	68.88	67.69	66.46	65.20
9.100	63.91	62.60	61.28	59.88	58.46
9.350	57.07	55.71	54.38	53.09	51.85
9.600	50.70	49.67	48.77	47.96	47.21
9.850	46.51	45.86	45.23	44.63	44.06
10.100	43.49	42.93	42.60	42.33	42.05
10.350	41.76	41.48	41.19	40.91	40.63
10.600	40.37	40.12	39.89	39.67	39.46
10.850	39.24	39.03	38.81	38.59	38.36

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.100	38.14	37.91	37.67	37.44	37.20
11.350	36.96	36.72	36.47	36.22	35.97
11.600	35.72	35.45	35.18	34.90	34.64
11.850	34.59	34.54	34.48	34.43	34.37
12.100	34.32	34.26	34.21	34.16	34.10
12.350	34.05	34.00	33.96	33.91	33.87
12.600	33.83	33.78	33.74	33.68	33.63
12.850	33.57	33.52	33.46	33.41	33.35
13.100	33.30	33.25	33.20	33.15	33.10
13.350	33.05	33.00	32.94	32.88	32.83
13.600	32.77	32.71	32.65	32.59	32.52
13.850	32.46	32.40	32.33	32.27	32.21
14.100	32.15	32.09	32.03	31.97	31.91
14.350	31.85	31.79	31.73	31.67	31.61
14.600	31.55	31.49	31.43	31.37	31.31
14.850	31.25	31.18	31.12	31.06	31.00
15.100	30.94	30.88	30.82	30.76	30.70
15.350	30.64	30.58	30.52	30.46	30.40
15.600	30.34	30.28	30.22	30.16	30.10
15.850	30.04	29.98	29.92	29.86	29.79
16.100	29.73	29.67	29.60	29.54	29.48
16.350	29.42	29.36	29.29	29.23	29.17
16.600	29.11	29.05	28.98	28.92	28.86
16.850	28.80	28.74	28.68	28.62	28.56
17.100	28.50	28.43	28.37	28.30	28.24
17.350	28.17	28.11	28.04	27.98	27.91
17.600	27.85	27.78	27.72	27.65	27.59
17.850	27.53	27.46	27.40	27.33	27.27
18.100	27.21	27.14	27.08	27.01	26.95
18.350	26.89	26.83	26.76	26.70	26.63
18.600	26.56	26.49	26.42	26.35	26.29
18.850	26.22	26.15	26.08	26.02	25.95
19.100	25.88	25.81	25.75	25.68	25.61
19.350	25.55	25.48	25.41	25.35	25.28
19.600	25.22	25.15	25.08	25.02	24.95
19.850	24.89	24.82	24.75	24.67	24.60
20.100	24.53	24.46	24.39	24.32	24.25
20.350	24.19	24.12	24.05	23.98	23.91
20.600	23.84	23.77	23.70	23.63	23.57
20.850	23.50	23.43	23.36	23.30	23.23
21.100	23.16	23.09	23.03	22.96	22.89
21.350	22.81	22.74	22.67	22.60	22.52

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Brunswick NC 10-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.600	22.45	22.38	22.31	22.24	22.17
21.850	22.10	22.03	21.96	21.89	21.82
22.100	21.75	21.68	21.61	21.54	21.47
22.350	21.40	21.33	21.26	21.19	21.13
22.600	21.06	20.99	20.92	20.85	20.77
22.850	20.70	20.63	20.55	20.48	20.40
23.100	20.33	20.26	20.19	20.11	20.04
23.350	19.97	19.90	19.83	19.76	19.69
23.600	19.61	19.54	19.47	19.40	19.33
23.850	19.26	19.19	19.12	19.05	(N/A)

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

Peak Discharge	152.78 ft³/s
Time to Peak	8.200 hours
Hydrograph Volume	64.988 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.550	0.00	0.00	0.00	0.01	0.01
1.800	0.02	0.03	0.04	0.05	0.06
2.050	0.07	0.09	0.10	0.12	0.15
2.300	0.18	0.21	0.25	0.29	0.34
2.550	0.39	0.45	0.51	0.58	0.65
2.800	0.72	0.80	0.88	0.97	1.06
3.050	1.30	1.57	1.84	2.10	2.37
3.300	2.64	2.91	3.19	3.46	3.74
3.550	4.02	4.31	4.61	4.91	5.22
3.800	5.53	5.86	6.18	6.51	6.84
4.050	7.18	7.51	7.84	8.14	8.44
4.300	8.74	9.04	9.35	9.66	9.98
4.550	10.30	10.62	10.95	11.24	11.54
4.800	11.85	12.16	12.47	12.80	13.13
5.050	13.47	13.82	14.13	14.46	14.79
5.300	15.13	15.48	15.84	16.21	16.55
5.550	16.88	17.21	17.55	17.88	18.22
5.800	18.56	18.89	19.21	19.54	19.87
6.050	20.22	20.58	20.96	21.33	21.71
6.300	22.10	22.50	22.91	23.30	23.68
6.550	24.06	24.44	24.80	25.13	25.44
6.800	25.76	26.07	26.40	26.73	27.05
7.050	27.38	27.73	28.11	28.49	28.88
7.300	29.30	29.74	30.20	30.68	31.18
7.550	31.76	32.47	33.45	34.71	42.21
7.800	58.22	73.28	83.92	95.94	112.05
8.050	130.47	143.69	150.93	152.78	150.41
8.300	146.09	140.73	134.69	128.34	121.96
8.550	115.80	111.08	107.60	104.54	101.78
8.800	99.18	96.67	94.21	91.78	89.39
9.050	88.07	86.90	85.67	84.41	83.10
9.300	81.77	80.42	79.06	77.43	75.29
9.550	73.26	71.37	69.67	68.15	66.78
9.800	65.51	64.34	63.23	62.19	61.21
10.050	60.20	59.22	58.27	57.35	56.46
10.300	55.61	54.81	54.04	53.32	52.65
10.550	52.02	51.45	50.95	50.53	50.14

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.800	49.78	49.43	49.08	48.73	48.38
11.050	48.02	47.67	47.31	46.95	46.59
11.300	46.22	45.85	45.48	45.11	44.74
11.550	44.36	43.98	43.57	43.15	42.77
11.800	42.57	42.36	42.16	41.95	41.75
12.050	41.55	41.35	41.17	40.99	40.83
12.300	40.68	40.55	40.43	40.33	40.25
12.550	40.19	40.12	40.03	39.91	39.78
12.800	39.64	39.49	39.35	39.20	39.06
13.050	38.92	38.80	38.71	38.64	38.57
13.300	38.50	38.43	38.35	38.25	38.15
13.550	38.04	37.92	37.80	37.68	37.55
13.800	37.41	37.28	37.15	37.03	36.90
14.050	36.78	36.66	36.56	36.46	36.36
14.300	36.27	36.18	36.10	36.01	35.93
14.550	35.85	35.76	35.68	35.60	35.52
14.800	35.44	35.36	35.28	35.20	35.12
15.050	35.04	34.97	34.89	34.81	34.74
15.300	34.66	34.64	34.62	34.60	34.59
15.550	34.57	34.55	34.54	34.52	34.50
15.800	34.48	34.46	34.44	34.42	34.40
16.050	34.37	34.35	34.33	34.31	34.28
16.300	34.26	34.23	34.21	34.18	34.15
16.550	34.13	34.10	34.07	34.04	34.01
16.800	33.98	33.95	33.92	33.89	33.86
17.050	33.83	33.80	33.76	33.73	33.70
17.300	33.66	33.63	33.59	33.56	33.52
17.550	33.49	33.45	33.42	33.38	33.34
17.800	33.30	33.27	33.23	33.19	33.15
18.050	33.10	33.06	33.02	32.97	32.93
18.300	32.88	32.84	32.80	32.75	32.70
18.550	32.66	32.61	32.57	32.52	32.47
18.800	32.42	32.38	32.33	32.28	32.23
19.050	32.18	32.13	32.08	32.03	31.98
19.300	31.93	31.88	31.83	31.78	31.72
19.550	31.67	31.62	31.56	31.51	31.45
19.800	31.40	31.34	31.28	31.22	31.17
20.050	31.11	31.05	30.99	30.93	30.88
20.300	30.82	30.76	30.70	30.64	30.58
20.550	30.52	30.46	30.40	30.34	30.28
20.800	30.22	30.16	30.10	30.03	29.97
21.050	29.90	29.84	29.77	29.70	29.64

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 25 years
Storm Event: Brunswick NC 25-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.300	29.57	29.50	29.44	29.37	29.30
21.550	29.24	29.17	29.10	29.03	28.97
21.800	28.90	28.83	28.76	28.69	28.63
22.050	28.56	28.49	28.42	28.35	28.27
22.300	28.20	28.12	28.05	27.97	27.90
22.550	27.82	27.75	27.67	27.60	27.52
22.800	27.45	27.37	27.30	27.22	27.15
23.050	27.07	27.00	26.92	26.85	26.77
23.300	26.69	26.61	26.53	26.45	26.36
23.550	26.28	26.20	26.12	26.03	25.95
23.800	25.87	25.79	25.70	25.62	25.54

Brunswick Site

Subsection: Pond Routed Hydrograph (total out) Return Event: 100 years
Label: PO-1 (OUT) Storm Event: Brunswik NC 100-yr

Peak Discharge	201.21 ft³/s
Time to Peak	8.150 hours
Hydrograph Volume	74.702 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.450	0.00	0.00	0.01	0.01	0.02
1.700	0.03	0.04	0.05	0.06	0.08
1.950	0.10	0.12	0.14	0.17	0.21
2.200	0.25	0.30	0.35	0.41	0.48
2.450	0.55	0.63	0.71	0.80	0.89
2.700	0.99	1.15	1.45	1.76	2.07
2.950	2.38	2.70	3.01	3.33	3.65
3.200	3.97	4.29	4.60	4.92	5.24
3.450	5.56	5.89	6.22	6.55	6.90
3.700	7.26	7.62	7.97	8.31	8.65
3.950	8.99	9.35	9.70	10.06	10.42
4.200	10.77	11.11	11.42	11.74	12.06
4.450	12.39	12.73	13.06	13.41	13.76
4.700	14.07	14.39	14.71	15.04	15.38
4.950	15.72	16.08	16.43	16.76	17.10
5.200	17.45	17.81	18.18	18.55	18.92
5.450	19.27	19.62	19.98	20.35	20.71
5.700	21.06	21.40	21.74	22.09	22.44
5.950	22.80	23.16	23.51	23.88	24.27
6.200	24.68	25.08	25.48	25.89	26.31
6.450	26.74	27.13	27.52	27.91	28.28
6.700	28.62	28.95	29.27	29.60	29.93
6.950	30.27	30.60	30.96	31.33	31.72
7.200	32.11	32.53	32.97	33.42	33.89
7.450	34.39	36.12	39.24	43.61	54.86
7.700	67.94	80.49	90.27	109.69	133.30
7.950	155.58	175.66	190.56	199.36	201.21
8.200	197.28	189.79	180.62	170.73	160.75
8.450	151.02	142.72	135.12	128.29	122.55
8.700	117.82	113.79	111.04	108.51	105.99
8.950	103.47	100.96	98.46	95.97	93.52
9.200	91.11	88.89	87.78	86.61	85.40
9.450	84.17	82.91	81.66	80.43	79.28
9.700	78.21	76.64	75.16	73.78	72.49
9.950	71.27	70.11	69.01	67.94	66.91
10.200	65.90	64.91	63.97	63.06	62.20
10.450	61.39	60.58	59.80	59.10	58.49

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.700	57.95	57.48	57.03	56.59	56.16
10.950	55.73	55.31	54.88	54.46	54.03
11.200	53.60	53.17	52.75	52.31	51.88
11.450	51.45	51.01	50.58	50.13	49.66
11.700	49.17	48.68	48.20	47.74	47.30
11.950	46.89	46.50	46.13	45.80	45.50
12.200	45.23	45.00	44.81	44.66	44.54
12.450	44.47	44.44	44.43	44.41	44.34
12.700	44.20	44.02	43.82	43.61	43.40
12.950	43.21	43.02	42.85	42.77	42.73
13.200	42.72	42.71	42.69	42.66	42.62
13.450	42.57	42.50	42.42	42.33	42.23
13.700	42.13	42.01	41.90	41.78	41.67
13.950	41.55	41.43	41.32	41.21	41.11
14.200	41.02	40.93	40.85	40.77	40.69
14.450	40.61	40.53	40.45	40.36	40.28
14.700	40.20	40.12	40.04	39.96	39.88
14.950	39.79	39.71	39.63	39.55	39.47
15.200	39.39	39.31	39.23	39.15	39.07
15.450	38.99	38.91	38.82	38.74	38.66
15.700	38.57	38.49	38.41	38.33	38.25
15.950	38.17	38.09	38.01	37.92	37.84
16.200	37.76	37.67	37.59	37.51	37.43
16.450	37.34	37.26	37.18	37.09	37.01
16.700	36.93	36.84	36.76	36.68	36.60
16.950	36.51	36.43	36.35	36.26	36.18
17.200	36.10	36.01	35.93	35.84	35.76
17.450	35.67	35.59	35.50	35.42	35.34
17.700	35.25	35.17	35.09	35.01	34.92
17.950	34.84	34.75	34.66	34.63	34.62
18.200	34.60	34.58	34.56	34.54	34.52
18.450	34.50	34.48	34.46	34.43	34.41
18.700	34.39	34.36	34.34	34.31	34.28
18.950	34.26	34.23	34.20	34.17	34.14
19.200	34.11	34.08	34.05	34.02	33.98
19.450	33.95	33.92	33.88	33.85	33.81
19.700	33.78	33.74	33.70	33.67	33.63
19.950	33.59	33.55	33.51	33.47	33.43
20.200	33.39	33.35	33.31	33.26	33.22
20.450	33.18	33.13	33.08	33.04	32.99
20.700	32.94	32.89	32.84	32.79	32.74
20.950	32.69	32.64	32.59	32.53	32.48

Brunswick Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
21.200	32.43	32.37	32.32	32.27	32.21
21.450	32.16	32.10	32.05	31.99	31.93
21.700	31.88	31.82	31.76	31.71	31.65
21.950	31.59	31.52	31.46	31.40	31.34
22.200	31.27	31.21	31.14	31.08	31.01
22.450	30.95	30.88	30.82	30.75	30.69
22.700	30.62	30.55	30.49	30.42	30.35
22.950	30.29	30.22	30.15	30.08	30.01
23.200	29.94	29.86	29.79	29.71	29.64
23.450	29.57	29.49	29.42	29.34	29.27
23.700	29.19	29.12	29.04	28.97	28.89
23.950	28.81	28.74	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	23.297	8.000	69.03
Flow (From)	CM-2	7.900	8.000	24.28
Flow (In)	PO-1	31.197	8.000	93.31

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	38.790	8.000	118.73
Flow (From)	CM-2	12.528	7.950	38.79
Flow (In)	PO-1	51.318	8.000	157.48

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	52.660	8.000	162.57
Flow (From)	CM-2	16.600	7.950	51.36
Flow (In)	PO-1	69.260	8.000	213.78

Brunswick Site

Subsection: Pond Inflow Summary
Label: PO-1 (IN)

Return Event: 100 years
Storm Event: Brunswik NC 100-yr

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1
<Catchment to Outflow Node>	CM-2

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	60.912	7.950	188.38
Flow (From)	CM-2	19.005	7.950	58.70
Flow (In)	PO-1	79.918	7.950	247.08

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Centennial Site

Project Summary	
Title	Centennial Site
Engineer	RMR
Company	Nevada City Engineering, Inc.
Date	9/10/2019

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Centennial Site

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
CM-1	Pre-Development 10	10	24.300	8.000	72.44
CM-1	Post-Development 10	10	28.807	7.950	89.68
CM-1	Pre-Development 100	100	39.469	8.000	121.02
CM-1	Post-Development 100	100	44.124	7.950	137.41

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Pre-Development 10	10	24.300	8.000	72.44
O-1	Post-Development 10	10	28.027	8.350	45.14
O-1	Pre-Development 100	100	39.469	8.000	121.02
O-1	Post-Development 100	100	43.107	8.300	75.75

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-1 (IN)	Post-Development 10	10	28.807	7.950	89.68	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 10	10	28.027	8.350	45.14	2,501.07	3.915
PO-1 (IN)	Post-Development 100	100	44.124	7.950	137.41	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 100	100	43.107	8.300	75.75	2,503.70	6.152

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time-Depth Curve: Idaho Maryland NC 100-yr	
Label	Idaho Maryland NC 100-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.1	0.1
0.500	0.1	0.1	0.1	0.2	0.2
1.000	0.2	0.2	0.2	0.3	0.3
1.500	0.3	0.4	0.4	0.4	0.5
2.000	0.5	0.5	0.5	0.6	0.6
2.500	0.6	0.7	0.7	0.7	0.8
3.000	0.8	0.8	0.9	0.9	0.9
3.500	0.9	1.0	1.0	1.0	1.1
4.000	1.1	1.2	1.2	1.2	1.3
4.500	1.3	1.3	1.4	1.4	1.5
5.000	1.5	1.5	1.6	1.6	1.7
5.500	1.7	1.8	1.8	1.9	1.9
6.000	2.0	2.0	2.1	2.2	2.2
6.500	2.3	2.3	2.4	2.5	2.5
7.000	2.6	2.7	2.7	2.8	2.9
7.500	3.0	3.2	3.4	3.7	3.9
8.000	4.1	4.2	4.4	4.5	4.5
8.500	4.6	4.7	4.8	4.9	4.9
9.000	5.0	5.1	5.1	5.2	5.2
9.500	5.3	5.4	5.4	5.5	5.5
10.000	5.6	5.6	5.7	5.7	5.7
10.500	5.8	5.8	5.9	5.9	6.0
11.000	6.0	6.1	6.1	6.1	6.2
11.500	6.2	6.3	6.3	6.3	6.4
12.000	6.4	6.4	6.5	6.5	6.5
12.500	6.6	6.6	6.7	6.7	6.7
13.000	6.8	6.8	6.8	6.9	6.9
13.500	6.9	7.0	7.0	7.0	7.1
14.000	7.1	7.1	7.2	7.2	7.2
14.500	7.3	7.3	7.3	7.4	7.4
15.000	7.4	7.4	7.5	7.5	7.5
15.500	7.6	7.6	7.6	7.7	7.7
16.000	7.7	7.8	7.8	7.8	7.8

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	7.9	7.9	7.9	8.0	8.0
17.000	8.0	8.0	8.1	8.1	8.1
17.500	8.2	8.2	8.2	8.2	8.3
18.000	8.3	8.3	8.3	8.4	8.4
18.500	8.4	8.4	8.5	8.5	8.5
19.000	8.6	8.6	8.6	8.6	8.7
19.500	8.7	8.7	8.7	8.7	8.8
20.000	8.8	8.8	8.8	8.9	8.9
20.500	8.9	8.9	9.0	9.0	9.0
21.000	9.0	9.1	9.1	9.1	9.1
21.500	9.1	9.2	9.2	9.2	9.2
22.000	9.2	9.3	9.3	9.3	9.3
22.500	9.4	9.4	9.4	9.4	9.4
23.000	9.5	9.5	9.5	9.5	9.5
23.500	9.5	9.6	9.6	9.6	9.6
24.000	9.6	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time-Depth Curve: Idaho Maryland NC 100-yr	
Label	Idaho Maryland NC 100-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.1	0.1
0.500	0.1	0.1	0.1	0.2	0.2
1.000	0.2	0.2	0.2	0.3	0.3
1.500	0.3	0.4	0.4	0.4	0.5
2.000	0.5	0.5	0.5	0.6	0.6
2.500	0.6	0.7	0.7	0.7	0.8
3.000	0.8	0.8	0.9	0.9	0.9
3.500	0.9	1.0	1.0	1.0	1.1
4.000	1.1	1.2	1.2	1.2	1.3
4.500	1.3	1.3	1.4	1.4	1.5
5.000	1.5	1.5	1.6	1.6	1.7
5.500	1.7	1.8	1.8	1.9	1.9
6.000	2.0	2.0	2.1	2.2	2.2
6.500	2.3	2.3	2.4	2.5	2.5
7.000	2.6	2.7	2.7	2.8	2.9
7.500	3.0	3.2	3.4	3.7	3.9
8.000	4.1	4.2	4.4	4.5	4.5
8.500	4.6	4.7	4.8	4.9	4.9
9.000	5.0	5.1	5.1	5.2	5.2
9.500	5.3	5.4	5.4	5.5	5.5
10.000	5.6	5.6	5.7	5.7	5.7
10.500	5.8	5.8	5.9	5.9	6.0
11.000	6.0	6.1	6.1	6.1	6.2
11.500	6.2	6.3	6.3	6.3	6.4
12.000	6.4	6.4	6.5	6.5	6.5
12.500	6.6	6.6	6.7	6.7	6.7
13.000	6.8	6.8	6.8	6.9	6.9
13.500	6.9	7.0	7.0	7.0	7.1
14.000	7.1	7.1	7.2	7.2	7.2
14.500	7.3	7.3	7.3	7.4	7.4
15.000	7.4	7.4	7.5	7.5	7.5
15.500	7.6	7.6	7.6	7.7	7.7
16.000	7.7	7.8	7.8	7.8	7.8

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	7.9	7.9	7.9	8.0	8.0
17.000	8.0	8.0	8.1	8.1	8.1
17.500	8.2	8.2	8.2	8.2	8.3
18.000	8.3	8.3	8.3	8.4	8.4
18.500	8.4	8.4	8.5	8.5	8.5
19.000	8.6	8.6	8.6	8.6	8.7
19.500	8.7	8.7	8.7	8.7	8.8
20.000	8.8	8.8	8.8	8.9	8.9
20.500	8.9	8.9	9.0	9.0	9.0
21.000	9.0	9.1	9.1	9.1	9.1
21.500	9.1	9.2	9.2	9.2	9.2
22.000	9.2	9.3	9.3	9.3	9.3
22.500	9.4	9.4	9.4	9.4	9.4
23.000	9.5	9.5	9.5	9.5	9.5
23.500	9.5	9.6	9.6	9.6	9.6
24.000	9.6	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time-Depth Curve: Idaho Maryland NC 10-yr	
Label	Idaho Maryland NC 10-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
0.500	0.1	0.1	0.1	0.1	0.1
1.000	0.1	0.2	0.2	0.2	0.2
1.500	0.2	0.3	0.3	0.3	0.3
2.000	0.3	0.4	0.4	0.4	0.4
2.500	0.4	0.5	0.5	0.5	0.5
3.000	0.6	0.6	0.6	0.6	0.6
3.500	0.7	0.7	0.7	0.7	0.8
4.000	0.8	0.8	0.8	0.9	0.9
4.500	0.9	0.9	1.0	1.0	1.0
5.000	1.1	1.1	1.1	1.2	1.2
5.500	1.2	1.3	1.3	1.3	1.4
6.000	1.4	1.4	1.5	1.5	1.6
6.500	1.6	1.7	1.7	1.7	1.8
7.000	1.8	1.9	1.9	2.0	2.0
7.500	2.1	2.3	2.4	2.6	2.7
8.000	2.9	3.0	3.1	3.1	3.2
8.500	3.3	3.3	3.4	3.4	3.5
9.000	3.5	3.6	3.6	3.7	3.7
9.500	3.7	3.8	3.8	3.9	3.9
10.000	3.9	4.0	4.0	4.0	4.1
10.500	4.1	4.1	4.2	4.2	4.2
11.000	4.2	4.3	4.3	4.3	4.4
11.500	4.4	4.4	4.4	4.5	4.5
12.000	4.5	4.5	4.6	4.6	4.6
12.500	4.6	4.7	4.7	4.7	4.7
13.000	4.8	4.8	4.8	4.8	4.9
13.500	4.9	4.9	4.9	5.0	5.0
14.000	5.0	5.0	5.1	5.1	5.1
14.500	5.1	5.1	5.2	5.2	5.2
15.000	5.2	5.3	5.3	5.3	5.3
15.500	5.3	5.4	5.4	5.4	5.4
16.000	5.4	5.5	5.5	5.5	5.5

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	5.6	5.6	5.6	5.6	5.6
17.000	5.7	5.7	5.7	5.7	5.7
17.500	5.8	5.8	5.8	5.8	5.8
18.000	5.8	5.9	5.9	5.9	5.9
18.500	5.9	6.0	6.0	6.0	6.0
19.000	6.0	6.0	6.1	6.1	6.1
19.500	6.1	6.1	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.3	6.3
20.500	6.3	6.3	6.3	6.3	6.4
21.000	6.4	6.4	6.4	6.4	6.4
21.500	6.4	6.5	6.5	6.5	6.5
22.000	6.5	6.5	6.6	6.6	6.6
22.500	6.6	6.6	6.6	6.6	6.7
23.000	6.7	6.7	6.7	6.7	6.7
23.500	6.7	6.7	6.8	6.8	6.8
24.000	6.8	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time-Depth Curve: Idaho Maryland NC 10-yr	
Label	Idaho Maryland NC 10-yr
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
0.500	0.1	0.1	0.1	0.1	0.1
1.000	0.1	0.2	0.2	0.2	0.2
1.500	0.2	0.3	0.3	0.3	0.3
2.000	0.3	0.4	0.4	0.4	0.4
2.500	0.4	0.5	0.5	0.5	0.5
3.000	0.6	0.6	0.6	0.6	0.6
3.500	0.7	0.7	0.7	0.7	0.8
4.000	0.8	0.8	0.8	0.9	0.9
4.500	0.9	0.9	1.0	1.0	1.0
5.000	1.1	1.1	1.1	1.2	1.2
5.500	1.2	1.3	1.3	1.3	1.4
6.000	1.4	1.4	1.5	1.5	1.6
6.500	1.6	1.7	1.7	1.7	1.8
7.000	1.8	1.9	1.9	2.0	2.0
7.500	2.1	2.3	2.4	2.6	2.7
8.000	2.9	3.0	3.1	3.1	3.2
8.500	3.3	3.3	3.4	3.4	3.5
9.000	3.5	3.6	3.6	3.7	3.7
9.500	3.7	3.8	3.8	3.9	3.9
10.000	3.9	4.0	4.0	4.0	4.1
10.500	4.1	4.1	4.2	4.2	4.2
11.000	4.2	4.3	4.3	4.3	4.4
11.500	4.4	4.4	4.4	4.5	4.5
12.000	4.5	4.5	4.6	4.6	4.6
12.500	4.6	4.7	4.7	4.7	4.7
13.000	4.8	4.8	4.8	4.8	4.9
13.500	4.9	4.9	4.9	5.0	5.0
14.000	5.0	5.0	5.1	5.1	5.1
14.500	5.1	5.1	5.2	5.2	5.2
15.000	5.2	5.3	5.3	5.3	5.3
15.500	5.3	5.4	5.4	5.4	5.4
16.000	5.4	5.5	5.5	5.5	5.5

Centennial Site

Subsection: Time-Depth Curve
Label: NC airport/NOAA

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
16.500	5.6	5.6	5.6	5.6	5.6
17.000	5.7	5.7	5.7	5.7	5.7
17.500	5.8	5.8	5.8	5.8	5.8
18.000	5.8	5.9	5.9	5.9	5.9
18.500	5.9	6.0	6.0	6.0	6.0
19.000	6.0	6.0	6.1	6.1	6.1
19.500	6.1	6.1	6.2	6.2	6.2
20.000	6.2	6.2	6.2	6.3	6.3
20.500	6.3	6.3	6.3	6.3	6.4
21.000	6.4	6.4	6.4	6.4	6.4
21.500	6.4	6.5	6.5	6.5	6.5
22.000	6.5	6.5	6.6	6.6	6.6
22.500	6.6	6.6	6.6	6.6	6.7
23.000	6.7	6.7	6.7	6.7	6.7
23.500	6.7	6.7	6.8	6.8	6.8
24.000	6.8	(N/A)	(N/A)	(N/A)	(N/A)

Unit Hydrograph Method (Computational Notes)

Definition of Terms

At	Total area (acres): At = Ai+Ap
Ai	Impervious area (acres)
Ap	Pervious area (acres)
CNi	Runoff curve number for impervious area
CNp	Runoff curve number for pervious area
fLoss	f loss constant infiltration (depth/time)
gKs	Saturated Hydraulic Conductivity (depth/time)
Md	Volumetric Moisture Deficit
Psi	Capillary Suction (length)
hK	Horton Infiltration Decay Rate (time^-1)
fo	Initial Infiltration Rate (depth/time)
fc	Ultimate(capacity)Infiltration Rate (depth/time)
Ia	Initial Abstraction (length)
dt	Computational increment (duration of unit excess rainfall) Default dt is smallest value of 0.1333Tc, rtm, and th (Smallest dt is then adjusted to match up with Tp)
UDdt	User specified override computational main time increment (only used if UDdt is => .1333Tc)
D(t)	Point on distribution curve (fraction of P) for time step t
K	2 / (1 + (Tr/Tp)): default K = 0.75: (for Tr/Tp = 1.67)
Ks	Hydrograph shape factor = Unit Conversions * K: = ((1hr/3600sec) * (1ft/12in) * ((5280ft)**2/sq.mi)) * K Default Ks = 645.333 * 0.75 = 484
Lag	Lag time from center of excess runoff (dt) to Tp: Lag = 0.6Tc
P	Total precipitation depth, inches
Pa(t)	Accumulated rainfall at time step t
Pi(t)	Incremental rainfall at time step t
qp	Peak discharge (cfs) for 1in. runoff, for 1hr, for 1 sq.mi. = (Ks * A * Q) / Tp (where Q = 1in. runoff, A=sq.mi.)
Qu(t)	Unit hydrograph ordinate (cfs) at time step t
Q(t)	Final hydrograph ordinate (cfs) at time step t
Rai(t)	Accumulated runoff (inches) at time step t for impervious area
Rap(t)	Accumulated runoff (inches) at time step t for pervious area
Rii(t)	Incremental runoff (inches) at time step t for impervious area
Rip(t)	Incremental runoff (inches) at time step t for pervious area
R(t)	Incremental weighted total runoff (inches)
Rtm	Time increment for rainfall table
Si	S for impervious area: Si = (1000/CNi) - 10
Sp	S for pervious area: Sp = (1000/CNp) - 10
t	Time step (row) number
Tc	Time of concentration
Tb	Time (hrs) of entire unit hydrograph: Tb = Tp + Tr
Tp	Time (hrs) to peak of a unit hydrograph: Tp = (dt/2) + Lag
Tr	Time (hrs) of receding limb of unit hydrograph: Tr = ratio of Tp

Centennial Site

Subsection: Unit Hydrograph Equations

Unit Hydrograph Method
Computational Notes
Precipitation

Column (1)	Time for time step t
Column (2)	D(t) = Point on distribution curve for time step t
Column (3)	Pi(t) = Pa(t) - Pa(t-1): Col.(4) - Preceding Col.(4)
Column (4)	Pa(t) = D(t) x P: Col.(2) x P

Pervious Area Runoff (using SCS Runoff CN Method)

	Rap(t) = Accumulated pervious runoff for time step t
	If (Pa(t) is <= 0.2Sp) then use: Rap(t) = 0.0
Column (5)	If (Pa(t) is > 0.2Sp) then use:
	Rap(t) = (Col.(4)-0.2Sp)**2 / (Col.(4)+0.8Sp)
	Rip(t) = Incremental pervious runoff for time step t
Column (6)	Rip(t) = Rap(t) - Rap(t-1)
	Rip(t) = Col.(5) for current row - Col.(5) for preceding row.

Impervious Area Runoff

Column (7 & 8)...	Did not specify to use impervious areas.

Incremental Weighted Runoff

Column (9)	R(t) = (Ap/At) x Rip(t) + (Ai/At) x Rii(t)
	R(t) = (Ap/At) x Col.(6) + (Ai/At) x Col.(8)

SCS Unit Hydrograph Method

Column (10)	Q(t) is computed with the SCS unit hydrograph method using R(t) and Qu(t).

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Storm Event	Idaho Maryland NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.170 hours
Area (User Defined)	66.860 acres
Computational Time Increment	0.023 hours
Time to Peak (Computed)	7.956 hours
Flow (Peak, Computed)	89.70 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	89.68 ft³/s
Drainage Area	
SCS CN (Composite)	86.120
Area (User Defined)	66.860 acres
Maximum Retention (Pervious)	1.6 in
Maximum Retention (Pervious, 20 percent)	0.3 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.2 in
Runoff Volume (Pervious)	28.901 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	28.807 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.170 hours
Computational Time Increment	0.023 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	445.62 ft^3/s
Unit peak time, Tp	0.113 hours
Unit receding limb, Tr	0.453 hours
Total unit time, Tb	0.567 hours

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 10 years
Label: CM-1 Storm Event: Idaho Maryland NC 10-yr

Storm Event	Idaho Maryland NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.170 hours
Area (User Defined)	66.860 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.900	0.00	0.00	0.03	0.10	0.23
2.150	0.39	0.56	0.74	0.92	1.10
2.400	1.28	1.45	1.62	1.79	1.95
2.650	2.11	2.26	2.41	2.56	2.71
2.900	2.85	2.99	3.13	3.26	3.38
3.150	3.49	3.61	3.73	3.87	4.00
3.400	4.15	4.30	4.46	4.63	4.84
3.650	5.06	5.27	5.47	5.65	5.83
3.900	6.01	6.19	6.37	6.52	6.66
4.150	6.79	6.93	7.08	7.24	7.42
4.400	7.60	7.78	7.97	8.16	8.36
4.650	8.56	8.77	8.98	9.20	9.43
4.900	9.67	9.91	10.16	10.43	10.73
5.150	11.04	11.34	11.62	11.90	12.16
5.400	12.42	12.67	12.92	13.13	13.28
5.650	13.42	13.61	13.85	14.13	14.42
5.900	14.73	15.05	15.42	15.86	16.48
6.150	17.11	17.64	18.08	18.47	18.82
6.400	19.13	19.40	19.64	19.72	19.44
6.650	19.12	19.03	19.14	19.40	19.76
6.900	20.21	20.72	21.33	22.01	22.80
7.150	23.64	24.60	25.61	26.72	27.89
7.400	29.20	30.56	32.11	36.74	49.24
7.650	62.99	73.03	79.67	84.25	87.30
7.900	89.05	89.68	89.09	85.70	76.50
8.150	66.34	58.63	53.15	48.74	45.14
8.400	41.97	39.30	36.97	35.50	35.35
8.650	35.57	35.27	34.61	33.74	32.85
8.900	31.91	31.01	30.12	29.28	28.44
9.150	27.65	26.90	26.20	25.51	24.88
9.400	24.28	23.73	23.20	22.87	22.88
9.650	22.99	22.96	22.84	22.65	22.44

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.900	22.22	22.00	21.77	21.52	21.22
10.150	20.91	20.64	20.42	20.21	20.03
10.400	19.88	19.75	19.62	19.55	19.62
10.650	19.71	19.69	19.61	19.48	19.34
10.900	19.19	19.04	18.88	18.73	18.57
11.150	18.41	18.25	18.10	17.93	17.77
11.400	17.61	17.46	17.29	17.11	16.86
11.650	16.62	16.43	16.29	16.17	16.08
11.900	15.99	15.92	15.87	15.84	15.82
12.150	15.81	15.83	15.87	15.94	16.01
12.400	16.10	16.19	16.32	16.34	16.12
12.650	15.82	15.62	15.49	15.40	15.33
12.900	15.29	15.26	15.22	15.26	15.44
13.150	15.62	15.66	15.60	15.51	15.42
13.400	15.29	15.17	15.07	14.97	14.89
13.650	14.80	14.72	14.65	14.60	14.56
13.900	14.52	14.47	14.45	14.45	14.47
14.150	14.49	14.50	14.49	14.46	14.44
14.400	14.41	14.39	14.36	14.32	14.30
14.650	14.27	14.24	14.21	14.17	14.13
14.900	14.11	14.08	14.06	14.04	14.01
15.150	13.98	13.95	13.92	13.89	13.86
15.400	13.82	13.78	13.75	13.73	13.69
15.650	13.66	13.63	13.61	13.59	13.57
15.900	13.54	13.50	13.46	13.43	13.40
16.150	13.37	13.34	13.30	13.28	13.25
16.400	13.22	13.18	13.16	13.13	13.10
16.650	13.06	13.04	13.01	12.98	12.94
16.900	12.92	12.89	12.86	12.82	12.79
17.150	12.77	12.73	12.70	12.66	12.62
17.400	12.59	12.57	12.54	12.52	12.49
17.650	12.45	12.43	12.40	12.37	12.33
17.900	12.29	12.25	12.22	12.19	12.16
18.150	12.13	12.10	12.07	12.05	12.03
18.400	11.99	11.96	11.92	11.88	11.85
18.650	11.82	11.79	11.75	11.72	11.70
18.900	11.66	11.63	11.60	11.57	11.54
19.150	11.50	11.48	11.45	11.41	11.38
19.400	11.35	11.32	11.29	11.25	11.22
19.650	11.20	11.16	11.12	11.08	11.05
19.900	11.01	10.99	10.97	10.94	10.91
20.150	10.87	10.85	10.82	10.78	10.74

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.400	10.70	10.67	10.64	10.61	10.57
20.650	10.54	10.51	10.48	10.46	10.43
20.900	10.40	10.36	10.32	10.28	10.25
21.150	10.23	10.19	10.15	10.12	10.10
21.400	10.06	10.03	10.00	9.97	9.93
21.650	9.90	9.87	9.84	9.81	9.77
21.900	9.74	9.71	9.68	9.64	9.61
22.150	9.58	9.55	9.51	9.47	9.43
22.400	9.40	9.37	9.35	9.32	9.29
22.650	9.26	9.23	9.20	9.16	9.12
22.900	9.08	9.04	9.01	8.98	8.95
23.150	8.91	8.88	8.86	8.83	8.81
23.400	8.77	8.74	8.69	8.66	8.62
23.650	8.60	8.56	8.52	8.49	8.47
23.900	8.43	8.40	8.36	(N/A)	(N/A)

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Storm Event	Idaho Maryland NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	69.960 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	72.44 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	72.44 ft³/s
Drainage Area	
SCS CN (Composite)	77.000
Area (User Defined)	69.960 acres
Maximum Retention (Pervious)	3.0 in
Maximum Retention (Pervious, 20 percent)	0.6 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.2 in
Runoff Volume (Pervious)	24.408 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	24.300 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	396.34 ft³/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 10 years
Label: CM-1 Storm Event: Idaho Maryland NC 10-yr

Storm Event	Idaho Maryland NC 10-yr
Return Event	10 years
Duration	24.000 hours
Depth	6.8 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	69.960 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
3.200	0.00	0.00	0.03	0.08	0.16
3.450	0.25	0.36	0.47	0.59	0.71
3.700	0.84	0.98	1.11	1.24	1.38
3.950	1.52	1.66	1.79	1.92	2.05
4.200	2.17	2.31	2.44	2.58	2.73
4.450	2.87	3.02	3.17	3.33	3.49
4.700	3.65	3.82	3.99	4.17	4.35
4.950	4.54	4.73	4.94	5.16	5.38
5.200	5.62	5.84	6.07	6.29	6.51
5.450	6.73	6.95	7.15	7.33	7.50
5.700	7.68	7.89	8.12	8.36	8.62
5.950	8.89	9.18	9.51	9.94	10.40
6.200	10.84	11.23	11.59	11.92	12.23
6.450	12.51	12.78	12.95	12.95	12.87
6.700	12.85	12.96	13.17	13.46	13.82
6.950	14.23	14.72	15.26	15.87	16.53
7.200	17.28	18.07	18.96	19.91	20.95
7.450	22.04	23.33	26.28	33.70	43.52
7.700	52.34	58.87	63.80	67.48	70.11
7.950	71.78	72.44	71.14	65.81	58.59
8.200	51.99	47.10	43.16	39.95	37.15
8.450	34.80	32.73	31.26	30.70	30.72
8.700	30.61	30.20	29.58	28.90	28.15
8.950	27.42	26.68	25.98	25.28	24.63
9.200	23.98	23.38	22.79	22.25	21.72
9.450	21.24	20.79	20.46	20.37	20.43
9.700	20.45	20.38	20.26	20.11	19.94
9.950	19.77	19.59	19.39	19.15	18.90
10.200	18.67	18.46	18.28	18.13	17.99
10.450	17.88	17.77	17.71	17.74	17.81
10.700	17.84	17.80	17.71	17.61	17.49
10.950	17.37	17.24	17.11	16.98	16.85

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 10 years
Label: CM-1 Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.200	16.71	16.58	16.44	16.31	16.17
11.450	16.04	15.90	15.74	15.55	15.34
11.700	15.16	15.02	14.91	14.82	14.74
11.950	14.68	14.63	14.60	14.58	14.58
12.200	14.59	14.63	14.68	14.75	14.84
12.450	14.93	15.04	15.09	14.97	14.75
12.700	14.55	14.42	14.33	14.26	14.21
12.950	14.18	14.16	14.17	14.30	14.46
13.200	14.54	14.53	14.47	14.39	14.30
13.450	14.19	14.10	14.01	13.93	13.86
13.700	13.79	13.72	13.67	13.64	13.60
13.950	13.56	13.54	13.53	13.55	13.57
14.200	13.59	13.59	13.57	13.56	13.54
14.450	13.52	13.50	13.47	13.45	13.43
14.700	13.41	13.38	13.35	13.32	13.30
14.950	13.28	13.26	13.24	13.22	13.20
15.200	13.17	13.15	13.13	13.10	13.07
15.450	13.04	13.01	12.99	12.97	12.94
15.700	12.91	12.90	12.88	12.86	12.84
15.950	12.81	12.78	12.75	12.72	12.70
16.200	12.67	12.64	12.62	12.60	12.57
16.450	12.54	12.52	12.49	12.47	12.44
16.700	12.41	12.39	12.36	12.34	12.31
16.950	12.29	12.26	12.23	12.21	12.18
17.200	12.16	12.13	12.09	12.06	12.03
17.450	12.01	11.99	11.97	11.94	11.92
17.700	11.89	11.87	11.84	11.81	11.77
17.950	11.74	11.71	11.69	11.66	11.63
18.200	11.60	11.58	11.56	11.54	11.51
18.450	11.48	11.44	11.41	11.38	11.36
18.700	11.33	11.30	11.27	11.25	11.22
18.950	11.19	11.16	11.13	11.10	11.07
19.200	11.05	11.02	10.99	10.96	10.93
19.450	10.91	10.88	10.85	10.82	10.80
19.700	10.77	10.73	10.70	10.66	10.63
19.950	10.61	10.58	10.56	10.53	10.50
20.200	10.48	10.45	10.42	10.39	10.35
20.450	10.32	10.28	10.26	10.23	10.20
20.700	10.17	10.14	10.12	10.10	10.07
20.950	10.04	10.00	9.96	9.93	9.91
21.200	9.88	9.84	9.81	9.79	9.76
21.450	9.72	9.70	9.67	9.64	9.61

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.700	9.58	9.55	9.52	9.49	9.46
21.950	9.43	9.40	9.37	9.34	9.31
22.200	9.28	9.25	9.21	9.17	9.14
22.450	9.11	9.09	9.07	9.04	9.01
22.700	8.98	8.95	8.92	8.88	8.84
22.950	8.81	8.78	8.75	8.72	8.68
23.200	8.65	8.63	8.60	8.58	8.55
23.450	8.52	8.48	8.44	8.41	8.38
23.700	8.35	8.32	8.29	8.26	8.23
23.950	8.20	8.17	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Storm Event	Idaho Maryland NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.170 hours
Area (User Defined)	66.860 acres
Computational Time Increment	0.023 hours
Time to Peak (Computed)	7.933 hours
Flow (Peak, Computed)	137.49 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	7.950 hours
Flow (Peak Interpolated Output)	137.41 ft³/s
Drainage Area	
SCS CN (Composite)	86.120
Area (User Defined)	66.860 acres
Maximum Retention (Pervious)	1.6 in
Maximum Retention (Pervious, 20 percent)	0.3 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	7.9 in
Runoff Volume (Pervious)	44.260 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	44.124 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.170 hours
Computational Time Increment	0.023 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	445.62 ft^3/s
Unit peak time, Tp	0.113 hours
Unit receding limb, Tr	0.453 hours
Total unit time, Tb	0.567 hours

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) | Return Event: 100 years
Label: CM-1 | Storm Event: Idaho Maryland NC 100-yr

Storm Event	Idaho Maryland NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.170 hours
Area (User Defined)	66.860 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.450	0.00	0.01	0.09	0.27	0.52
1.700	0.81	1.11	1.42	1.72	2.02
1.950	2.32	2.62	2.93	3.25	3.57
2.200	3.89	4.19	4.49	4.78	5.06
2.450	5.34	5.61	5.86	6.09	6.31
2.700	6.53	6.75	6.96	7.18	7.39
2.950	7.59	7.79	7.97	8.11	8.25
3.200	8.41	8.59	8.78	8.98	9.21
3.450	9.45	9.69	9.96	10.32	10.69
3.700	11.04	11.35	11.64	11.91	12.19
3.950	12.46	12.72	12.95	13.13	13.30
4.200	13.49	13.71	13.95	14.20	14.47
4.450	14.75	15.03	15.32	15.61	15.91
4.700	16.22	16.53	16.87	17.21	17.58
4.950	17.95	18.33	18.73	19.20	19.68
5.200	20.14	20.57	20.98	21.36	21.74
5.450	22.10	22.46	22.76	22.94	23.11
5.700	23.38	23.72	24.12	24.54	25.00
5.950	25.48	26.03	26.71	27.66	28.64
6.200	29.45	30.11	30.68	31.17	31.60
6.450	31.98	32.29	32.34	31.81	31.22
6.700	31.01	31.13	31.49	31.99	32.66
6.950	33.42	34.35	35.37	36.57	37.85
7.200	39.30	40.82	42.52	44.28	46.27
7.450	48.33	50.68	57.84	77.26	98.51
7.700	113.83	123.75	130.40	134.65	136.88
7.950	137.41	136.10	130.56	116.30	100.66
8.200	88.80	80.38	73.60	68.08	63.23
8.450	59.15	55.60	53.34	53.06	53.36
8.700	52.87	51.85	50.52	49.14	47.71
8.950	46.34	44.98	43.71	42.43	41.24
9.200	40.09	39.03	37.99	37.04	36.12

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-1 Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
9.450	35.29	34.50	33.99	33.99	34.14
9.700	34.09	33.89	33.61	33.29	32.95
9.950	32.62	32.26	31.88	31.42	30.97
10.200	30.56	30.21	29.90	29.63	29.40
10.450	29.20	28.99	28.89	28.98	29.11
10.700	29.08	28.95	28.75	28.54	28.31
10.950	28.09	27.85	27.61	27.37	27.13
11.200	26.89	26.66	26.41	26.17	25.93
11.450	25.69	25.45	25.17	24.81	24.45
11.700	24.16	23.95	23.77	23.63	23.50
11.950	23.39	23.32	23.27	23.23	23.22
12.200	23.24	23.30	23.39	23.50	23.62
12.450	23.76	23.94	23.96	23.63	23.20
12.700	22.90	22.71	22.57	22.47	22.40
12.950	22.35	22.30	22.35	22.61	22.88
13.200	22.92	22.84	22.71	22.57	22.38
13.450	22.20	22.04	21.91	21.78	21.65
13.700	21.53	21.42	21.35	21.29	21.22
13.950	21.15	21.12	21.11	21.14	21.17
14.200	21.18	21.16	21.13	21.08	21.04
14.450	21.01	20.96	20.91	20.87	20.83
14.700	20.78	20.73	20.67	20.62	20.58
14.950	20.54	20.51	20.47	20.43	20.38
15.200	20.34	20.30	20.25	20.20	20.14
15.450	20.09	20.04	20.00	19.95	19.90
15.700	19.86	19.83	19.79	19.76	19.71
15.950	19.66	19.60	19.55	19.50	19.46
16.200	19.41	19.36	19.32	19.28	19.23
16.450	19.18	19.14	19.10	19.05	19.00
16.700	18.96	18.92	18.87	18.82	18.78
16.950	18.74	18.69	18.64	18.60	18.56
17.200	18.51	18.45	18.39	18.34	18.29
17.450	18.26	18.22	18.19	18.14	18.09
17.700	18.05	18.01	17.96	17.90	17.84
17.950	17.79	17.74	17.70	17.65	17.60
18.200	17.56	17.52	17.49	17.45	17.40
18.450	17.35	17.29	17.24	17.19	17.15
18.700	17.10	17.05	17.01	16.96	16.91
18.950	16.86	16.82	16.78	16.73	16.68
19.200	16.64	16.60	16.54	16.49	16.45
19.450	16.41	16.36	16.31	16.27	16.22
19.700	16.17	16.12	16.06	16.00	15.96

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-1 Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
19.950	15.92	15.89	15.85	15.80	15.75
20.200	15.71	15.67	15.62	15.56	15.50
20.450	15.44	15.40	15.36	15.30	15.25
20.700	15.21	15.17	15.14	15.10	15.05
20.950	15.00	14.94	14.88	14.84	14.80
21.200	14.74	14.69	14.65	14.61	14.56
21.450	14.51	14.46	14.42	14.37	14.32
21.700	14.28	14.23	14.18	14.13	14.09
21.950	14.05	13.99	13.94	13.90	13.86
22.200	13.81	13.75	13.69	13.63	13.59
22.450	13.55	13.52	13.48	13.43	13.38
22.700	13.34	13.29	13.24	13.19	13.13
22.950	13.07	13.02	12.98	12.93	12.88
23.200	12.83	12.80	12.76	12.73	12.68
23.450	12.62	12.56	12.50	12.46	12.42
23.700	12.36	12.31	12.27	12.23	12.17
23.950	12.13	12.08	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Storm Event	Idaho Maryland NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	69.960 acres
Computational Time Increment	0.027 hours
Time to Peak (Computed)	8.000 hours
Flow (Peak, Computed)	121.02 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	8.000 hours
Flow (Peak Interpolated Output)	121.02 ft³/s
Drainage Area	
SCS CN (Composite)	77.000
Area (User Defined)	69.960 acres
Maximum Retention (Pervious)	3.0 in
Maximum Retention (Pervious, 20 percent)	0.6 in
Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.8 in
Runoff Volume (Pervious)	39.629 ac-ft
Hydrograph Volume (Area under Hydrograph curve)	
Volume	39.469 ac-ft
SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.200 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749

Centennial Site

Subsection: Unit Hydrograph Summary
Label: CM-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

SCS Unit Hydrograph Parameters	
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	396.34 ft^3/s
Unit peak time, Tp	0.133 hours
Unit receding limb, Tr	0.533 hours
Total unit time, Tb	0.667 hours

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-1 Storm Event: Idaho Maryland NC 100-yr

Storm Event	Idaho Maryland NC 100-yr
Return Event	100 years
Duration	24.000 hours
Depth	9.6 in
Time of Concentration (Composite)	0.200 hours
Area (User Defined)	69.960 acres

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.400	0.00	0.02	0.08	0.20	0.36
2.650	0.55	0.75	0.95	1.15	1.36
2.900	1.56	1.76	1.95	2.14	2.32
3.150	2.50	2.67	2.85	3.03	3.21
3.400	3.41	3.60	3.81	4.02	4.26
3.650	4.52	4.78	5.04	5.28	5.52
3.900	5.76	6.01	6.24	6.47	6.67
4.150	6.87	7.07	7.28	7.50	7.73
4.400	7.98	8.23	8.48	8.74	9.01
4.650	9.28	9.55	9.83	10.13	10.43
4.900	10.75	11.08	11.41	11.76	12.14
5.150	12.55	12.95	13.34	13.72	14.09
5.400	14.45	14.81	15.16	15.49	15.75
5.650	15.98	16.25	16.57	16.94	17.33
5.900	17.75	18.19	18.68	19.24	19.98
6.150	20.79	21.54	22.19	22.77	23.29
6.400	23.76	24.19	24.57	24.79	24.68
6.650	24.41	24.27	24.37	24.67	25.11
6.900	25.69	26.35	27.14	28.03	29.04
7.150	30.14	31.38	32.70	34.19	35.75
7.400	37.47	39.28	41.40	46.42	59.18
7.650	75.96	90.80	101.46	109.25	114.80
7.900	118.52	120.60	121.02	118.24	108.92
8.150	96.59	85.42	77.13	70.48	65.07
8.400	60.37	56.44	52.98	50.52	49.54
8.650	49.48	49.24	48.51	47.45	46.30
8.900	45.05	43.82	42.60	41.43	40.28
9.150	39.20	38.13	37.15	36.18	35.28
9.400	34.42	33.64	32.90	32.36	32.19
9.650	32.26	32.27	32.14	31.93	31.67
9.900	31.39	31.09	30.78	30.46	30.07
10.150	29.66	29.27	28.94	28.64	28.38

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table)
Label: CM-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.400	28.16	27.97	27.78	27.67	27.70
10.650	27.80	27.83	27.75	27.61	27.44
10.900	27.24	27.04	26.82	26.61	26.40
11.150	26.18	25.96	25.75	25.52	25.30
11.400	25.08	24.86	24.63	24.39	24.08
11.650	23.75	23.46	23.23	23.05	22.91
11.900	22.78	22.67	22.59	22.54	22.51
12.150	22.49	22.51	22.55	22.63	22.73
12.400	22.85	22.98	23.15	23.22	23.03
12.650	22.69	22.38	22.17	22.02	21.91
12.900	21.83	21.78	21.73	21.75	21.93
13.150	22.17	22.29	22.27	22.17	22.05
13.400	21.90	21.73	21.58	21.45	21.32
13.650	21.20	21.08	20.98	20.90	20.84
13.900	20.78	20.72	20.68	20.66	20.68
14.150	20.71	20.73	20.73	20.70	20.67
14.400	20.64	20.61	20.57	20.52	20.49
14.650	20.45	20.41	20.37	20.32	20.27
14.900	20.23	20.19	20.16	20.13	20.09
15.150	20.05	20.01	19.98	19.94	19.89
15.400	19.84	19.79	19.75	19.71	19.67
15.650	19.62	19.58	19.55	19.52	19.49
15.900	19.45	19.40	19.35	19.30	19.26
16.150	19.22	19.18	19.13	19.09	19.06
16.400	19.01	18.97	18.93	18.89	18.85
16.650	18.80	18.76	18.72	18.68	18.63
16.900	18.59	18.55	18.51	18.47	18.42
17.150	18.39	18.34	18.29	18.24	18.19
17.400	18.14	18.11	18.07	18.04	18.00
17.650	17.95	17.91	17.87	17.83	17.78
17.900	17.72	17.67	17.63	17.59	17.54
18.150	17.49	17.45	17.42	17.38	17.35
18.400	17.31	17.26	17.20	17.15	17.11
18.650	17.07	17.02	16.97	16.93	16.89
18.900	16.84	16.80	16.75	16.71	16.67
19.150	16.62	16.58	16.54	16.49	16.44
19.400	16.40	16.36	16.31	16.27	16.22
19.650	16.18	16.14	16.08	16.03	15.97
19.900	15.93	15.89	15.85	15.82	15.78
20.150	15.73	15.69	15.65	15.60	15.55
20.400	15.49	15.44	15.39	15.35	15.30
20.650	15.25	15.21	15.17	15.14	15.10

Centennial Site

Subsection: Unit Hydrograph (Hydrograph Table) Return Event: 100 years
Label: CM-1 Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
20.900	15.06	15.00	14.95	14.89	14.85
21.150	14.81	14.76	14.71	14.66	14.62
21.400	14.57	14.53	14.48	14.44	14.39
21.650	14.34	14.30	14.26	14.21	14.16
21.900	14.12	14.07	14.03	13.98	13.93
22.150	13.89	13.84	13.79	13.73	13.68
22.400	13.63	13.59	13.55	13.52	13.47
22.650	13.42	13.38	13.34	13.29	13.24
22.900	13.18	13.12	13.07	13.03	12.98
23.150	12.93	12.89	12.85	12.81	12.78
23.400	12.73	12.68	12.62	12.57	12.52
23.650	12.48	12.43	12.38	12.33	12.29
23.900	12.24	12.19	12.16	(N/A)	(N/A)

Centennial Site

Subsection: Addition Summary
Label: O-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	28.027	8.350	45.14
Flow (In)	O-1	28.027	8.350	45.14

Centennial Site

Subsection: Addition Summary
Label: O-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	24.300	8.000	72.44
Flow (In)	O-1	24.300	8.000	72.44

Centennial Site

Subsection: Addition Summary
Label: O-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	43.107	8.300	75.75
Flow (In)	O-1	43.107	8.300	75.75

Centennial Site

Subsection: Addition Summary
Label: O-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	39.469	8.000	121.02
Flow (In)	O-1	39.469	8.000	121.02

Centennial Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
0.250	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
0.500	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
0.750	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.000	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.250	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.500	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.750	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
2.000	2,495.00	2,495.00	2,495.00	2,495.00	2,495.01
2.250	2,495.01	2,495.02	2,495.03	2,495.04	2,495.05
2.500	2,495.06	2,495.07	2,495.08	2,495.10	2,495.11
2.750	2,495.13	2,495.15	2,495.16	2,495.18	2,495.20
3.000	2,495.22	2,495.24	2,495.26	2,495.29	2,495.31
3.250	2,495.33	2,495.36	2,495.38	2,495.40	2,495.43
3.500	2,495.46	2,495.48	2,495.51	2,495.54	2,495.57
3.750	2,495.59	2,495.62	2,495.65	2,495.68	2,495.70
4.000	2,495.73	2,495.76	2,495.78	2,495.81	2,495.84
4.250	2,495.86	2,495.89	2,495.91	2,495.94	2,495.97
4.500	2,495.99	2,496.02	2,496.04	2,496.07	2,496.09
4.750	2,496.11	2,496.14	2,496.16	2,496.18	2,496.21
5.000	2,496.23	2,496.26	2,496.28	2,496.30	2,496.33
5.250	2,496.36	2,496.38	2,496.41	2,496.43	2,496.46
5.500	2,496.48	2,496.51	2,496.53	2,496.56	2,496.58
5.750	2,496.60	2,496.63	2,496.65	2,496.68	2,496.70
6.000	2,496.73	2,496.75	2,496.78	2,496.81	2,496.84
6.250	2,496.88	2,496.91	2,496.95	2,496.98	2,497.02
6.500	2,497.05	2,497.08	2,497.11	2,497.13	2,497.16
6.750	2,497.18	2,497.20	2,497.22	2,497.24	2,497.27
7.000	2,497.30	2,497.33	2,497.36	2,497.39	2,497.43
7.250	2,497.48	2,497.52	2,497.58	2,497.63	2,497.69
7.500	2,497.76	2,497.84	2,497.98	2,498.18	2,498.45
7.750	2,498.74	2,499.06	2,499.37	2,499.68	2,499.98
8.000	2,500.26	2,500.52	2,500.73	2,500.88	2,500.97
8.250	2,501.03	2,501.06	2,501.07	2,501.07	2,501.04
8.500	2,501.01	2,500.96	2,500.92	2,500.87	2,500.82
8.750	2,500.78	2,500.73	2,500.68	2,500.62	2,500.56
9.000	2,500.50	2,500.44	2,500.37	2,500.30	2,500.23
9.250	2,500.16	2,500.08	2,500.01	2,499.93	2,499.85
9.500	2,499.77	2,499.69	2,499.62	2,499.54	2,499.47
9.750	2,499.40	2,499.34	2,499.27	2,499.21	2,499.14
10.000	2,499.08	2,499.02	2,498.96	2,498.90	2,498.84

Centennial Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	2,498.78	2,498.73	2,498.67	2,498.62	2,498.57
10.500	2,498.52	2,498.47	2,498.42	2,498.37	2,498.33
10.750	2,498.29	2,498.25	2,498.21	2,498.18	2,498.14
11.000	2,498.10	2,498.07	2,498.04	2,498.00	2,497.97
11.250	2,497.94	2,497.91	2,497.88	2,497.85	2,497.82
11.500	2,497.79	2,497.76	2,497.73	2,497.70	2,497.68
11.750	2,497.65	2,497.62	2,497.60	2,497.57	2,497.55
12.000	2,497.52	2,497.50	2,497.48	2,497.46	2,497.44
12.250	2,497.42	2,497.41	2,497.39	2,497.38	2,497.37
12.500	2,497.36	2,497.35	2,497.34	2,497.33	2,497.32
12.750	2,497.30	2,497.29	2,497.28	2,497.27	2,497.26
13.000	2,497.25	2,497.24	2,497.23	2,497.22	2,497.22
13.250	2,497.21	2,497.21	2,497.20	2,497.19	2,497.19
13.500	2,497.18	2,497.17	2,497.17	2,497.16	2,497.15
13.750	2,497.14	2,497.14	2,497.13	2,497.12	2,497.12
14.000	2,497.11	2,497.10	2,497.10	2,497.09	2,497.09
14.250	2,497.08	2,497.08	2,497.07	2,497.07	2,497.06
14.500	2,497.06	2,497.06	2,497.05	2,497.05	2,497.04
14.750	2,497.04	2,497.04	2,497.03	2,497.03	2,497.02
15.000	2,497.02	2,497.02	2,497.01	2,497.01	2,497.01
15.250	2,497.00	2,497.00	2,497.00	2,496.99	2,496.99
15.500	2,496.99	2,496.98	2,496.98	2,496.98	2,496.97
15.750	2,496.97	2,496.97	2,496.96	2,496.96	2,496.96
16.000	2,496.95	2,496.95	2,496.95	2,496.94	2,496.94
16.250	2,496.94	2,496.93	2,496.93	2,496.93	2,496.92
16.500	2,496.92	2,496.92	2,496.91	2,496.91	2,496.91
16.750	2,496.90	2,496.90	2,496.90	2,496.89	2,496.89
17.000	2,496.89	2,496.89	2,496.88	2,496.88	2,496.88
17.250	2,496.87	2,496.87	2,496.87	2,496.86	2,496.86
17.500	2,496.86	2,496.85	2,496.85	2,496.85	2,496.84
17.750	2,496.84	2,496.84	2,496.83	2,496.83	2,496.83
18.000	2,496.82	2,496.82	2,496.82	2,496.82	2,496.81
18.250	2,496.81	2,496.81	2,496.80	2,496.80	2,496.80
18.500	2,496.79	2,496.79	2,496.79	2,496.78	2,496.78
18.750	2,496.78	2,496.77	2,496.77	2,496.77	2,496.76
19.000	2,496.76	2,496.76	2,496.75	2,496.75	2,496.75
19.250	2,496.74	2,496.74	2,496.74	2,496.74	2,496.73
19.500	2,496.73	2,496.73	2,496.72	2,496.72	2,496.72
19.750	2,496.71	2,496.71	2,496.71	2,496.70	2,496.70
20.000	2,496.70	2,496.69	2,496.69	2,496.69	2,496.68
20.250	2,496.68	2,496.68	2,496.67	2,496.67	2,496.67

Centennial Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	2,496.66	2,496.66	2,496.66	2,496.65	2,496.65
20.750	2,496.65	2,496.64	2,496.64	2,496.64	2,496.63
21.000	2,496.63	2,496.63	2,496.62	2,496.62	2,496.62
21.250	2,496.61	2,496.61	2,496.61	2,496.60	2,496.60
21.500	2,496.60	2,496.59	2,496.59	2,496.59	2,496.59
21.750	2,496.58	2,496.58	2,496.58	2,496.57	2,496.57
22.000	2,496.57	2,496.56	2,496.56	2,496.56	2,496.55
22.250	2,496.55	2,496.55	2,496.54	2,496.54	2,496.54
22.500	2,496.53	2,496.53	2,496.53	2,496.52	2,496.52
22.750	2,496.52	2,496.51	2,496.51	2,496.51	2,496.50
23.000	2,496.50	2,496.50	2,496.49	2,496.49	2,496.49
23.250	2,496.48	2,496.48	2,496.48	2,496.47	2,496.47
23.500	2,496.47	2,496.46	2,496.46	2,496.45	2,496.45
23.750	2,496.45	2,496.44	2,496.44	2,496.44	2,496.43
24.000	2,496.43	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
0.250	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
0.500	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
0.750	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.000	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.250	2,495.00	2,495.00	2,495.00	2,495.00	2,495.00
1.500	2,495.00	2,495.00	2,495.00	2,495.00	2,495.01
1.750	2,495.02	2,495.03	2,495.04	2,495.05	2,495.07
2.000	2,495.09	2,495.11	2,495.13	2,495.15	2,495.18
2.250	2,495.21	2,495.24	2,495.27	2,495.30	2,495.34
2.500	2,495.38	2,495.41	2,495.45	2,495.49	2,495.53
2.750	2,495.57	2,495.61	2,495.65	2,495.68	2,495.72
3.000	2,495.76	2,495.79	2,495.83	2,495.86	2,495.90
3.250	2,495.93	2,495.97	2,496.00	2,496.03	2,496.06
3.500	2,496.09	2,496.12	2,496.15	2,496.18	2,496.22
3.750	2,496.25	2,496.28	2,496.31	2,496.34	2,496.37
4.000	2,496.40	2,496.43	2,496.46	2,496.49	2,496.52
4.250	2,496.54	2,496.57	2,496.60	2,496.62	2,496.65
4.500	2,496.68	2,496.70	2,496.73	2,496.76	2,496.78
4.750	2,496.81	2,496.84	2,496.87	2,496.90	2,496.93
5.000	2,496.96	2,496.99	2,497.02	2,497.05	2,497.08
5.250	2,497.12	2,497.15	2,497.19	2,497.22	2,497.26
5.500	2,497.29	2,497.33	2,497.37	2,497.40	2,497.43
5.750	2,497.47	2,497.50	2,497.53	2,497.57	2,497.60
6.000	2,497.64	2,497.68	2,497.72	2,497.77	2,497.81
6.250	2,497.86	2,497.92	2,497.97	2,498.02	2,498.07
6.500	2,498.12	2,498.17	2,498.21	2,498.25	2,498.29
6.750	2,498.32	2,498.35	2,498.38	2,498.42	2,498.46
7.000	2,498.50	2,498.54	2,498.59	2,498.64	2,498.70
7.250	2,498.77	2,498.84	2,498.92	2,499.01	2,499.10
7.500	2,499.20	2,499.32	2,499.52	2,499.82	2,500.20
7.750	2,500.63	2,501.07	2,501.52	2,501.96	2,502.38
8.000	2,502.78	2,503.12	2,503.39	2,503.56	2,503.65
8.250	2,503.70	2,503.70	2,503.68	2,503.64	2,503.58
8.500	2,503.51	2,503.44	2,503.36	2,503.30	2,503.24
8.750	2,503.18	2,503.13	2,503.07	2,503.01	2,502.96
9.000	2,502.90	2,502.83	2,502.77	2,502.70	2,502.63
9.250	2,502.56	2,502.49	2,502.41	2,502.33	2,502.26
9.500	2,502.17	2,502.09	2,502.01	2,501.93	2,501.85
9.750	2,501.77	2,501.69	2,501.62	2,501.54	2,501.47
10.000	2,501.39	2,501.31	2,501.24	2,501.16	2,501.08

Centennial Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.250	2,501.01	2,500.93	2,500.85	2,500.78	2,500.70
10.500	2,500.63	2,500.56	2,500.49	2,500.42	2,500.35
10.750	2,500.29	2,500.23	2,500.17	2,500.11	2,500.05
11.000	2,499.99	2,499.93	2,499.87	2,499.81	2,499.75
11.250	2,499.70	2,499.64	2,499.59	2,499.53	2,499.48
11.500	2,499.42	2,499.37	2,499.32	2,499.27	2,499.21
11.750	2,499.16	2,499.11	2,499.06	2,499.01	2,498.96
12.000	2,498.92	2,498.87	2,498.83	2,498.79	2,498.75
12.250	2,498.71	2,498.68	2,498.64	2,498.61	2,498.58
12.500	2,498.56	2,498.53	2,498.51	2,498.48	2,498.46
12.750	2,498.43	2,498.40	2,498.37	2,498.35	2,498.32
13.000	2,498.30	2,498.28	2,498.26	2,498.24	2,498.22
13.250	2,498.21	2,498.19	2,498.18	2,498.16	2,498.15
13.500	2,498.13	2,498.12	2,498.10	2,498.08	2,498.07
13.750	2,498.05	2,498.04	2,498.02	2,498.01	2,497.99
14.000	2,497.98	2,497.96	2,497.95	2,497.94	2,497.93
14.250	2,497.92	2,497.90	2,497.90	2,497.89	2,497.88
14.500	2,497.87	2,497.86	2,497.85	2,497.84	2,497.83
14.750	2,497.82	2,497.82	2,497.81	2,497.80	2,497.79
15.000	2,497.79	2,497.78	2,497.77	2,497.76	2,497.76
15.250	2,497.75	2,497.74	2,497.74	2,497.73	2,497.73
15.500	2,497.72	2,497.71	2,497.71	2,497.70	2,497.69
15.750	2,497.69	2,497.68	2,497.68	2,497.67	2,497.66
16.000	2,497.66	2,497.65	2,497.65	2,497.64	2,497.64
16.250	2,497.63	2,497.62	2,497.62	2,497.61	2,497.61
16.500	2,497.60	2,497.60	2,497.59	2,497.58	2,497.58
16.750	2,497.57	2,497.57	2,497.56	2,497.56	2,497.55
17.000	2,497.55	2,497.54	2,497.54	2,497.53	2,497.53
17.250	2,497.52	2,497.51	2,497.51	2,497.50	2,497.50
17.500	2,497.49	2,497.49	2,497.48	2,497.48	2,497.47
17.750	2,497.47	2,497.46	2,497.46	2,497.45	2,497.45
18.000	2,497.44	2,497.43	2,497.43	2,497.42	2,497.42
18.250	2,497.41	2,497.41	2,497.40	2,497.40	2,497.39
18.500	2,497.39	2,497.38	2,497.38	2,497.37	2,497.37
18.750	2,497.36	2,497.36	2,497.35	2,497.35	2,497.34
19.000	2,497.34	2,497.33	2,497.33	2,497.32	2,497.32
19.250	2,497.31	2,497.31	2,497.30	2,497.30	2,497.29
19.500	2,497.29	2,497.28	2,497.28	2,497.27	2,497.27
19.750	2,497.26	2,497.26	2,497.25	2,497.25	2,497.24
20.000	2,497.24	2,497.23	2,497.23	2,497.22	2,497.22
20.250	2,497.21	2,497.21	2,497.20	2,497.20	2,497.19

Centennial Site

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time vs. Elevation (ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.500	2,497.19	2,497.18	2,497.18	2,497.17	2,497.17
20.750	2,497.16	2,497.16	2,497.15	2,497.15	2,497.14
21.000	2,497.14	2,497.13	2,497.13	2,497.12	2,497.12
21.250	2,497.11	2,497.11	2,497.10	2,497.10	2,497.09
21.500	2,497.09	2,497.08	2,497.08	2,497.07	2,497.07
21.750	2,497.06	2,497.06	2,497.05	2,497.05	2,497.04
22.000	2,497.04	2,497.03	2,497.03	2,497.02	2,497.02
22.250	2,497.01	2,497.01	2,497.00	2,497.00	2,496.99
22.500	2,496.98	2,496.98	2,496.97	2,496.97	2,496.96
22.750	2,496.96	2,496.95	2,496.95	2,496.94	2,496.94
23.000	2,496.93	2,496.93	2,496.92	2,496.92	2,496.91
23.250	2,496.91	2,496.90	2,496.90	2,496.89	2,496.89
23.500	2,496.88	2,496.88	2,496.87	2,496.87	2,496.86
23.750	2,496.86	2,496.85	2,496.85	2,496.84	2,496.84
24.000	2,496.83	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.000	0.000	0.000
1.750	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.001	0.002	0.004
2.250	0.007	0.010	0.014	0.018	0.023
2.500	0.029	0.035	0.042	0.050	0.058
2.750	0.066	0.075	0.084	0.094	0.104
3.000	0.114	0.125	0.137	0.148	0.160
3.250	0.172	0.185	0.197	0.211	0.224
3.500	0.238	0.253	0.267	0.282	0.297
3.750	0.311	0.326	0.341	0.356	0.371
4.000	0.386	0.401	0.415	0.430	0.444
4.250	0.459	0.473	0.487	0.501	0.516
4.500	0.530	0.544	0.558	0.572	0.585
4.750	0.598	0.612	0.625	0.639	0.652
5.000	0.666	0.679	0.693	0.707	0.722
5.250	0.736	0.751	0.766	0.781	0.796
5.500	0.811	0.825	0.840	0.853	0.867
5.750	0.881	0.894	0.908	0.922	0.937
6.000	0.952	0.968	0.984	1.003	1.022
6.250	1.042	1.062	1.083	1.104	1.124
6.500	1.143	1.162	1.180	1.195	1.209
6.750	1.222	1.235	1.248	1.262	1.277
7.000	1.293	1.311	1.331	1.353	1.378
7.250	1.405	1.434	1.466	1.501	1.539
7.500	1.581	1.634	1.719	1.850	2.024
7.750	2.221	2.434	2.652	2.871	3.087
8.000	3.293	3.487	3.646	3.761	3.838
8.250	3.884	3.908	3.915	3.909	3.891
8.500	3.864	3.829	3.791	3.756	3.721
8.750	3.685	3.648	3.609	3.567	3.523
9.000	3.477	3.428	3.377	3.325	3.272
9.250	3.218	3.163	3.108	3.051	2.994
9.500	2.937	2.881	2.827	2.775	2.726
9.750	2.677	2.629	2.583	2.539	2.495
10.000	2.453	2.411	2.370	2.329	2.289

Centennial Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	2.249	2.211	2.174	2.138	2.103
10.500	2.070	2.037	2.005	1.976	1.948
10.750	1.921	1.896	1.871	1.847	1.824
11.000	1.801	1.779	1.757	1.736	1.715
11.250	1.695	1.675	1.655	1.636	1.617
11.500	1.599	1.581	1.564	1.546	1.529
11.750	1.512	1.495	1.479	1.463	1.448
12.000	1.434	1.420	1.407	1.394	1.383
12.250	1.372	1.362	1.353	1.345	1.337
12.500	1.331	1.325	1.319	1.313	1.306
12.750	1.298	1.291	1.284	1.277	1.271
13.000	1.264	1.258	1.253	1.249	1.246
13.250	1.242	1.239	1.236	1.232	1.228
13.500	1.224	1.219	1.215	1.211	1.206
13.750	1.201	1.197	1.193	1.188	1.184
14.000	1.180	1.176	1.173	1.169	1.166
14.250	1.163	1.161	1.158	1.155	1.153
14.500	1.150	1.148	1.146	1.143	1.141
14.750	1.138	1.136	1.134	1.132	1.129
15.000	1.127	1.125	1.123	1.121	1.119
15.250	1.116	1.114	1.112	1.110	1.108
15.500	1.106	1.104	1.102	1.100	1.097
15.750	1.095	1.093	1.092	1.090	1.088
16.000	1.086	1.084	1.082	1.080	1.078
16.250	1.076	1.074	1.072	1.070	1.068
16.500	1.066	1.064	1.063	1.061	1.059
16.750	1.057	1.055	1.053	1.051	1.049
17.000	1.048	1.046	1.044	1.042	1.040
17.250	1.038	1.036	1.034	1.032	1.030
17.500	1.029	1.027	1.025	1.023	1.021
17.750	1.019	1.018	1.016	1.014	1.012
18.000	1.010	1.008	1.006	1.004	1.002
18.250	1.000	0.999	0.997	0.995	0.993
18.500	0.991	0.989	0.987	0.985	0.984
18.750	0.982	0.980	0.978	0.976	0.974
19.000	0.972	0.970	0.968	0.967	0.965
19.250	0.963	0.961	0.959	0.957	0.955
19.500	0.953	0.951	0.949	0.948	0.946
19.750	0.944	0.942	0.940	0.938	0.936
20.000	0.934	0.932	0.930	0.929	0.927
20.250	0.925	0.923	0.921	0.919	0.917

Centennial Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	0.915	0.913	0.911	0.909	0.907
20.750	0.905	0.904	0.902	0.900	0.898
21.000	0.896	0.894	0.892	0.890	0.888
21.250	0.886	0.885	0.883	0.881	0.879
21.500	0.877	0.875	0.873	0.871	0.869
21.750	0.867	0.865	0.863	0.861	0.860
22.000	0.858	0.856	0.854	0.852	0.850
22.250	0.848	0.846	0.844	0.842	0.840
22.500	0.838	0.836	0.835	0.833	0.831
22.750	0.829	0.827	0.825	0.823	0.821
23.000	0.819	0.817	0.815	0.813	0.811
23.250	0.809	0.807	0.805	0.803	0.801
23.500	0.799	0.797	0.796	0.794	0.792
23.750	0.790	0.788	0.786	0.784	0.782
24.000	0.780	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.000
0.250	0.000	0.000	0.000	0.000	0.000
0.500	0.000	0.000	0.000	0.000	0.000
0.750	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
1.250	0.000	0.000	0.000	0.000	0.000
1.500	0.000	0.000	0.001	0.003	0.005
1.750	0.009	0.014	0.020	0.027	0.035
2.000	0.044	0.055	0.066	0.079	0.093
2.250	0.107	0.123	0.140	0.157	0.176
2.500	0.195	0.215	0.236	0.257	0.278
2.750	0.299	0.320	0.340	0.361	0.381
3.000	0.401	0.421	0.440	0.460	0.479
3.250	0.497	0.516	0.535	0.552	0.570
3.500	0.587	0.604	0.621	0.639	0.656
3.750	0.674	0.692	0.710	0.728	0.745
4.000	0.763	0.780	0.797	0.814	0.830
4.250	0.845	0.860	0.876	0.891	0.907
4.500	0.922	0.938	0.954	0.970	0.986
4.750	1.002	1.019	1.036	1.053	1.071
5.000	1.089	1.107	1.126	1.145	1.165
5.250	1.185	1.206	1.228	1.249	1.271
5.500	1.293	1.315	1.336	1.357	1.378
5.750	1.398	1.419	1.440	1.461	1.483
6.000	1.506	1.530	1.557	1.585	1.616
6.250	1.648	1.681	1.714	1.747	1.779
6.500	1.811	1.842	1.871	1.896	1.919
6.750	1.940	1.961	1.983	2.006	2.031
7.000	2.058	2.087	2.119	2.155	2.194
7.250	2.238	2.287	2.341	2.400	2.463
7.500	2.533	2.620	2.757	2.970	3.250
7.750	3.571	3.916	4.272	4.631	4.984
8.000	5.323	5.629	5.867	6.023	6.108
8.250	6.147	6.152	6.133	6.095	6.043
8.500	5.981	5.912	5.845	5.785	5.731
8.750	5.681	5.631	5.582	5.532	5.480
9.000	5.426	5.370	5.313	5.254	5.194
9.250	5.134	5.073	5.009	4.943	4.875
9.500	4.807	4.737	4.669	4.602	4.537
9.750	4.473	4.410	4.349	4.288	4.226
10.000	4.165	4.104	4.043	3.983	3.923

Centennial Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
10.250	3.863	3.803	3.743	3.685	3.628
10.500	3.572	3.518	3.465	3.414	3.365
10.750	3.317	3.270	3.225	3.180	3.137
11.000	3.093	3.050	3.007	2.965	2.924
11.250	2.883	2.844	2.805	2.767	2.729
11.500	2.690	2.653	2.616	2.579	2.543
11.750	2.507	2.472	2.438	2.405	2.372
12.000	2.340	2.309	2.280	2.252	2.225
12.250	2.200	2.177	2.155	2.134	2.115
12.500	2.097	2.081	2.065	2.048	2.030
12.750	2.012	1.994	1.977	1.960	1.944
13.000	1.928	1.913	1.900	1.889	1.878
13.250	1.868	1.859	1.849	1.839	1.829
13.500	1.818	1.808	1.798	1.787	1.777
13.750	1.767	1.757	1.747	1.737	1.728
14.000	1.719	1.710	1.701	1.694	1.687
14.250	1.680	1.673	1.667	1.661	1.655
14.500	1.649	1.643	1.638	1.633	1.627
14.750	1.622	1.617	1.612	1.607	1.603
15.000	1.598	1.593	1.589	1.585	1.580
15.250	1.576	1.572	1.568	1.564	1.560
15.500	1.556	1.552	1.548	1.544	1.540
15.750	1.536	1.532	1.529	1.525	1.521
16.000	1.518	1.514	1.510	1.507	1.503
16.250	1.500	1.496	1.493	1.489	1.486
16.500	1.482	1.479	1.475	1.472	1.468
16.750	1.465	1.462	1.458	1.455	1.452
17.000	1.448	1.445	1.442	1.438	1.435
17.250	1.432	1.428	1.425	1.421	1.418
17.500	1.415	1.411	1.408	1.405	1.401
17.750	1.398	1.395	1.392	1.388	1.385
18.000	1.382	1.379	1.375	1.372	1.369
18.250	1.366	1.363	1.359	1.356	1.353
18.500	1.350	1.347	1.344	1.341	1.338
18.750	1.334	1.331	1.328	1.325	1.322
19.000	1.319	1.316	1.313	1.310	1.307
19.250	1.303	1.300	1.297	1.294	1.291
19.500	1.288	1.285	1.282	1.279	1.276
19.750	1.273	1.270	1.267	1.264	1.260
20.000	1.257	1.254	1.251	1.248	1.245
20.250	1.242	1.239	1.236	1.233	1.230

Centennial Site

Subsection: Time vs. Volume
Label: PO-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Time vs. Volume (ac-ft)

Output Time increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
20.500	1.227	1.224	1.221	1.218	1.215
20.750	1.212	1.209	1.206	1.203	1.200
21.000	1.197	1.194	1.191	1.187	1.184
21.250	1.181	1.178	1.175	1.172	1.169
21.500	1.166	1.163	1.160	1.157	1.154
21.750	1.151	1.148	1.145	1.142	1.139
22.000	1.136	1.133	1.130	1.127	1.124
22.250	1.121	1.118	1.115	1.111	1.108
22.500	1.105	1.102	1.099	1.096	1.093
22.750	1.090	1.087	1.084	1.081	1.078
23.000	1.075	1.072	1.069	1.066	1.063
23.250	1.060	1.057	1.054	1.051	1.048
23.500	1.045	1.042	1.039	1.036	1.033
23.750	1.031	1.028	1.025	1.022	1.019
24.000	1.016	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Elevation-Area Volume Curve
Label: PO-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Elevation (ft)	Planimeter (ft^2)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
2,495.00	0.0	0.510	0.000	0.000	0.000
2,496.00	0.0	0.560	1.604	0.535	0.535
2,498.00	0.0	0.640	1.799	1.199	1.734
2,500.00	0.0	0.730	2.054	1.369	3.103
2,502.00	0.0	0.830	2.338	1.559	4.662
2,504.00	0.0	0.940	2.653	1.769	6.431
2,506.00	0.0	1.050	2.983	1.989	8.420
2,508.00	0.0	1.170	3.328	2.219	10.639
2,510.00	0.0	1.310	3.718	2.479	13.117

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Centennial Site

Subsection: Elevation-Area Volume Curve
Label: PO-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
2,495.00	0.0	0.510	0.000	0.000	0.000
2,496.00	0.0	0.560	1.604	0.535	0.535
2,498.00	0.0	0.640	1.799	1.199	1.734
2,500.00	0.0	0.730	2.054	1.369	3.103
2,502.00	0.0	0.830	2.338	1.559	4.662
2,504.00	0.0	0.940	2.653	1.769	6.431
2,506.00	0.0	1.050	2.983	1.989	8.420
2,508.00	0.0	1.170	3.328	2.219	10.639
2,510.00	0.0	1.310	3.718	2.479	13.117

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Centennial Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Requested Pond Water Surface Elevations	
Minimum (Headwater)	2,495.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	2,510.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 2	Forward	Culvert - 1	2,502.50	2,510.00
Stand Pipe	Riser - 1	Forward	Culvert - 1	2,505.00	2,510.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	2,495.00	2,510.00
Culvert-Circular	Culvert - 1	Forward	TW	2,495.00	2,510.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	48.0 in
Length	170.00 ft
Length (Computed Barrel)	170.07 ft
Slope (Computed)	0.029 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.121
T2 ratio (HW/D)	1.282
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	2,499.48 ft	T1 Flow	87.96 ft³/s
T2 Elevation	2,500.13 ft	T2 Flow	100.53 ft³/s

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	2,505.00 ft
Diameter	60.0 in
Orifice Area	19.6 ft²
Orifice Coefficient	0.600
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	6
Elevation	2,495.00 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	6
Elevation	2,502.50 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft

Convergence Tolerances	
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Centennial Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 143.53 ft³/s
Upstream ID = Orifice - 2, Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,495.00	0.00	0.00	0.00	Free Outfall	0.00	0.00	(N/A)	0.00
2,495.50	1.14	2,495.46	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,496.00	4.52	2,495.93	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,496.50	9.51	2,496.37	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,497.00	14.40	2,496.71	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,497.50	19.09	2,496.98	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,498.00	23.50	2,497.22	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,498.50	27.60	2,497.43	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,499.00	31.43	2,497.60	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,499.50	35.02	2,497.77	Free Outfall	Free Outfall	0.00	0.03	(N/A)	0.00
2,500.00	38.44	2,497.92	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,500.50	41.63	2,498.05	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,501.00	44.71	2,498.18	Free Outfall	Free Outfall	0.00	0.01	(N/A)	0.00
2,501.50	47.60	2,498.30	Free Outfall	Free Outfall	0.00	0.04	(N/A)	0.00
2,502.00	50.41	2,498.41	Free Outfall	Free Outfall	0.00	0.03	(N/A)	0.00
2,502.50	53.09	2,498.52	Free Outfall	Free Outfall	0.00	0.04	(N/A)	0.00
2,503.00	59.55	2,498.77	Free Outfall	Free Outfall	0.00	0.05	(N/A)	0.00
2,503.50	71.66	2,499.22	Free Outfall	Free Outfall	0.00	0.02	(N/A)	0.00
2,504.00	81.88	2,499.60	Free Outfall	Free Outfall	0.00	0.04	(N/A)	0.00
2,504.50	89.37	2,499.87	Free Outfall	Free Outfall	0.00	0.05	(N/A)	0.00
2,505.00	95.99	2,500.12	Free Outfall	Free Outfall	0.00	0.08	(N/A)	0.00
2,505.50	115.54	2,500.90	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,506.00	142.31	2,502.56	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,506.50	158.98	2,504.65	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,507.00	171.52	2,506.48	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,507.50	176.46	2,507.24	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,508.00	180.68	2,507.90	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,508.50	184.35	2,508.48	Free Outfall	Free Outfall	0.00	0.00	(N/A)	0.00
2,509.00	187.55	2,509.00	Free Outfall	Free Outfall	0.00	1.46	(N/A)	0.00
2,509.50	190.62	2,509.50	Free Outfall	Free Outfall	0.00	9.86	(N/A)	0.00
2,510.00	193.63	2,510.00	Free Outfall	Free Outfall	0.00	17.68	(N/A)	0.00

Message

WS below an invert; no flow.

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 143.53 ft^3/s
Upstream ID = Orifice - 2, Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
CRIT.DEPTH CONTROL Vh= .104ft Dcr= .306ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .212ft Dcr= .614ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .316ft Dcr= .898ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .397ft Dcr= 1.111ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .466ft Dcr= 1.285ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .526ft Dcr= 1.431ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .580ft Dcr= 1.556ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .627ft Dcr= 1.664ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .671ft Dcr= 1.761ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .712ft Dcr= 1.849ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .750ft Dcr= 1.928ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .786ft Dcr= 2.001ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .820ft Dcr= 2.068ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .853ft Dcr= 2.131ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .884ft Dcr= 2.189ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .960ft Dcr= 2.325ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.106ft Dcr= 2.560ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.236ft Dcr= 2.742ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.336ft Dcr= 2.866ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= 1.430ft Dcr= 2.970ft CRIT.DEPTH Hev= .00ft

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Culvert - 1 (Culvert-Circular)

Mannings open channel maximum capacity: 143.53 ft³/s
Upstream ID = Orifice - 2, Riser - 1, Orifice - 1
Downstream ID = Tailwater (Pond Outfall)

Message
INLET CONTROL... Submerged: HW =5.90
INLET CONTROL... Submerged: HW =7.56
FULL FLOW...Lfull=155.21ft Vh=2.487ft HL=10.212ft Hev= .00ft
FULL FLOW...Lfull=163.66ft Vh=2.895ft HL=12.296ft Hev= .00ft
FULL FLOW...Lfull=165.34ft Vh=3.064ft HL=13.102ft Hev= .00ft
FULL FLOW...Lfull=166.32ft Vh=3.213ft HL=13.788ft Hev= .00ft
FULL FLOW...Lfull=166.85ft Vh=3.345ft HL=14.384ft Hev= .00ft
FULL FLOW...Lfull=167.48ft Vh=3.462ft HL=14.924ft Hev= .00ft
FULL FLOW...Lfull=167.73ft Vh=3.576ft HL=15.431ft Hev= .00ft
FULL FLOW...Lfull=167.96ft Vh=3.690ft HL=15.938ft Hev= .00ft

Centennial Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,495.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
2,495.50	0.00	0.00	0.00	2,495.46	0.00	0.00	(N/A)	0.00
2,496.00	0.00	0.00	0.00	2,495.93	0.00	0.00	(N/A)	0.00
2,496.50	0.00	0.00	0.00	2,496.37	0.00	0.00	(N/A)	0.00
2,497.00	0.00	0.00	0.00	2,496.71	0.00	0.00	(N/A)	0.00
2,497.50	0.00	0.00	0.00	2,496.98	0.00	0.00	(N/A)	0.00
2,498.00	0.00	0.00	0.00	2,497.22	0.00	0.00	(N/A)	0.00
2,498.50	0.00	0.00	0.00	2,497.43	0.00	0.00	(N/A)	0.00
2,499.00	0.00	0.00	0.00	2,497.60	0.00	0.00	(N/A)	0.00
2,499.50	0.00	0.00	0.00	2,497.77	0.00	0.00	(N/A)	0.00
2,500.00	0.00	0.00	0.00	2,497.92	0.00	0.00	(N/A)	0.00
2,500.50	0.00	0.00	0.00	2,498.05	0.00	0.00	(N/A)	0.00
2,501.00	0.00	0.00	0.00	2,498.18	0.00	0.00	(N/A)	0.00
2,501.50	0.00	0.00	0.00	2,498.30	0.00	0.00	(N/A)	0.00
2,502.00	0.00	0.00	0.00	2,498.41	0.00	0.00	(N/A)	0.00
2,502.50	0.00	0.00	0.00	2,498.52	0.00	0.00	(N/A)	0.00
2,503.00	0.00	0.00	0.00	2,498.77	0.00	0.00	(N/A)	0.00
2,503.50	0.00	0.00	0.00	2,499.22	0.00	0.00	(N/A)	0.00
2,504.00	0.00	0.00	0.00	2,499.60	0.00	0.00	(N/A)	0.00
2,504.50	0.00	0.00	0.00	2,499.87	0.00	0.00	(N/A)	0.00
2,505.00	0.00	0.00	0.00	2,500.12	0.00	0.00	(N/A)	0.00
2,505.50	16.66	2,505.50	Free Outfall	2,500.90	0.00	0.00	(N/A)	0.00
2,506.00	47.12	2,506.00	Free Outfall	2,502.56	0.00	0.00	(N/A)	0.00
2,506.50	86.57	2,506.50	Free Outfall	2,504.65	0.00	0.00	(N/A)	0.00
2,507.00	133.29	2,507.00	2,506.48	2,506.48	0.00	0.00	(N/A)	0.00
2,507.50	149.42	2,507.50	2,507.24	2,507.24	0.00	0.00	(N/A)	0.00
2,508.00	163.69	2,508.00	2,507.90	2,507.90	0.00	0.00	(N/A)	0.00
2,508.50	176.80	2,508.50	2,508.48	2,508.48	0.00	0.00	(N/A)	0.00
2,509.00	189.01	2,509.00	2,509.00	2,509.00	0.00	0.00	(N/A)	0.00
2,509.50	200.47	2,509.50	2,509.50	2,509.50	0.00	0.00	(N/A)	0.00
2,510.00	211.32	2,510.00	2,510.00	2,510.00	0.00	0.00	(N/A)	0.00

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Riser - 1 (Stand Pipe)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
Weir: H =0.5ft
Weir: H =1ft
Weir: H =1.5ft
FULLY CHARGED RISER: ADJUSTED TO WEIR: H =2ft
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.00
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=4.00
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=4.50
FULLY CHARGED RISER: Orifice Equation Control to Crest; H=5.00

Centennial Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft³/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft³/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,495.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
2,495.50	1.22	2,495.50	2,495.46	2,495.46	0.00	0.00	(N/A)	0.00
2,496.00	4.68	2,496.00	2,495.93	2,495.93	0.00	0.00	(N/A)	0.00
2,496.50	9.51	2,496.50	2,496.37	2,496.37	0.00	0.00	(N/A)	0.00
2,497.00	14.41	2,497.00	2,496.71	2,496.71	0.00	0.00	(N/A)	0.00
2,497.50	19.11	2,497.50	2,496.98	2,496.98	0.00	0.00	(N/A)	0.00
2,498.00	23.50	2,498.00	2,497.22	2,497.22	0.00	0.00	(N/A)	0.00
2,498.50	27.60	2,498.50	2,497.43	2,497.43	0.00	0.00	(N/A)	0.00
2,499.00	31.44	2,499.00	2,497.60	2,497.60	0.00	0.00	(N/A)	0.00
2,499.50	35.04	2,499.50	2,497.77	2,497.77	0.00	0.00	(N/A)	0.00
2,500.00	38.42	2,500.00	2,497.92	2,497.92	0.00	0.00	(N/A)	0.00
2,500.50	41.65	2,500.50	2,498.05	2,498.05	0.00	0.00	(N/A)	0.00
2,501.00	44.71	2,501.00	2,498.18	2,498.18	0.00	0.00	(N/A)	0.00
2,501.50	47.64	2,501.50	2,498.30	2,498.30	0.00	0.00	(N/A)	0.00
2,502.00	50.44	2,502.00	2,498.41	2,498.41	0.00	0.00	(N/A)	0.00
2,502.50	53.13	2,502.50	2,498.52	2,498.52	0.00	0.00	(N/A)	0.00
2,503.00	54.78	2,503.00	2,498.77	2,498.77	0.00	0.00	(N/A)	0.00
2,503.50	55.08	2,503.50	2,499.22	2,499.22	0.00	0.00	(N/A)	0.00
2,504.00	55.87	2,504.00	2,499.60	2,499.60	0.00	0.00	(N/A)	0.00
2,504.50	57.27	2,504.50	2,499.87	2,499.87	0.00	0.00	(N/A)	0.00
2,505.00	58.82	2,505.00	2,500.12	2,500.12	0.00	0.00	(N/A)	0.00
2,505.50	57.06	2,505.50	2,500.90	2,500.90	0.00	0.00	(N/A)	0.00
2,506.00	49.36	2,506.00	2,502.56	2,502.56	0.00	0.00	(N/A)	0.00
2,506.50	36.21	2,506.50	2,504.65	2,504.65	0.00	0.00	(N/A)	0.00
2,507.00	19.12	2,507.00	2,506.48	2,506.48	0.00	0.00	(N/A)	0.00
2,507.50	13.52	2,507.50	2,507.24	2,507.24	0.00	0.00	(N/A)	0.00
2,508.00	8.50	2,508.00	2,507.90	2,507.90	0.00	0.00	(N/A)	0.00
2,508.50	3.78	2,508.50	2,508.48	2,508.48	0.00	0.00	(N/A)	0.00
2,509.00	0.00	2,509.00	2,509.00	2,509.00	0.00	0.00	(N/A)	0.00
2,509.50	0.00	2,509.50	2,509.50	2,509.50	0.00	0.00	(N/A)	0.00
2,510.00	0.00	2,510.00	2,510.00	2,510.00	0.00	0.00	(N/A)	0.00

Message

WS below an invert; no flow.
BACKWATER CONTROL.. Vh= .038ft
hwDi= .461ft Lbw= .0ft Hev= .00ft

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
BACKWATER CONTROL.. Vh= .068ft hwDi= .931ft Lbw= .0ft Hev= .00ft
H =.13
H =.29
H =.52
H =.78
H =1.07
H =1.40
H =1.73
H =2.08
H =2.45
H =2.82
H =3.20
H =3.59
H =3.98
H =4.23
H =4.28
H =4.40
H =4.63
H =4.88
H =4.60
H =3.44
H =1.85
H =.52
H =.26
H =.10
H =.02
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Centennial Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Water Surface Elevation (ft)	Device Flow (ft^3/s)	(into) Headwater Hydraulic Grade Line (ft)	Converge Downstream Hydraulic Grade Line (ft)	Next Downstream Hydraulic Grade Line (ft)	Downstream Hydraulic Grade Line Error (ft)	Convergence Error (ft^3/s)	Downstream Channel Tailwater (ft)	Tailwater Error (ft)
2,495.00	0.00	0.00	0.00	0.00	0.00	0.00	(N/A)	0.00
2,495.50	0.00	0.00	0.00	2,495.46	0.00	0.00	(N/A)	0.00
2,496.00	0.00	0.00	0.00	2,495.93	0.00	0.00	(N/A)	0.00
2,496.50	0.00	0.00	0.00	2,496.37	0.00	0.00	(N/A)	0.00
2,497.00	0.00	0.00	0.00	2,496.71	0.00	0.00	(N/A)	0.00
2,497.50	0.00	0.00	0.00	2,496.98	0.00	0.00	(N/A)	0.00
2,498.00	0.00	0.00	0.00	2,497.22	0.00	0.00	(N/A)	0.00
2,498.50	0.00	0.00	0.00	2,497.43	0.00	0.00	(N/A)	0.00
2,499.00	0.00	0.00	0.00	2,497.60	0.00	0.00	(N/A)	0.00
2,499.50	0.00	0.00	0.00	2,497.77	0.00	0.00	(N/A)	0.00
2,500.00	0.00	0.00	0.00	2,497.92	0.00	0.00	(N/A)	0.00
2,500.50	0.00	0.00	0.00	2,498.05	0.00	0.00	(N/A)	0.00
2,501.00	0.00	0.00	0.00	2,498.18	0.00	0.00	(N/A)	0.00
2,501.50	0.00	0.00	0.00	2,498.30	0.00	0.00	(N/A)	0.00
2,502.00	0.00	0.00	0.00	2,498.41	0.00	0.00	(N/A)	0.00
2,502.50	0.00	0.00	0.00	2,498.52	0.00	0.00	(N/A)	0.00
2,503.00	4.82	2,503.00	Free Outfall	2,498.77	0.00	0.00	(N/A)	0.00
2,503.50	16.61	2,503.50	Free Outfall	2,499.22	0.00	0.00	(N/A)	0.00
2,504.00	26.06	2,504.00	Free Outfall	2,499.60	0.00	0.00	(N/A)	0.00
2,504.50	32.14	2,504.50	Free Outfall	2,499.87	0.00	0.00	(N/A)	0.00
2,505.00	37.25	2,505.00	Free Outfall	2,500.12	0.00	0.00	(N/A)	0.00
2,505.50	41.74	2,505.50	Free Outfall	2,500.90	0.00	0.00	(N/A)	0.00
2,506.00	45.78	2,506.00	2,502.56	2,502.56	0.00	0.00	(N/A)	0.00
2,506.50	36.21	2,506.50	2,504.65	2,504.65	0.00	0.00	(N/A)	0.00
2,507.00	19.12	2,507.00	2,506.48	2,506.48	0.00	0.00	(N/A)	0.00
2,507.50	13.52	2,507.50	2,507.24	2,507.24	0.00	0.00	(N/A)	0.00
2,508.00	8.50	2,508.00	2,507.90	2,507.90	0.00	0.00	(N/A)	0.00
2,508.50	3.78	2,508.50	2,508.48	2,508.48	0.00	0.00	(N/A)	0.00
2,509.00	0.00	2,509.00	2,509.00	2,509.00	0.00	0.00	(N/A)	0.00
2,509.50	0.00	2,509.50	2,509.50	2,509.50	0.00	0.00	(N/A)	0.00
2,510.00	0.00	2,510.00	2,510.00	2,510.00	0.00	0.00	(N/A)	0.00

Message

WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.

Centennial Site

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Culvert - 1 (Culvert-Circular)

Message
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
WS below an invert; no flow.
CRIT.DEPTH CONTROL Vh= .134ft Dcr= .366ft CRIT.DEPTH Hev= .00ft
CRIT.DEPTH CONTROL Vh= .302ft Dcr= .698ft CRIT.DEPTH Hev= .00ft
H =.96
H =1.46
H =1.96
H =2.46
H =2.96
H =1.85
H =.52
H =.26
H =.10
H =.02
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE
FLOW PRECEDENCE SET TO DOWNSTREAM CONTROLLING STRUCTURE

Centennial Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,495.00	0.00	(N/A)	0.00
2,495.50	1.18	(N/A)	0.00
2,496.00	4.60	(N/A)	0.00
2,496.50	9.51	(N/A)	0.00
2,497.00	14.40	(N/A)	0.00
2,497.50	19.09	(N/A)	0.00
2,498.00	23.50	(N/A)	0.00
2,498.50	27.60	(N/A)	0.00
2,499.00	31.43	(N/A)	0.00
2,499.50	35.02	(N/A)	0.00
2,500.00	38.44	(N/A)	0.00
2,500.50	41.63	(N/A)	0.00
2,501.00	44.71	(N/A)	0.00
2,501.50	47.60	(N/A)	0.00
2,502.00	50.41	(N/A)	0.00
2,502.50	53.09	(N/A)	0.00
2,503.00	59.55	(N/A)	0.00
2,503.50	71.66	(N/A)	0.00
2,504.00	81.88	(N/A)	0.00
2,504.50	89.37	(N/A)	0.00
2,505.00	95.99	(N/A)	0.00
2,505.50	115.46	(N/A)	0.00
2,506.00	142.27	(N/A)	0.00
2,506.50	158.98	(N/A)	0.00
2,507.00	171.52	(N/A)	0.00
2,507.50	176.46	(N/A)	0.00
2,508.00	180.68	(N/A)	0.00
2,508.50	184.35	(N/A)	0.00
2,509.00	187.55	(N/A)	0.00
2,509.50	190.62	(N/A)	0.00
2,510.00	193.63	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)

Centennial Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Composite Outflow Summary

Contributing Structures
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1

Centennial Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Composite Outflow Summary

Contributing Structures
Riser - 1,Culvert - 1 (no Q: Orifice - 2,Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 2,Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 2,Orifice - 1)

Centennial Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Requested Pond Water Surface Elevations	
Minimum (Headwater)	2,495.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	2,510.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 2	Forward	Culvert - 1	2,502.50	2,510.00
Stand Pipe	Riser - 1	Forward	Culvert - 1	2,505.00	2,510.00
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	2,495.00	2,510.00
Culvert-Circular	Culvert - 1	Forward	TW	2,495.00	2,510.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Centennial Site

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	48.0 in
Length	170.00 ft
Length (Computed Barrel)	170.07 ft
Slope (Computed)	0.029 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.017
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.121
T2 ratio (HW/D)	1.282
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	2,499.48 ft	T1 Flow	87.96 ft³/s
T2 Elevation	2,500.13 ft	T2 Flow	100.53 ft³/s

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	2,505.00 ft
Diameter	60.0 in
Orifice Area	19.6 ft²
Orifice Coefficient	0.600
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	6
Elevation	2,495.00 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	6
Elevation	2,502.50 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft

Convergence Tolerances	
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
Contributing Structures			

Subsection: Individual Outlet Curves
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = ()

Upstream ID =
Downstream ID =

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)

Contributing Structures

Centennial Site

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
2,495.00	0.00	(N/A)	0.00
2,495.50	1.18	(N/A)	0.00
2,496.00	4.60	(N/A)	0.00
2,496.50	9.51	(N/A)	0.00
2,497.00	14.40	(N/A)	0.00
2,497.50	19.09	(N/A)	0.00
2,498.00	23.50	(N/A)	0.00
2,498.50	27.60	(N/A)	0.00
2,499.00	31.43	(N/A)	0.00
2,499.50	35.02	(N/A)	0.00
2,500.00	38.44	(N/A)	0.00
2,500.50	41.63	(N/A)	0.00
2,501.00	44.71	(N/A)	0.00
2,501.50	47.60	(N/A)	0.00
2,502.00	50.41	(N/A)	0.00
2,502.50	53.09	(N/A)	0.00
2,503.00	59.55	(N/A)	0.00
2,503.50	71.64	(N/A)	0.00
2,504.00	81.86	(N/A)	0.00
2,504.50	89.37	(N/A)	0.00
2,505.00	96.02	(N/A)	0.00
2,505.50	115.46	(N/A)	0.00
2,506.00	142.27	(N/A)	0.00
2,506.50	158.98	(N/A)	0.00
2,507.00	171.52	(N/A)	0.00
2,507.50	176.46	(N/A)	0.00
2,508.00	180.68	(N/A)	0.00
2,508.50	184.35	(N/A)	0.00
2,509.00	187.55	(N/A)	0.00
2,509.50	190.62	(N/A)	0.00
2,510.00	193.63	(N/A)	0.00

Contributing Structures

(no Q: Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Composite Outflow Summary

Contributing Structures
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Orifice - 2,Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1
Orifice - 2,Riser - 1,Orifice - 1,Culvert - 1

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Composite Outflow Summary

Contributing Structures
Riser - 1,Culvert - 1 (no Q: Orifice - 2,Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 2,Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 2,Orifice - 1)

Centennial Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Peak Discharge	45.14 ft³/s
Time to Peak	8.350 hours
Hydrograph Volume	28.027 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.000	0.00	0.00	0.00	0.01	0.02
2.250	0.03	0.05	0.06	0.08	0.11
2.500	0.13	0.16	0.20	0.23	0.27
2.750	0.30	0.34	0.39	0.43	0.48
3.000	0.52	0.57	0.63	0.68	0.73
3.250	0.78	0.84	0.90	0.96	1.02
3.500	1.08	1.14	1.26	1.45	1.63
3.750	1.82	2.01	2.20	2.38	2.57
4.000	2.76	2.94	3.13	3.31	3.49
4.250	3.66	3.84	4.02	4.19	4.37
4.500	4.54	4.77	5.01	5.24	5.48
4.750	5.71	5.94	6.18	6.41	6.64
5.000	6.87	7.11	7.35	7.59	7.84
5.250	8.09	8.34	8.59	8.85	9.10
5.500	9.35	9.60	9.84	10.07	10.30
5.750	10.53	10.76	10.99	11.23	11.47
6.000	11.72	11.98	12.26	12.56	12.88
6.250	13.21	13.55	13.89	14.22	14.55
6.500	14.85	15.15	15.42	15.66	15.87
6.750	16.07	16.27	16.47	16.69	16.92
7.000	17.18	17.45	17.76	18.10	18.47
7.250	18.88	19.31	19.75	20.25	20.79
7.500	21.38	22.12	23.29	24.98	27.16
7.750	29.46	31.83	34.08	36.24	38.29
8.000	40.09	41.74	43.02	43.95	44.56
8.250	44.91	45.09	45.14	45.09	44.96
8.500	44.76	44.48	44.19	43.90	43.63
8.750	43.34	43.04	42.72	42.39	42.03
9.000	41.65	41.24	40.81	40.36	39.90
9.250	39.44	38.96	38.48	37.95	37.41
9.500	36.87	36.34	35.82	35.32	34.83
9.750	34.33	33.85	33.38	32.92	32.46
10.000	32.02	31.59	31.14	30.67	30.22
10.250	29.78	29.34	28.92	28.51	28.11
10.500	27.72	27.32	26.93	26.56	26.21
10.750	25.88	25.56	25.24	24.94	24.65
11.000	24.36	24.08	23.80	23.53	23.24

Centennial Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.250	22.96	22.68	22.41	22.14	21.88
11.500	21.63	21.38	21.13	20.89	20.64
11.750	20.40	20.17	19.94	19.72	19.51
12.000	19.31	19.11	18.91	18.72	18.54
12.250	18.38	18.22	18.08	17.96	17.85
12.500	17.75	17.66	17.57	17.47	17.37
12.750	17.25	17.14	17.03	16.93	16.82
13.000	16.73	16.63	16.56	16.49	16.44
13.250	16.39	16.34	16.28	16.23	16.17
13.500	16.10	16.03	15.97	15.90	15.83
13.750	15.76	15.69	15.62	15.55	15.49
14.000	15.42	15.36	15.31	15.26	15.21
14.250	15.17	15.12	15.08	15.04	15.00
14.500	14.96	14.92	14.89	14.85	14.81
14.750	14.78	14.74	14.70	14.67	14.63
15.000	14.60	14.56	14.53	14.50	14.46
15.250	14.43	14.40	14.36	14.33	14.29
15.500	14.26	14.23	14.19	14.16	14.12
15.750	14.09	14.06	14.03	13.99	13.96
16.000	13.93	13.90	13.87	13.83	13.80
16.250	13.77	13.74	13.71	13.68	13.64
16.500	13.61	13.58	13.55	13.52	13.49
16.750	13.46	13.43	13.40	13.36	13.33
17.000	13.30	13.27	13.24	13.21	13.18
17.250	13.15	13.12	13.09	13.05	13.02
17.500	12.99	12.96	12.93	12.90	12.87
17.750	12.84	12.81	12.78	12.75	12.72
18.000	12.68	12.65	12.62	12.59	12.56
18.250	12.53	12.50	12.47	12.44	12.40
18.500	12.37	12.34	12.31	12.28	12.25
18.750	12.22	12.18	12.15	12.12	12.09
19.000	12.06	12.03	12.00	11.96	11.93
19.250	11.90	11.87	11.84	11.81	11.78
19.500	11.74	11.71	11.68	11.65	11.62
19.750	11.59	11.56	11.52	11.49	11.46
20.000	11.43	11.39	11.36	11.33	11.30
20.250	11.27	11.24	11.21	11.17	11.14
20.500	11.11	11.08	11.04	11.01	10.98
20.750	10.95	10.92	10.88	10.85	10.82
21.000	10.79	10.76	10.73	10.69	10.66
21.250	10.63	10.60	10.56	10.53	10.50
21.500	10.47	10.44	10.40	10.37	10.34

Centennial Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.750	10.31	10.27	10.24	10.21	10.18
22.000	10.15	10.11	10.08	10.05	10.02
22.250	9.98	9.95	9.92	9.89	9.85
22.500	9.82	9.79	9.76	9.72	9.69
22.750	9.66	9.63	9.60	9.56	9.53
23.000	9.50	9.46	9.43	9.39	9.36
23.250	9.33	9.29	9.26	9.23	9.20
23.500	9.16	9.13	9.10	9.06	9.03
23.750	9.00	8.96	8.93	8.90	8.86
24.000	8.83	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Peak Discharge	75.75 ft³/s
Time to Peak	8.300 hours
Hydrograph Volume	43.107 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.550	0.00	0.00	0.01	0.02	0.04
1.800	0.06	0.09	0.12	0.16	0.21
2.050	0.25	0.31	0.36	0.43	0.49
2.300	0.56	0.64	0.72	0.80	0.89
2.550	0.98	1.07	1.17	1.40	1.67
2.800	1.93	2.19	2.44	2.70	2.95
3.050	3.20	3.44	3.68	3.91	4.14
3.300	4.37	4.60	4.91	5.21	5.51
3.550	5.81	6.10	6.41	6.71	7.02
3.800	7.33	7.63	7.94	8.24	8.54
4.050	8.83	9.12	9.40	9.67	9.93
4.300	10.19	10.45	10.71	10.97	11.23
4.550	11.49	11.75	12.02	12.29	12.56
4.800	12.83	13.11	13.40	13.69	13.98
5.050	14.28	14.58	14.88	15.19	15.51
5.300	15.83	16.16	16.50	16.83	17.17
5.550	17.50	17.83	18.15	18.47	18.78
5.800	19.10	19.39	19.69	20.00	20.33
6.050	20.67	21.03	21.43	21.86	22.31
6.300	22.76	23.22	23.66	24.07	24.48
6.550	24.88	25.25	25.56	25.85	26.11
6.800	26.38	26.65	26.94	27.25	27.58
7.050	27.92	28.29	28.70	29.15	29.65
7.300	30.20	30.81	31.47	32.13	32.85
7.550	33.75	35.15	37.18	39.71	42.42
7.800	45.14	47.73	50.20	52.47	56.68
8.050	62.54	68.96	72.87	74.78	75.63
8.300	75.75	75.32	74.48	73.32	71.93
8.550	70.15	68.36	66.76	65.33	63.96
8.800	62.61	61.27	59.91	58.99	58.20
9.050	57.37	56.52	55.65	54.75	53.85
9.300	53.02	52.62	52.21	51.78	51.34
9.550	50.90	50.46	50.00	49.56	49.12
9.800	48.69	48.26	47.84	47.40	46.96
10.050	46.52	46.08	45.64	45.20	44.76
10.300	44.28	43.81	43.34	42.88	42.43
10.550	41.99	41.56	41.12	40.70	40.29

Centennial Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.800	39.89	39.50	39.11	38.73	38.35
11.050	37.94	37.53	37.14	36.75	36.36
11.300	35.98	35.61	35.24	34.86	34.47
11.550	34.09	33.71	33.33	32.96	32.58
11.800	32.22	31.86	31.52	31.15	30.80
12.050	30.45	30.12	29.81	29.50	29.22
12.300	28.95	28.70	28.46	28.24	28.04
12.550	27.85	27.67	27.46	27.23	27.01
12.800	26.79	26.57	26.36	26.16	25.96
13.050	25.78	25.61	25.47	25.34	25.21
13.300	25.09	24.96	24.84	24.71	24.58
13.550	24.44	24.31	24.18	24.05	23.92
13.800	23.79	23.66	23.54	23.41	23.29
14.050	23.16	23.05	22.94	22.84	22.75
14.300	22.66	22.57	22.49	22.41	22.33
14.550	22.25	22.17	22.10	22.02	21.95
14.800	21.88	21.81	21.75	21.68	21.61
15.050	21.55	21.49	21.43	21.37	21.31
15.300	21.25	21.19	21.14	21.08	21.02
15.550	20.96	20.91	20.85	20.80	20.75
15.800	20.69	20.64	20.59	20.54	20.49
16.050	20.44	20.39	20.34	20.28	20.23
16.300	20.18	20.13	20.09	20.04	19.99
16.550	19.94	19.89	19.84	19.79	19.74
16.800	19.70	19.65	19.60	19.55	19.51
17.050	19.46	19.41	19.36	19.32	19.27
17.300	19.22	19.17	19.13	19.08	19.03
17.550	18.98	18.93	18.88	18.83	18.78
17.800	18.73	18.68	18.63	18.58	18.53
18.050	18.48	18.43	18.38	18.33	18.28
18.300	18.23	18.19	18.14	18.09	18.05
18.550	18.00	17.95	17.90	17.85	17.80
18.800	17.76	17.71	17.66	17.61	17.57
19.050	17.52	17.47	17.42	17.38	17.33
19.300	17.28	17.24	17.19	17.14	17.10
19.550	17.05	17.00	16.96	16.91	16.86
19.800	16.81	16.77	16.72	16.67	16.62
20.050	16.58	16.53	16.48	16.44	16.39
20.300	16.34	16.30	16.25	16.20	16.15
20.550	16.11	16.06	16.01	15.96	15.91
20.800	15.87	15.82	15.78	15.73	15.68
21.050	15.64	15.59	15.54	15.49	15.44

Centennial Site

Subsection: Diverted Hydrograph
Label: Outlet-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.300	15.40	15.35	15.30	15.26	15.21
21.550	15.16	15.11	15.07	15.02	14.97
21.800	14.92	14.88	14.83	14.78	14.74
22.050	14.69	14.64	14.59	14.55	14.50
22.300	14.45	14.40	14.35	14.30	14.25
22.550	14.20	14.15	14.10	14.05	14.00
22.800	13.95	13.90	13.85	13.80	13.75
23.050	13.70	13.65	13.60	13.55	13.51
23.300	13.46	13.41	13.36	13.32	13.27
23.550	13.22	13.17	13.12	13.07	13.02
23.800	12.98	12.93	12.88	12.83	12.78

Centennial Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,495.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2,495.00	0.00	0.000	0.510	0.00	0.00	0.00
2,495.50	1.18	0.261	0.535	0.00	1.18	127.58
2,496.00	4.60	0.535	0.560	0.00	4.60	263.45
2,496.50	9.51	0.820	0.579	0.00	9.51	406.22
2,497.00	14.40	1.114	0.599	0.00	14.40	553.75
2,497.50	19.09	1.419	0.619	0.00	19.09	705.91
2,498.00	23.50	1.734	0.640	0.00	23.50	862.71
2,498.50	27.60	2.059	0.662	0.00	27.60	1,024.35
2,499.00	31.43	2.396	0.684	0.00	31.43	1,191.05
2,499.50	35.02	2.744	0.707	0.00	35.02	1,362.97
2,500.00	38.44	3.103	0.730	0.00	38.44	1,540.25
2,500.50	41.63	3.474	0.754	0.00	41.63	1,723.05
2,501.00	44.71	3.857	0.779	0.00	44.71	1,911.69
2,501.50	47.60	4.253	0.804	0.00	47.60	2,106.18
2,502.00	50.41	4.662	0.830	0.00	50.41	2,306.75
2,502.50	53.09	5.084	0.857	0.00	53.09	2,513.53
2,503.00	59.55	5.519	0.884	0.00	59.55	2,730.65
2,503.50	71.66	5.968	0.912	0.00	71.66	2,960.07
2,504.00	81.88	6.431	0.940	0.00	81.88	3,194.35
2,504.50	89.37	6.907	0.967	0.00	89.37	3,432.57
2,505.00	95.99	7.398	0.994	0.00	95.99	3,676.48
2,505.50	115.46	7.902	1.022	0.00	115.46	3,939.90
2,506.00	142.27	8.420	1.050	0.00	142.27	4,217.40
2,506.50	158.98	8.952	1.079	0.00	158.98	4,491.77
2,507.00	171.52	9.499	1.109	0.00	171.52	4,769.11
2,507.50	176.46	10.061	1.139	0.00	176.46	5,046.13
2,508.00	180.68	10.639	1.170	0.00	180.68	5,329.77
2,508.50	184.35	11.232	1.204	0.00	184.35	5,620.72
2,509.00	187.55	11.843	1.239	0.00	187.55	5,919.54

Centennial Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
2,509.50	190.62	12.471	1.274	0.00	190.62	6,226.71
2,510.00	193.63	13.117	1.310	0.00	193.63	6,542.41

Centennial Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,495.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
2,495.00	0.00	0.000	0.510	0.00	0.00	0.00
2,495.50	1.18	0.261	0.535	0.00	1.18	127.58
2,496.00	4.60	0.535	0.560	0.00	4.60	263.45
2,496.50	9.51	0.820	0.579	0.00	9.51	406.22
2,497.00	14.40	1.114	0.599	0.00	14.40	553.75
2,497.50	19.09	1.419	0.619	0.00	19.09	705.91
2,498.00	23.50	1.734	0.640	0.00	23.50	862.71
2,498.50	27.60	2.059	0.662	0.00	27.60	1,024.35
2,499.00	31.43	2.396	0.684	0.00	31.43	1,191.05
2,499.50	35.02	2.744	0.707	0.00	35.02	1,362.97
2,500.00	38.44	3.103	0.730	0.00	38.44	1,540.25
2,500.50	41.63	3.474	0.754	0.00	41.63	1,723.05
2,501.00	44.71	3.857	0.779	0.00	44.71	1,911.69
2,501.50	47.60	4.253	0.804	0.00	47.60	2,106.18
2,502.00	50.41	4.662	0.830	0.00	50.41	2,306.75
2,502.50	53.09	5.084	0.857	0.00	53.09	2,513.53
2,503.00	59.55	5.519	0.884	0.00	59.55	2,730.65
2,503.50	71.64	5.968	0.912	0.00	71.64	2,960.04
2,504.00	81.86	6.431	0.940	0.00	81.86	3,194.33
2,504.50	89.37	6.907	0.967	0.00	89.37	3,432.56
2,505.00	96.02	7.398	0.994	0.00	96.02	3,676.51
2,505.50	115.46	7.902	1.022	0.00	115.46	3,939.90
2,506.00	142.27	8.420	1.050	0.00	142.27	4,217.40
2,506.50	158.98	8.952	1.079	0.00	158.98	4,491.77
2,507.00	171.52	9.499	1.109	0.00	171.52	4,769.11
2,507.50	176.46	10.061	1.139	0.00	176.46	5,046.13
2,508.00	180.68	10.639	1.170	0.00	180.68	5,329.77
2,508.50	184.35	11.232	1.204	0.00	184.35	5,620.72
2,509.00	187.55	11.843	1.239	0.00	187.55	5,919.54

Centennial Site

Subsection: Elevation-Volume-Flow Table (Pond)
Label: PO-1

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
2,509.50	190.62	12.471	1.274	0.00	190.62	6,226.71
2,510.00	193.63	13.117	1.310	0.00	193.63	6,542.41

Centennial Site

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,495.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	89.68 ft³/s	Time to Peak (Flow, In)	7.950 hours
Flow (Peak Outlet)	45.14 ft³/s	Time to Peak (Flow, Outlet)	8.350 hours

Elevation (Water Surface, Peak)	2,501.07 ft
Volume (Peak)	3.915 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	28.807 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	28.027 ac-ft
Volume (Retained)	0.744 ac-ft
Volume (Unrouted)	-0.036 ac-ft
Error (Mass Balance)	0.1 %

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	2,495.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	137.41 ft³/s	Time to Peak (Flow, In)	7.950 hours
Flow (Peak Outlet)	75.75 ft³/s	Time to Peak (Flow, Outlet)	8.300 hours

Elevation (Water Surface, Peak)	2,503.70 ft
Volume (Peak)	6.152 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	44.124 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	43.107 ac-ft
Volume (Retained)	0.965 ac-ft
Volume (Unrouted)	-0.052 ac-ft
Error (Mass Balance)	0.1 %

Centennial Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

Peak Discharge	45.14 ft³/s
Time to Peak	8.350 hours
Hydrograph Volume	28.027 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
2.000	0.00	0.00	0.00	0.01	0.02
2.250	0.03	0.05	0.06	0.08	0.11
2.500	0.13	0.16	0.20	0.23	0.27
2.750	0.30	0.34	0.39	0.43	0.48
3.000	0.52	0.57	0.63	0.68	0.73
3.250	0.78	0.84	0.90	0.96	1.02
3.500	1.08	1.14	1.26	1.45	1.63
3.750	1.82	2.01	2.20	2.38	2.57
4.000	2.76	2.94	3.13	3.31	3.49
4.250	3.66	3.84	4.02	4.19	4.37
4.500	4.54	4.77	5.01	5.24	5.48
4.750	5.71	5.94	6.18	6.41	6.64
5.000	6.87	7.11	7.35	7.59	7.84
5.250	8.09	8.34	8.59	8.85	9.10
5.500	9.35	9.60	9.84	10.07	10.30
5.750	10.53	10.76	10.99	11.23	11.47
6.000	11.72	11.98	12.26	12.56	12.88
6.250	13.21	13.55	13.89	14.22	14.55
6.500	14.85	15.15	15.42	15.66	15.87
6.750	16.07	16.27	16.47	16.69	16.92
7.000	17.18	17.45	17.76	18.10	18.47
7.250	18.88	19.31	19.75	20.25	20.79
7.500	21.38	22.12	23.29	24.98	27.16
7.750	29.46	31.83	34.08	36.24	38.29
8.000	40.09	41.74	43.02	43.95	44.56
8.250	44.91	45.09	45.14	45.09	44.96
8.500	44.76	44.48	44.19	43.90	43.63
8.750	43.34	43.04	42.72	42.39	42.03
9.000	41.65	41.24	40.81	40.36	39.90
9.250	39.44	38.96	38.48	37.95	37.41
9.500	36.87	36.34	35.82	35.32	34.83
9.750	34.33	33.85	33.38	32.92	32.46
10.000	32.02	31.59	31.14	30.67	30.22
10.250	29.78	29.34	28.92	28.51	28.11
10.500	27.72	27.32	26.93	26.56	26.21
10.750	25.88	25.56	25.24	24.94	24.65
11.000	24.36	24.08	23.80	23.53	23.24

Centennial Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
11.250	22.96	22.68	22.41	22.14	21.88
11.500	21.63	21.38	21.13	20.89	20.64
11.750	20.40	20.17	19.94	19.72	19.51
12.000	19.31	19.11	18.91	18.72	18.54
12.250	18.38	18.22	18.08	17.96	17.85
12.500	17.75	17.66	17.57	17.47	17.37
12.750	17.25	17.14	17.03	16.93	16.82
13.000	16.73	16.63	16.56	16.49	16.44
13.250	16.39	16.34	16.28	16.23	16.17
13.500	16.10	16.03	15.97	15.90	15.83
13.750	15.76	15.69	15.62	15.55	15.49
14.000	15.42	15.36	15.31	15.26	15.21
14.250	15.17	15.12	15.08	15.04	15.00
14.500	14.96	14.92	14.89	14.85	14.81
14.750	14.78	14.74	14.70	14.67	14.63
15.000	14.60	14.56	14.53	14.50	14.46
15.250	14.43	14.40	14.36	14.33	14.29
15.500	14.26	14.23	14.19	14.16	14.12
15.750	14.09	14.06	14.03	13.99	13.96
16.000	13.93	13.90	13.87	13.83	13.80
16.250	13.77	13.74	13.71	13.68	13.64
16.500	13.61	13.58	13.55	13.52	13.49
16.750	13.46	13.43	13.40	13.36	13.33
17.000	13.30	13.27	13.24	13.21	13.18
17.250	13.15	13.12	13.09	13.05	13.02
17.500	12.99	12.96	12.93	12.90	12.87
17.750	12.84	12.81	12.78	12.75	12.72
18.000	12.68	12.65	12.62	12.59	12.56
18.250	12.53	12.50	12.47	12.44	12.40
18.500	12.37	12.34	12.31	12.28	12.25
18.750	12.22	12.18	12.15	12.12	12.09
19.000	12.06	12.03	12.00	11.96	11.93
19.250	11.90	11.87	11.84	11.81	11.78
19.500	11.74	11.71	11.68	11.65	11.62
19.750	11.59	11.56	11.52	11.49	11.46
20.000	11.43	11.39	11.36	11.33	11.30
20.250	11.27	11.24	11.21	11.17	11.14
20.500	11.11	11.08	11.04	11.01	10.98
20.750	10.95	10.92	10.88	10.85	10.82
21.000	10.79	10.76	10.73	10.69	10.66
21.250	10.63	10.60	10.56	10.53	10.50
21.500	10.47	10.44	10.40	10.37	10.34

Centennial Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 10 years
Storm Event: Idaho Maryland NC 10-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.750	10.31	10.27	10.24	10.21	10.18
22.000	10.15	10.11	10.08	10.05	10.02
22.250	9.98	9.95	9.92	9.89	9.85
22.500	9.82	9.79	9.76	9.72	9.69
22.750	9.66	9.63	9.60	9.56	9.53
23.000	9.50	9.46	9.43	9.39	9.36
23.250	9.33	9.29	9.26	9.23	9.20
23.500	9.16	9.13	9.10	9.06	9.03
23.750	9.00	8.96	8.93	8.90	8.86
24.000	8.83	(N/A)	(N/A)	(N/A)	(N/A)

Centennial Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Peak Discharge	75.75 ft³/s
Time to Peak	8.300 hours
Hydrograph Volume	43.107 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
1.550	0.00	0.00	0.01	0.02	0.04
1.800	0.06	0.09	0.12	0.16	0.21
2.050	0.25	0.31	0.36	0.43	0.49
2.300	0.56	0.64	0.72	0.80	0.89
2.550	0.98	1.07	1.17	1.40	1.67
2.800	1.93	2.19	2.44	2.70	2.95
3.050	3.20	3.44	3.68	3.91	4.14
3.300	4.37	4.60	4.91	5.21	5.51
3.550	5.81	6.10	6.41	6.71	7.02
3.800	7.33	7.63	7.94	8.24	8.54
4.050	8.83	9.12	9.40	9.67	9.93
4.300	10.19	10.45	10.71	10.97	11.23
4.550	11.49	11.75	12.02	12.29	12.56
4.800	12.83	13.11	13.40	13.69	13.98
5.050	14.28	14.58	14.88	15.19	15.51
5.300	15.83	16.16	16.50	16.83	17.17
5.550	17.50	17.83	18.15	18.47	18.78
5.800	19.10	19.39	19.69	20.00	20.33
6.050	20.67	21.03	21.43	21.86	22.31
6.300	22.76	23.22	23.66	24.07	24.48
6.550	24.88	25.25	25.56	25.85	26.11
6.800	26.38	26.65	26.94	27.25	27.58
7.050	27.92	28.29	28.70	29.15	29.65
7.300	30.20	30.81	31.47	32.13	32.85
7.550	33.75	35.15	37.18	39.71	42.42
7.800	45.14	47.73	50.20	52.47	56.68
8.050	62.54	68.96	72.87	74.78	75.63
8.300	75.75	75.32	74.48	73.32	71.93
8.550	70.15	68.36	66.76	65.33	63.96
8.800	62.61	61.27	59.91	58.99	58.20
9.050	57.37	56.52	55.65	54.75	53.85
9.300	53.02	52.62	52.21	51.78	51.34
9.550	50.90	50.46	50.00	49.56	49.12
9.800	48.69	48.26	47.84	47.40	46.96
10.050	46.52	46.08	45.64	45.20	44.76
10.300	44.28	43.81	43.34	42.88	42.43
10.550	41.99	41.56	41.12	40.70	40.29

Centennial Site

Subsection: Pond Routed Hydrograph (total out)
Label: PO-1 (OUT)

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
10.800	39.89	39.50	39.11	38.73	38.35
11.050	37.94	37.53	37.14	36.75	36.36
11.300	35.98	35.61	35.24	34.86	34.47
11.550	34.09	33.71	33.33	32.96	32.58
11.800	32.22	31.86	31.52	31.15	30.80
12.050	30.45	30.12	29.81	29.50	29.22
12.300	28.95	28.70	28.46	28.24	28.04
12.550	27.85	27.67	27.46	27.23	27.01
12.800	26.79	26.57	26.36	26.16	25.96
13.050	25.78	25.61	25.47	25.34	25.21
13.300	25.09	24.96	24.84	24.71	24.58
13.550	24.44	24.31	24.18	24.05	23.92
13.800	23.79	23.66	23.54	23.41	23.29
14.050	23.16	23.05	22.94	22.84	22.75
14.300	22.66	22.57	22.49	22.41	22.33
14.550	22.25	22.17	22.10	22.02	21.95
14.800	21.88	21.81	21.75	21.68	21.61
15.050	21.55	21.49	21.43	21.37	21.31
15.300	21.25	21.19	21.14	21.08	21.02
15.550	20.96	20.91	20.85	20.80	20.75
15.800	20.69	20.64	20.59	20.54	20.49
16.050	20.44	20.39	20.34	20.28	20.23
16.300	20.18	20.13	20.09	20.04	19.99
16.550	19.94	19.89	19.84	19.79	19.74
16.800	19.70	19.65	19.60	19.55	19.51
17.050	19.46	19.41	19.36	19.32	19.27
17.300	19.22	19.17	19.13	19.08	19.03
17.550	18.98	18.93	18.88	18.83	18.78
17.800	18.73	18.68	18.63	18.58	18.53
18.050	18.48	18.43	18.38	18.33	18.28
18.300	18.23	18.19	18.14	18.09	18.05
18.550	18.00	17.95	17.90	17.85	17.80
18.800	17.76	17.71	17.66	17.61	17.57
19.050	17.52	17.47	17.42	17.38	17.33
19.300	17.28	17.24	17.19	17.14	17.10
19.550	17.05	17.00	16.96	16.91	16.86
19.800	16.81	16.77	16.72	16.67	16.62
20.050	16.58	16.53	16.48	16.44	16.39
20.300	16.34	16.30	16.25	16.20	16.15
20.550	16.11	16.06	16.01	15.96	15.91
20.800	15.87	15.82	15.78	15.73	15.68
21.050	15.64	15.59	15.54	15.49	15.44

Centennial Site

Subsection: Pond Routed Hydrograph (total out) Return Event: 100 years

Label: PO-1 (OUT) Storm Event: Idaho Maryland NC 100-yr

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.050 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
21.300	15.40	15.35	15.30	15.26	15.21
21.550	15.16	15.11	15.07	15.02	14.97
21.800	14.92	14.88	14.83	14.78	14.74
22.050	14.69	14.64	14.59	14.55	14.50
22.300	14.45	14.40	14.35	14.30	14.25
22.550	14.20	14.15	14.10	14.05	14.00
22.800	13.95	13.90	13.85	13.80	13.75
23.050	13.70	13.65	13.60	13.55	13.51
23.300	13.46	13.41	13.36	13.32	13.27
23.550	13.22	13.17	13.12	13.07	13.02
23.800	12.98	12.93	12.88	12.83	12.78

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	28.807	7.950	89.68
Flow (In)	PO-1	28.807	7.950	89.68

Centennial Site

Subsection: Pond Inflow Summary
Label: PO-1 (IN)

Return Event: 100 years
Storm Event: Idaho Maryland NC 100-yr

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	44.124	7.950	137.41
Flow (In)	PO-1	44.124	7.950	137.41

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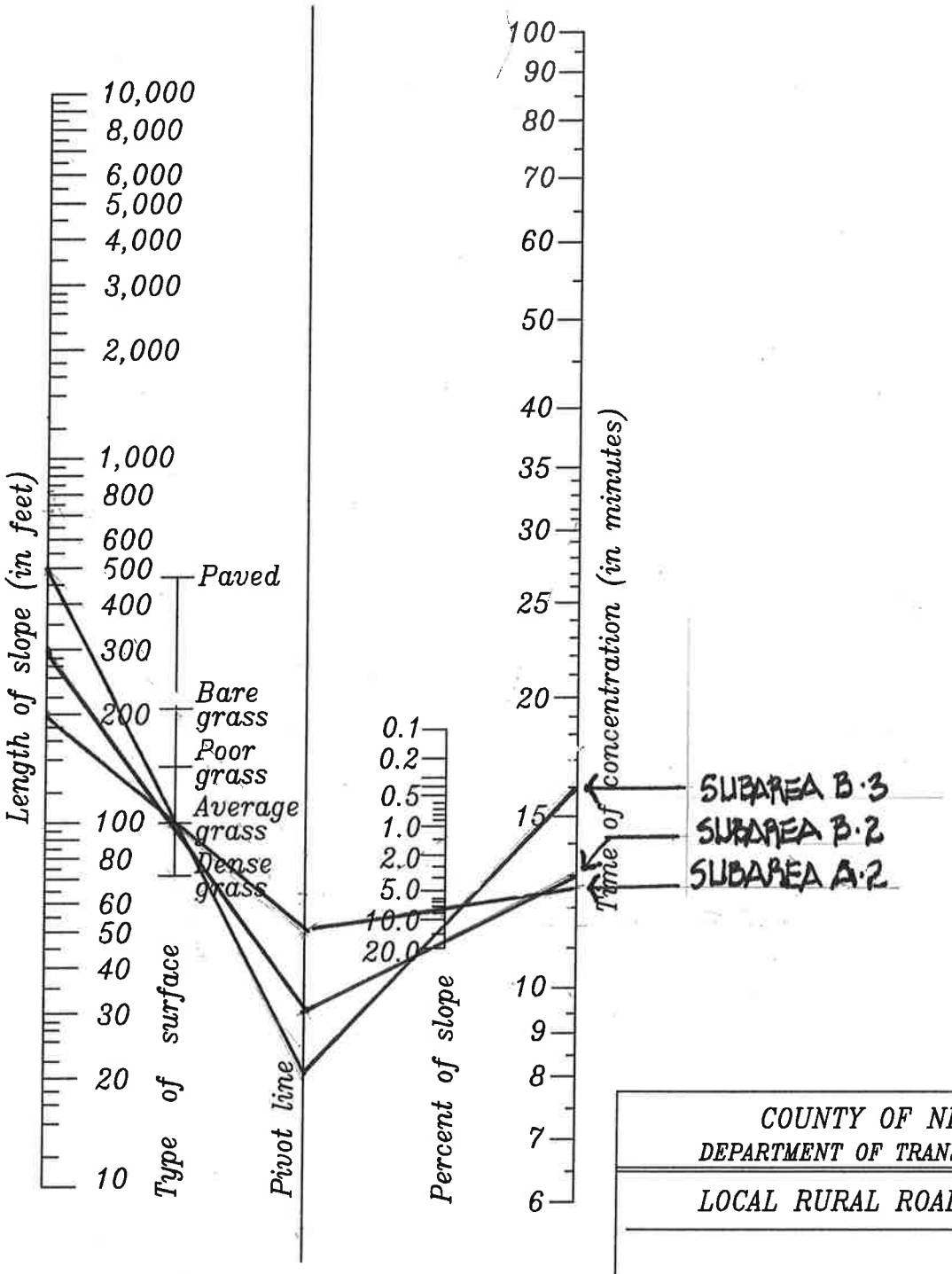


REGISTERED PROFESSIONAL ENGINEER
JOHN W. RUMSEY, III
No. 40386
Exp. 3-31-99
CIVIL
STATE OF CALIFORNIA

COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

LOCAL RURAL ROAD SYSTEM

TIME OF CONCENTRATION
SHEET FLOW

Approved by:
John W. Rumsey 5-10-95
Senior Civil Engineer Date

STANDARD DRAWING
D-8

Rev.5-10-95

VELOCITIES IN GUTTERS, CHANNELS & EXISTING DRAINAGE CHANNELS FOR GIVEN SLOPE

Slope	Velocity	Slope	Velocity
0.5%	= 1.7'/Sec	8.0	= 6.6
1.0	= 2.3	.5	= 6.9
1.5	= 3.0	9.0	= 7.2
2.0	= 3.4	.5	= 7.5
2.5	= 3.8	10.0	= 7.8
3.0	= 4.2	.5	= 8.0
3.5	= 4.4	11.0	= 8.2
4.0	= 4.6	.5	= 8.5
.5	= 4.8	12.0	= 8.7
5.0	= 5.0	.5	= 8.9
.5	= 5.2	13.0	= 9.1
6.0	= 5.4	.5	= 9.3
.5	= 5.7	14.0	= 9.6
7.0	= 6.0	.5	= 9.8
.5	= 6.3	15.0	= 10.0

NOTE: The velocities shown hereon are to be used only for the purpose of calculating Tc, Time of Concentration.

COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

LOCAL RURAL ROAD SYSTEM

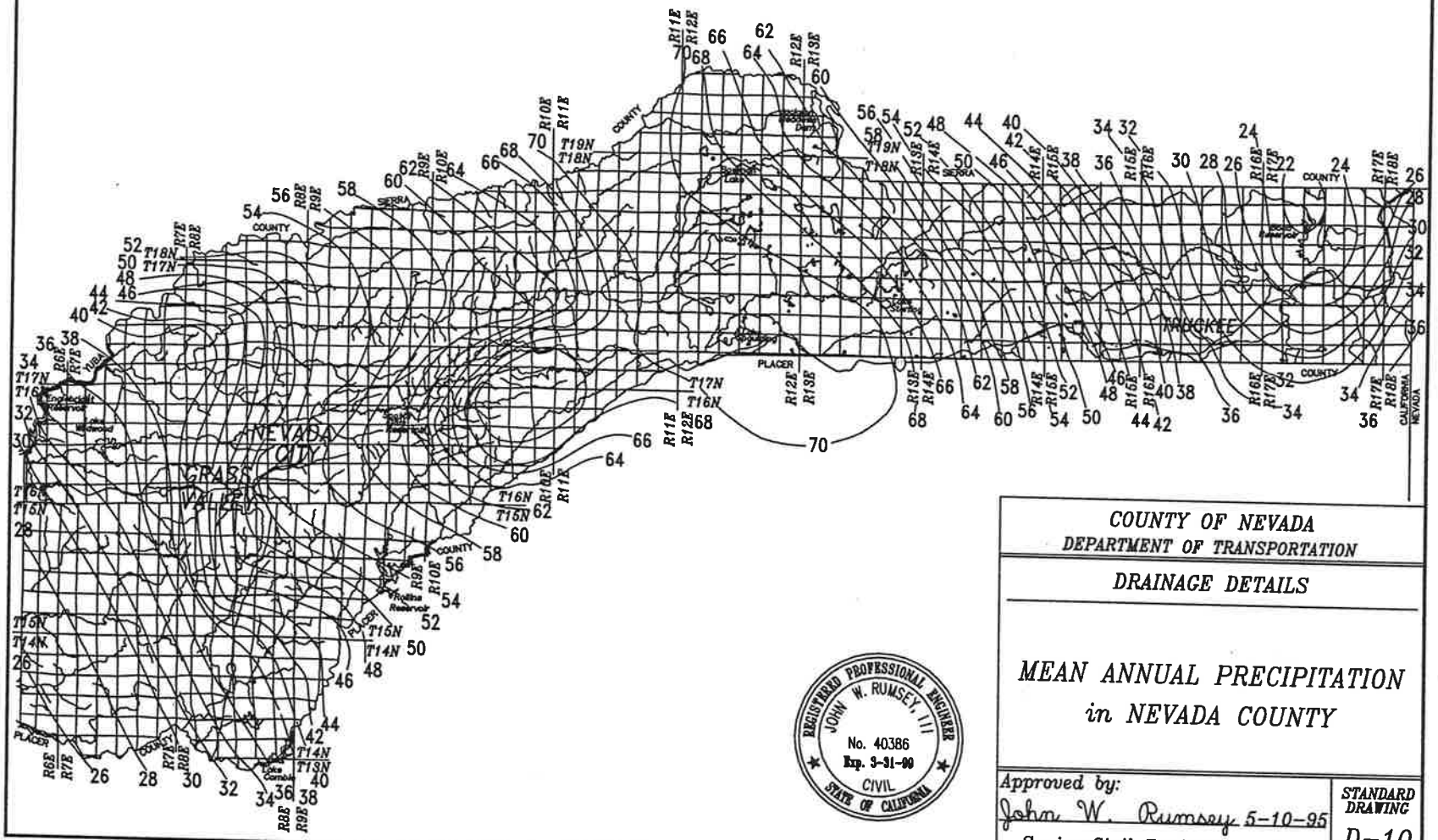
VELOCITIES IN GUTTERS & CHANNELS

Approved by: John W. Rumsey 5-10-95
Senior Civil Engineer Date

STANDARD DRAWING D-9

Rev.5-10-95

NEVADA COUNTY



REGISTERED PROFESSIONAL ENGINEER
JOHN W. RUMSEY, III
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STATE OF CALIFORNIA

COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DETAILS

MEAN ANNUAL PRECIPITATION
in NEVADA COUNTY

Approved by: John W. Rumsey 5-10-95
Senior Civil Engineer Date

STANDARD DRAWING
D-10

Rev.5-10-95

REMARKS

NEVADA COUNTY DESIGN STORM (INTENSITY)

10 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Mean Annual Precipitation Inches	5	10	15	30	60 1hr	120 2Hr	180 3Hr	360 6Hr	720 12Hr	1440 24Hr
	Intensity in inches per hour									
20	1.57	1.15	.96	.70	.51	.38	.31	.23	.17	.12
22	1.68	1.23	1.03	.75	.55	.40	.34	.25	.18	.13
24	1.80	1.31	1.10	.80	.59	.43	.36	.26	.19	.14
26	1.91	1.40	1.17	.85	.62	.46	.38	.28	.20	.15
28	2.02	1.48	1.23	.90	.66	.48	.40	.30	.22	.16
30	2.14	1.57	1.30	.95	.70	.51	.43	.31	.23	.17
32	2.25	1.65	1.37	1.01	.74	.54	.45	.33	.24	.18
34	2.37	1.73	1.44	1.06	.77	.57	.47	.35	.25	.19
36	2.48	1.82	1.51	1.11	.81	.59	.49	.36	.27	.19
38	2.59	1.90	1.58	1.16	.85	.62	.52	.38	.28	.20
40	2.71	1.98	1.65	1.21	.89	.65	.54	.40	.29	.21
42	2.82	2.07	1.72	1.26	.92	.68	.56	.41	.30	.22
44	2.94	2.15	1.79	1.31	.96	.70	.59	.43	.31	.23
46	3.05	2.23	1.86	1.36	1.00	.73	.61	.45	.33	.24
48	3.17	2.32	1.93	1.41	1.03	.76	.63	.46	.34	.25
50	3.28	2.40	2.00	1.46	1.07	.78	.65	.48	.35	.26
52	3.39	2.48	2.07	1.52	1.11	.81	.68	.50	.36	.27
54	3.51	2.57	2.14	1.57	1.15	.84	.70	.51	.37	.27
56	3.62	2.65	2.21	1.62	1.18	.87	.72	.53	.39	.28
58	3.74	2.73	2.28	1.67	1.22	.89	.74	.55	.40	.29
60	3.85	2.82	2.35	1.72	1.26	.92	.77	.56	.41	.30
62	3.96	2.90	2.42	1.77	1.30	.95	.79	.58	.42	.31
64	4.08	2.98	2.49	1.82	1.33	.98	.81	.60	.44	.32
66	4.19	3.07	2.56	1.87	1.37	1.00	.84	.61	.45	.33
68	4.31	3.15	2.63	1.92	1.41	1.03	.86	.63	.46	.34
70	4.42	3.24	2.70	1.97	1.44	1.06	.88	.65	.47	.35
72	4.53	3.32	2.77	2.02	1.48	1.08	.90	.66	.48	.35
74	4.65	3.40	2.84	2.08	1.52	1.11	.93	.68	.50	.36
76	4.76	3.49	2.90	2.13	1.56	1.14	.95	.70	.51	.37
78	4.88	3.57	2.97	2.18	1.59	1.17	.97	.71	.52	.38
80	4.99	3.65	3.04	2.23	1.63	1.19	.99	.73	.53	.39

REGISTERED PROFESSIONAL ENGINEER
JOHN W. RUMSEY, III
No. 40386
Exp. 3-31-99
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STATE OF CALIFORNIA

COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DETAIL

10 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Approved by:
John W. Rumsey 5-11-95
Senior Civil Engineer Date

STANDARD DRAWING
D-11

Rev.5-11-95

NEVADA COUNTY DESIGN STORM (INTENSITY)

100 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Mean Annual Precipitation Inches	5	10	15	30	60 1hr	120 2hr	180 3hr	360 6hr	720 12hr	1440 24hr
	Intensity in inches per hour									
20	2.22	1.63	1.36	.99	.73	.53	.44	.32	.24	.17
22	2.39	1.75	1.46	1.07	.78	.57	.48	.35	.25	.19
24	2.55	1.86	1.55	1.14	.83	.61	.51	.37	.27	.20
26	2.71	1.98	1.65	1.21	.89	.65	.54	.40	.29	.21
28	2.87	2.10	1.75	1.28	.94	.69	.57	.42	.31	.22
30	3.03	2.22	1.85	1.35	.99	.73	.60	.44	.32	.24
32	3.19	2.34	1.95	1.43	1.04	.76	.64	.47	.34	.25
34	3.36	2.46	2.05	1.50	1.10	.80	.67	.49	.36	.26
36	3.52	2.58	2.15	1.57	1.15	.84	.70	.51	.38	.28
38	3.68	2.69	2.24	1.64	1.20	.88	.73	.54	.39	.29
40	3.84	2.81	2.34	1.72	1.26	.92	.77	.56	.41	.30
42	4.00	2.93	2.44	1.79	1.31	.96	.80	.58	.43	.31
44	4.17	3.05	2.54	1.86	1.36	1.00	.83	.61	.45	.33
46	4.33	3.17	2.64	1.93	1.41	1.04	.86	.63	.46	.34
48	4.49	3.29	2.74	2.00	1.47	1.07	.89	.66	.48	.35
50	4.65	3.40	2.84	2.08	1.52	1.11	.93	.68	.50	.36
52	4.81	3.52	2.94	2.15	1.57	1.15	.96	.70	.51	.38
54	4.97	3.64	3.03	2.22	1.63	1.19	.99	.73	.53	.39
56	5.14	3.76	3.13	2.29	1.68	1.23	1.02	.75	.55	.40
58	5.30	3.88	3.23	2.37	1.73	1.27	1.06	.77	.57	.41
60	5.46	4.00	3.33	2.44	1.78	1.31	1.09	.80	.58	.43
62	5.62	4.12	3.43	2.51	1.84	1.35	1.12	.82	.60	.44
64	5.78	4.23	3.53	2.58	1.89	1.38	1.15	.84	.62	.45
66	5.94	4.35	3.63	2.65	1.94	1.42	1.19	.87	.64	.46
68	6.11	4.47	3.72	2.73	2.00	1.46	1.22	.89	.65	.48
70	6.27	4.59	3.82	2.80	2.05	1.50	1.25	.91	.67	.49
72	6.43	4.71	3.92	2.87	2.10	1.54	1.28	.94	.69	.50
74	6.59	4.83	4.02	2.94	2.15	1.58	1.31	.96	.70	.52
76	6.75	4.94	4.12	3.02	2.21	1.62	1.35	.99	.72	.53
78	6.92	5.06	4.22	3.09	2.26	1.65	1.38	1.01	.74	.54
80	7.08	5.18	4.32	3.16	2.31	1.69	1.41	1.03	.76	.55

REGISTERED PROFESSIONAL ENGINEER
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COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DETAIL

100 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Approved by:
John W. Rumsey 5-11-95
Senior Civil Engineer Date

STANDARD DRAWING
D-12

Rev.5-11-95

NEVADA COUNTY DESIGN STORM (DEPTH)

10 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Mean Annual Precipitation Inches	5	10	15	30	60 1hr	120 2Hr	180 3Hr	360 6Hr	720 12Hr	1440 24Hr
	Design Storm Depth in inches									
20	.13	.19	.24	.35	.51	.75	.94	1.37	2.01	2.94
22	.14	.21	.26	.38	.55	.81	1.01	1.47	2.16	3.16
24	.15	.22	.27	.40	.59	.86	1.07	1.57	2.30	3.37
26	.16	.23	.29	.43	.62	.91	1.14	1.67	2.45	3.59
28	.17	.25	.31	.45	.66	.97	1.21	1.77	2.60	3.80
30	.18	.26	.33	.48	.70	1.02	1.28	1.87	2.74	4.01
32	.19	.27	.34	.50	.74	1.08	1.35	1.97	2.89	4.23
34	.20	.29	.36	.53	.77	1.13	1.42	2.07	3.03	4.44
36	.21	.30	.38	.55	.81	1.19	1.48	2.17	3.18	4.66
38	.22	.32	.40	.58	.85	1.24	1.55	2.27	3.33	4.87
40	.23	.33	.41	.60	.89	1.30	1.62	2.37	3.47	5.08
42	.24	.34	.43	.63	.92	1.35	1.69	2.47	3.62	5.30
44	.24	.36	.45	.66	.96	1.41	1.76	2.57	3.77	5.51
46	.25	.37	.47	.68	1.00	1.46	1.82	2.67	3.91	5.73
48	.26	.39	.48	.71	1.03	1.51	1.89	2.77	4.06	5.94
50	.27	.40	.50	.73	1.07	1.57	1.96	2.87	4.20	6.16
52	.28	.41	.52	.76	1.11	1.62	2.03	2.97	4.35	6.37
54	.29	.43	.53	.78	1.15	1.68	2.10	3.07	4.50	6.58
56	.30	.44	.55	.81	1.18	1.73	2.17	3.17	4.64	6.80
58	.31	.46	.57	.83	1.22	1.79	2.23	3.27	4.79	7.01
60	.32	.47	.59	.86	1.26	1.84	2.30	3.37	4.94	7.23
62	.33	.48	.60	.88	1.30	1.90	2.37	3.47	5.08	7.44
64	.34	.50	.62	.91	1.33	1.95	2.44	3.57	5.23	7.65
66	.35	.51	.64	.94	1.37	2.01	2.51	3.67	5.37	7.87
68	.36	.53	.66	.96	1.41	2.06	2.58	3.77	5.52	8.08
70	.37	.54	.67	.99	1.44	2.12	2.64	3.87	5.67	8.30
72	.38	.55	.69	1.01	1.48	2.17	2.71	3.97	5.81	8.51
74	.39	.57	.71	1.04	1.52	2.22	2.78	4.07	5.96	8.72
76	.40	.58	.73	1.06	1.56	2.28	2.85	4.17	6.11	8.94
78	.41	.59	.74	1.09	1.59	2.33	2.92	4.27	6.25	9.15
80	.42	.61	.76	1.11	1.63	2.39	2.98	4.37	6.40	9.37

COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DETAIL

10 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Approved by: John W. Rumsey 5-11-95
Senior Civil Engineer Date

STANDARD DRAWING D-13

Rev.5-11-95

NEVADA COUNTY DESIGN STORM (DEPTH)

100 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Mean Annual Precipitation Inches	5	10	15	30	60 1hr	120 2hr	180 3hr	360 6hr	720 12hr	1440 24hr
	Design Storm depth in inches									
20	.19	.27	.34	.50	.73	1.06	1.33	1.95	2.85	4.17
22	.20	.29	.36	.53	.78	1.14	1.43	2.09	3.06	4.48
24	.21	.31	.39	.57	.83	1.22	1.52	2.23	3.27	4.78
26	.23	.33	.41	.60	.89	1.30	1.62	2.37	3.47	5.09
28	.24	.35	.44	.64	.94	1.37	1.72	2.51	3.68	5.39
30	.25	.37	.46	.68	.99	1.45	1.81	2.66	3.89	5.69
32	.27	.39	.49	.71	1.04	1.53	1.91	2.80	4.10	6.00
34	.28	.41	.51	.75	1.10	1.61	2.01	2.94	4.30	6.30
36	.29	.43	.54	.79	1.15	1.68	2.10	3.08	4.51	6.60
38	.31	.45	.56	.82	1.20	1.76	2.20	3.22	4.72	6.91
40	.32	.47	.59	.86	1.26	1.84	2.30	3.36	4.93	7.21
42	.33	.49	.61	.89	1.31	1.92	2.39	3.51	5.13	7.51
44	.35	.51	.64	.93	1.36	1.99	2.49	3.65	5.34	7.82
46	.36	.53	.66	.97	1.41	2.07	2.59	3.79	5.55	8.12
48	.37	.55	.68	1.00	1.47	2.15	2.68	3.93	5.76	8.43
50	.39	.57	.71	1.04	1.52	2.23	2.78	4.07	5.96	8.73
52	.40	.59	.73	1.07	1.57	2.30	2.88	4.21	6.17	9.03
54	.41	.61	.76	1.11	1.63	2.38	2.98	4.36	6.38	9.34
56	.43	.63	.78	1.15	1.68	2.46	3.07	4.50	6.58	9.64
58	.44	.65	.81	1.18	1.73	2.54	3.17	4.64	6.79	9.94
60	.45	.67	.83	1.22	1.78	2.61	3.27	4.78	7.00	10.25
62	.47	.69	.86	1.25	1.84	2.69	3.36	4.92	7.21	10.55
64	.48	.71	.88	1.29	1.89	2.77	3.46	5.06	7.41	10.86
66	.50	.73	.91	1.33	1.94	2.84	3.56	5.21	7.62	11.16
68	.51	.75	.93	1.36	2.00	2.92	3.65	5.35	7.83	11.46
70	.52	.76	.96	1.40	2.05	3.00	3.75	5.49	8.04	11.77
72	.54	.78	.98	1.44	2.10	3.08	3.85	5.63	8.24	12.07
74	.55	.80	1.01	1.47	2.15	3.15	3.94	5.77	8.45	12.37
76	.56	.82	1.03	1.51	2.21	3.23	4.04	5.91	8.66	12.68
78	.58	.84	1.05	1.54	2.26	3.31	4.14	6.06	8.87	12.98
80	.59	.86	1.08	1.58	2.31	3.39	4.23	6.20	9.07	13.28

COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DETAIL

100 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Approved by: John W. Rumsey 5-11-95
Senior Civil engineer Date

STANDARD DRAWING
D-14

Rev.5-11-95

TABLE FOR ESTIMATING "C" IN RATIONAL FORMULA

UNIMPROVED AREAS

CONDITION	EXTREME	HIGH	MODERATE	LOW
Slope	.36 – .28 Above 30%	.28 – .15 30% – 10%	.15 – .10 10% – 5%	.10 – .05 5% – 0
Surface permeability	.20 – .15 Bare rock or very thin soil	.15 – .07 Impervious clays shallow soils	.07 – .04 Deep pervious loam, sandy loam	.03 Deep sand, volcanic ash
Vegetation	.20 – .15 None or very sparse	.15 – .07 Less than 20% covered with substantial growth	.07 – .04 About 50% covered with heavy growth	.03 90% covered with heavy growth, deep hummus layer
Surface	.20 – .15 Smooth soil, slick rock drainage flow continous	.15 – .07 Roughened soil or rocks	.07 – .04 Drainage flow interrupted many ponds, lakes & marshes	.03 Drainage flow arrested many ponds, lakes & marshes

IMPROVED AREAS

Surface	C
Roof surfaces	.95
A.C. or P.C.C. pavement, patios, driveways, streets, sidewalks	.90
Landscaped areas	.25
Gravel walks, roadways	.30

EXAMPLE: Unimproved

20% slope	.22
Well drained soil	.05
Fair cover	.07
No ponds	.08
	C= .42

EXAMPLE: Improved

100 acre tract

15 ac.	@.95
50 ac. A.C.pave.	@.90
35 ac. landscaped.	@.25

$$C=\frac{(15 \times .95)+(50 \times .90)+(35 \times .25)}{100 \text{ acres}}= 0.68 \quad C= 0.68$$

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COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

DRAINAGE DETAILS

VALUES FOR ESTIMATING COEFFICIENT OF RUNOFF "C"

Approved by:
John W. Rumsey 5-11-95
Senior Civil Engineer Date

STANDARD DRAWING
D-15

Rev.5-11-95

LAND USE DESCRIPTION		HYDROLOGIC SOIL GROUP			
		A	B	C	D
Cultivated land:①	without conservation treatment	72	81	88	91
	with conservation treatment	62	71	78	81
Pasture or range land:	poor condition	68	79	86	89
	good condition	39	61	74	80
Meadow: good condition		30	58	71	78
Wood or Forest land:	thin stand, poor cover, no mulch	45	66	77	83
	good cover②	25	55	70	77
Open spaces, lawns, parks, golf courses, cemeteries, etc.					
good condition: grass cover on 75% or more of the area		39	61	74	80
fair condition: grass cover on 50% to 75% of the area		49	69	79	84
Commercial and business areas (85% impervious)		89	92	94	95
Industrial districts (72% impervious)		81	88	91	93
Residential:③					
Average lot size	Average % Impervious④				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved parking lots, roofs, driveways, etc.		98	98	98	98
Streets and roads:					
paved with curbs and storm sewers		98	98	98	98
gravel		76	85	89	91
dirt		72	82	87	89

①For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, August 1972.

②Good cover is protected from grazing and litter and brush cover soil.

③Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

④The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

REGISTERED PROFESSIONAL ENGINEER
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COUNTY OF NEVADA
DEPARTMENT OF TRANSPORTATION

RUNOFF CURVE NUMBERS

Approved by: John W. Rumsey 5-11-95
Senior Civil Engineer — Date

STANDARD DRAWING
D–16

Table 7-3. For Determining the Vertical Distance $\bar{y}$ below the Water Surface to the Center of Gravity of a Cross Section of a Trapezoidal Channel

Let $\frac{\text{depth of water}}{\text{bottom width of channel}} = \frac{D}{b}$ and $C_{\bar{y}}$ = tabulated value. Then $\bar{y} = C_{\bar{y}}D$.

$\frac{D}{b}$	Side slopes of channel, ratio of horizontal to vertical									
	⅛–1	¼–1	½–1	¾–1	1–1	1½–1	2–1	2½–1	3–1	4–1
0.05	.499	.498	.496	.494	.492	.488	.485	.481	.478	.472
.1	.498	.496	.492	.488	.485	.478	.472	.467	.462	.452
.15	.497	.494	.488	.483	.478	.469	.462	.455	.448	.438
.2	.496	.492	.485	.478	.472	.462	.452	.444	.438	.426
.25	.495	.490	.481	.474	.467	.455	.444	.436	.429	.417
.3	.494	.488	.478	.469	.462	.448	.438	.429	.421	.409
.35	.493	.487	.475	.465	.457	.443	.431	.422	.415	.403
.4	.492	.485	.472	.462	.452	.438	.426	.417	.409	.397
.45	.491	.483	.469	.458	.448	.433	.421	.412	.404	.393
.5	.490	.481	.467	.455	.444	.429	.417	.407	.400	.389
.6	.488	.478	.462	.448	.438	.421	.409	.400	.393	.382
.7	.487	.475	.457	.443	.431	.415	.403	.394	.387	.377
.8	.485	.472	.452	.438	.426	.409	.397	.389	.382	.373
.9	.483	.469	.448	.433	.421	.404	.393	.385	.378	.370
1.0	.481	.467	.444	.429	.417	.400	.389	.381	.375	.367
1.1	.480	.464	.441	.425	.413	.396	.385	.378	.372	.364
1.2	.478	.462	.438	.421	.409	.393	.382	.375	.370	.362
1.3	.477	.459	.434	.418	.406	.390	.380	.373	.367	.360
1.4	.475	.457	.431	.415	.403	.387	.377	.370	.365	.359
1.5	.474	.455	.429	.412	.400	.385	.375	.368	.364	.357
1.6	.472	.452	.426	.409	.397	.382	.373	.367	.362	.356
1.7	.471	.450	.423	.407	.395	.380	.371	.365	.361	.355
1.8	.469	.448	.421	.404	.393	.378	.370	.364	.359	.354
1.9	.468	.446	.419	.402	.391	.377	.368	.362	.358	.353
2.0	.467	.444	.417	.400	.389	.375	.367	.361	.357	.352

Table 7-4. For Determining the Area a of the Cross Section of a Circular Conduit Flowing Part Full

Let $\frac{\text{depth of water}}{\text{diameter of channel}} = \frac{D}{d}$ and C_a = the tabulated value. Then $a = C_a d^2$.

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0013	.0037	.0069	.0105	.0147	.0192	.0242	.0294	.0350
.1	.0409	.0470	.0534	.0600	.0668	.0739	.0811	.0885	.0961	.1039
.2	.1118	.1199	.1281	.1365	.1449	.1535	.1623	.1711	.1800	.1890
.3	.1982	.2074	.2167	.2260	.2355	.2450	.2546	.2642	.2739	.2836
.4	.2934	.3032	.3130	.3229	.3328	.3428	.3527	.3627	.3727	.3827
.5	.393	.403	.413	.423	.433	.443	.453	.462	.472	.482
.6	.492	.502	.512	.521	.531	.540	.550	.559	.569	.578
.7	.587	.596	.605	.614	.623	.632	.640	.649	.657	.666
.8	.674	.681	.689	.697	.704	.712	.719	.725	.732	.738
.9	.745	.750	.756	.761	.766	.771	.775	.779	.782	.784

Table 7-5. For Determining the Hydraulic Radius r of the Cross Section of a Circular Conduit Flowing Part Full

Let $\frac{\text{depth of water}}{\text{diameter of channel}} = \frac{D}{d}$ and C_r = the tabulated value. Then $r = C_r d$.

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.000	.007	.013	.020	.026	.033	.039	.045	.051	.057
.1	.063	.070	.075	.081	.087	.093	.099	.104	.110	.115
.2	.121	.126	.131	.136	.142	.147	.152	.157	.161	.166
.3	.171	.176	.180	.185	.189	.193	.198	.202	.206	.210
.4	.214	.218	.222	.226	.229	.233	.236	.240	.243	.247
.5	.250	.253	.256	.259	.262	.265	.268	.270	.273	.275
.6	.278	.280	.282	.284	.286	.288	.290	.292	.293	.295
.7	.296	.298	.299	.300	.301	.302	.302	.303	.304	.304
.8	.304	.304	.304	.304	.304	.303	.303	.302	.301	.299
.9	.298	.296	.294	.292	.289	.286	.283	.279	.274	.267

Table 7-13. Values of K for Circular Channels in the Formula

$$Q = \frac{K}{n} D^{8/3} S^{1/2}$$

D = depth of water d = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		15.02	10.56	8.57	7.38	6.55	5.95	5.47	5.08	4.76
.1	4.49	4.25	4.04	3.86	3.69	3.54	3.41	3.28	3.17	3.06
.2	2.96	2.87	2.79	2.71	2.63	2.56	2.49	2.42	2.36	2.30
.3	2.25	2.20	2.14	2.09	2.05	2.00	1.96	1.92	1.87	1.84
.4	1.80	1.76	1.72	1.69	1.66	1.62	1.59	1.56	1.53	1.50
.5	1.470	1.442	1.415	1.388	1.362	1.336	1.311	1.286	1.262	1.238
.6	1.215	1.192	1.170	1.148	1.126	1.105	1.084	1.064	1.043	1.023
.7	1.004	.984	.965	.947	.928	.910	.891	.874	.856	.838
.8	.821	.804	.787	.770	.753	.736	.720	.703	.687	.670
.9	.654	.637	.621	.604	.588	.571	.553	.535	.516	.496
1.0	.463									

Table 7-14. Values of K' for Circular Channels in the Formula

$$Q = \frac{K'}{n} d^{8/3} S^{1/2}$$

D = depth of water d = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		.00007	.00031	.00074	.00138	.00222	.00328	.00455	.00604	.00775
.1	.00967	.0118	.0142	.0167	.0195	.0225	.0257	.0291	.0327	.0366
.2	.0406	.0448	.0492	.0537	.0585	.0634	.0686	.0738	.0793	.0849
.3	.0907	.0966	.1027	.1089	.1153	.1218	.1284	.1352	.1420	.1490
.4	.1561	.1633	.1705	.1779	.1854	.1929	.2005	.2082	.2160	.2238
.5	.232	.239	.247	.255	.263	.271	.279	.287	.295	.303
.6	.311	.319	.327	.335	.343	.350	.358	.366	.373	.380
.7	.388	.395	.402	.409	.416	.422	.429	.435	.441	.447
.8	.453	.458	.463	.468	.473	.477	.481	.485	.488	.491
.9	.494	.496	.497	.498	.498	.498	.496	.494	.489	.483
1.0	.463									

Table 7-15. Values of K for Parabolic Channels in the Formula

$$Q = \frac{K}{n} D^{8/3} S^{1/2}$$

D = depth of water T = top width of channel

$\frac{D}{T}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		75.59	37.77	25.16	18.85	15.05	12.52	10.71	9.35	8.28
.1	7.43	6.73	6.15	5.65	5.23	4.86	4.53	4.24	3.99	3.76
.2	3.55	3.36	3.19	3.04	2.89	2.76	2.64	2.52	2.42	2.32
.3	2.226	2.140	2.059	1.984	1.912	1.845	1.782	1.722	1.665	1.611
.4	1.560	1.511	1.465	1.421	1.379	1.339	1.301	1.265	1.230	1.197
.5	1.165	1.134	1.105	1.077	1.050	1.024	.999	.975	.952	.929
.6	.908	.887	.867	.848	.829	.811	.794	.777	.761	.745
.7	.730	.715	.701	.687	.674	.661	.648	.636	.624	.613
.8	.601	.590	.580	.570	.560	.550	.540	.531	.522	.514
.9	.505	.497	.489	.481	.473	.466	.458	.451	.444	.438
1.0	.431									

Table 7-16. Values of K' for Parabolic Channels in the Formula

$$Q = \frac{K'}{n} T^{8/3} S^{1/2}$$

D = depth of water T = top width of channel

$\frac{D}{T}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		.00035	.00111	.00219	.00353	.00511	.00691	.00891	.01110	.01347
.1	.0160	.0187	.0215	.0245	.0276	.0308	.0342	.0376	.0412	.0448
.2	.0486	.0524	.0563	.0603	.0643	.0684	.0726	.0768	.0811	.0854
.3	.0898	.0942	.0987	.1032	.1077	.1123	.1168	.1215	.1261	.1308
.4	.1355	.1402	.1450	.1497	.1545	.1593	.1641	.1689	.1737	.1786
.5	.183	.188	.193	.198	.203	.208	.213	.218	.223	.228
.6	.232	.237	.242	.247	.252	.257	.262	.267	.272	.277
.7	.282	.287	.292	.297	.302	.307	.312	.317	.322	.327
.8	.332	.337	.342	.347	.352	.357	.361	.366	.371	.376
.9	.381	.386	.391	.396	.401	.406	.411	.416	.421	.426
1.0	.431									

SCALE: 1" = 200'
CONTOUR INTERVAL: 2'

LEGEND:

- DRAINAGE SUBAREA BOUNDARY
- EXISTING CONTOUR W/ ELEVATION
- PROPERTY LINE
- A-1 / 0.13 — DRAINAGE SUBAREA DESIGNATION / ACREAGE OF SUBAREA

TERMINOLOGY PER POND PACK PROGRAM

CM-1	CATCHMENT AREA (SAME AS DRAINAGE SUBAREA ABOVE)
PO-1	POND #
O-1	OUTLET #
POE-2	POND OUTLET ENTRANCE #
OUTLET-1	OUTLET CULVERT #

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No. 29650
Exp. 3/31/21
CIVIL
STATE OF CALIFORNIA

REVISION:	DATE:	DESCRIPTION:

CENTENNIAL SITE

RISE GRASS VALLEY INC.

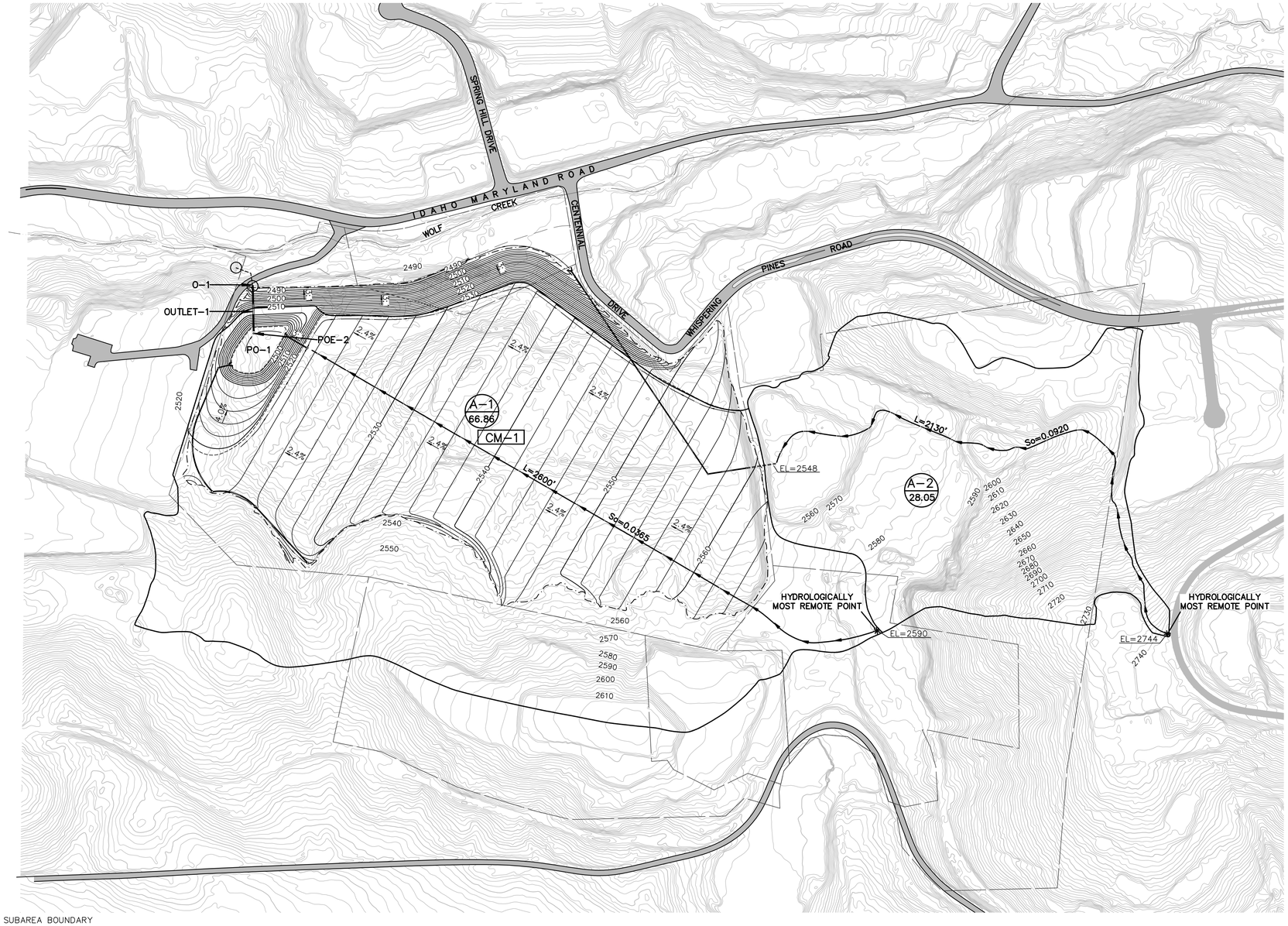
SEC. 26, T.16N., R.8E., M.D.M.

NEVADA COUNTY , CALIFORNIA

HYDROLOGY MAP PRE-DEVELOPMENT

H-1

SCALE: 1" = 200'
CONTOUR INTERVAL: 2'



L E G E N D :

- DRAINAGE SUBAREA BOUNDARY
- EXISTING CONTOUR W/ ELEVATION
- PROPOSED CONTOUR W/ ELEVATION
- PROPOSED DAYLIGHT LINE
- PROPOSED FLOWLINE OF CONCRETE V-DITCH
- PROPERTY LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED STORM DRAIN INLET
- PROPOSED STORM DRAIN MANHOLE
- A-1 / 0.13 — DRAINAGE SUBAREA DESIGNATION / ACREAGE OF SUBAREA

TERMINOLOGY PER POND PACK PROGRAM

CM-1	CATCHMENT AREA (SAME AS DRAINAGE SUBAREA ABOVE)
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RISE GRASS VALLEY INC.

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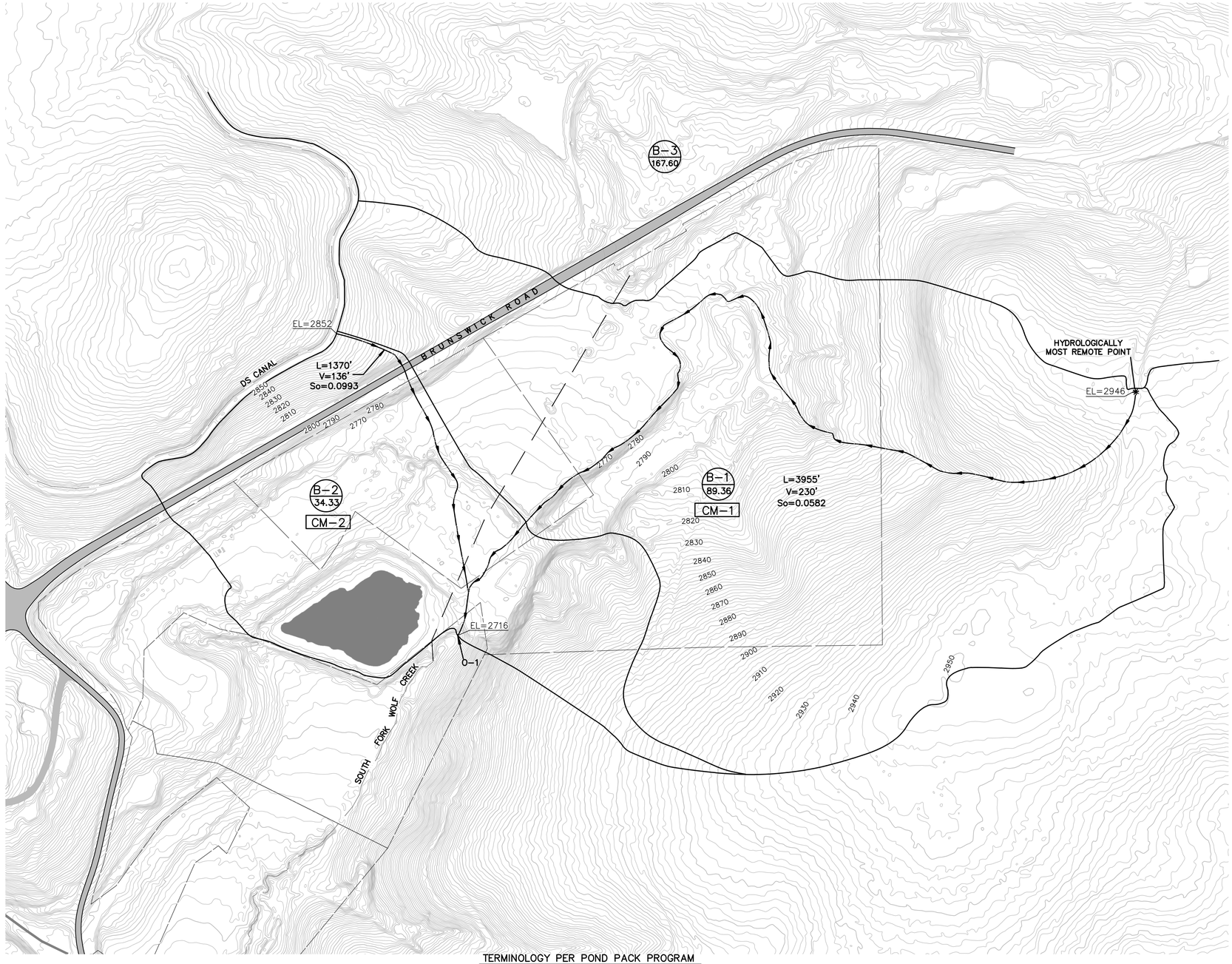
NEVADA COUNTY , CALIFORNIA

HYDROLOGY MAP POST-DEVELOPMENT

H-2

SCALE: 1" = 200'
CONTOUR INTERVAL: 2'



LEGEND:

- DRAINAGE SUBAREA BOUNDARY
- EXISTING CONTOUR W/ ELEVATION
- PROPERTY LINE
- B-1 / 0.13 — DRAINAGE SUBAREA DESIGNATION / ACREAGE OF SUBAREA

TERMINOLOGY PER POND PACK PROGRAM

CM-1	CATCHMENT AREA (SAME AS DRAINAGE SUBAREA ABOVE)
PO-1	POND #
O-1	OUTLET #
POE-2	POND OUTLET ENTRANCE #
OUTLET-1	OUTLET CULVERT #

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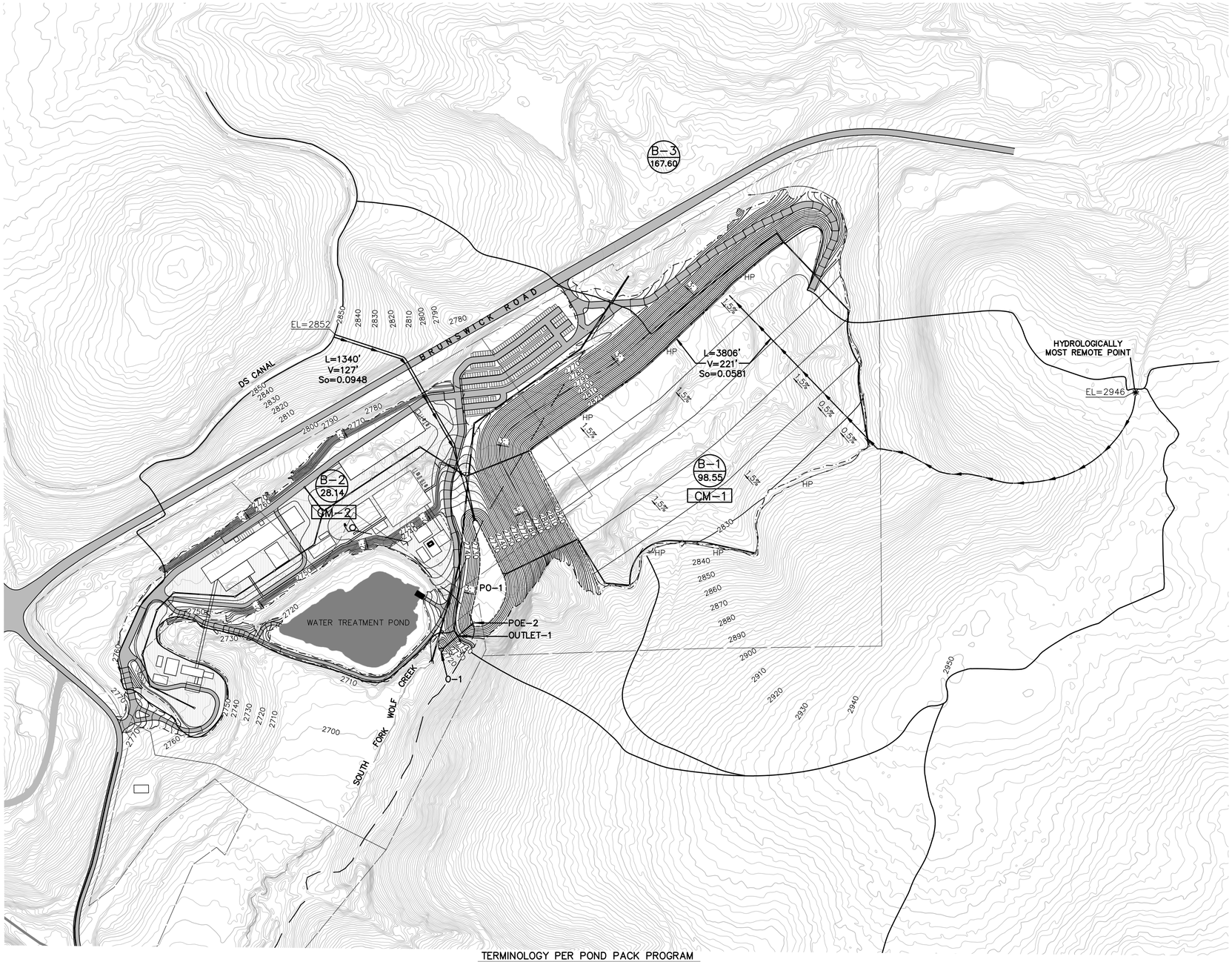
NEVADA COUNTY , CALIFORNIA

HYDROLOGY MAP PRE-DEVELOPMENT

H-3

SCALE: 1" = 200'
CONTOUR INTERVAL: 2'



LEGEND:

- DRAINAGE SUBAREA BOUNDARY
- EXISTING CONTOUR W/ ELEVATION
- PROPOSED CONTOUR W/ ELEVATION
- PROPOSED DAYLIGHT LINE
- PROPOSED FLOWLINE OF CONCRETE V-DITCH
- PROPERTY LINE
- PROPOSED STORM DRAIN LINE
- PROPOSED STORM DRAIN INLET
- PROPOSED STORM DRAIN MANHOLE
- B-1 / 0.13 — DRAINAGE SUBAREA DESIGNATION / ACREAGE OF SUBAREA

TERMINOLOGY PER POND PACK PROGRAM

CM-1	CATCHMENT AREA (SAME AS DRAINAGE SUBAREA ABOVE)
PO-1	POND #
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POE-2	POND OUTLET ENTRANCE #
OUTLET-1	OUTLET CULVERT #

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RISE GRASS VALLEY INC.

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NEVADA COUNTY , CALIFORNIA

HYDROLOGY MAP POST-DEVELOPMENT

H-4

APPENDIX H
CENTENNIAL INDUSTRIAL SITE HABITAT MANAGEMENT PLAN FOR THE PINE HILL FLANNELBUSH

Centennial Industrial Site

Habitat Management Plan for the

Pine Hill Flannelbush (Fremontodendron decumbens)

Prepared for:
Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Prepared by:
Greg Matuzak, Principal Biologist
Greg Matuzak Environmental Consulting LLC
471 Sutton Way, Suite #210
Grass Valley, CA 95945
Email: gmatuzak@gmail.com

January 2021

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INFORMATION SUMMARY

Report Date: January 2021

Report Preparer: Mr. Greg Matuzak
Greg Matuzak Environmental Consulting LLC

Project Site: Centennial Industrial Site

Project Site Location: SECTION 26, T.16N, R.8E

CENTENNIAL INDUSTRIAL SITE		
Assessor Parcel Number	**Site Address**	**Lot Size (Acres)**
009-550-032	N/A	20,908 SF (0.48 AC)
009-550-037	10344 Centennial Drive	4.47 AC
009-550-038	10350 Centennial Drive	40.1 AC
009-550-039	10344 Centennial Drive	42,668 SF (0.98 AC)
009-550-040	N/A	5,662 SF (0.13 AC)
009-560-036	10350 Centennial Drive	10.25 AC
Centennial Industrial Site - Land Total:		**56.41 AC**

Property Owner / Applicant: Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Principal Investigators: Greg Matuzak, Principal
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471 Sutton Way, Suite #210
Grass Valley, CA 95945
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21802 Purdon Road
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Habitat Management Plan Summary

This Habitat Management Plan (HMP) includes the results of the background research, reconnaissance-level and protocol-level biological surveys, data analysis, and impact assessment for the Pine Hill flannelbush (*Fremontodendron decumbens*) within the Centennial Industrial Site.

Pine Hill flannelbush (*Fremontodendron decumbens*), a species listed on the federal Endangered Species Act (ESA), has been identified and mapped within the southern portion of the Centennial Site. Sixty individual mature and flowering plants occupy an absolute area of 0.22 acres over approximately 4.5 acres of the Centennial Site.

This HMP includes avoidance, minimization, and mitigation measures to protect the species. Recommendations are also provided for conducting regulatory agency permitting and consultations covering the species.

The 5-year review of the species covered under the USFWS Recovery Plan concluded for the Pine Hill flannelbush that results of subsequent genetic work by a University of California, Davis researcher, to determine if Nevada and Yuba County flannelbushes are Pine Hill flannelbush, were inconclusive; therefore, the USFWS continue under the assumption that these plants are not the listed entity (USFWS, 2019).

1 INTRODUCTION

1.1 Pine Hill Flannelbush USFW Recovery Plan

Pine Hill flannelbush *(Fremontodendron decumbens)* inhabits rocky ridges on gabbro and serpentine soils within chaparral and cismontane woodlands within the central Sierra Nevada foothills. This species is endemic to these soil types and is normally documented between 1,390 and 2,495 feet above Mean Sea Level ("MSL"). It is listed as endangered by the United States Fish and Wildlife Service ("USFWS") under the federal Endangered Species Act ("FESA") and is listed as Rare by the California Department of Fish and Wildlife ("CDFW"). Pine Hill flannelbush also has a California Rare Plant Rank ("CRPR") 1B.2 status on the California Native Plant Society's ("CNPS") *Inventory of Rare and Endangered Plants* (CNPS, 2019).

In 2002, USFWS published a Recovery Plan for five federally listed plant species and one additional species of concern that primarily occur on gabbroic substrates in the central Sierra Nevada foothills (USFWS, 2002). In 2019, the USFWS published their 5-year review of the species covered under the recovery plan, including the Pine Hill flannelbush (USFWS, 2019). Of the species covered under the Recovery Plan, only the Pine Hill flannelbush occurs within the Centennial Industrial Site ("Centennial Site"). Another FESA listed species covered under the Recovery Plan, Stebbins' morning-glory (*Calystegia stebbinsii*), was not documented within the Centennial Site and therefore, is not covered under this Habitat Management Plan ("HMP"). Federal recovery plans delineate reasonable actions that are believed to be required to recover and/or protect listed species. Recovery plans have no legal authority, but provide guidelines to federal, state, local, and private entities for management actions that will assist in preventing extinction of listed species and facilitating those species towards achieving recovery.

The Recovery Plan presents a community-level strategy for recovery and conservation of the six species as all six species co-occur in the same natural chaparral community within the Pine Hill formation in western El Dorado County, as well as where any of the species occur within their range. Therefore, the likelihood of successful recovery for these species is increased by protecting the entire community in which these species occur for the Pine Hill formation in western El Dorado County given the species almost exclusively occurs at that location. The federal Recovery Plan also considers the requirements of each individual species and presents individual recovery criteria for each species (USFWS, 2002).

The Recovery Plan identifies habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance necessary for reproduction, all ultimately tied to increasing urbanization within the species' range, as the primary reasons for the

decline of, and ongoing threats, to all six species, including the Pine Hill flannelbush. Lesser threats to these species identified by the Recovery Plan include road widening and maintenance, off-road vehicle use, garbage dumping, horse paddocking, and competition with invasive non-native vegetation. The Recovery Plan notes that activities often associated with rural residential areas, such as clearing chaparral for fire protection around houses, bulldozing land (grading for houses or barns), planting fruit trees, and irrigation sometimes adversely modify habitat, rendering it unsuitable for Pine Hill flannelbush and the other five species.

Interim goals of the Recovery Plan include stabilizing and protecting populations, conducting research necessary to refine reclassification and recovery criteria, and reclassifying (i.e. downlisting) Pine Hill flannelbush from endangered to threatened. The Recovery Plan's ultimate goals include:

> (1) protect and restore sufficient habitat and numbers of populations; and
>
> (2) ameliorate both the threats that caused five of the gabbro soil plants to be listed and any other newly identified threats to warrant delisting of Stebbins' morning-glory and two of the other listed species and downlisting of Pine Hill flannelbush and one of the other listed species (USFWS, 2002).

Criteria used to evaluate when listed species are "recovered" include number and distribution of populations, population sizes, and probabilities of persistence over specific time periods. The Recovery Plan emphasizes the following recovery and long-term conservation tasks:

> (1) habitat protection and management;
>
> (2) surveying and monitoring;
>
> (3) research; and
>
> (4) public participation, outreach, and education.

The Recovery Plan specifically recommends that management plans be prepared for all populations recommended for protection and any adjacent areas identified as necessary for continued survival and recovery (USFWS, 2002). However, the 5-year review of the species covered under the Recovery Plan concluded for the Pine Hill flannelbush that results of subsequent genetic work by a University of California, Davis researcher, to determine if Nevada and Yuba County flannelbushes are Pine Hill flannelbush, were inconclusive; therefore, the USFWS continue under the assumption that these plants are not the listed entity (USFWS, 2019).

1.2 Centennial Industrial Site in Nevada County

At the request of Rise Grass Valley Inc. ("Rise Grass Valley" or "Rise"), Mr. Greg Matuzak was retained to prepare a Habitat Management Plan for the Pine Hill flannelbush. The HMP is specific for the Centennial Site and proposed Idaho-Maryland Mine Project ("IMM Project") located in Grass Valley, Nevada County, California (see Appendix A). The Centennial Site is a 56.41-acre property.

The Centennial Site is part of the original land holdings of the historic Idaho-Maryland Mine, which operated between approximately 1851 and 1956. The Centennial Site was the location of the mine tailings storage area for the larger mine site. The site discharged water into the main stem of Wolf Creek via a decant tower, which is still in place in the northwest portion of the site. During the 1930s, the Idaho-Maryland Mine operated a mineral processing plant, located adjacent and to the east of the Centennial Site. The results of historic mine tailing deposition in the Centennial Site can still be seen in the soils within the site, some of which have the appearance of many layers of deposited material of varying color.

The Centennial Site is located along Idaho Maryland Road on the northern boundary, Centennial Drive along the northeast boundary, DeMartini RV Sales along the western boundary, commercial development along the eastern boundary, and privately-owned industrial land along the southern boundary. Overall, the Centennial Site is surrounded by private commercial and industrial land use and zoning.

The Pine Hill flannelbush is listed within the California Natural Diversity Data Base ("CNDDB") (CDFW, 2019) as potentially occurring within the southern section of the Centennial Site and within adjacent private lands to the south. Initially identified and mapped as Pine Hill flannelbush in 1999, 2008, and 2009; however, since the species was mapped by the CDDDB within the Centennial Site as the Pine Hill flannelbush, the identity of the plants has been questioned. The Centennial Site does contain the appropriate soils and vegetation community types required for the Pine Hill flannelbush (see Appendix B and Appendix C). Without further genetic identification of the plants, their identity within the Centennial Site can't be certain. CDFW assumes that the plants mapped within the Centennial Site are either a distinct population of Pine Hill flannelbush or a hybrid with the more common *Fremontodendron californicum* (CDFW, 2019; see attached Pine Hill flannelbush mapping within the Centennial Site in Appendix D). However, the 5-year review of the species covered under the Recovery Plan concluded for the Pine Hill flannelbush that results of subsequent genetic work by a University of California, Davis researcher, to determine if Nevada and Yuba County flannelbushes are Pine Hill flannelbush, were inconclusive; therefore, the USFWS continue under the assumption that these plants are not the listed entity (USFWS, 2019).

1.3 Project Understanding

Rise proposes to reinitiate underground mining and ore processing of the Idaho-Maryland Mine in Nevada County, CA. The proposed facilities and operations to support underground mining will be located on the approximate 119-acre Brunswick Industrial Site. As a component of the mine project, Rise proposes to grade the Centennial Industrial Site to create usable industrial property for potential future development. Grading of the Centennial Site will utilize engineered fill material produced from mining operations at the Brunswick Industrial Site. Development of the Centennial Site into an industrial subdivision is not part of the proposed IMM Project and is not proposed by Rise.

The Centennial Site is located in Nevada County, CA and borders the City of Grass Valley city limits. Zones within the approximate 56-acre Centennial Site contain elevated metal concentrations from historical land use. Rise is working with the California Department of Toxic Substances Control (DTSC) to fully remediate the site by consolidating and capping the contaminated soils in a manner consistent with current federal and state regulations.

The environmental cleanup work at the Centennial Site will be completed under the DTSC voluntary cleanup program and is outside the scope of the IMM Project. It is estimated that the cleanup program will cause a surface disturbance of approximately 26.56 acres. The DTSC cleanup program will have no impact on the Pine Hill flannelbush given the proposed areas of disturbance (excavation and mine waste consolidation areas within the Centennial Site are located outside of any area containing a mapped Pine Hill flannelbush). See Appendix E for site plans showing the locations of the proposed exaction and mine waste consolidation areas in relation to the mapped locations of the Pine Hill flannelbush within the Centennial Site. Impacts to the Pine Hill flannelbush covered under this HMP will be limited to the IMM Project only.

After the environmental cleanup work at the Centennial Site is complete, Rise proposes to truck engineered fill from the Brunswick Industrial Site to the Centennial Site. The engineered fill, composed of barren rock and sand, will be placed, graded, and compacted. Concurrent with fill and grading activities, the fill slopes will be revegetated to control erosion and ensure slope stability. Grading activities associated with the IMM Project will cause a surface disturbance of 17.15 acres.

The base of the engineered fill will extend approximately 44 acres across the site, although much of the area will have experienced surface disturbance by site remediation efforts. Disturbance and engineered fill placement will be avoided on the remaining 12.7 acres, which includes the main stem of Wolf Creek, the 100-foot non-disturbance setback of the main stem of Wolf Creek, and an undisturbed and protected zone containing Pine Hill flannelbush (see the proposed IMM Project Site Plan in Appendix E).

The proposed placement of engineered fill at the Centennial Site will impact 18 Pine Hill flannelbush plants directly by requiring their removal as part of the IMM Project. The remaining forty- two (42) individual Pine Hill flannelbush plants are located outside of the proposed engineered fill areas and therefore, they will not be directly impacted by the IMM Project. However, four (4) individual Pine Hill flannelbush plants will be located within 30 feet of the edge of the engineered fill material and could be subject to indirect effects from changes in topography, runoff, etc. that could occur as an edge effect on those individual plants. The 4 individual plants are located approximately 27, 26, 28, and 29 feet from the edge of the engineered fill. Therefore, as part of this HMP it is estimated that 18 individual Pine Hill flannelbush plants will be directly impacted and potentially 4 additional Pine Hill flannelbush plants could be indirectly impacted by the IMM Project.

1.4 Purpose of the Habitat Management Plan

This HMP has been developed in compliance with the Nevada County Land Use and Development Code, Section L-II 4.3.12, which includes regulations intended to follow the federal and state Endangered Species Acts (FESA and CESA), by avoiding the impact to development on rare, threatened, endangered, and special status species and their habitat, or where avoidance is not possible, to minimize or compensate for such impacts and to retain their habitat as non-disturbance open space. The regulations indicate that a project may only be approved when it is determined by the Nevada County Planning Agency that it will not adversely affect rare, threatened, or endangered species or their occupied habitat and that it will result in no net loss of habitat function or value for the defined species. When it is determined that a project will adversely affect a defined species or their habitat, the regulations require that a site-specific habitat management plan consistent with state and federal requirements be prepared.

This HMP includes an evaluation of the Pine Hill flannelbush identified and mapped within the Centennial Site. The species is regulated by CDFW, USFWS, and Nevada County. Preparation of the HMP included background research, field reconnaissance-level biological resources surveys, protocol-level surveys, data analysis, and impact assessment for the Pine Hill flannelbush. Development of recommendations for the management of the species within the Centennial Site is based on the Recovery Plan and the expertise of botanists with the understanding of the species ecology. This HMP also includes recommended avoidance, minimization, and mitigation measures to ensure that any direct and indirect effects of the IMM Project on the species are fully mitigated.

This HMP references and incorporates the findings of a stand-alone botanical report developed for the Centennial Site (Boes, 2021) as well as the findings of the Biological Resources Assessment and IMM Project Impact Assessment Technical Memorandum developed for the Centennial Site (Matuzak, 2021a; Matuzak, 2021b).

2 SPECIES DESCRIPTION, IDENTIFICATION, DISTRIBUTION, AND ECOLOGY

2.1 Description and Identification

2.1.1 Taxonomy

Beecher Crampton made the first collection of *Fremontodendron californicum* ssp. *decumbens* in 1956. Robert M. Lloyd (1965) described *F. californicum* ssp. *decumbens* as *F. decumbens* based on the type specimen he collected in May 1964 from "California, El Dorado Co., Pine Hill, ca. 3 kilometers north of Rescue." Munz (1968) reduced *F. decumbens* to a subspecies of *F. californicum*. Kelman (1991), in his revision of *Fremontodendron*, recognized *F. californicum* ssp. *decumbens* as a full species based upon morphological variation. At the time of the publication of the Recovery Plan, this taxon was known as *Fremontodendron californicum* ssp. *decumbens* (Whetstone and Atkinson 1993); however, this taxon is now considered its own species and is known just as *Fremontodendron decumbens* (USFWS, 2002; CNPS, 2019; CDFW, 2019).

2.1.2 Description

Pine Hill flannelbush is a branched spreading shrub of the cacao family (Sterculiaceae) growing to 1.3 meters (4 feet) tall. Dense star-shaped hairs cover the leaves and the younger twigs and branchlets. Its leaves are elliptic-ovate to ovate, shallowly or deeply palmately lobed with 5 to 7 lobes. Pine Hill flannelbush produces flower buds in late winter. Showy light-orange to reddish-brown flowers appear from late April to early July, though is at its peak in June. Its fruit is a capsule. *Fremontodendron decumbens* can be distinguished from *F. californicum* and *F. mexicanum* (Mexican flannelbush) by its decumbent growth habit (stems lying on the ground and growing upward only at the tip), its relatively long peduncles (stalks that support the inflorescence), and its copper-orange flowers. Pine Hill flannelbush is thought to be fire dependent, with studies resulting in only 2 percent of seed germination in the absence of fire (Boyd, 1987 in USFWS, 2002).

Boyd and Serafini (1992) summarized the life cycle of the Pine Hill flannelbush. Plants start producing flower buds in late winter. By the time the flowers open, most of the flower buds have been destroyed (Boyd and Serafini, 1992). Native solitary bees pollinate the flowers (Boyd, 1994). Seventy percent of the developing fruit is destroyed by insects prior to maturing. The remaining fruit dehisces (opens up) during summer and releases seeds onto the soil. The seeds are eaten by rodents and dispersed by harvester ants (*Messor andrei*) (Boyd, 1996; USFWS, 2002).

2.2 Historical and Current Distribution

2.2.1 Distribution within the Sierra Nevada Foothills

Pine Hill flannelbush is known to occur in serpentine and gabbro soils in chaparral and cismontane woodlands, at elevations ranging from 1,390 to 2,495 feet. It is known from twelve occurrences in Eldorado, Nevada and Yuba Counties in the foothills of the Sierra Nevada. It is threatened by development and alteration of the fire regime (CNPS, 2019).

Pine Hill flannelbush occurs on scattered rocky outcrops in chaparral on and in the vicinity of Pine Hill and in the black oak woodland on Pine Hill (L. Eng *in litt*. 1999). Community associates are *Pinus ponderosa* (ponderosa pine), *P. sabiniana* (foothill pine), *Adenostoma fasciculatum* (chamise), *Heteromeles arbutifolia* (toyon), and *Arctostaphylos glauca* (bigberry manzanita) (Kelman, 1991 & Boyd, 1996). The species largest identified and mapped population is from a localized area near Pine Hill in western El Dorado County, scattered within an area of approximately 2,000 hectares (5,000 acres; USFWS, 2019).

Although there are some reports of Pine Hill flannelbush occurring in some small scattered populations in Yuba or Nevada County, other reports describe these individuals as aberrant *F. californicum* (California flannelbush). Most occurrences of Pine Hill flannelbush are on private land (CDFW, 2019). One occurrence is on Bureau of Land Management land and one occurrence is on CDFW and California Department of Forestry and Fire Protection lands within the Pine Hill formation (CDFW, 2019). Presently, the majority of the Pine Hill flannelbush individuals are located on the parcel managed by the California Department of Forestry and Fire Protection on Pine Hill, and on a nearby private parcel.

The Recovery Plan states that the only verified location of this plant is near Pine Hill in western El Dorado County, and that the reported occurrences of this plant in Nevada County may be erroneous. It states:

"Although there are some reports of F. californicum ssp. decumbens occurring in some small scattered populations in Yuba or Nevada County, other reports describe these individuals as aberrant F. californicum ssp. californicum (California flannelbush)." (Recovery Plan pp. II-13). However, within the CNDDB, CDFW documents several locations of the Pine Hill flannelbush (or hybrids of flannelbush species) in Nevada County (CDFW, 2019). Additionally, the 5-year review of the species covered under the Recovery Plan concluded for the Pine Hill flannelbush that results of subsequent genetic work by a University of California, Davis researcher, to determine if Nevada and Yuba County flannelbushes are Pine Hill flannelbush, were inconclusive; therefore, the USFWS continue under the assumption that these plants are not the listed entity (USFWS, 2019).

2.2.2 Pine Hill Flannelbush within the Centennial Industrial Site

Reconnaissance-level biological resources field surveys were conducted on foot for the entirety of the Centennial Site (56.41 acres) by Greg Matuzak, Principal Biologist and owner of Greg Matuzak Environmental Consulting LLC, and Wendy Boes, a local Nevada County botanist, on December 9th through 12th and 17th and 18th, 2018. Follow up reconnaissance-level biological resources field surveys were conducted by Greg Matuzak for potential special-status wildlife species habitats on December 30th, 2018 and by Wendy Boes for the CNPS ranked plants and special-status plant species habitat on January 3rd, 2019. The purpose of the surveys conducted in December 2018 and January 2019 was to identify habitat and vegetation types and to determine the potential for any CNPS ranked plants and special-status plant and wildlife species identified in the desktop analysis and background research to occur within the Centennial Site.

Further evaluation of the Centennial Site was conducted on July 1st, 10th, and 14th, 2019 by Ms. Boes who implemented protocol-level botanical surveys within the entirety of the Centennial Site during the time of year when the target CNPS ranked plants and special-status plant species with potential to occur within the Centennial Site are known to be in bloom and identification of each is most likely, including the Pine Hill flannelbush. Ms. Boes identified and mapped the population of Pine Hill flannelbush during the July 2019 surveys of the Centennial Site (see Appendix D).

The Centennial Site has suitable habitat for the Pine Hill flannelbush in the Dubekella and Secca-Rock Outcrop complex soil series, a soil derived from gabbrodiorite parent material (see Appendix B). The known occurrence of the previously mapped Pine Hill flannelbush population within and directly adjacent to the Centennial Site (CDFW, 2019) was initially located within the Centennial Site in December 2018 and tentatively identified due to it being a perennial shrubby plant with characteristics (leaf morphology, plant habit, seeds, fruits) that allowed it to be fairly confidently identified at that time of year. The identification was verified during its blooming period when species-specific surveys for Pine Hill flannelbush were implemented, and the whole of the population that occurs within the Centennial Site was mapped in July of 2019. Sixty individuals were counted within the Centennial Site, all mature, flowering plants. No seedling or juvenile individuals were encountered. They occupied an absolute area of 0.22 acres over approximately 4.5 acres in the southern portion of the Centennial Site, with one plant occurring disjunct from main population, in the center of the study area (see Appendix D for a map of the species locations within the Centennial Site). The population extends beyond the Centennial Site towards the south into adjacent private properties (previously mapped by CDFW 2019). The population was not mapped or documented beyond the edge of the Centennial Site.

3 REGULATORY OVERVIEW FOR PROTECTION OF ENDANDERED SPECIES

3.1 Federal Regulations

3.1.1 Endangered Species Act of 1973

For the Centennial Site, consultation with the USFWS would be necessary if a proposed action may affect a federally listed species. This consultation would proceed under Section 7 of the Endangered Species Act (ESA) if a federal action is part of the proposed action or through Section 10 of the ESA if no such nexus were available (USFWS, 1973). There are three federally protected plant species listed under the ESA that have previously been documented within 5 miles of the Centennial Site (CDFW 2019). Scadden Flat checkerbloom (*Sidalcea stipularis*), Stebbins' morning glory (*Calystegia stebbinsii*), and Pine Hill flannelbush (*Fremontodendron decumbens*) are ESA listed species as Endangered.

Only the Pine Hill flannelbush is known to occur within the Centennial Site (see Appendix D and Appendix H).

3.2 State Regulations

3.2.1 California Endangered Species Act

The California Department of Fish and Wildlife (CDFW) has jurisdiction over plant and wildlife species listed as threatened or endangered under section 2080 of the California Fish and Game Code. The California Endangered Species Act (CESA) regulates take of state-listed threatened and endangered species. The state Act differs from the federal Act in that it does not include habitat destruction in its definition of *take*. The CDFW defines *take* as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The CDFW may authorize *take* under the CESA through Sections 2081 permits. If the results of a biological survey indicate that a state-listed species would be affected by the project, the CDFW would issue a permit under Section 2081 of the CDFW Code. CDFW maintains lists for Candidate-Endangered Species and Candidate-Threatened Species. Scadden Flat checkerbloom (*Sidalcea stipularis*) and Stebbins' morning glory (*Calystegia stebbinsii*) are State ESA listed species as Endangered, while Pine Hill flannelbush (*Fremontodendron decumbens*) is designated as a State Rare Species. All three plants have been known to occur within 5 miles of the Centennial Site (CDFW 2019, Appendix H), however only the Pine Hill flannelbush has been potentially identified within the site.

Pine Hill flannelbush has been documented to occur within the southern and southwestern sections of the Centennial Site (see map in Appendix D). In addition, the

foothill yellow-legged frog (*Rana boylii*) is a Candidate for listing as a Threatened species under the State ESA and, although not found at this site, it has been evaluated given the presence of several perennial, intermittent, and ephemeral streams within the Centennial Site. The California black rail (*Laterallus jamaicensis coturniculus*) has been previously documented within 5 miles of the Centennial Site and is listed as Threatened under CESA. This species is known to occur in freshwater marsh wetlands with a perennial water source. The Centennial Site contains only marginally suitable habitat for both species, and neither the foothill yellow-legged frog or the California black rail have been identified within the Centennial Site.

3.2.2 California Environmental Quality Act Guidelines Section 15380

California Environmental Quality Act (CEQA) Guidelines section 15380(b) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specific criteria. This section was included in the guidelines to deal primarily with situations in which a public agency is reviewing a project that may have a significant effect on, for example a "candidate species" that has not yet been listed by the USFWS or CDFW. CEQA, therefore, enables an agency to protect a species from significant project impacts until the respective government agencies have had an opportunity to list the species as protected, if warranted (CNRA 2019).

Plants appearing on the California Native Plant Society (CNPS) California Rare Plant Rank (CRPR) are considered to meet CEQA's Section 15380 criteria. Ranks include: 1A) plants presumed extirpated in California and either rare or extinct elsewhere, 1B) plant rare, threatened, or endangered in California and elsewhere, 2A) plants presumed extirpated in California, but more common elsewhere, and 2B) plants rare, threatened, or endangered in California, but more common elsewhere. Impacts to these species could therefore be considered "significant" requiring mitigation, or less than significant depending on the circumstances.

3.3 Local Regulations

3.3.1 Rare, Threatened, and Endangered Species and Their Habitat

The Nevada County Land Use and Development Code, Section L-II 4.3.12, includes regulations intended to follow the federal and state Endangered Species Acts, by avoiding the impact to development on rare, threatened, endangered, and special status species and their habitat, or where avoidance is not possible, to minimize or compensate for such impacts and to retain their habitat as non-disturbance open space. The regulations indicate that a project may only be approved when it is determined by the Nevada County Planning Agency that it will not adversely affect rare, threatened, or

endangered species or their occupied habitat and that it will result in no net loss of habitat function or value for the defined species. When it is determined that a project will adversely affect a defined species or their habitat, the regulations require that a site-specific habitat management plan consistent with state and federal requirements be prepared.

3.3.2 Nevada County General Plan

Land use changes and/or any subsequent development on the Centennial Site would be required to comply with those goals and policies outlined in the Nevada County General Plan and thus are included here.

The following goals and policies regarding relevant biological resources are set forth in Chapter 13: Wildlife and Vegetation of the Nevada County General Plan.

Goal 13.1 Identify and manage significant areas to achieve sustainable habitat.

Objective 13.1 Discourage intrusion and encroachment by incompatible land uses in significant and sensitive habitats.

Policy 13.1 Where significant environmental features, as defined in Policy 1.17, are identified during review of projects, the County shall require all portions of the project site that contain or influence said areas to be retained as non-disturbance open space through clustered development on suitable portions of the project site, or other means where mandatory clustering cannot be achieved. The intent and emphasis of such open space designation and non-disturbance is to promote continued viability of contiguous or inter-dependent habitats by avoiding fragmentation of existing habitat areas and preserving movement corridors between related habitats. Vegetation management for the benefit of habitat preservation or restoration shall be considered consistent with the intent of this policy.

Policy 13.2 As part of the Comprehensive Site Development Standards, include standards to minimize removal of existing vegetation and require installation and long-term maintenance of landscaping in Chapter 13: Wildlife and Vegetation Element Nevada County General Plan Volume I - Page 13-5 setbacks and buffer areas. These standards shall be applicable to all discretionary projects and to all ministerial projects other than a single-family residence located on an individual lot. Tree removal may be allowed where necessary to comply with public right-of-way development or dedication, or development of required site access and public utilities. Individual trees or groups of trees shall be protected during construction to prevent damage to the trees and their root systems. Vegetation in proximity to structures shall conform to applicable fire protection standards.

Policy 13.2A Project review standards shall include a requirement to conduct a site-specific biological inventory to determine the presence of special status species or habitat for such species that may be affected by a proposed project. The results of the

biological inventory shall be used as the basis for establishing land use siting and design tools required to achieve the objective of no net loss of habitat function or value for special status species. Where a Habitat Management Plan is deemed appropriate, the Plan shall be prepared to comply with the requirements of the Federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA). The plan shall provide the background data, impact analysis, and mitigation programs necessary to obtain a FESA Section 10(a) and CESA Section 2081 permit authorizing incidental take of federal and state listed threatened and endangered species that occur in areas proposed for future development. Prior to implementation of an adopted Habitat Management Plan, project applicants proposing the development of a project that would impact a federal or state listed species, or a species that is proposed for listing, shall be individually responsible for obtaining federal and state incidental take permits on a project-by-project basis.

Policy 13.3 As part of the Comprehensive Site Development Standards, require the maximum feasible use of drought tolerant native plant species for landscaping of all new multi-family residential, commercial, industrial, and public projects. Invasive, non-native plants, as determined by a landscape architect or other similar expert, that may displace native vegetation on adjoining undeveloped lands shall not be used. Landscaping with native trees and shrubs shall be encouraged to provide suitable habitat for native wildlife, particularly in proposed open space uses of future development.

Policy 13.4 Encourage long-term sustainability and maintenance of landscaped areas.

Policy 13.4A No net loss of habitat functions or values shall be caused by development where rare and endangered species and wetlands of over 1 acre, in aggregate, are identified during the review of proposed projects. No net loss shall be achieved through avoidance of the resource, or through creation or restoration of habitat of superior or comparable quality, in accordance with guidelines of the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

Policy 13.4B Habitat that is required to be protected, restored, or created as mitigation for a project's impacts shall be monitored and maintained in accord with a County-approved Habitat Management Plan.

Objective 13.2 Minimize impacts to corridors to ensure movement of wildlife.

Objective 13.3 Provide for the integrity and continuity of wildlife environments.

Objective 13.5 Support, where feasible, the continued diversity and sustain ability of the habitat resource through restoration and protection.

4 SITE DESCRIPTION

4.1 General Description

The Centennial site has been disturbed by historic mining and lumber mill practices, public access, and ongoing management for many years. Within the Centennial Site, additional disturbance such as the dumping of soils, landscape materials, and other miscellaneous activities has also occurred for many years. Areas not subject to this regular type of disturbance are dominated by native habitat. Each of the vascular plant species identified within the Centennial Site were recorded using keys and descriptions in *The Jepson Manual* (Baldwin et al., 2012, see Appendix F).

The Centennial Site is located in Nevada County, CA in the northern-central Sierra Nevada foothills. The Sierra Nevada foothills lie between the western edge of the Sierra Nevada and the eastern border of the Central Valley. The foothills form a belt 10 to 30 miles wide that ranges from 500 to 5,000 feet in elevation in a series of northwest to north-northwest aligned ridges that decline in elevation from northeast to southwest. Many rapidly flowing rivers and streams run westerly in deeply incised canyons with bedrock channels to the Central Valley and eventually to the Pacific Ocean. Alluvial fans, floodplains, and terraces are not extensive; and all but the largest streams are generally dry during the summer. Dominant vegetation communities include grasslands, oak woodlands, and chaparral.

Vegetation communities within the Centennial Site are typical of the lower Sierra Nevada foothills. However, the terrain within the Centennial Site is not typical of the lower Sierra Nevada foothills that normally vary between flat ridges and valleys to gently and moderately sloping hillsides. The Centennial Site elevation ranges from approximately 2,500 to 2,600 feet above mean sea level (MSL) and much of the Centennial Site has been impacted due to historical mining and lumber mill practices, which has included the placement of large amounts of mine tailings within the Centennial Site and the removal of vegetation, among other disturbances. The Centennial Site is located along the main stem of Wolf Creek and the interior of the site is dominated by mixed hardwood-conifer forests, with areas of montane riparian woodland, mixed chaparral, mixed wetland types, and annual grassland.

Natural hydrological sources for the Centennial Site include precipitation and surface run-off from adjacent lands. Mean annual rainfall in the area is 53.74 inches (NRCS, 2018). The Centennial Site includes a perennial stream: the main stem of Wolf Creek. The main stem of Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Site. In addition, the Centennial Site contains several ephemeral and intermittent streams that connect directly and

indirectly with the main stem of Wolf Creek within the northwestern section of the Centennial Site.

4.2 Centennial Site Soil Types

The USDA identifies four soil types within the Centennial Site. USDA soil mapping for the Centennial Site area is included in Appendix B and the soil types are described in detail as follows:

- **Cut and fill land (Ct).** This soil type consists of areas that have been altered by activities other than mining such that there are no intact soil characteristics. This soil is not hydric.
- **Placer diggings (Pr).** The Placer diggings series consists of remnant tertiary river deposits associated with hydraulic mining and placer mining operations as well natural deposits within stream channels. Areas with this soil type are 90 to 100 percent rock, cobble or gravel. 50 to 75 percent of these lands have a mixture of rock, cobbles, gravel and soil. This soil contains unnamed hydric inclusions in drainages and depressions.
- **Rock outcrop-Dubakella complex on 5 to 50 percent slopes (RrE).** The Rock outcrop-Dubakella complex consists of well-drained soils on mountains. This complex is made up of 50 percent Dubakella gravelly loam, 40 percent rock outcrop and 10 percent included soils. These soils formed from weathered rocks with a large amount of serpentinitic minerals. Drainage is slow and runoff is very high. These soils are not hydric. A typical profile for this complex consists of dark brown (7.5 YR 3/2) gravelly loam from 0 to 2 inches underlain by a reddish brown (5YR 3/4) gravelly clay loam from 2 to 10 inches. This layer is underlain by a variegated yellowish brown (10YR 4/4) and reddish brown (7.5YR 4/4) very cobbly clay from 11 to 21 inches. This layer underlain by a blue green, hard, fractured and partly weathered serpentinized layer at 21 inches. Several CNPS ranked plants and special-status plant species have the potential to occur on the gabbro soils of the Dubakella and Secca-Rock complex soils within the Centennial Site (Boes 2020, see Section 4.4 below).
- **Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE).** This complex consists of moderately well-drained soils on gently sloping to steep mountain terrain. These soils formed from basic igneous and metamorphic rock. Drainage is slow and runoff is slow to rapid. These soils are not hydric. A typical profile for Secca-Rock outcrop complex consists of brown (5YR 3/4) gravelly silt loam from 0 to 6 inches. This layer is underlain by a reddish brown (5YR 3/4) gravelly silt loam from 6 to 15 inches. This layer is underlain by dark reddish brown (5YR 3/4) cobbly silty clay loam from 15 to 22 inches. From 22 to 36 inches is a strong brown (7.5YR

4/4) cobbly clay, which is underlain by a yellowish brown (10YR 5/6) cobbly clay from 36 to 45 inches. At 45 inches is weathered metabasic rock.

Within the Centennial Site, the population of Pine Hill flannelbush is located within the southern section of the site where Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE) has been mapped. A single individual of the Pine Hill flannelbush has been identified and mapped within a Placer diggings (Pr) soil unit.

4.3 Centennial Site Vegetation Communities

Vegetation communities within the Centennial Site include the following vegetation community types: montane hardwood, montane hardwood-conifer, annual grassland, montane riparian, wet meadow, and freshwater emergent marsh wetlands (see Appendix D for the Vegetation Community Map).

Approximately 16.24 acres of the Centennial Site has been mapped as mixed chaparral, the vegetation community that the Pine Hill flannelbush most associates with. Below is a description of the mixed chaparral habitat identified and mapped within the Centennial Site.

Mixed Chaparral

Mixed chaparral is identified within the Centennial Site. Mixed chaparral is primarily associated with the gabbro soils of the Secca and Dubekella complexes that are known to occur within the south and southwestern sections of the site. In the gabbro, this vegetation type is relatively intact and is characterized by whiteleaf manzanita, buck brush (*Ceanothus cuneatus),* Oregon white oak (*Quercus garryana* var. *semota),* chaparral pea (*Pickeringia montana), and* occasionally scattered foothill pine. McNab cypress (*Hesperocyparis macnabiana)* is occasional in the southwestern portions of the Centennial Site. Pine Hill flannelbush has also been identified and mapped within this vegetation community within the Centennial Site.

With the exception of occasional natural and manmade openings within this habitat type, mixed chaparral forms almost continuous stands within the southern portion of the Centennial Site. Mixed chaparral is also present in heavily disturbed areas, both recent and historic disturbances. In some of the more disturbed, ruderal habitats there is a scattered formation of chaparral, usually characterized by whiteleaf manzanita with buck brush and coyote brush (*Baccharis pilularis)*.

5 GENERAL MANAGEMENT CONSIDERATIONS FOR THE SPECIES

The Recovery Plan for the Pine Hill flannelbush (USFWS, 2002) reports that the habitat in which this plant occurs is naturally and artificially limited and conservation of not just the populations, but adjacent vacant habitat is beneficial to long-term persistence for this species. However, the 5-year review of the species covered under the USFWS Recovery Plan concluded for the Pine Hill flannelbush that results of subsequent genetic work by a University of California, Davis researcher, to determine if Nevada and Yuba County flannelbushes are Pine Hill flannelbush, were inconclusive; therefore, the USFWS continue under the assumption that these plants are not the listed entity (USFWS, 2019).

Therefore, given the species is protected under FESA and it is unknown whether the species will be impacted by the IMM Project given inconclusive genetic evidence that flannelbush in Nevada County are Pine Hill flannelbush, for the purposes of this HMP, it is assumed for the IMM Project that the individual plants identified within the Centennial Site may be the FESA listed Pine Hill flannelbush. Furthermore, as discussed below, coordination and consultation with the USFWS for this species within the Centennial Site will be ongoing and the results of the consultation will determine the level at which, if any, mitigation is applied to the potential impacts to flannelbush within the Centennial Site.

It is estimated 18 plants are located within the engineered fill area footprint of the Centennial Site (see Appendix E), the following management considerations of the species within the Centennial Site have been developed and are recommended. Additionally, another 4 individual Pine Hill flannelbush plants are located within 30 feet of the edge of the engineered fill material and could be temporarily and/or indirectly impacted through on-site construction and site disturbance. The DTSC cleanup project will have no impact on the Pine Hill flannelbush (see Appendix E for the site plan containing the extent of the proposed disturbance of the DTSC cleanup project in relation to individual Pine Hill flannelbush mapped within the Centennial Site) and therefore, the recommendations outlined within this HMP are included as part of the development of the IMM Project exclusively.

Pine Hill flannelbush within the Centennial Site have been confined to the southern section that has been mapped by USDA as Secca-Rock outcrop complex, 2 to 50 percent slopes (see Appendix B). A majority of this soil type will not be impacted by the IMM Project and the area of impact to this soil type will be limited to the southeastern portion of the Centennial Site where the soil type has been mapped and there has only been a single cluster of the plant in that area and proposed engineer fill will impact the mapped area containing the Secca-Rock outcrop complex, 2 to 50percent slopes (see Appendix E).

Furthermore, Appendix B contains mapping of USDA soils series within 6 miles of the Centennial Site that area known to contain gabbro parent material, the soil type required

for the Pine Hill flannelbush. The soils series within Nevada County that are known to contain gabbro parent material include Secca, Sites, Boomer, and Chaix variants USDA soils series (from the Nevada County USDA Soils Series, see Appendix B). A majority of the mapped Secca-Rock outcrop complex, 2 to 50 percent slopes soil type is located to the southwest of the Centennial Site where the largest area of previously mapped flannelbush in Nevada County has occurred within and adjacent to the Nevada County transfer station off of McCourtney Road (CNDDB, 2020). Within 6 miles of the Centennial Site, approximately 8,124 acres of Secca-Rock outcrop complex, 2 to 50 percent slopes have been mapped and a total of 30,741 acres of Secca, Sites, Boomer, and Chaix variants USDA soils series have been mapped within 6 miles of the Centennial Site. Therefore, gabbro soils are not a limiting factor within the region of the Centennial Site and proposed impacts to less than half of the Secca-Rock outcrop complex, 2 to 50 percent slopes soil type mapped within the Centennial Site (~5 acres) would not be a limiting factor for this species.

Therefore, avoidance, minimization, and mitigation measures associated with the overall management and persistence of the species shall be implemented to minimize potential impacts to the species and to mitigate for the direct and indirect effects the IMM Project may have on the species within the Centennial Site. The IMM Project-specific protection measures are identified and included within Section 6 below. This section includes the recommended general management of the Centennial Site for the persistence of the 42 Pine Hill flannelbush that will not be directly impacted by the IMM Project. The final avoidance, minimization, and mitigation measures required for the proposed IMM Project's Pine Hill flannelbush impacts will be developed in coordination and consultation with the USFWS, most likely under a Section 7 ESA consultation between the United States Army Corps of Engineers (Corps) and USFWS as outlined in Section 6 below.

5.1 Recovery Plan Goals

The ultimate goals of the Pine Hill flannelbush Recovery Plan include the following:

(1) protect and restore sufficient habitat and numbers of populations;

(2) ameliorate both the threats and any other newly identified threats; and

(3) downlist of the Pine Hill flannelbush.

Pine Hill flannelbush is not currently considered delistable (USFWS, 2002). Elements common to the recovery criteria of most listed species include:

(1) protection from development and incompatible uses of the habitat of populations representing the full range of genetic and geographic variation in the species; and

(2) achievement of self-sustaining status in specified populations.

Recovery and long-term conservation tasks emphasized in the Recovery Plan are

(1) habitat protection and management;

(2) surveying and monitoring;

(3) research; and

(4) public participation, outreach, and education.

Management actions needed as identified in the Recovery Plan, which guide the habitat and population enhancement and restoration efforts include the following: burning; general surveys; baseline monitoring; monitoring for trends of populations, success of management actions and threats at all populations identified for protection; monitoring for habitat fragmentation, major shifts in vegetation type, and tracking of occurrence establishment, and extirpation; assessment of disease as threat; introduction; and seed banking.

5.2 Threats to Species

Identified threats to the Pine Hill flannelbush, according to the Recovery Plan (USFWS, 2002):

- Habitat loss: development throughout the range;
- Habitat fragmentation;
- Clearing of chaparral;
- Small set-asides as project mitigation;
- Garbage dumping;
- Alteration of natural fire regime: too frequent or infrequent of fires;
- Suppression of disturbance requires scarification for germination of seeds; and
- Increased risk of extinction due to environmental, demographic or genetic random events.

Mitigation for development often is by small "set asides" (small natural areas within the development), which increase habitat fragmentation, are difficult to manage for fire, and are subject to edge effect problems. In some instances such as within the Centennial Site, the population of potential Pine Hill flannelbush is already small and isolated so the protection of the population within the southern section of the Centennial Site would be beneficial to the species.

Specific threats identified within the Centennial Site include:

- Removal of vegetation by homeless to create camps at site may have resulted in individuals being removed;
- Foot traffic at site to access camps may have resulted in crushing young individual plants;
- Fire rings observed in camps that could result in fire;
- Invasive nonnative plant species;
- Garbage dumping; and

5.3 Overall Management Approach

5.4 Goal 1: Eliminate or minimize potential direct and indirect impacts from Project Operations

Conduct full coverage pre-construction surveys in the appropriate phenological blooming period when detection is the most probable.

1. Operation Actions Resulting in direct effects to Pine Hill flannelbush

    - Engineered fill placement, clearing for reclamation, access, roads, etc. resulting in direct take of individuals of 18 individuals.

      Mitigation:
        - Flag and avoid all individuals where possible.
        - Protection of individuals near project activities with fencing and other physical blockades as protective measures.
        - Transplant individuals that will be taken. Develop a Transplantation Plan for 1) identifying location for dormant season relocation; 2) site selection for transplanting; and 3) metrics of successful establishment (see Section 6 below).

2. Operation Actions resulting in indirect effects to Pine Hill flannelbush

    - Dust resulting in reduced photosynthetic capacity, reduced visitation by pollinators have the potential to impact the 4 individual plants located within 30 feet of the southern edge of the engineered fill.

      Mitigation:
        - A Dust Control Management Plan during construction would assist with limiting the indirect impacts on the species for dust.

    - Removal of habitat resulting in reduced capacity for recruitment and persistence.

Mitigation:

- Onsite habitat protection and enhancement – refer to Goal 2.

- Habitat fragmentation resulting in habitat too small to support the viability of the population and make it more vulnerable to increased disturbance regimes.

Mitigation:

- Offsite habitat protection and enhancement – refer to Goal 2.

- Long term indirect effect of increased access and disturbance of individuals due to increased accessibility.

Mitigation:

- Consider blockades and security measures to protect habitat.

- Increased introduction and abundance of invasive plant species resulting in increased competition with Pine Hill flannelbush.

Mitigation:

- Monitor and treat invasive plants annually until the success criteria as listed in Section 6.3.1 is met.
- Retain vegetation barriers between areas of disturbance and the population to act as a biological barrier to invasion

- Reduced habitat for harvester ants and other seed dispersal agents, and pollinators, especially native solitary bees.

Mitigation:

- Onsite habitat protection and enhancement – refer to Goal 2.

5.5 Goal 2: On and Off-site habitat enhancement and restoration

5.5.1 Protect Existing Population and Adjacent Suitable Habitat

Protect all individuals of Pine Hill flannelbush and their habitat that occur outside of the disturbance footprint. The Recovery Plan for Pine Hill flannelbush (USFWS, 2002) reports that the habitat in which this plant occurs is naturally and artificially limited, and conservation of not just the populations, but adjacent vacant habitat is beneficial to long-term persistence.

- Map suitable onsite habitat contiguous with occurrence and preserve.

5.5.2 Enhance Habitat

Measures should be taken to enhance Pine Hill flannelbush habitat outside the disturbance footprint, such as:

- Pilot Study: Collaborate with CalFire or other research facility to conduct prescribed fire in areas to enhance natural germination and recruitment. Pine Hill flannelbush needs fire for successful germination, and root sprouts.
- Removal of invasive plants.
- Prevention of trespassers who would remove vegetation.

5.6 Goal 3: Onsite enhancement and restoration of population.

5.6.1 Ameliorate or eliminate existing threats

Measures should be taken to ameliorate or eliminate existing threats to the Pine Hill flannelbush outside the disturbance footprint, such as:

- Prevent trespass and establishment of encampments to prevent accidental take of individuals.
- Removal of invasive plants.
- Clear vegetation overhanging existing individuals.

6 IMM PROJECT SPECIFIC CONSERVATION MEASURES AND SPECIES MANAGEMENT

Coordination and consultation with CDFW and USFWS will be required given the Pine Hill flannelbush is listed under FESA and is identified as a Rare Species by CDFW. The applicant will require the development of a Biological Assessment (BA) that incorporates the background and findings of this HMP. The USFWS will develop a Biological Opinion (BO) if the IMM Project is covered under a Section 7 ESA consultation or if the IMM Project is covered under a Section 10 ESA consultation, a Habitat Conservation Plan ("HCP") for the Pine Hill flannelbush would most likely be required. The BO or HCP covering impacts to this species within the Centennial Site may contain additional requirements related to avoidance, minimization, and mitigation measures to ensure the IMM Project does not jeopardize the persistence of the species.

6.1 Pre-Construction Surveys and Avoidance

Conduct pre-construction surveys for special status plants (any state or federally listed plant as well as any CNPS plant listed 1 or 2) in the appropriate phenological blooming period when each species is identifiable.

If any sensitive plants are identified during the pre-construction surveys, the following avoidance, minimization, and protection measures are recommended to avoid and minimize potential impacts to sensitive plants.

Avoid impacts to sensitive plants where identified within the proposed disturbance areas. However, if avoidance and preservation is not possible, consultation with CDFW and USFWS will be required for impacts to Pine Hill flannelbush (*Fremontodendron decurrens)*. Based on the consultation with CDFW and USFWS for this species, mitigation requirements could include, but may not be limited to the following: appropriate onsite enhancement for the species, site restoration for the species, and/or offsite compensation of impacts for the species. Consultation with CDFW and USFWS is also recommended for the development and implementation of other state and federally listed plant species or CNPS list 1 and 2 species identified within the project disturbance areas.

6.2 Seed Collection and Propagation Techniques

Seed collection was conducted on August 21, 2019 with Mr. Brett Hall[1] from the UC Santa Cruz Arboretum as a part of the UC Santa Cruz Native Plant Program. Four plants on the northern edge of the distributional limit of the population were selected for seed collection as there is the greatest potential for these individuals to be impacted. These

[1] UCSC Arboretum has a MOU with CDFW permitting collecting of California Rare, Threatened, and Endangered Plants (10-01 M).

are the plants within 30 feet of the southern edge of the engineered fill that could be impacted indirectly. These 4 plants will be included as part of the monitoring program outlined below and if the health of any of these 4 plants is identified to decline during monitoring, additional planting of propagated plants would be required as identified below for transplants.

The seed had largely dispersed, but approximately 30-100 seeds were collected per plant, which was approximately 1 to 2 seeds per fruit. The seeds will be cleaned and stored in the seedbank at UC Santa Cruz for either future propagation efforts, or as a part of seed banking efforts.

As the seed had largely dispersed for the 2019 collection cycle, additional seed will need to be collected in 2020 to have enough seed for growing and seed banking. There will need to be at a minimum, 100 seeds collected for each plant that will be destroyed or transplanted. It is recommended that up to 400 seeds should be collected from each plant to be destroyed or transplanted to have sufficient buffers for future propagation efforts and for seed banking. A minimum of 200 seeds per plant destroyed or transplanted should be stored for seed banking while the remaining 200 seeds would be propagated for germination and planting as required.

Seeds will be seed banked and grown out in accordance with the most recent and successful propagation techniques such as follows (Brett Hall, UC Santa Cruz Arboretum, personal communication, 2019):

1. Collect seed.

2. Clean and dry the seed at 20-25% humidity for 2 to 4 weeks and then freeze the seed for the seed bank. To seedbank, place in sealed envelopes and database with provenance etc. and given an accession number. Collect and process while tracking and storing by maternal lines to maintain accurate accounting of biodiversity.

3. Seeds would be given germination treatments in accordance with best available techniques:

(https://www.fs.fed.us/rm/pubs_other/wo_AgricHandbook727/wo_AgricHandbook727_544_546.pdf)

4. Once germination occurs, grow on and upsize into containers then grow on and either plant out or upsize again into larger containers until planting. It is recommended to plant out sizable plants, say 4 inch to one-gallon size depending on the quantity. It is recommended to cage plants to protect against rodents and deer. Planting should occur in the fall/winter after good rains.

6.2.1 Increase Natural Recruitment and Germination

As discussed above and as feasible, collaborate with research facility to study fire management. Controlled burning can be used for increased germination, without fire the germination rates are estimated at only 2%.

6.3 Project Specific Mitigation Measures and Management

6.3.1 Transplantation and Monitoring for Direct and Indirect Impacts to Pine Hill Flannelbush

Protect all individuals of Pine Hill flannelbush and their habitat that occur outside of the disturbance footprint. The Recovery Plan for Pine Hill flannelbush (USFWS 2002) reports that the habitat in which this plant occurs is naturally and artificially limited, and conservation of not just the populations, but adjacent vacant habitat is beneficial to long-term persistence. The following steps are recommended for the transplantation and monitoring of any individual Pine Hill flannelbush plants that can't be avoided from direct impacts to them. The following steps also incorporate the 4 individual plants within 30 feet of the southern edge of the engineered fill area, which will be included as part of the monitoring plan and assessed for their health through the length of monitoring required to meet the success criteria. Monitoring and success criteria are recommended below.

STEP 1: Seed Collection

Collect seed for seedbanking and for future replacement and recovery efforts (see Section 6.2 above).

STEP 2: Develop Transplantation Plan and Monitoring Plan

Prior to transplanting or monitoring: 1.) Develop a Transplantation Plan and model for site selection for transplanting; and 2.) Develop a Monitoring Plan with criteria for "aliveness" and metrics of establishment (see Section 6.3.2 below).

STEP 3: Transplanting

Attempt to move the individuals of Pine Hill flannelbush that fall within the disturbance footprint to another site with similar soil, hydrologic, vegetation type and aspect. The transplantation site(s) selected should extend the known population spatially, in other words, planting beyond the known perimeters of the existing population is preferable, to maintain population coverage.

STEP 4: Transplant Monitoring

Transplanting shall occur in the season deemed to have the greatest potential for success, generally the fall, after rains have commenced. Transplants will be monitored every month for the first six months, then subsequently, every two months for the first two years. After monitoring identifies successful establishment and flowering for the second season for each of the transplants, transplanting will have been deemed successful.

STEP 5: Alternative Measures to Transplantation and Seed Collection

If these measures are not successful in maintaining the Pine Hill flannelbush population numbers, then the following measures should be taken:

- Individuals will be grown from seed and transplanted out in a 100:1 ratio for those taken.
- Transplants of individuals grown from seed will be planted with similar soil, hydrologic, vegetation type and aspect.
- Transplanting shall occur in the season deemed to have the greatest potential for success, generally the fall, after rains have commenced.
- Transplants will be monitored every month for the first six months, then subsequently, every two months for the first two years.

SUCCESS CRITERIA:

After two summer seasons of monitoring identifies successful establishment of 25% of the initial transplants, transplant seedlings will have been deemed successful. See Section **6.3.2** for a description of the required monitoring and monitoring plan.

6.3.2 Monitoring Plan

Monitoring of the population should be conducted on an annual basis until the success criteria as listed above in Section 6.3.1 is met. As per the Recovery Plan (USFWS) monitoring shall include: (1) population counts and demographics including some estimate of seedbank dynamics; (2) photopoints; (3) existing or new threats; (4) co-occuring species especially invasive plant cover estimates; (5) density and estimates of acreage occupied; and (6) time since last disturbance.

Monitoring of the habitat will be conducted on an annual basis until the success criteria as listed above in Section 6.3.1 is met and will include (1)degree of habitat fragmentation; (2) shifts in vegetation type; (3) establishment and extirpation of plant occurrences on

the landscape (metapopulation dynamics and in the context of entire extent of this species). Aerial photographs may be used in ascertaining some of this information.

A report will be prepared by the end of each monitoring year and submitted to Nevada County and Partners (applicant, regulatory agencies, consultants, etc.) until the success criteria as listed above in Section 6.3.1 is met. The report shall be prepared by a qualified botanist or ecologist and include the following:

- Dates of monitoring and participants.
- Sampling procedures
- A literature review of any new research that may be applicable to this project.
- General condition of the site including any significant changes or new threats observed. General condition for the species.
- Raw data submitted electronically.
- Summarized results of the monitoring presented graphically or in tabular form and discussed.
- Immediate Actions Taken or Needed.
- Any changes in the sampling procedure or timing made or needed.
- Statement of the next monitoring session as per the prescribed time table.

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8 QUALIFICATIONS OF REPORT PREPARERS

Mr. Greg Matuzak, Principal and owner of Greg Matuzak Environmental Consulting LLC is a wetlands ecologist and wildlife biologist with 20 years of experience conducting aquatic resources delineations and biological resources assessments in Northern California. Mr. Matuzak is 40-hour Wetland Delineation Certified (Wetland Training Institute) and has conducted aquatic resources delineations for 100's of linear miles of projects and 1000s of acres of site development projects. Additionally, Mr. Matuzak has implemented special-status biological resources surveys and developed biological resources assessments for dozens of projects in Nevada County. Mr. Matuzak has lived and worked in Nevada County for over 13 years.

Ms. Wendy Boes is a local Nevada County botanist and most recently worked for the Tahoe National Forest as a botanist. Ms. Boes is an independent consultant, GIS specialist, and conducts field data collection and GIS mapping for field related projects. Mr. Matuzak and Ms. Boes were responsible for the field data collection and assessment developed as part of the development of this Biological Report. Both Mr. Matuzak and Ms. Boes are on the Nevada County Planning Department's list of Qualified Biological Resources Consultants.

Appendix A

Centennial Site Map

Figure. Centennial Industrial Site

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

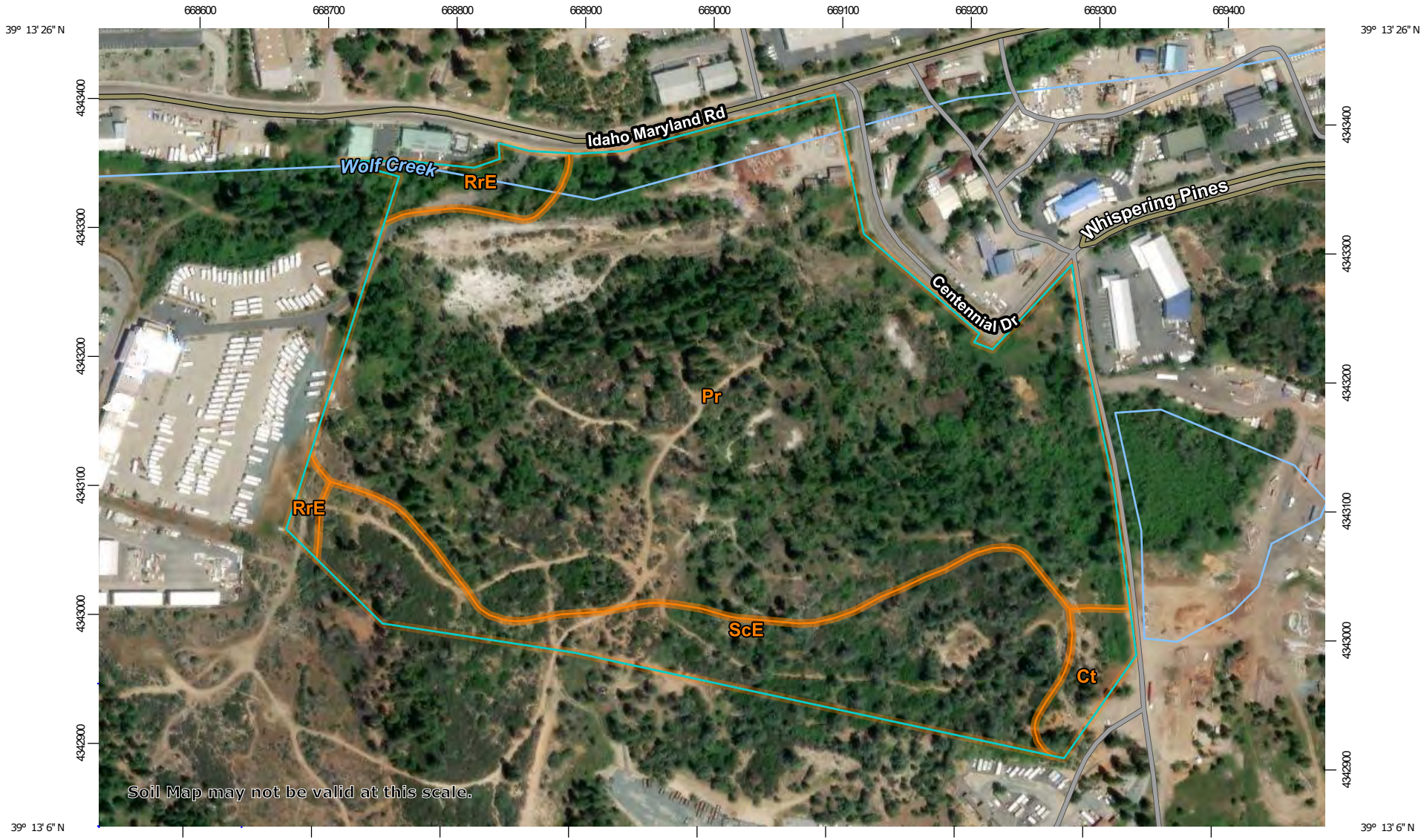
SCALE: 1 inch = 300 feet

Legend

Centennial Industrial Site Study Area, 56.41 ac.

Appendix B

USDA Soils Maps



Map Scale: 1:4,360 if printed on A landscape (11" x 8.5") sheet.

N

0 50 100 200 300 Meters

0 200 400 800 1200 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

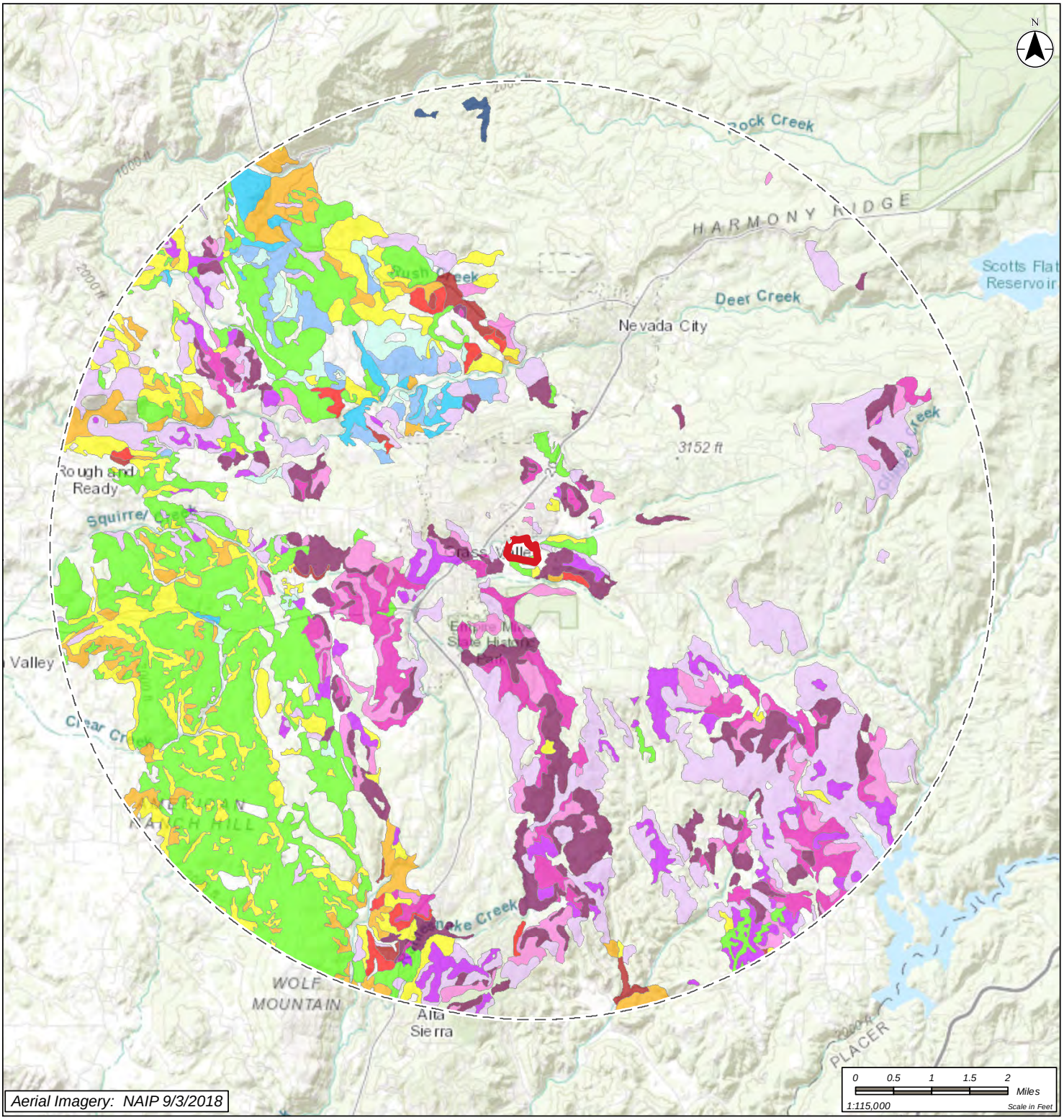
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ct	Cut and fill land	1.1	2.2%
Pr	Placer diggings	43.2	76.4%
RrE	Rock outcrop-Dubakella complex, 5 to 50 percent slopes	1.8	3.1%
ScE	Secca-Rock outcrop complex, 2 to 50 percent slopes	10.31	18.4%
Totals for Area of Interest		**56.41**	**100.0%**



Legend

- Project Boundary
- 6 mile Buffer on Project Boundary

Soil Extent*

- Boomer loam, 5 to 15 percent slopes
- Boomer loam, hard bedrock, 7 to 28 percent slopes
- Boomer, hard bedrock - Rock outcrop complex, 15 to 60 percent slopes
- Boomer, hard bedrock - Rock outcrop complex, 5 to 30 percent slopes
- Chaix sandy loam, 15 to 50 percent slopes, eroded
- Chaix very stony loam, thick solum variant, 15 to 30 percent slopes
- Chaix very stony loam, thick solum variant, 30 to 50 percent slopes
- Chaix very stony loam, thick solum variant, 5 to 15 percent slopes
- Secca-Rock outcrop complex, 2 to 50 percent slopes
- Sites silt loam, 15 to 30 percent slopes, N low montane
- Sites silt loam, 2 to 9 percent slopes, N low montane
- Sites silt loam, 9 to 15 percent slopes, N low montane
- Sites very stony loam, 15 to 50 percent slopes
- Sites very stony loam, 2 to 15 percent slopes

* Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online. Accessed 11/11/2020

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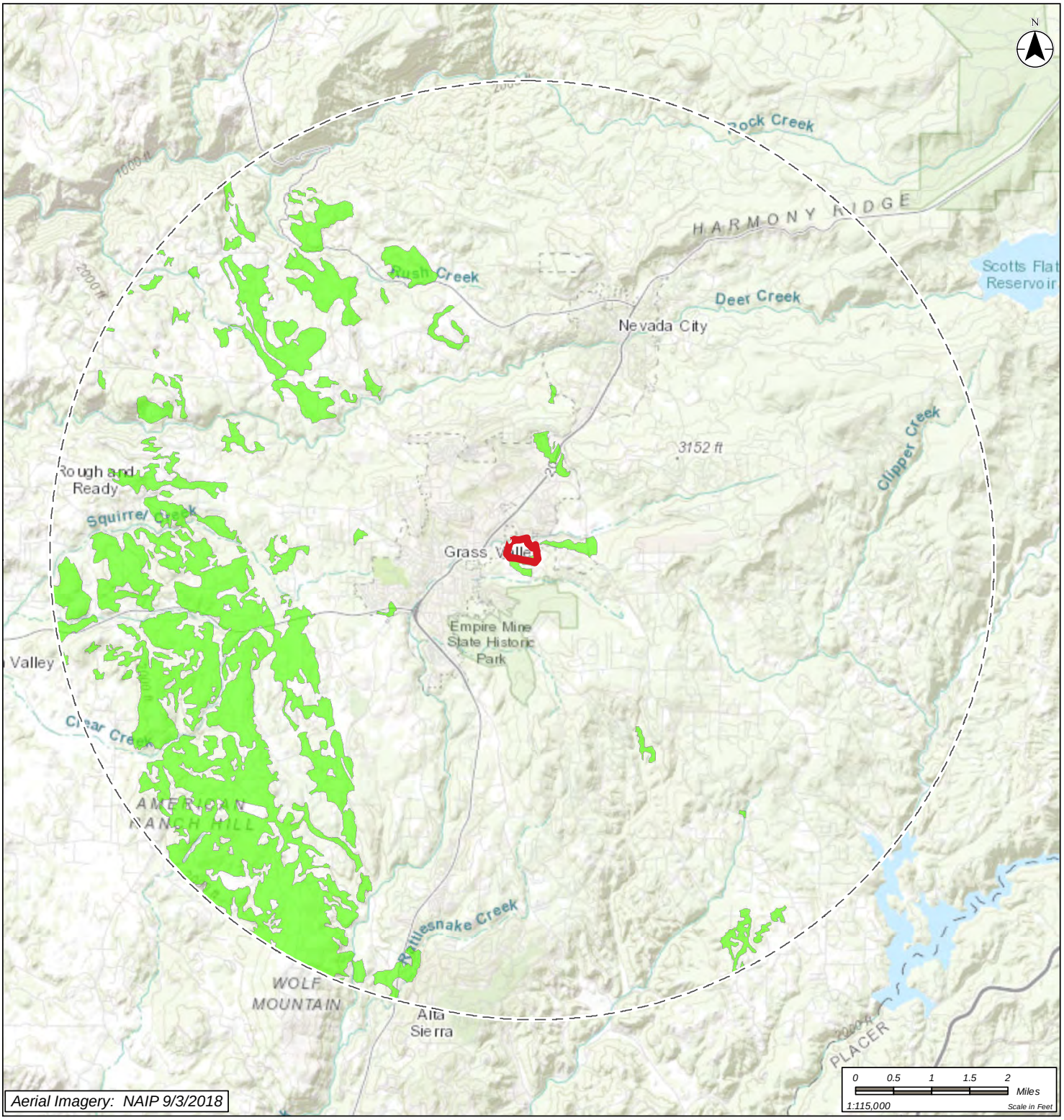
Centennial Industrial Site

Soils Map

Prepared: Melissa Nugent 12/6/2020 E:\2020_GIS_Matuzak\20201201_NevadaCnty_CentennialIndustrialSite\mxd\SoilsMap_20201201_NevadaCnty_CentennialIndustrialSite.mxd



Legend

Project Boundary

6 mile Buffer on Project Boundary

Soil Extent*

Secca-Rock outcrop complex, 2 to 50 percent slopes

* Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online. Accessed 11/11/2020

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Centennial Industrial Site

Soils Map - Secca-Rock outcrop complex, 2 to 50 percent slopes

Prepared: Melissa Nugent 12/6/2020 E:\2020_GIS_Matuzak\20201201_NevadaCnty_CentennialIndustrialSite\mxd\SoilsMap_Secca_20201201_NevadaCnty_CentennialIndustrialSite.mxd

Type of parent material	*Soil series or land type name*
Stratified mixed alluvium (recent)	Loamy and clayey alluvium
Stratified mixed alluvium (Tertiary river gravels)	Horseshoe
Andesitic conglomerate (Mehrten formation)	Ailken, Cohasset, Iron Mountain, Josephine, McCarthy
Granodiorite	Ahwahnee, Auberry, Chaix, Hoda, Hotaw, Musick, Sierra, Shenadoah, Trabuco
Gabbrodiorite	Boomer, Chaix variant, Secca, Sites
Serpentine	Dubakella, Dubakella variant
Slate (Mariposa group)	Mariposa, Josephine
Metamorphosed volcanic rock, greenstone, amphibolite schist	Auburn, Argonaut, Boomer, Cohasset, Josephine, Rescue, Secca, Sobrante, Sites
Slates and Schists (Calaveras group)	Mariposo, Maymen, Sites, Josephine

Appendix C

Vegetation Community Map

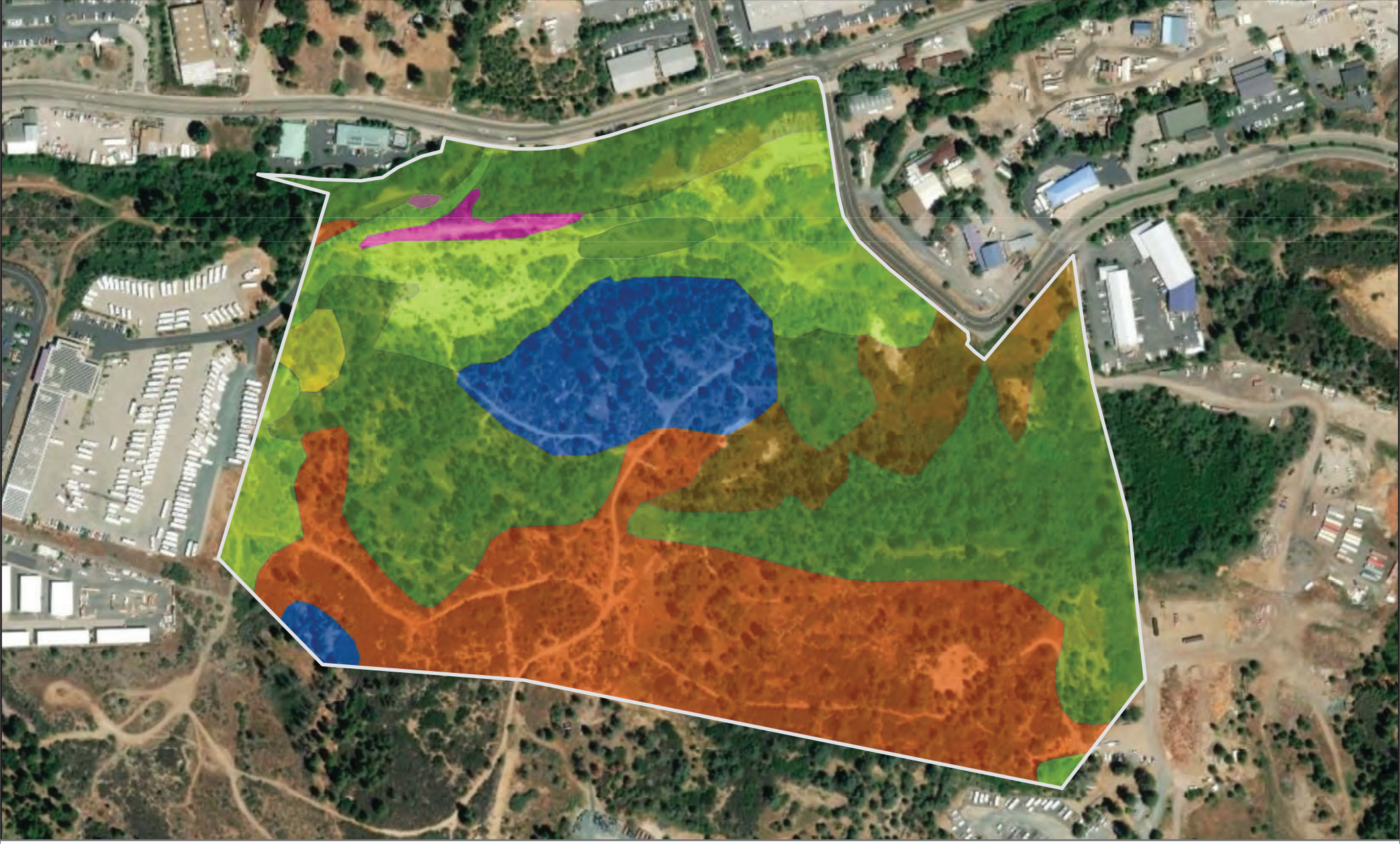


Figure. Vegetation Communities within the Centennial Industrial Site

Legend

- Centennial Industrial Site Study Area

Vegetation Type

- Annual Grassland
- Fresh Emergent Wetland
- Mixed Chaparral
- Montane Hardwood-Conifer
- Montane Hardwood
- Montane Riparian
- Wet Meadow

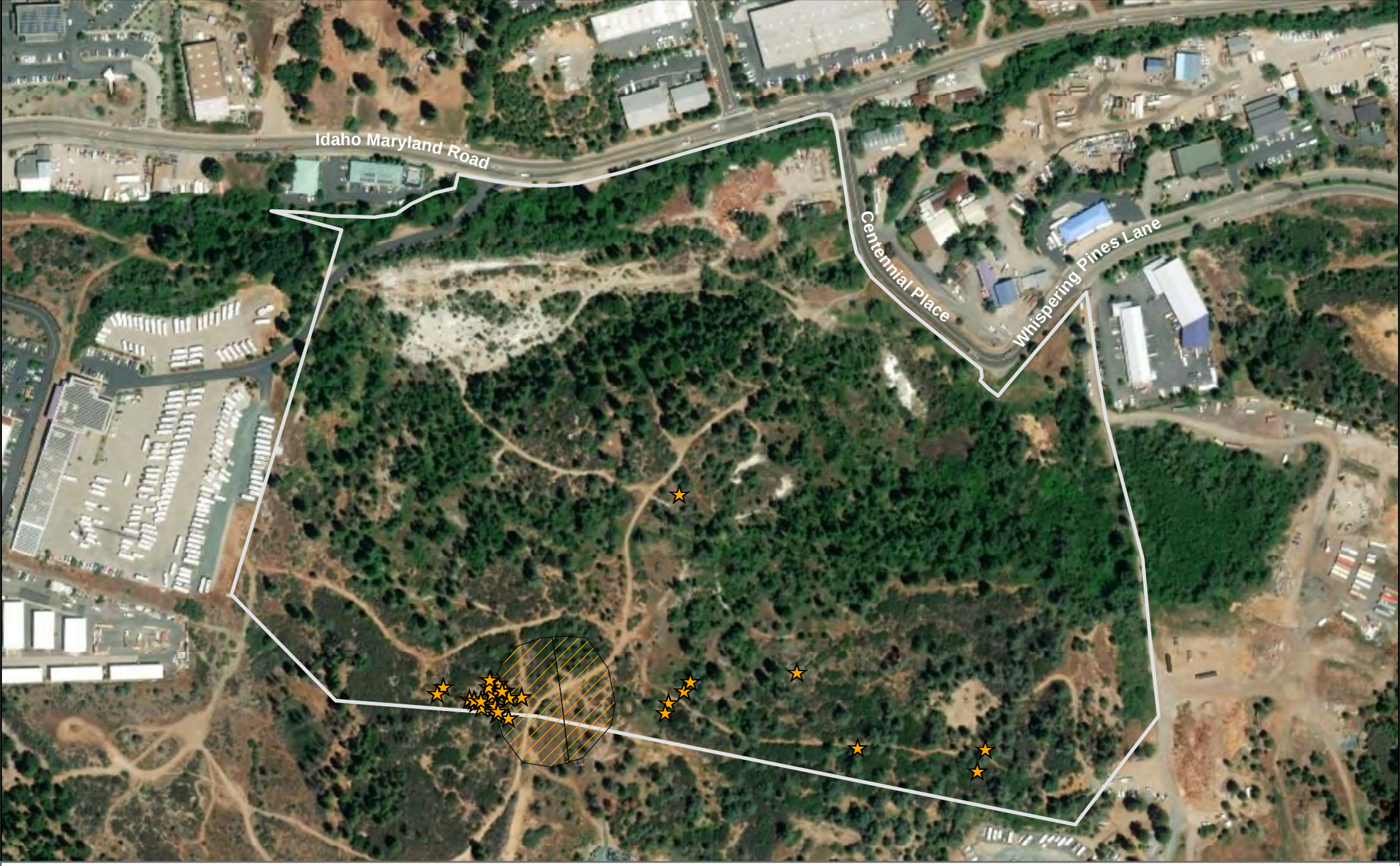
SCALE: 1 inch = 300 feet

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Appendix D

Pine Hill Flannelbush Locations Map



Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Figure. Pine Hill Flannelbush Occurrences Within the Centennial Industrial Site

SCALE: 1 inch = 300 feet

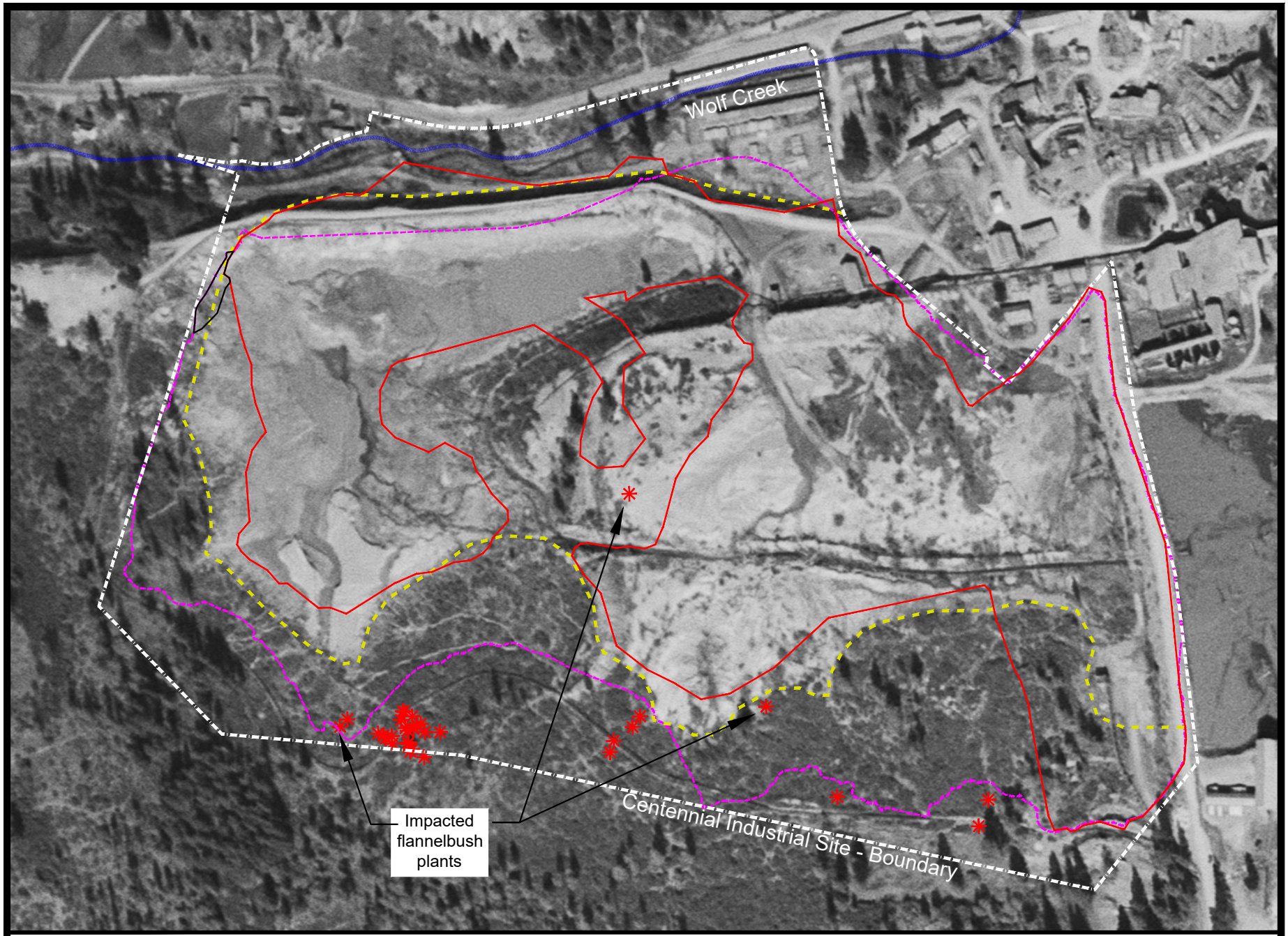
Legend

- Pine HIll flannelbush (individuals or clusters)
- CNDDB mapped extant of Pine Hill flannelbush*
- **Centennial Industrial Site Study Area**

***The mapped extent from digitization of 1999 paper map by Karen Callahan is likely cause for part of discrepency.**

Appendix E

IMM Project **and DTSC Clean Up** Site Plan**s**

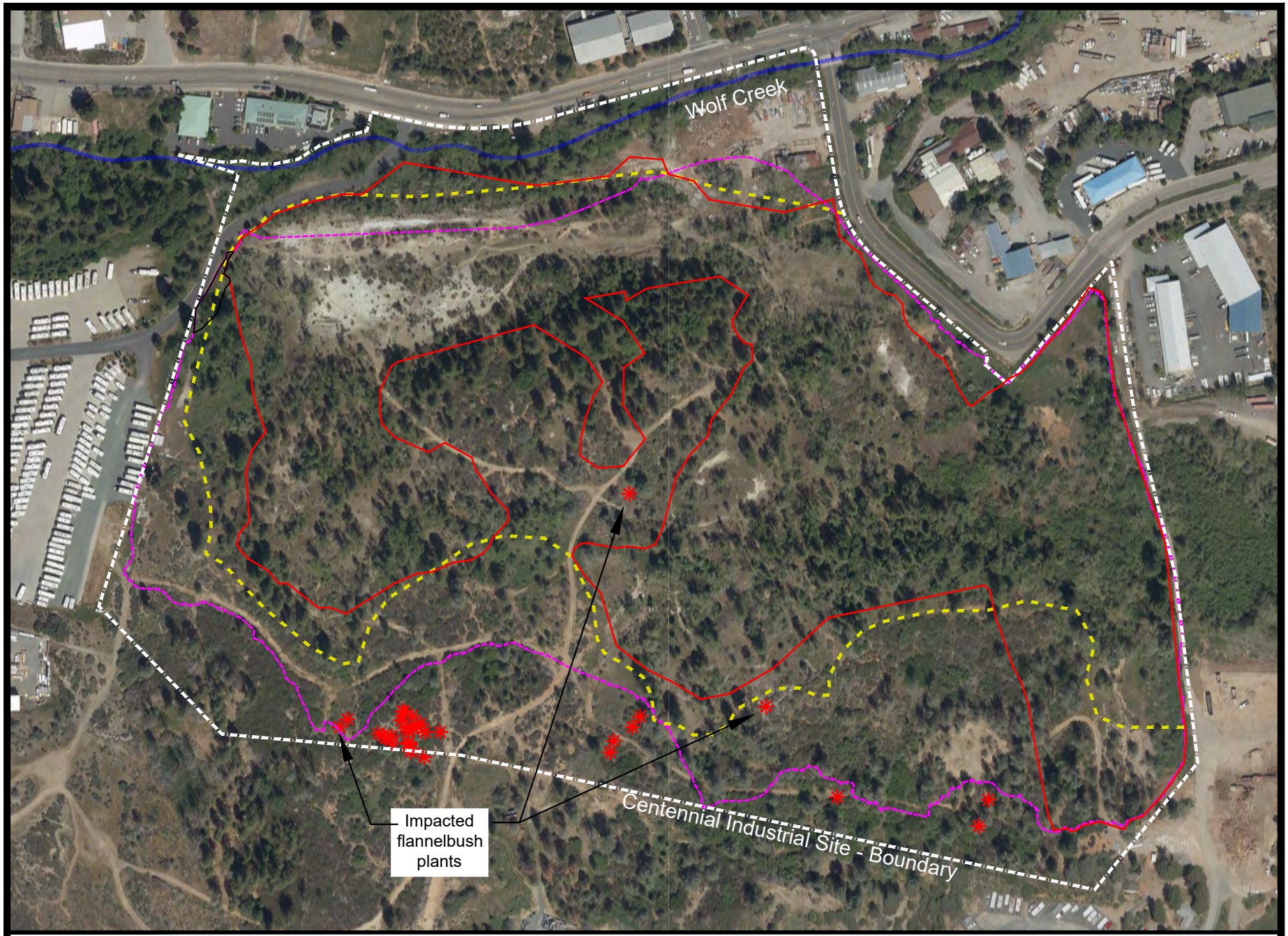


LEGEND

- Centennial Industrial Site - Boundary
- Boundary of historic tailings placement (approximate)
- Boundary of DTSC Clean-up Project (approximate)
- Boundary of IM Mine Project Engineered Fill placement
- Pine Hill Flannelbush

FIGURE A
DISTURBANCE AREA
SHOWING 1947 AIR PHOTO

Scale 1 inch = 300 ft

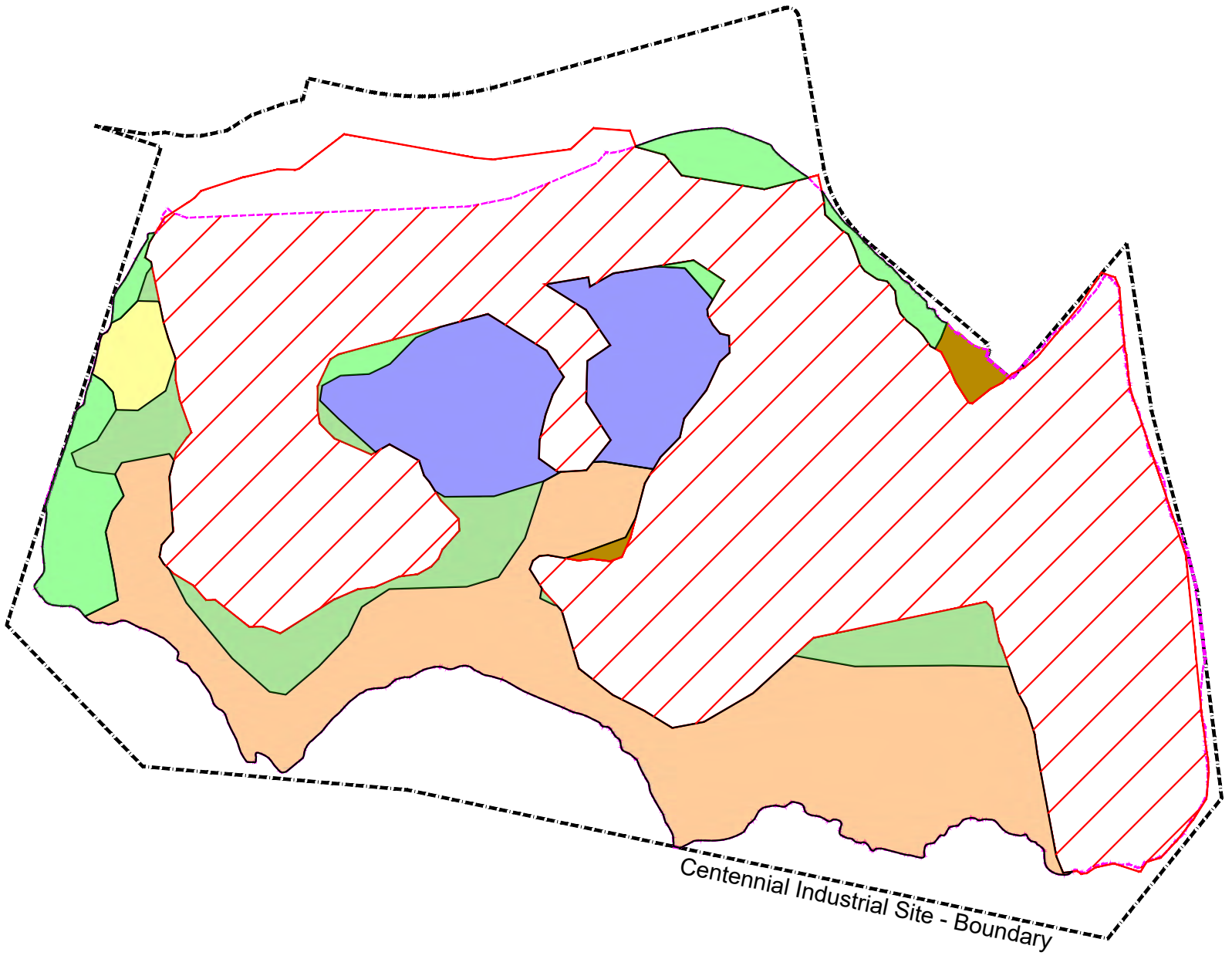


LEGEND

- Centennial Industrial Site - Boundary
- Boundary of historic tailings placement (approximate)
- Boundary of DTSC Clean-up Project (approximate)
- Boundary of IM Mine Project Engineered Fill placement
- Pine Hill Flannelbush

FIGURE B
DISTURBANCE AREA
SHOWING 2017 AIR PHOTO

Scale 1 inch = 300 ft



LEGEND

Centennial Site Boundary

26.56 Ac	Area Previously Disturbed by DTSC clean-up project (Estimated) - (IM Mine Project Baseline)		
1.84 Ac	Annual Grassland	2.40 Ac	Montane Riparian
8.52 Ac	Mixed Chaparral	0.26 Ac	Wet Meadow
3.67 Ac	Montane Hardwood-Conifer		
0.46 Ac	Montane Hardwood		

FIGURE C
DISTURBANCE AREA
VEGETATION COMMUNITIES

Scale 1 inch = 300 ft

Appendix F

Plants Observed During Site Surveys

VASCULAR PLANTS OCCURRING IN THE CENTENNIAL INDUSTRIAL SITE

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Acer macrophyllum	Bigleaf maple	native	Tree	-	FACU	-
Agoseris retrorsa	Spear leaved agoseris	native	perennial herb	-	-	-
Agrostis gigantea	Creeping bentgras	non-native	perennial grass	-	FAC	-
Ailanthus altissima	Tree of heaven	non-native (invasive)	Tree	-	FACU	Moderate
Aira caryophyllea	Silvery hairgrass	non-native (invasive)	annual grass	-	FACU	-
Allium amplectens	Narrow leaved onion	Native	perennial herb (bulb)	-	-	-
Alnus rhombifolia	White alder	Native	Tree	-	FACW	-
Ammi visnaga	Bisnaga	non-native	annual, biennial herb	-	-	-
Anaphalis margaritacea	Pearly everlasting	Native	perennial herb	-	FACU	-
Andropogon virginicus var. virginicus	Broomsedge bluestem	non-native	perennial grass	-	FAC	-
Arbutus menziesii	Madrono	Native	Tree	-	-	-
Arctostaphylos mewukka ssp. mewukka	Indian manzanita	Native	Shrub	-	-	-
Arctostaphylos viscida ssp. viscida	Smooth white leaf manzanita	Native	tree, shrub	-	-	-
Artemisia douglasiana	California mugwort	Native	perennial herb	-	FACW	-
Asclepias sp.	-	-	-	-	-	-
Asclepias speciosa	Showy milkweed	Native	perennial herb	-	FAC	-
Avena sp.	-	-	-	-	-	-
Baccharis pilularis	Coyote brush	Native	Shrub	-	-	-
Berberis aquifolium var. repens	Creeping oregon grape	Native	Shrub	-	FACU	-
Brodiaea minor	Low brodiaea	Native	perennial herb	-	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Brodiaea sierrae	Sierra foothills brodiaea	Native	perennial herb	Rank 4.3	-	-
Bromus hordeaceus	Soft chess	non-native (invasive)	annual grass	-	FACU	Limited
Bromus madritensis	Foxtail chess, foxtail brome	non-native	annual grass	-	FACU	-
Calocedrus decurrens	Incense cedar	Native	Tree	-	-	-
Calycadenia multiglandulosa	Rosin weed	Native	annual herb	-	-	-
Carex feta	Green sheathed sedge	Native	perennial grasslike herb	-	FACW	-
Ceanothus cuneatus	Buck brush	Native	Shrub	-	-	-
Ceanothus integerrimus	Deer brush	Native	Shrub	-	-	-
Ceanothus lemmonii	Lemmon's ceanothus	Native	Shrub	-	-	-
Centaurea solstitialis	Yellow starthistle	non-native (invasive)	annual herb	-	-	High
Centaurium tenuiflorum	Slender centaury	non-native	annual herb	-	FACW	-
Centranthus sp.	-	-	-	-	-	-
Centromadia fitchii	Spikeweed	Native	annual herb	-	FACU	-
Chlorogalum pomeridianum	Amole	Native	perennial herb	-	-	-
Chondrilla juncea	Skeleton weed	non-native (invasive)	perennial herb	-	-	Moderate
Cichorium intybus	Chicory	non-native	perennial herb	-	FACU	-
Cirsium vulgare	Bullthistle	non-native (invasive)	perennial herb	-	FACU	Moderate
Cornus nuttallii	Mountain dogwood	Native	Shrub	-	FACU	-
Cornus sericea	American dogwood	Native	Shrub	-	FACW	-
Cortaderia jubata	Andean pampas grass	non-native (invasive)	perennial grass	-	FACU	High
Crataegus monogyna	Hawthorn	non-native (invasive)	Shrub	-	FAC	Limited
Croton setiger	Turkey-mullein	Native	perennial herb	-	-	-
Cynodon dactylon	Bermuda grass	non-native (invasive)	perennial grass	-	FACU	Moderate
Cynosurus echinatus	Dogtail grass	non-native (invasive)	annual grass	-	-	Moderate
Cyperus eragrostis	Tall cyperus	Native	perennial grasslike herb	-	FACW	-
Dactylis glomerata	Orchardgrass	non-native (invasive)	perennial grass	-	FACU	Limited

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Danthonia californica	California oatgrass	Native	perennial grass	-	FAC	-
Deschampsia elongata	Hairgrass	Native	perennial grass	-	FACW	-
Elymus caput-medusae	Medusa head	non-native	annual grass	-	-	-
Elymus elymoides	Squirrel tail grass	Native	perennial grass	-	FACU	-
Elymus hispidus	Intermediate wheatgrass	non-native	perennial grass	-	-	-
Epilobium sp.	-	-	-	-	-	-
Epipactis gigantea	Stream orchid	Native	perennial herb	-	OBL	-
Eriodictyon californicum	Yerba santa	Native	Shrub	-	-	-
Eriophyllum lanatum	Wooly sunflower	Native	perennial herb	-	-	-
Euthamia occidentalis	Western goldenrod	Native	perennial herb	-	FACW	-
Festuca arundinacea	Reed fescue	non-native (invasive)	perennial grass	-	FAC	Moderate
Festuca idahoensis	Blue fescue	Native	perennial grass	-	FACU	-
Festuca microstachys	Small fescue	Native	annual grass	-	-	-
Ficus sp.	-	-	-	-	-	-
Frangula californica ssp. tomentella	Hoary coffeeberry	Native	Shrub	-	-	-
Frangula rubra	Red buckthorn	Native	Shrub	-	-	-
Fremontodendron decumbens	Pine hill flannelbush	Native	Shrub	FE, SR, Rank 1B.2	-	-
Galium porrigens	Climbing bedstraw	Native	vine, shrub	-	-	-
Gamochaeta sp.	-	-	-	-	-	-
Garrya fremontii	Fremont's silk tassel	Native	Shrub	-	-	-
Grindelia camporum	Gumweed	Native	perennial herb	-	FACW	-
Grindelia sp.	-	-	-	-	-	-
Hedera helix	English ivy	non-native (invasive)	vine, shrub	-	FACU	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Hemizonella minima	Opposite leaved tarweed	Native	annual herb	-	-	-
Hesperocyparis macnabiana	Macnab cypress	Native	tree, shrub	-	-	-
Hirschfeldia incana	Mustard	non-native (invasive)	perennial herb	-	-	Moderate
Holcus lanatus	Common velvetgrass	non-native (invasive)	perennial grass	-	FAC	Moderate
Hypericum perforatum ssp. perforatum	Klamathweed	non-native	perennial herb	-	FACU	-
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	-	FACU	Moderate
Juncus articulatus ssp. articulatus	Jointed rush	Native	perennial grasslike herb	-	OBL	-
Juncus balticus ssp. ater	Baltic rush	Native	perennial grasslike herb	-	FACW	-
Juncus confusus	Colorado rush	Native	perennial grasslike herb	-	FAC	-
Juncus effusus ssp. pacificus	Pacific rush	Native	perennial grasslike herb	-	FACW	-
Juncus trilocularis	-	Native	annual grasslike herb	-	-	-
Lactuca serriola	Prickly lettuce	non-native (invasive)	annual herb	-	FACU	-
Lathyrus latifolius	Sweet pea	non-native	perennial herb	-	-	-
Leontodon saxatilis	Hawkbit	non-native	annual herb	-	FACU	-
Leucanthemum vulgare	Oxe eye daisy	non-native (invasive)	perennial herb	-	FACU	Moderate
Lilium humboldtii ssp. humboldtii	Humboldt lily	Native	perennial herb	Rank 4.2	-	-
Lonicera hispidula	Pink honeysuckle	Native	vine, shrub	-	FACU	-
Lonicera interrupta	Chaparral honeysuckle	Native	vine, shrub	-	-	-
Lotus corniculatus	Bird's foot trefoil	non-native (invasive)	perennial herb	-	FAC	-
Lysimachia arvensis	Scarlet pimpernel	non-native	annual herb	-	FAC	-
Madia gracilis	Gumweed	Native	annual herb	-	-	-
Melica californica	California melic	Native	perennial grass	-	-	-
Melilotus albus	White sweetclover	non-native (invasive)	annual, biennial herb	-	-	-
Muhlenbergia rigens	Deergrass	Native	perennial grass	-	UPL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Panicum sp.	-	-	-	-	-	-
Parthenocissus sp.	-	-	-	-	-	-
Penstemon heterophyllus	Foothill penstemon	Native	perennial herb	-	-	-
Pickeringia montana	Chaparral pea	Native	Shrub	-	-	-
Pinus ponderosa	Yellow pine	Native	Tree	-	FACU	-
Pinus sabiniana	Bull pine	Native	Tree	-	-	-
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	-	FACU	Limited
Polygala cornuta	Sierra milkwort	Native	perennial herb	-	FACW	-
Polypogon sp.	-	-	-	-	-	-
Populus fremontii ssp. fremontii	Cottonwood	Native	Tree	-	FAC	-
Poterium sanguisorba	Garden burnet	non-native	perennial herb	-	UPL	-
Prunella vulgaris	Self heal	Native	perennial herb	-	FACU	-
Prunus subcordata	Sierra plum	Native	tree, shrub	-	-	-
Pyracantha sp.	-	-	-	-	-	-
Quercus garryana var. semota	Oregon white oak	Native	Tree	-	FACU	-
Rhamnus crocea	Redberry	Native	Shrub	-	-	-
Rosa canina	Dog rose	non-native	Shrub	-	-	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	Shrub	-	FACU	High
Rubus leucodermis	White bark raspberry	Native	Shrub	-	FACU	-
Rumex crispus	Curly dock	non-native (invasive)	perennial herb	-	FAC	Limited
Salix exigua	Narrowleaf willow	Native	tree, shrub	-	FACW	-
Salix laevigata	Polished willow	Native	Tree	-	FACW	-
Salix lasiolepis	Arroyo willow	Native	tree, shrub	-	FACW	-
Salvia sonomensis	Sonoma sage	Native	perennial herb	-	-	-
Schoenoplectus acutus var. occidentalis	Tule	Native	perennial grasslike herb	-	OBL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Scutellaria tuberosa	Dannie's scullcap	Native	perennial herb	-	-	-
Solidago sp.	-	-	-	-	-	-
Toxicodendron diversilobum	Poison oak	Native	vine, shrub	-	FAC	-
Tragopogon dubius	Goat's beard	non-native (invasive)	perennial herb	-	-	-
Trichostema lanceolatum	Vinegarweed	Native	annual herb	-	FACU	-
Trifolium hirtum	Rose clover	non-native (invasive)	annual herb	-	-	Limited
Trifolium sp.	-	-	-	-	-	-
Triteleia hyacinthina	Wild hyacinth	Native	perennial herb	-	FAC	-
Typha domingensis	Cattail	Native	perennial herb	-	OBL	-
Verbascum blattaria	Moth mullein	non-native	perennial herb	-	UPL	-
Verbascum thapsus	Woolly mullein	non-native (invasive)	perennial herb	-	FACU	Limited
Vitis californica	California wild grape	Native	vine, shrub	-	FACU	-
Wyethia angustifolia	Narrow leaved mule ears	Native	perennial herb	-	FACU	-
Wyethia bolanderi	Bolander's wyethia	Native	perennial herb	-	-	-

Appendix G

Photo Log

Photos of Field Surveys of the Centennial Industrial Site

Photo 1. Spring within the western section of the Centennial Industrial Site.

Photo 2. Annual grassland area within the northwestern section of the Centennial Industrial Site.

Photo 3. Mapped drainage with adjacent annual grassland in the northern/northwestern section of the Centennial Industrial Site.

Photo 4. Roadside wet meadow wetlands in the western section of the Centennial Industrial Site.

Photo 5. Wet meadow wetland and ephemeral drainage within the northwestern section of the Centennial Industrial Site.

Photo 6. Chaparral and annual grasslands in the western section of the Centennial Industrial Site.

Photo 7. Wetlands, woodlands, and annual grasslands in the central section of the Centennial Industrial Site.

Photo 8. Marsh wetland habitat for California red-legged frog, California black rail, and western pond turtle in the eastern section of the Centennial Industrial Site.

Photo 9. Ponded marsh wetland habitat for California red-legged frog, California black rail, and western pond turtle in the eastern section of the Centennial Industrial Site.

Photo 10. Wet meadow wetland area in the eastern section of the Centennial Industrial Site.

Photo 11. Large montane riparian area in the eastern section of the Centennial Industrial Site.

Photo 12. Edge of large montane riparian area in the eastern section of the Centennial Industrial Site.

Photo 13. Disturbed area in the western section of the Centennial Industrial Site.

Photo 14. Large area of montane riparian wetlands within the eastern section of the Centennial Industrial Site.

Photo 15. Mixed chaparral and montane hardwood-conifer vegetation communities within the southwestern section of the Centennial Industrial Site.

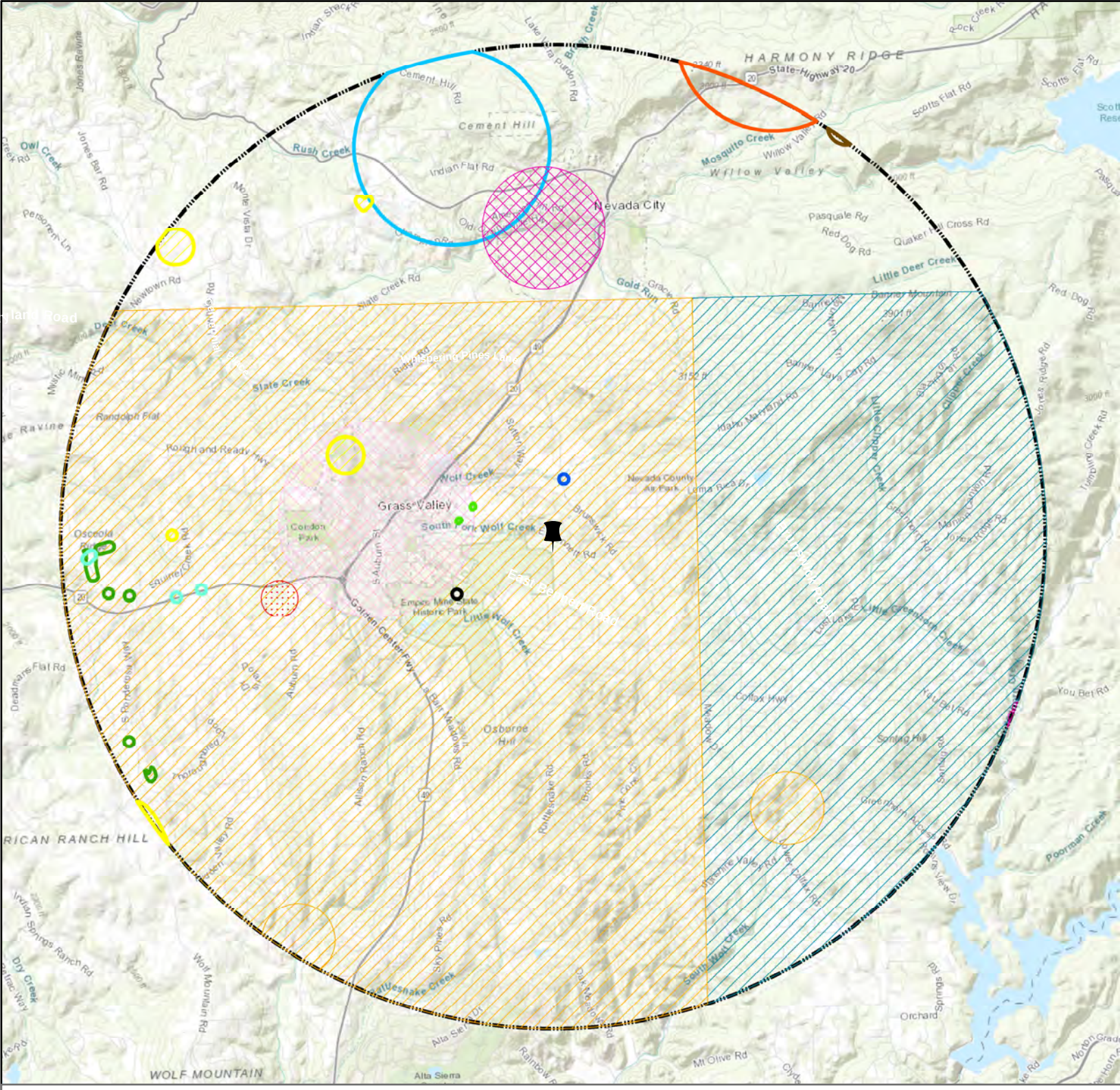
Photo 16. Mixed chaparral vegetation community within the southern section of the Centennial Industrial Site.

Photo 17. Mixed chaparral and montane hardwood-conifer vegetation communities within the southwestern section of the Centennial Industrial Site. Photo looking north.

Photo 18. Mixed chaparral and montane hardwood-conifer vegetation communities within the southwestern section of the Centennial Industrial Site. Photo looking northeast.

Appendix H

CNDDB 5-Mile Buffer Figure


HARMONY RIDGE
State Highway 20
Cement Hill
Nevada City
Rush Creek
Mosquito Creek
Willow Valley
Grass Valley
Wolf Creek
South Fork Wolf Creek
Little Wolf Creek
Osborne Hill
Empire Mine State Historic Park
Golden Center Freeway
Bear River
Scotts Flat Reservoir
Rattlesnake Creek
WOLF MOUNTAIN
Alta Sierra
Orchard
Lake of the Pines
Banner Mountain
Little Chipps Creek
Dry Creek
Poorman Creek
Deadmans Flat Rd
Scotts Flat Rd
Little Deer Creek
Gold Run
Slate Creek
Newtown Rd
Idaho Maryland Rd
Rough and Ready Hwy
Randolph Flat
Wolf Mountain Rd
Rattlesnake Rd
Sky Pines Rd
Mt Olive Rd
Rainbow Rd
Yuba River
Lost Lake
Lake Vera Purdon
Brush Creek
Cement Hill Rd
Indian Flat Rd
Pasquale Rd
Red Dog Rd
Quaker Hill Rd
Banner Lava Cap Rd
Lime Kiln Rd
Tyler Foothill Rd
Auburn Ranch Rd
Bluff Meadows Rd
Skillman Rd
Brunswick Rd
Nevada County Air Park
Loma Rica Dr
Meadow Dr
Sonora Hill Rd
Greenhorn Ridge Rd
Yuba Gap Rd
Yuba Pass Rd
Jones Bar Rd
Monte Vista Dr
Owl Creek Rd
Pensoren Ln
Indian Springs Ranch Rd
Dry Creek
Wolf Mountain Rd
Tyler Foothill Rd
Auburn Rd
Colfax Hwy
You Bet Rd
Scotts Flat Reservoir
Lake of the Pines
Banner Mountain
Little Chipps Creek
Poorman Creek
Dry

Appendix I

USFWS iPac Report

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Nevada County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

NOT FOR CONSULTATION

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Amphibians

NAME	STATUS

California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt Hypomesus transpacificus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/321	Threatened

Flowering Plants

NAME	STATUS
Pine Hill Flannelbush Fremontodendron californicum ssp. decumbens No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4818	Endangered
Stebbins' Morning-glory Calystegia stebbinsii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3991	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

NOT FOR CONSULTATION

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

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NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Cassin's Finch Carpodacus cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Willow Flycatcher Empidonax traillii — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/3482

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

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3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

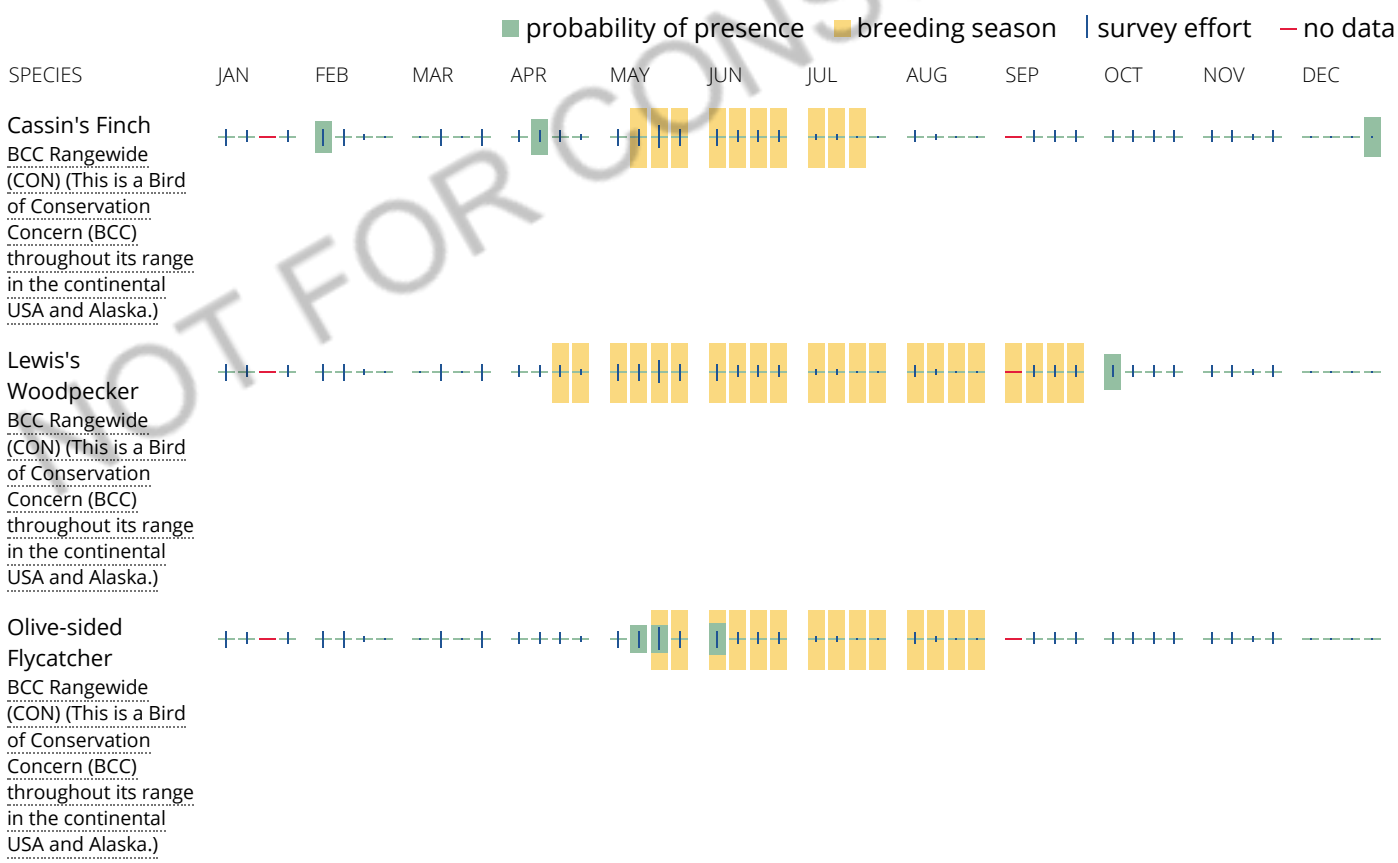
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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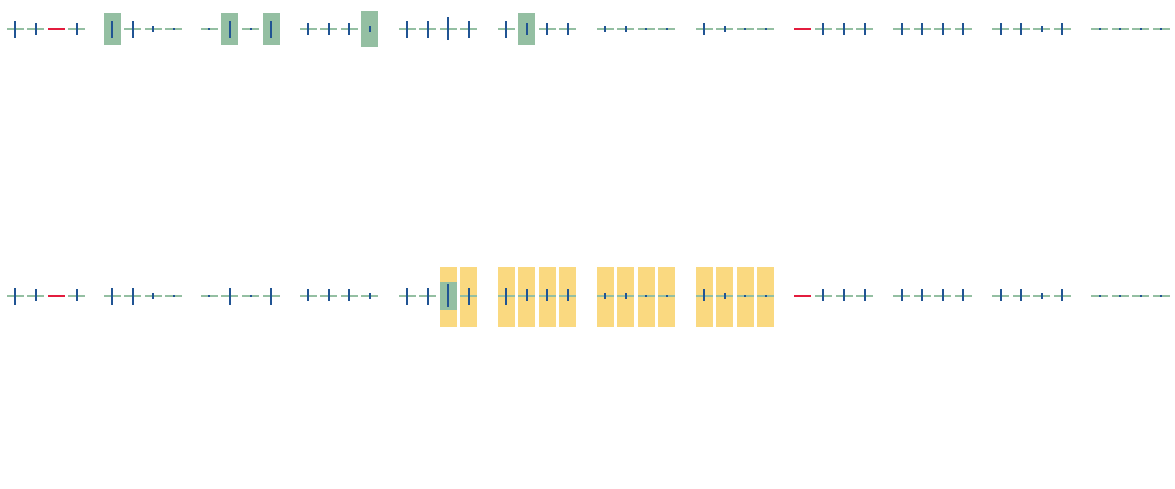

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

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To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to

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confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1A

FRESHWATER FORESTED/SHRUB WETLAND

PFOC

FRESHWATER POND

PUBK

RIVERINE

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R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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APPENDIX I

BRUNSWICK INDUSTRIAL SITE, IDAHO MARYLAND MINE PROJECT, WATERCOURSE/WETLANDS/RIPARIAN AREAS MANAGEMENT PLAN

Brunswick Industrial Site and East Bennett Road Right of Way (ROW)

Watercourse / Wetlands / Riparian Areas Management Plan

Prepared for:
Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Prepared by:
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January 2021

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1 REPORT COVER

Report Date: January 2021

Report Preparer: Mr. Greg Matuzak
Greg Matuzak Environmental Consulting LLC

Project Site: Brunswick Industrial Site
East Bennett Road ROW

Project Site Location: SECTION 36, T.16N, R.8E & SECTION 31, T.16N, R.9E
SECTION 25, T.16N, R.8E

BRUNSWICK INDUSTRIAL SITE		
Assessor Parcel Number	**Site Address**	**Lot Size (Acres)**
009-630-037	12603 East Bennett Road	21.8 AC
009-630-039	12301 Millsite Road	15.07 AC
006-441-003	12503 Brunswick Road	15.19 AC
006-441-004	12625 Brunswick Road	0.85 AC
006-441-005	12791 Brunswick Road	50.01 AC
006-441-034	12381 Brunswick Road	16.01 AC
Brunswick Industrial Site - Land Total:		**118.93 AC**
East Bennett Road ROW:		**10.3 AC**
Brunswick Area - Land Total:		**129.23 AC**

Property Owner / Applicant: Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Principal Investigators: Greg Matuzak, Principal
Greg Matuzak Environmental Consulting LLC
471 Sutton Way, Suite #210
Grass Valley, CA 95945
E: gmatuzak@gmail.com

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Botanical Consultant
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Nevada City, CA 95959
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2 INTRODUCTION

2.1 Introduction

At the request of Rise Grass Valley Inc. ("Rise Grass Valley" or "Rise"), Mr. Greg Matuzak was retained to prepare a Watercourse / Wetlands / Riparian Areas Management Plan ("Management Plan" or "Aquatic Resources Management Plan") for the Brunswick Industrial Site and East Bennett Road Right of Way ("Brunswick Area") located in Nevada County, California (see Project Overview Figures in Appendix A). The East Bennett Road Right of Way ("East Bennett Road ROW") is an approximate 1.25-mile public right of way that connects the Brunswick Industrial Site with Rise's Centennial Industrial Site. This Management Plan references and incorporates the findings of two stand-alone reports completed for the Brunswick Area:

- Brunswick Industrial Site and East Bennett Road Right of Way (ROW) Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020a).
- Brunswick Industrial Site and East Bennett Road Right of Way (ROW) Biological Resources Assessment (Greg Matuzak Environmental Consulting LLC, 2021).

2.2 Nevada County Land Use and Development Code

Per the Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.17 (Ordinance Number 2033) requires a Watercourses, Wetlands, and Riparian Areas Management Plan be prepared for projects in non-disturbance buffers, including areas that are within 100 feet of the high water mark of perennial streams, watercourses, and wetlands, 50 feet from the high water mark of intermittent watercourses, and 100 feet upslope or 20 feet downslope from an NID canal (Nevada County Code, 2000). Therefore, this Aquatic Resources Management Plan was developed due to the proposed future impacts to protected aquatic resources and their non-disturbance buffers within the Brunswick Area. The development of this Management Plan meets the requirements of the Nevada County Land Use and Development Code for the proposed development within aquatic features mapped within the Brunswick Area, as well as potential disturbance within their non-disturbance buffers.

2.3 Project Statement

This Management Plan was developed pursuant to Sec. L-II 4.3.17.C of Nevada County Zoning Regulations, required for development projects that will result in disturbance of sensitive aquatic resources. Table 1.0 below outlines the proposed disturbance impacts to aquatic resources subject to Nevada County regulations within the Brunswick Area.

The proposed disturbance within the Brunswick Area includes ~0.57 acres of permanent impacts to wetlands subject to a 100-foot non-disturbance buffer, ~0.01 acres of permanent impacts to the perennial South Fork Wolf Creek subject to a 100-foot non-disturbance buffer, and ~0.052 acres of permanent impacts to intermittent and ephemeral streams (I-5 and E-2) subject to 50-foot non-disturbance buffer. Additionally, temporary disturbances are estimated to include ~0.04 acres to the perennial South Fork Wolf Creek subject to a 100-foot non-disturbance buffer and
~0.001 acres to ephemeral stream E-1 subject to a 50-foot non-disturbance buffer as detailed in Table 1.0. The disturbance impacts are based on the Project Description outlined in Section 5 of this Management Plan and the Site Plan Figure 1 and Figure 2.

The proposed disturbance or encroachment into the 100-foot non-disturbance buffer areas to wetlands and perennial streams and 50-foot non-disturbance buffer areas to intermittent aquatic resources is the focus of this Management Plan.

TABLE 1.0 DISTURBANCE IMPACTS TO AQUATIC RESOURCES

Direct & Permanent Disturbance Impacts			
Size	**Impact Type**	**Mapped Feature ID**	**Non-Disturbance Buffer**
0.57 acres	Permanent fill impacts to wetlands	WM-1, WM-2, WM-3, MA-1, MA-2, MA-3, MA-4, MA-5, MA-6, RI-1	100 ft
15 linear feet (x 30ft) (~0.01 acres)	Permanent fill impact to perennial stream	South Fork Wolf Creek	100 ft
33.5 linear feet (~0.002 acres)	Permanent fill impact to intermittent stream	I-5	50 ft
188 linear feet (~0.05 acres)	Permanent fill impact to ephemeral stream	E-2	50 ft
Temporary Disturbance Impacts			
Size	**Impact Type**	**Mapped Feature ID**	**Non-Disturbance Buffer**
40 linear feet (~0.04 acres)	Temporary disturbance to perennial stream	South Fork Wolf Creek	100 ft
16 linear feet (~0.001 acres)	Temporary disturbance to ephemeral stream	E-1	50 ft

3 SUMMARY OF MANAGEMENT PLAN CONCLUSIONS AND RECOMMENDATIONS

Permanent and temporary impacts to stream and wetland resources mapped within the Brunswick Area will be included in regulatory agency permits. The regulatory agency permits as outlined in Section 7 .1 of this Management Plan will include required measures to minimize and mitigate for impacts to such resources.

Additionally, Section 7 of this Management Plan includes mitigation measures to ensure that potential impacts to stream and wetland resources, as well as their non-disturbance buffer areas, are minimized. The recommended measures of mitigation include the following:

- Limit construction to periods of extended dry weather and the dry summer season, if feasible;
- Establishing the areas around active stream channels and wetlands as Environmentally Sensitive Area (ESA) where those areas will not be impacted by construction or thereafter;
- No fill or dredge material will enter or be removed from any wetlands or streams except for those identified in Table 4.0 and Table 5.0 in this Management Plan during construction and thereafter;
- Use appropriate machinery and equipment to limit disturbance within and directly adjacent to these areas;
- Placement of soil erosion control devices (such as wattles, hay bales, etc.) between the protected aquatic resources (wetlands and streams) and the areas to be graded and disturbed to limit potential runoff and sedimentation into such protected resources;
- Dewatering of any streams that will be required to occur as part of the proposed disturbance within the Brunswick Area must include a Water Diversion Plan and be approved by CDFW prior to the implementation of such dewatering activities; and
- Implement Best Management Practices during and following construction.

Additional mitigation measures are incorporated by reference from the Biological Resources Assessment developed for the Brunswick Area specifically for special-status wildlife and plant species that have the potential to occur within the proposed disturbance areas within the Brunswick Area.

4 PROPERTY DESCRIPTION

4.1 Project Setting

The Management Plan encompasses complete coverage of the 118.93-acre Brunswick Industrial Site and the 10.3-acre East Bennett Road ROW for a total Brunswick Area of 129.23 acres; see Appendix A for Brunswick Area Overview Figures. The recorded owner of the surface land which comprises the Brunswick Industrial Site is Rise Grass Valley while the East Bennett Road ROW is a public right of way.

The Brunswick Industrial Site is bordered by Brunswick Road along the eastern boundary and East Bennett Road along the northern boundary. The Brunswick Industrial Site is surrounded by private developed and undeveloped residential and industrial districts zoning and land uses. The East Bennett Road ROW study area is surrounded by private residential and industrial districts zoning and land uses. The East Bennett Road ROW study area includes an easement area from East Bennett Road to the Centennial Industrial Site. The easement area crosses private industrial property that is heavily disturbed by industrial operations.

4.2 Brunswick Area Characterization

The Brunswick Industrial Site has been disturbed by historic mining and lumber mill practices, public access, and ongoing management for many years which is now considered baseline condition for the Brunswick Industrial Site. Within the Brunswick Industrial Site, the dumping of soils, landscape materials, and other miscellaneous items has also occurred for many years and the current circumstances are now considered baseline conditions. A large section of the Brunswick Industrial Site located in the eastern areas along Brunswick Road are characterized as disturbed and/or developed given the amount of pavement and impervious surfaces in those areas as well as the remaining infrastructure related to historic mining and mill operations. Areas not subject to this regular type of previous disturbance are dominated by native habitat and, therefore, are also the baseline condition within the Brunswick Industrial Site.

The portion of the Brunswick Area that includes the East Bennett Road ROW contains a developed and paved public road and ROW that has been used for decades. In addition, the shoulders of East Bennett Road that are included as part of the East Bennett Road ROW are also developed given the grading and fill material associated with the development of the road within the Brunswick Area. A Photo Log for the Brunswick Area is included in Appendix E.

The Brunswick Area includes a single perennial stream, South Fork Wolf Creek.

A 48" culvert runs ~1600 ft underneath the Brunswick Industrial Site from the western side of Brunswick Road to the western side of the Brunswick Industrial Site. This culvert collects runoff from Brunswick Road as well as from a portion of the watershed to the east and south of the Brunswick Industrial Site.

South Fork Wolf Creek originates from the outlet of this 48" diameter culvert on the western side of the Brunswick Industrial Site and flows in a north westerly direction approximately 2.7 miles. Within the City of Grass Valley, the creek enters into an underground culvert and concrete channel system which conveys the waters of the South Fork to the main stem of Wolf Creek.

4.3 Brunswick Area Resources

The Aquatic Resources Delineation Report for the Brunswick Area (Matuzak, 2020a) evaluated and mapped the location and extent of "waters of the United States", including wetlands and "waters of the State of California". A summary of the aquatic resource delineation results for the Brunswick Area are presented in Table 2.0 (see Figure 3 for an overview of the Aquatic Resources mapped within the Brunswick Area).

TABLE 2.0 SUMMARY OF AQUATIC RESOURCES DELINEATION RESULTS

Wetland/Stream Type	No. of Features	Size (Acres)	Length (Linear Feet)
Wetlands			
Meadow Wetland	4	6.97	
Freshwater Emergent Marsh Wetland	6	0.50	
Riparian Wetland	3	1.16	
Roadside Wetland	1	0.09	
Total	**14**	**8.72**	
"Other Waters of the U.S"			
Perennial Stream	2	0.75	3,264
Intermittent Stream	5	0.07	745
Ephemeral Stream	2	0.06	383
Total	**8**	**0.88**	**4,392**

The key findings of the Aquatic Resources Delineation (Matuzak, 2020a) included the following:

- A total of 9.60 acres of "waters of the U.S.", including wetlands, and "waters of the State of California", were identified and mapped within the Brunswick Industrial Site and along the East Bennett Road Right of Way. The 9.60 acres of wetland-waters include 8.72 acres of mapped wetlands and 0.88 acres of mapped "other waters of the U.S.," including a perennial drainage along the western edge of Brunswick Road, South Fork Wolf Creek, as well as several intermittent and

ephemeral streams. The mapped wetlands and "other waters of the U.S." require verification by the U.S. Army Corps of Engineers (Corps) and the Central Valley Regional Water Quality Control Board (RWQCB).

The key findings of the Biological Resources Assessment (Matuzak, 2021) included the following:

- Perennial marsh wetlands, a large manmade pond, and South Fork of Wolf Creek within the Brunswick Industrial Site contains suitable habitat for several special-status aquatic wildlife species, including the foothill yellow-legged frog (*Rana boylii*), listed as Endangered under the California State ESA (CESA), California black rail (*Laterallus jamaicensis coturiculus*) listed as Threatened under CESA, the California red-legged frog (*Rana aurora draytonii*) listed as Threatened under the federal ESA, and the Western pond turtle (*Emys marmorata*), a California State Species of Concern. None of these species were observed within the Brunswick Industrial Site during any of the special-status species surveys within the Brunswick Area; however, the mapped aquatic habitat within the Brunswick Area contains suitable habitat for these species.
- The Brunswick Area contains suitable habitat for several CNPS ranked plants and special-status plant species. A single California Native Plant Society (CNPS) List 4 Species, the Humboldt lily (*Lilium humboldtii ssp. humboldtii*) was documented and mapped within the Brunswick Area during special-status plant surveys. A single occurrence of the Humboldt lily consisting of a few individuals was mapped within the East Bennett Road ROW and a single occurrence of the Humboldt lily consisting of 10 individuals was mapped within the Brunswick Industrial Site during 2019 field surveys. These CNPS List 4 species are not threatened or endangered and do not have protected status under CEQA.
- Woodland and grassland habitats within the Brunswick Industrial Site and along the East Bennett Road Right of Way contains suitable nesting habitat for protected raptors and birds. Suitable habitat for these species includes the edges of the South Fork Wolf Creek and other riparian wetlands mapped within the Brunswick Industrial Site. None of these species were observed within the Brunswick Industrial Site or along the East Bennett Road Right of Way during any of the special-status species surveys within the Brunswick Area.
- The disturbed and developed areas within the Brunswick Industrial Site contain suitable habitat for the coast horned lizard (*Phrynosoma blainvillii*), a California Species of Concern, and the historic cement silos within the Brunswick Industrial Site contains roosting habitat for bats, including the Townsend's big-eared bat (*Corynorhinus townsendii*), a California Species of Concern. Additionally, the forested areas within the Brunswick Area contain suitable habitat for other bat species. None of these species was observed within the Brunswick Area during any

of the special-status species surveys within the Brunswick Area and both species have a low likelihood to occur within the Brunswick Area.

Descriptions of biological resources, as excerpted from the Biological Resources Assessment (Matuzak, 2021), are included as reference material in the following Appendices:

Appendix B – USDA Soils Maps and Descriptions

Appendix C – Vegetation Community Map and Descriptions

Appendix D – Plant Species Observed During Site Surveys

Appendix F – CNPS Ranked Plants and Special-Status Plants and

Wildlife Species Descriptions

5 PROJECT DESCRIPTION

5.1 Project Description

Rise Grass Valley proposes to reinitiate underground mining and ore processing of the Idaho-Maryland Mine in Nevada County, CA. The proposed facilities and operations to support underground mining will be located on the Brunswick Industrial Site consisting of six contiguous parcels zoned Light Industrial ("M-1"). The project comprises four primary elements: (1) dewatering of the existing underground mine workings, (2) mining existing and new underground mine workings, (3) processing ore and rock, and (4) placing engineered fill at the Centennial and Brunswick Industrial Sites.

The Brunswick Industrial Site is approximately 2 miles from the center of the City of Grass Valley and State Route 49. Several shaft entrances are located on the Brunswick Industrial Site from historic mine operations, including the Brunswick and Union Hill shafts. Other portions of the site include graveled or paved areas from previous land uses.

The project site plan for the Brunswick Industrial Site comprises five areas: aboveground site facilities, underground mining, treated and potable water pipelines, the Brunswick engineered fill area, and outfall for the treated water to South Fork Wolf Creek. See Figure 1 and Figure 2 for the proposed project site plan.

In total, approximately 60 acres of the 118.93-acre site will be subject to surface use and/or development for the aboveground facilities and fill placement to support dewatering, mining, and processing. The remaining ~59 acres will be undisturbed from the proposed project. An ~8-acre area of meadow wetlands and riparian wetlands located north and adjacent to South Fork Wolf Creek will remain undisturbed due to development on the Brunswick Industrial Site.

5.2 Project Components and Associated Impacts

Project Components that may cause potential impacts to aquatic resources and associated non-disturbance buffer zones in the Brunswick Area, include the following:

- The groundwater from the mine will be pumped via a pipeline to an existing clay-lined settling pond for water treatment. An aboveground pipe will convey treated water from the water treatment facility at the Brunswick Industrial Site along an existing access road on the property to an outfall located at South Fork Wolf Creek. The pipe and discharge point are located entirely within the property boundaries. Initial dewatering of the underground workings and subsequent operational dewatering of the mine are estimated to have a maximum discharge rate of 5.6 cubic feet per second (cfs).

IMPACT 1: Construction of treated mine water outfall to South Fork Wolf Creek.

IMPACT 2: Treated water pipe placement will cross an ephemeral stream.

- The existing culvert that daylights on the Brunswick Industrial Site, creating the South Fork Wolf Creek, will be replaced and upgraded with a new culvert to replace the existing culvert.

  IMPACT 3: Replacement of deteriorated culvert at South Fork Work Creek.

- A buried potable water pipeline will be installed to provide water to residences along the portion of the Brunswick Area containing the East Bennett Road ROW. The existing Nevada Irrigation District (NID) potable water pipeline will be extended within the East Bennet Road ROW to provide potable water service to residences currently on wells that may be affected by the project.

  NO IMPACTS.

- To support dewatering and underground mining, aboveground structures and processing facilities will be constructed and installed. Engineered fill, a by-product of the underground mining process composed of barren rock and sand, will be placed, graded, and compacted in a series of lifts across the southwest portion of the Brunswick Industrial Site.

  IMPACT 4: Permanent fill to small wetlands from construction and grading.

  IMPACT 5: Site grading will include permanent fill of a section of an intermittent stream.

  IMPACT 6: Engineered fill industrial pad will include permanent fill a section of an ephemeral stream.

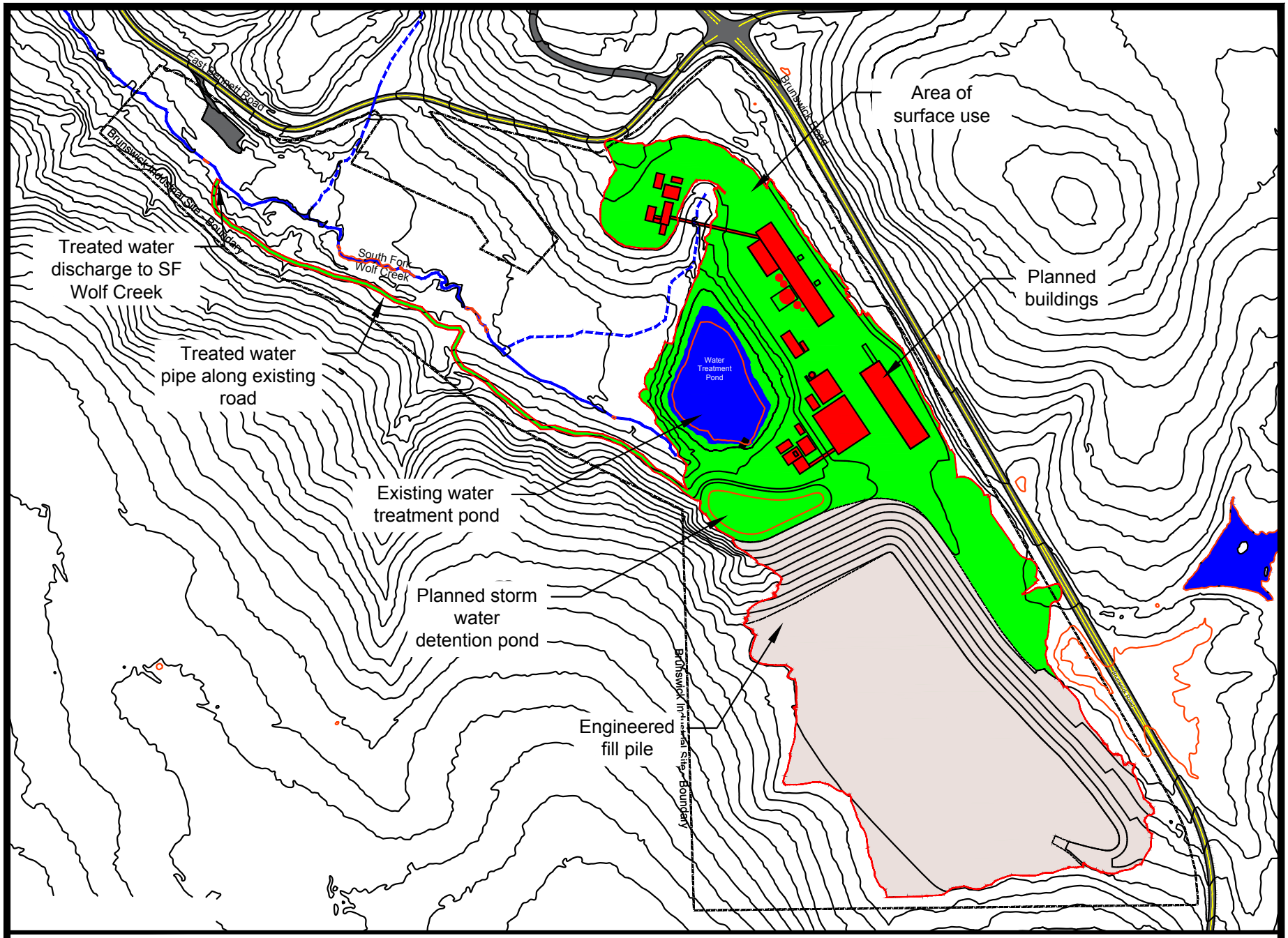
- The existing clay lined pond will be used for water treatment and surface storage capacity to support initial and operational mine dewatering activities.

  IMPACT 7: Repair to the existing manmade pond will require work in the 100-foot non-disturbance buffer of South Fork Wolf Creek.

Project development will permanently impact approximately 7% of the Brunswick Area wetlands: ~0.57 acres wetlands impacted of the total 8.72 acres mapped wetlands.

Project development will permanently impact approximately 6% of the Brunswick Area "waters of the U.S.": ~237 linear feet of streams impacted of the total 3,691 linear feet of mapped streams.

Project development will temporarily cause disturbance impact to approximately 2% of the Brunswick Area "waters of the U.S.": ~56 linear feet of streams impacted of the total 3,691 linear feet of mapped streams.



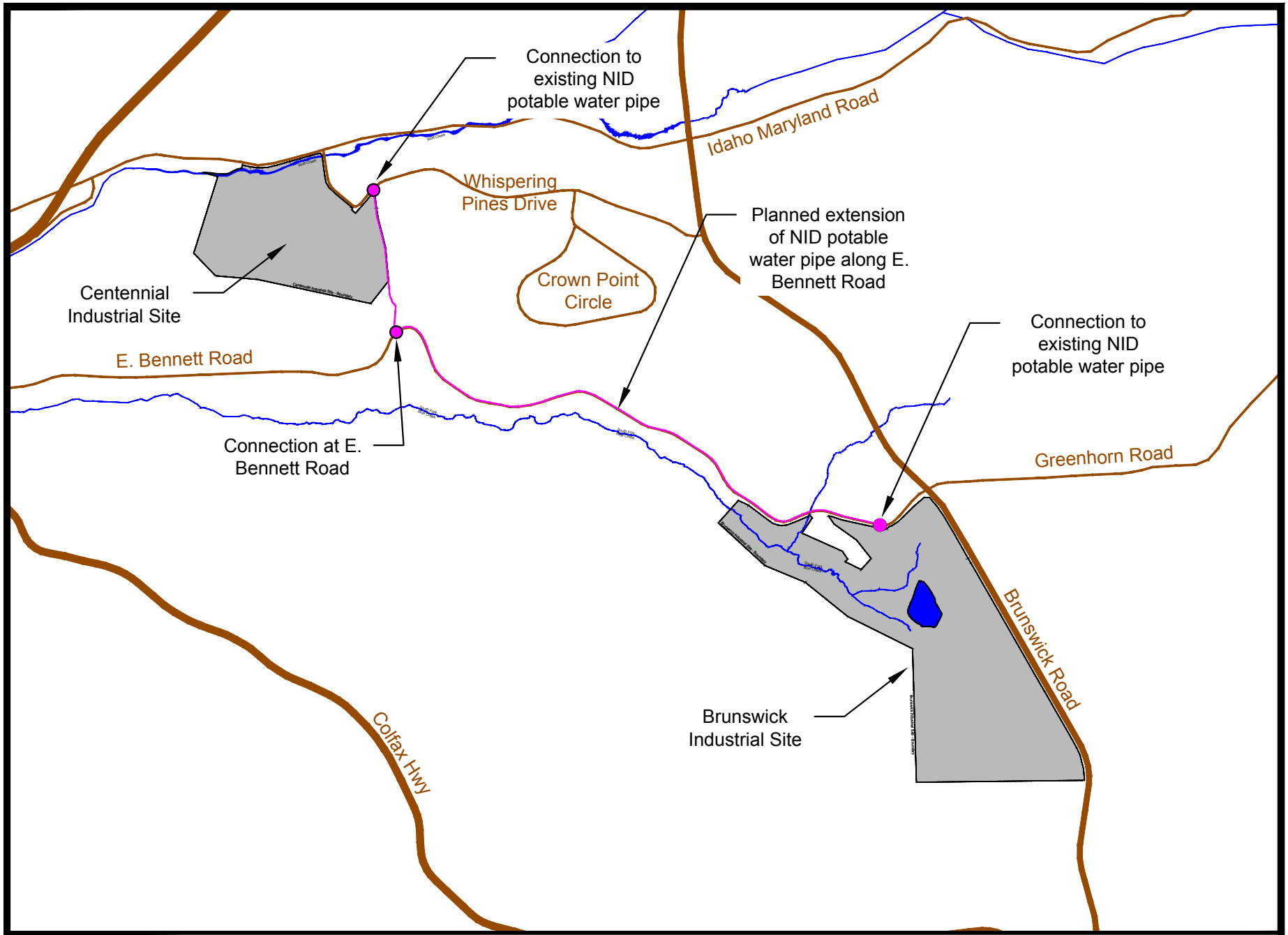
Idaho-Maryland Gold Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945

SCALE 1"=500'
500 ft

Brunswick Industrial Site

Site Plan

Showing final topography
Elevation contours at 10 ft intervals



Idaho-Maryland Gold Project
Rise Grass Valley Inc.
PO Box 271
Grass Valley, California, USA 95945

SCALE 1"=1500'
1250 ft

NID potable water pipe extesion

Showing route of new pipe along E. Bennett Road

6 ANALYSIS OF POTENTIAL IMPACTS

Background biological resources surveys and technical reporting developed for the Brunswick Area that form the basis for this Management Plan include the following:

- Brunswick Industrial Site and East Bennett Road ROW Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020a).
- Brunswick Industrial Site and East Bennett Road ROW Biological Resources Assessment (Greg Matuzak Environmental Consulting LLC, 2021).
- Brunswick Site Special Status Plant Survey Report (Wendy Boes Botanical Consultant, August 2020).

6.1 Reconnaissance-level Biological Resources Field Surveys

Reconnaissance-level biological resources field surveys as well as the delineation of "waters of the U.S.," including wetlands, were conducted on foot for the entirety of the Brunswick Area (129.23 acres) by Greg Matuzak, Principal Biologist and owner of Greg Matuzak Environmental Consulting LLC, and Wendy Boes, a local Nevada County botanist, on December 9th through 12th, 17th, and 18th, 2018. Follow up reconnaissance-level biological resources, including finalizing the initial delineation of aquatic resources field surveys within the Brunswick Area were conducted by Greg Matuzak on December 30th, 2018 and by Wendy Boes for the CNPS ranked plant and special-status plant species habitat on January 3rd, 2019. The purpose of the surveys completed in December 2018 and January 2019 was to identify habitat and vegetation types and to determine the potential for any special- status plant and wildlife species identified in the desktop analysis and background research to occur within the Brunswick Area as well as identify and map each of the "waters of the U.S.," including wetlands, covered within this Management Plan.

Further evaluation of the Brunswick Area was conducted on July 1st and 14th, and August 16th, 2019 by Ms. Boes who implemented botanical surveys within the entirety of the Brunswick Area during the time of year when the target CNPS ranked plants and special-status plant species with potential to occur within the Brunswick Area are known to be in bloom and identification of each is most likely. Mr. Matuzak conducted a follow up delineation of "waters of the U.S.," including wetlands, within the Brunswick Industrial Site and a habitat assessment and VES method survey for the foothill yellow-legged frog in South Fork Wolf Creek within the Brunswick Industrial Site on August 29th, 2019.

The presence of streams and wetlands within the Brunswick Area that could be regulated by state and/or federal agencies were identified and mapped, see the stand-alone

Aquatic Resources Delineation reporting for the Brunswick Area (Matuzak, 2020a). The entirety of the Brunswick Area was surveyed on foot and a list of plant and wildlife species observed during the field surveys was compiled (see Appendix D for species lists). A Photo Log is included in Appendix E, which documents the Brunswick Area during the field surveys.

6.2 Environmental Setting

Vegetation communities within the Brunswick Area are typical of the lower Sierra Nevada foothills. However, the terrain within the Brunswick Area is not typical of the lower Sierra Nevada foothills that normally vary between flat ridges and valleys to gently and moderately sloping hillsides given the high level of development and disturbance within the Brunswick Area. The Brunswick Industrial Site elevation ranges from approximately 2,675 to 2,950 feet above mean sea level (MSL) and the East Bennett Road ROW elevation ranges from approximately 2,650 to 2,850 to feet above MSL.

The Brunswick Area is located in an area containing South Fork Wolf Creek, a perennial stream. Several intermittent and ephemeral streams connect directly to South Fork Wolf Creek within the Brunswick Industrial Site. South Fork Wolf Creek is located to the south of the East Bennett Road ROW within the Brunswick Area. South Fork Wolf Creek contains associated riparian woodland and scrub and large tracks of wet meadow wetlands dominant in the northwestern section of the Brunswick Industrial Site.

South Fork Wolf Creek surfaces within the Brunswick Industrial Site south of a large man-made clay lined pond and flows northwest across the Brunswick Area. South Fork Wolf Creek daylights from an existing 48" diameter culvert which is approximately 1,600 feet long (Regional Water Quality Control Board Order No. 88-185, December 18th, 1990). The 48" culvert appears to be fed by surface drainage on the east side of Brunswick Road, which crosses Brunswick Road through a culvert. Additionally, perennial surface drainage from the west side of Brunswick Road drains north to the 48" culvert inlet. The 48" culvert was flowing water in December 2018 as well as during the July and August 2019 site surveys conducted as part of the development of this Management Plan (see Photo Log in Appendix E).

6.3 Brunswick Area Soil Types

The soil types mapped within the Brunswick Area are included in Appendix B with a description of each.

6.4 Brunswick Area Vegetation Communities

The vegetation communities identified within the Brunswick Area and their associated acreages mapped are presented in Table 3.0. Appendix C includes a map and descriptions of the vegetation communities.

TABLE 3.0 VEGETATION COMMUNITIES AND ACREAGES

Vegetation Community	Acres within Brunswick Area
Montane Hardwood-Conifer	15.63
Montane Hardwood	1.65
Ponderosa Pine	4.85
Sierran Mixed Conifer	35.98
Annual Grassland	8.15
Manmade Pond	7.28
Wet Meadow	9.36
Developed	29.49
Disturbed	16.84
Total	**129.23**

6.5 Special-Status Species

Appendix F includes an evaluation of the CNPS ranked plants and special-status plant and wildlife species with potential to occur within the Brunswick Area and those species are represented within Table 6.0 below.

6.6 Brunswick Area Disturbance Impacts to Sensitive Biological Resources

In total, approximately 60 acres of the 118.93-acre site will be subject to surface use and/or development for the aboveground facilities and fill placement to support dewatering, mining, and processing. The proposed disturbance or encroachment into the 100-foot non-disturbance buffer areas to wetlands and perennial streams and 50-foot non-disturbance buffer areas to intermittent aquatic resources is the focus of this Management Plan. An evaluation of impacts to the aquatic resources and their subsequent non-disturbance buffer zone covered under this Management Plan are provided below.

6.6.1 Project Impact Tables

Based on the Project Description of the proposed Idaho-Maryland Mine, Table 4.0 and Table 5.0 below include the estimated disturbance within the Brunswick Area to mapped wetlands and streams per the Aquatic Resources Delineation of Waters of the United States and State of California (Matuzak, 2020a). The Aquatic Resources Delineation is presented in Figure 3 below.

TABLE 4.0 AREA OF DISTURBANCE TO MAPPED WETLANDS WITHIN THE BRUNSWICK AREA

No.	Wetland Type	Wetland ID Number	Size (Acres)	Area of Disturbance (Acres)
1	Meadow wetland	WM-1	0.02	0.02
2	Meadow wetland	WM-2	0.01	0.01
3	Meadow wetland	WM-3	0.01	0.01
4	Meadow wetland	WM-4	6.93	-------
5	Marsh	MA-1	0.1	0.1
6	Marsh	MA-2	0.3	0.3
7	Marsh	MA-3	0.02	0.02
8	Marsh	MA-4	0.007	0.007
9	Marsh	MA-5	0.05	0.05
10	Marsh	MA-6	0.02	0.02
11	Riparian	RI-1	0.03	0.03
12	Riparian	RI-2	0.76	-------
13	Riparian	RI-3	0.37	-------
14	Roadside Wetland	RW-1	0.09	-------
14	-------	**TOTAL**	**8.72**	**0.57 acres**

TABLE 5.0 AREA OF DISTURBANCE TO MAPPED STREAMS WITHIN THE BRUNSWICK AREA

No.	Stream Type	Stream ID Number	Size (Acres)	Estimated Disturbance (acres and linear feet)
1	Perennial Stream	South Fork Wolf Creek – 1	0.59	15 lf. (0.01 acres) * 40 lf. (0.04 acres) *
2	Perennial Drainage	P – 1	0.16	-------
3	Intermittent Stream	I – 1	0.05	-------
4	Intermittent Stream	I – 2	0.002	-------
5	Intermittent Stream	I – 3	0.006	-------
6	Intermittent Stream	I – 4	0.003	-------
7	Intermittent Stream	I – 5	0.004	33.5 lf. (0.002 acres)
8	Ephemeral Stream	E – 1	0.01	16 lf. (0.001 acres)
9	Ephemeral Stream	E – 2	0.05	188 lf. (0.05 acres)
9	-------	**TOTAL**	**0.88**	293 lf. (0.103 acres) **

* impacts estimated at 0.01 acres (permanent) and 0.04 acres (temporary)
** impacts estimated at 0.062 acres (permanent) and 0.041 acres (temporary)

Special-status species associated with the vegetation communities mapped within the Brunswick Area are included in Table 6.0 below. Each of the vegetation communities in Table 6.0 contain the wetlands and streams and/or their non- disturbance buffers that are covered under this Management Plan.

TABLE 6.0 SPECIAL-STATUS SPECIES ASSOCIATED WITH VEGETATION COMMUNITIES

Vegetation Community	Associated Special-Status Species
Montane Hardwood-Conifer	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Montane Hardwood	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Ponderosa Pine	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Sierran Mixed Conifer	Sierra arching sedge (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2) Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Manmade Pond	Western pond turtle (CSC), California red-legged frog (ESA listed), migratory birds (CDFW)
Disturbed and Developed	Coast horned lizard (CSC), Townsend's big-eared bat (CSC)
Annual Grassland	Brownish beaked-rush (Rank 2B.2)
Wet Meadow	Brownish beaked-rush (Rank 2B.2) and finger rush (Rank 1B.1)

6.6.2 Evaluation of Impacts

The proposed Idaho-Maryland Mine Project within the Brunswick Area will create surface impacts to sensitive aquatic resources as outlined in Section 5.

Project development may permanently fill approximately 0.57 acres of mapped wetlands (see Table 4.0).

Project development may permanently impact approximately 237 linear feet (~0.062 acres) of mapped streams and temporarily impact approximately 56 linear feet (~0.041 acres) of mapped streams (see Table 5.0).

Specific to South Fork Wolf Creek, impacts are estimated to be 0.01 acres of permanent impacts due to the proposed outfall and 0.04 acres of temporary impacts due to culvert replacement within South Fork Wolf Creek (see Table 5.0).

The specific impacts to aquatic resources are detailed as follows:

IMPACT 1: Construction of treated mine water outfall to South Fork Wolf Creek.

The proposed treated mine water discharge pipe outfall will be placed within or adjacent to South Fork Wolf Creek. Construction of the outfall may cause ~15 linear feet of permanent impact (~0.01 acres) to the southern bank of the creek from placement of the pipe and modification of the stream bank to ensure adequate energy dissipation and erosion protection.

Placement of the discharge pipeline connecting the proposed outfall within the southern bank of the South Fork Wolf Creek may cause a "temporary impact" to the non-disturbance buffer zone during construction or placement of the pipeline. The pipeline has been routed along an existing access road to minimize the potential impacts to non-disturbance setback environments.

South Fork Wolf Creek (perennial stream) has a 100-foot non-disturbance buffer zone.

IMPACT 2: Treated water pipe placement will cross an ephemeral stream (E-1).

The proposed treated mine water discharge pipe is an aboveground pipe that will be located along an existing access road on the south side of South Fork Wolf Creek. The existing access road crosses the ephemeral stream feature E-1. A support structure will be constructed across the ephemeral stream (E-1) so that the pipe crosses over the 2ft- wide stream instead of through the stream which may cause a temporary impact to ~16 linear feet of the stream.

Riparian vegetation, if present along the existing access road, may be impacted from placement of the discharge pipe. The pipeline has been routed along an existing access road to minimize the potential impacts to riparian environments as well as the 50-foot non-disturbance buffer of the ephemeral stream. Portions of the existing access road are located within the 100-foot non-disturbance buffer zone of South Fork Wolf Creek.

Ephemeral stream E-1 has a 50-foot non-disturbance buffer zone.

IMPACT 3: Replacement of deteriorated culvert at South Fork Work Creek.

The deteriorated 48" buried culvert that runs underneath the Brunswick Industrial Site will be replaced and upgraded as part of the proposed project. It is estimated that the culvert replacement may have a temporary impact area of 40 ft. x 40 ft. (0.04 acres) within or adjacent to South Fork Wolf Creek. This would cause a temporary impact during replacement and existing conditions would be re-established once the culvert is replaced.

South Fork Wolf Creek (perennial stream) has a 100-foot non-disturbance buffer zone.

IMPACT 4: Permanent fill to small wetlands from construction and grading.

Construction and grading from surface facilities and the engineered fill industrial pad on the Brunswick Industrial Site will cause permanent impacts to ten (10) mapped wetland features (WM-1, WM-2, WM-3, MA-1, MA-2, MA-3, MA-4, MA-5, MA-6, and RI-1). The 10 wetland features consist of 3 meadow wetlands, 7 marsh wetlands, and 1 riparian wetland. It is estimated that ~0.57 acres of mapped wetlands will be permanently filled.

The impacted wetland features are small wetlands located in already developed or disturbed areas or immediately adjacent to developed or disturbed areas of the Brunswick Industrial Site. Wetland features MA-1 and MA-2 have developed in site drainage features, constructed by previous operations, that connect to culverts as part of the existing management of surface drainage on the site.

Wetland aquatic resources have a 100-foot non-disturbance buffer zone.

IMPACT 5: Site grading will encroach on intermittent stream (I-*5*).

Grading of the site for construction preparation will cause a permanent impact to ~34 linear feet of the intermittent stream feature I-5. This mapped intermittent stream feature originates from a culvert which transports surface drainage from the north-eastern portion of the Brunswick Industrial Site. The intermittent stream extends to a drainage gully which is identified as a riparian wetland. Proposed construction activities would require extension of the existing culvert so that flow of surface drainage is not interrupted.

Intermittent stream I-5 has a 50-foot non-disturbance buffer zone.

IMPACT 6: Engineered fill industrial pad will encroach on ephemeral stream (E-2).

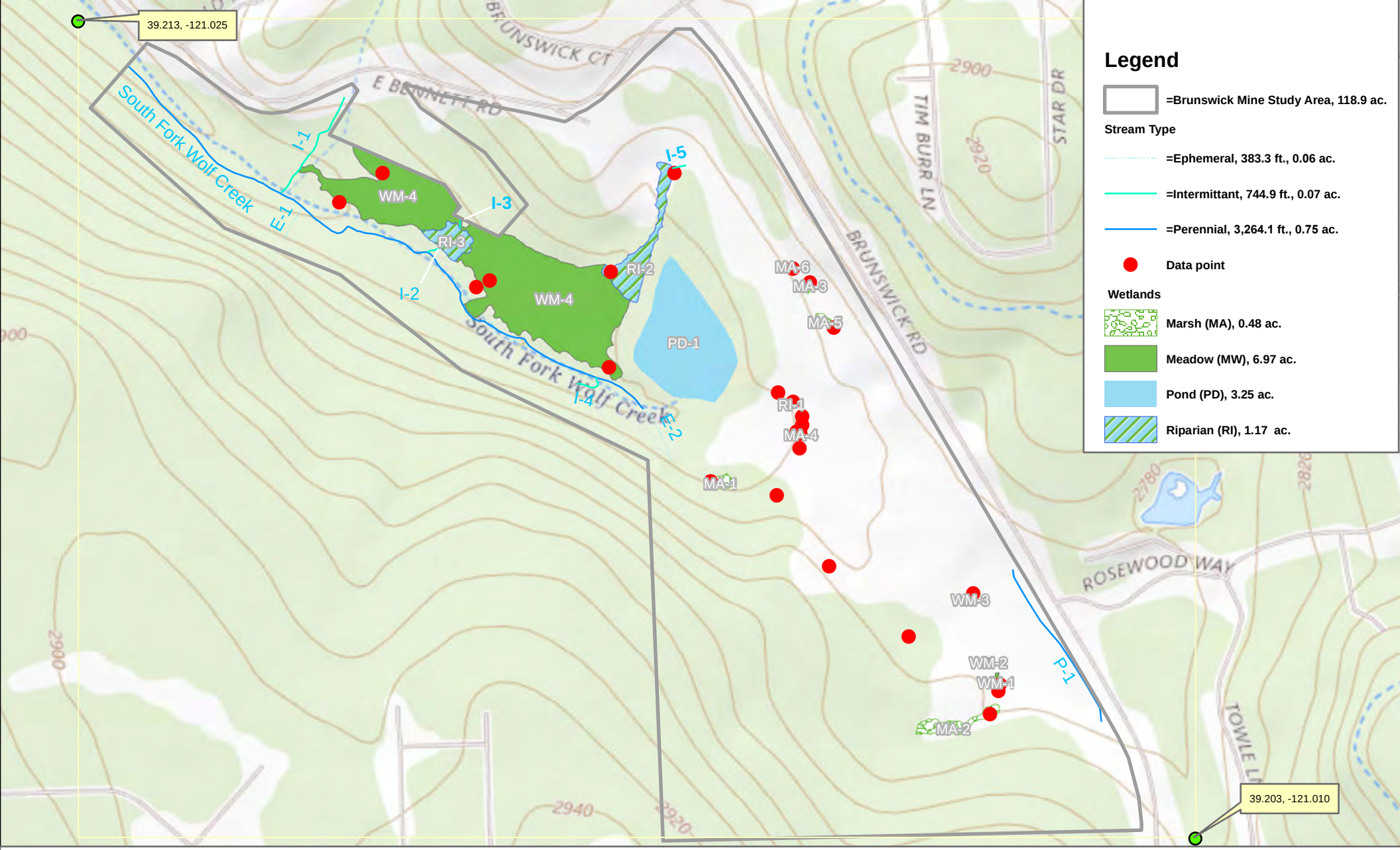
Currently, the ephemeral stream feature E-2 transmits site drainage from the south-eastern hills and offsite drainage which eventually flows into South Fork Wolf Creek.

Development of the industrial pad with engineered fill material will cause surface disturbance on the eastern area of the site. The industrial pad will include a surface detention pond to manage storm-water drainage. The construction extents of the surface detention pond will cause a permanent impact to ~188 linear feet of ephemeral stream feature E-2. Following construction, site drainage will continue to drain to the lower reaches of ephemeral stream feature E-2 and subsequently South Fork Wolf Creek, similar to pre-construction conditions.

Ephemeral stream E-2 has a 50-foot non-disturbance buffer zone.

IMPACT 7: Repair of existing clay lined pond berm will require work in the 100-foot non-disturbance buffer near the head of South Fork Wolf Creek

It is expected that a segment of the berm of the existing clay lined pond will be excavated and rebuilt to remove pockets of sawdust not removed during historic construction. This segment of the pond berm is located adjacent to South Fork Wolf Creek and in the 100-foot non-disturbance buffer zone of South Fork Wolf Creek. This crest of the berm will be paved to provide a surfaced access road along the perimeter of the pond and a section of the pond berm is within the 100-foot non-disturbance buffer zone of South Fork Wolf Creek and the wetland meadow mapped adjacent to it. The paved perimeter access road will be cross sloped to drain water into the pond rather than towards the creek or wetland meadow.



Grass Valley, CA (APNs 006-441-003, 006-441-004, 006-441-005, 006-441-034, 009-630-037 & 009-630-039)
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 36 &
T16N, R9E Section 31

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Figure. Brunswick Mine Study Area Aquatic Resources Overview, USGS basemap.

SCALE: 1 inch = 500 feet

0 250 500 1,000
Feet

This delineation has been conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual and the Western Mountains Regional Supplement (2010). The identification of ordinary high water mark (OHWM) was based on A Guide to Ordinary High Water Mark (OHWM) for Non-Perennial Streams in the Western Mountains (2014).

Created August 31, 2020.

Figure. East Bennett Road Right of Way

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 25

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 600 feet

This delineation has been conducted in accordancewith the 1987 Corps of Engineers Wetlands Delineation Manual and the Western Mountains Regional Supplement (2010). The identification of ordinary high water mark (OHWM) was based on A Guide to Ordinary High Water Mark (OHWM) for Non-Perennial Streams in the Western Mountains (2014).

Created January 1, 2019

7 RECOMMENDED MITIGATIONS AND CONDITIONS

Recommended mitigations and conditions for the Brunswick Area are based on an impact assessment of the Project Description outlined in Section 5 and the vegetation communities and aquatic resources mapped within the Brunswick Area (see Appendix C and Figure 3). A total of ~60 acres will be subject to surface use and/or development within the Brunswick Industrial Site.

The proposed disturbance within the Brunswick Area would have both direct and permanent impacts to ephemeral, intermittent, and perennial aquatic resources, as well as potential indirect impacts to these features and their non-disturbance buffers (see Table 4.0 and Table 5.0). Within the East Bennett Road ROW, potential temporary impacts from the construction of an NID potable water pipeline would be maintained within the pavement of the road and would have no impact on adjacent vegetation.

Minimization and mitigation measures are proposed to ensure that direct, indirect, permanent, and/or temporary disturbances do not cause a significant impact to the sensitive aquatic resources (watercourses, wetlands, and riparian areas) as defined by the Nevada County Land Use and Development Code. Therefore, with the implementation of the following minimization and mitigation measures, such impacts to the mapped aquatic resources, as well as any special-status plant and wildlife species that associate with such aquatic resources, within the Brunswick Area would be fully mitigated.

7.1 Mitigation Requirements for Aquatic Resources Protected Under the Federal Clean Water Act, by the State of California (CDFW), and Nevada County

7.1.1 Clean Water Act (CWA) Sections 404 and 401 Compliance

Each of the mapped wetland features and stream features included as part of the Brunswick Industrial Site and East Bennett Road ROW Aquatic Resources Delineation Report (Matuzak, 2020a) are assumed to fall under Corps jurisdiction pursuant to Section 404 of the CWA. The RWQCB pursuant to Section 401 of the CWA also has jurisdiction over areas subject to regulation by the Corps under Section 404 of the CWA.

A CWA Section 404 permit will be required for the proposed fill within the "waters of the U.S.," including wetlands as outlined in Table 4.0 and Table 5.0. Given the proposed disturbance will include 0.5 acres or greater of fill within such CWA regulated features, the proposed disturbance would not meet the general conditions of any previously authorized Nationwide Permit and therefore, an Individual Permit would be required prior to the filling of 0.5 acres or greater of such CWA regulated features. As part of the

Individual Permit process a functional assessment of the wetlands and waters to be impacted by the proposed site disturbance should be conducted and based on the results of the functional assessment and coordination with the Corps, an approved Compensatory Mitigation Plan that mitigates for impacts to such CWA regulated features at a minimum of a 1:1 ratio is required. Compensatory mitigation can include but is not limited to the following: onsite and/or offsite wetland creation and/or restoration, payment of an in-lieu fee, and/or purchase of mitigation credits at an approved Corps wetland mitigation or conservation bank. Additionally, a Water Quality Certification under Section 401 of the CWA will be required by the RWQCB.

7.1.2 CDFW Streambed Alteration Agreement

The perennial, intermittent, and ephemeral streams within the Brunswick Area would likely fall under CDFW jurisdiction as these areas each contain a bed and bank. Any substantial alteration of a stream and vegetation growing within the bed and bank of such mapped streams within the Brunswick Area would most likely require a Streambed Alteration Agreement from the CDFW pursuant to Section 1600 *et. seq.* of the California Fish and Game Code prior to construction. This includes any disturbance within the South Fork Wolf Creek or other mapped streams within the Brunswick Area.

Table 5.0 outlines the proposed permanent and temporary impacts to streams mapped within the Brunswick Area and therefore, a CDFW Streambed Alteration Agreement will be applied for as part of the permitting process for the project. The CDFW permit will most likely state that any temporary impacts to the stream zones within the Brunswick Area, including riparian habitat growing within the bed and bank of a mapped stream, would be required to be restored to pre-construction contours and revegetated as needed. Site restoration would include all exposed/disturbed areas and access points within any stream as a result of the disturbance activities (pipeline, outfall, new culvert, etc.). These areas shall be restored using locally native grass and/or forb seeds, locally native grass plugs and/or a mix of quick growing sterile non-native grass with locally native grass/forb seeds. Seeded areas shall be covered with broadcast straw and/or seeded erosion control blankets. Additionally, a site revegetation plan would be required to be developed and approved by CDFW as part of a Streambed Alteration Agreement condition for the removal of native riparian trees growing within the bed and bank of any mapped stream within the Brunswick Area.

7.2 Subsequent Potential Impacts to Special-Status Species that Associate with Impacted Aquatic Resources

Several special-status species are known to associate with the types of wetland and stream habitats identified and mapped within the Brunswick Area as well as their non-disturbance buffer areas. Those special-status wildlife species include nesting birds, the

western pond turtle, California black rail, foothill yellow-legged frog, and California red-legged frog. Additionally, special-status plant species, such as the Sierra arching sedge, finger rush, brownish-beaked rush, and Scadden Flat checkerbloom are known to associate with the types of wetlands and stream habitats mapped within the Brunswick Area as well as their non-disturbance buffer areas (see Appendix F for a description of CNPS ranked plants and special-status species and their likelihood to occur within the Brunswick Area).

None of these special-status wildlife or plant species were identified during the field surveys conducted as part of the development of the Biological Resources Assessment for the Brunswick Area and the results of which are included in this Management Plan. However, given that these species have at least a limited potential to occur within the mapped streams and wetlands within the Brunswick Area and their non-disturbance buffers, mitigation measures outlined for those species within the Biological Resources Assessment for the Brunswick Area are incorporated by reference as part of this Management Plan and will be implemented should any of those species be found by pre-construction surveys prior to any proposed disturbance within the mapped wetlands, streams, and non-disturbance buffers to ensure that potential impacts to special-status species are avoided, minimized, and fully mitigated.

7.3 Management Plan Best Management Practices (BMPs)

ENCROACHMENT INTO THE NON-DISTURBANCE BUFFERS

Temporary impacts to ephemeral, intermittent, and perennial features mapped within the Brunswick Area include soil disturbance and potential erosion along the adjacent slopes. If such project related disturbance occurs within 50 feet of any ephemeral or intermittent stream or within 100 feet of any perennial stream or wetlands, then specific measures have been developed as part of this Management Plan to protect the non-disturbance buffers to such resources within the Brunswick Area. The mitigation measures outlined below should be implemented to avoid and minimize such impacts to the non-disturbance buffers of such resources. The applicant intends to construct all components of the proposed project in compliance with State and federal laws, as well as in compliance with Nevada County and the Nevada County Building Code.

Protected non-disturbance buffers within the Brunswick Area are associated with areas directly adjacent to the permanent and temporary impacts to intermittent and perennial stream and wetland resources within the Brunswick Areas, as included in Figure 3. Encroachment into the non-disturbance buffers of such resources could have an indirect impact on such protected resources and therefore, mitigation for encroachment into such non-disturbance buffers within the Brunswick Area is a requirement of this Management Plan.

MITIGATION FOR ENCROACHMENT INTO THE NON-DISTURBANCE BUFFERS

The mitigation measures listed below are intended for inclusion within the entirety of the proposed development (direct permanent and temporary impacts to protected aquatic resources) and/or disturbances within the non-disturbance buffers during and after construction. The intent of these measures is to minimize direct and indirect impacts to water quality during and following construction and the negative impacts that sedimentation and other hazardous substances can have on such protected aquatic resources. Such protections will be accomplished by implementing the following during and following construction:

- Limit construction to periods of extended dry weather and the dry summer season, if feasible;
- Establishing the areas around active stream channels and wetlands as Environmentally Sensitive Area (ESA) where those areas will not be impacted by construction or thereafter;
- No fill or dredge material will enter or be removed from any wetlands or streams except for those identified in Table 4.0 and Table 5.0 in this Management Plan during construction and thereafter;
- Use appropriate machinery and equipment to limit disturbance within and directly adjacent to these areas;
- Placement of soil erosion control devices (such as wattles, hay bales, etc.) between the protected aquatic resources (wetlands and streams) and the areas to be graded and disturbed to limit potential runoff and sedimentation into such protected resources;
- Dewatering of any streams that will be required to occur as part of the proposed disturbance within the Brunswick Area must include a Water Diversion Plan and be approved by CDFW prior to the implementation of such dewatering activities; and
- Implement Best Management Practices during and following construction.

REMEDIATION AND RESTORATION OF SOUTH FORK WOLF CREEK

It is recommended that the pipeline and areas immediately adjacent to the outfall and rock or rip rap dissipation proposed within the southern bank of South Fork Wolf Creek be restored to pre-construction contours and revegetated immediately following construction. Any other areas of impacts within the 100-foot non-disturbance buffer to South Fork Wolf Creek, including the upgrade of the existing culvert where water daylights within the Brunswick Industrial Site as well as the riparian areas along the pipeline route connecting to the proposed outfall location, should also be restored to pre-

construction contours where feasible and replanted with native vegetation. The following is recommended to remediate and restore areas adjacent to South Fork Wolf Creek and other streams and wetlands within the Brunswick Area where native vegetation and trees will be removed within the non-disturbance buffers of such protected resources and their non-disturbance buffers:

- Placement of rock and rip rap along the embankment of the South Fork Wolf Creek should be minimized to reduce the footprint of such impacts to the perennial creek and its embankments;

- Some of the rock and rip rap can be placed at the top of the embankment of the South Fork Wolf Creek to protect the embankment from further erosion during restoration of the riparian zone and embankment on the southern side of the perennial stream.

- Plant willow cuttings from the adjacent willow trees and other native shrubs and riparian trees along the embankment and broadcast seed the embankment with local, native grass seed. A revegetation plan will be a requirement of the CDFW Streambed Alteration Agreement that will include impacts to the bed and bank, of any stream within the Brunswick Area. Implementation of General and Project Specific Conditions will be required for all permits for the proposed project.

Given the adjacent embankment areas contain dense stands of Himalayan blackberry shrubs within open areas along the bank of the stream, those shrubs will quickly establish themselves within the exposed embankment once the existing trees and vegetation layer is removed. The establishment of the Himalayan blackberry shrubs and willow stock cuttings will begin to establish a natural, long-term bank stabilization and will limit erosion and sedimentation.

IMPLEMENTATION OF BEST MANAGEMENT PRACTICES DURING CONSTRUCTION

To protect the intermittent and perennial resources covered under this Management Plan and their non-disturbance buffer areas, as well as water quality and downstream water resources, the applicant shall implement standard Best Management Practices during and after construction. These measures should include, but are not limited to:

- Minimize the number and size of work areas for equipment and spoil storage sites in the vicinity of any streams and wetlands. Place staging areas and other work areas outside of the 50-foot non-disturbance buffers of ephemeral and intermittent aquatic resources and 100-foot non-disturbance buffers of perennial aquatic resources.

- The applicant shall exercise reasonable precaution to protect the aquatic resources within the Brunswick Area as well as the adjacent non-disturbance buffers of such aquatic resources from pollution with fuels, oils, and other harmful materials. Construction byproducts and pollutants such as oil, cement, and wash water shall be

prevented from discharging into or near these resources and shall be collected for removal off the site. All construction debris and associated materials and litter shall be removed from the work site immediately upon completion.

- No equipment for vehicle maintenance or refueling shall occur within the 50-foot and 100-foot non-disturbance buffers. The contractor shall immediately contain and clean up any petroleum or other chemical spills with absorbent materials such as sawdust or kitty litter. For other hazardous materials, follow the cleanup instruction on the label.

Post Construction Erosion Control

Exposed bare soil along the embankment of South Fork Wolf Creek where the outfall and dissipation rip rap will occur as well as any exposed bare soil adjacent to the other mapped aquatic resources within the Brunswick Area, including their 50-foot and 100-foot non-disturbance buffers, should be protected against loss from erosion by the seeding of an erosion control mixture and restored with native grasses and mulching per Nevada County and regulatory agency guidelines (to be included in required permits prior to such disturbance within protected aquatic resources, see Appendix H for a potential native seed mix from Caltrans and the Nevada County Erosion Control Plan Standards). Non-native species that are known to invade wild lands, such as orchard grass, velvet grass, rose clover, winter and spring vetch, and wild oats should not be used as they displace native species.

Provide Copies of Mitigation Measures to Contractors

To ensure the proper and timely implementation of all mitigation measures contained in this Management Plan, as well as the terms and conditions of any other required permits, the applicant shall distribute copies of these mitigation measures and permit requirements to the contractors prior to grading and construction within the non-disturbance buffers. All contractors shall be completely familiar with the mitigation measures contained above and with the terms and conditions of all permits.

8 JUSTIFICATION TO SUPPORT MANAGEMENT PLAN

Consistent with the provisions of Sec. L-II 4.3.3.B, total avoidance of protected aquatic resources is not feasible given the constraints of the Brunswick Area and given the history of the Brunswick Industrial Site with past historic mining and lumber operations that have occurred. However, the disturbed and developed nature of the Brunswick Industrial Site is being taken advantage of as the largest percentage of the site to be impacted will be located within the areas of the site that are currently heavily developed and disturbed by historic land uses. Additionally, the project has been specifically designed to avoid the largest wet meadow wetlands within the northwestern section of the Brunswick Industrial Site, and they are not being impacted by the proposed disturbance. Therefore, given the topography, history of mining and timber activities, and existing level of disturbance and development within the Brunswick Area, total avoidance of sensitive aquatic resources is not feasible. However, the largest and least disturbed wetlands within the Brunswick Industrial Site will be avoided given the proposed disturbance will occur mostly within the larger developed and disturbed areas of the site where several smaller wetland and stream features will be permanently impacted by the proposed project.

Alternative project designs and their feasibility were considered as part of the overall project design. Several alternative project designs would have had greater levels of impact on aquatic resources and within the northwestern area of the Brunswick Industrial Site. However, the selected project design both minimizes impacts to aquatic resources and the permanent and temporary impacts are mostly proposed to occur within a largely developed and disturbed area of the site. Fewer, smaller, and more disturbed wetland features will be disturbed from the implementation of the proposed project compared to other project designs that have been considered within the Brunswick Area.

9 STATEMENT OF QUALIFICATIONS

Mr. Greg Matuzak, Principal and owner of Greg Matuzak Environmental Consulting LLC is a wetlands ecologist and wildlife biologist with 20 years of experience conducting aquatic resources delineations and biological resources assessments in Northern California. Mr. Matuzak is 40-hour Wetland Delineation Certified (Wetland Training Institute) and has conducted aquatic resources delineations for 100's of linear miles of projects and 1000s of acres of site development projects. Additionally, Mr. Matuzak has implemented special-status biological resources surveys and developed biological resources assessments and management plans for dozens of projects in Nevada County. Mr. Matuzak has lived and worked in Nevada County for over 13 years. Ms. Wendy Boes is a local Nevada County botanist and most recently worked for the Tahoe National Forest as a botanist. Ms. Boes is an independent consultant, GIS specialist, and conducts field data collection and GIS mapping for field related projects. Mr. Matuzak and Ms. Boes were responsible for the field data collection and assessment developed as part of the development of this Management Plan. Both Mr. Matuzak and Ms. Boes are on the Nevada County Planning Department's list of Qualified Biological Resources Consultants.

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Appendix A

Project Overview Area Figures

Figure. Brunswick Industrial Site

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 36 &
T16N, R9E Section 31

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 500 feet

Legend

= Brunswick Industrial Site 118.93 ac.

Figure. East Bennett Road Right of Way Overview

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 25

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 600 feet

This delineation has been conducted in accordancewith the 1987 Corps of Engineers Wetlands Delineation Manual and the Western Mountains Regional Supplement (2010). The identification of ordinary high water mark (OHWM) was based on A Guide to Ordinary High Water Mark (OHWM) for Non-Perennial Streams in the Western Mountains (2014).

Created January 1, 2019

Appendix B

USDA Soils Maps

and

USDA Soils Descriptions

Map Scale: 1:8,350 if printed on A landscape (11" x 8.5") sheet.

N

0 100 200 400 600 Meters

0 400 800 1600 2400 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AfC	Aiken loam, 9 to 15 percent slopes, high precip	12.91	10.9%
AfD	Aiken loam, 15 to 30 percent slopes, N Low Mid Montane	0.71	0.6%
AfE	Aiken loam, 30 to 50 percent slopes	17.7	14.9%
Ao	Alluvial land, clayey	13.8	11.7%
CmB	Cohasset loam, summits, 2 to 15 percent slopes	1.41	1.2%
CmC	Cohasset loam, shoulders, 3 to 20 percent slopes	24.7	20.9%
CmD	Cohasset loam, backslopes, 5 to 30 percent slopes	4.7	3.6%
CoD	Cohasset cobbly loam, 5 to 30 percent slopes	1.9	1.6%
Pr	Placer diggings	40.8	34.5%
SlD	Sites silt loam, 15 to 30 percent slopes, N low montane	0.3	0.2%
Totals for Area of Interest		**118.93**	**100.0%**

121° 2' 27" W
121° 0' 54" W
669200
669400
669600
669800
670000
670200
670400
670600
670800
671000
671200
39° 13' 19" N
39° 12' 32" N
4343300
4343100
4342900
4342700
4342500
4342300
4342100
4341900
Brunswick
Crown Point Cir
Bet Rd
Ct
BrD
SID
BrE
SfD
BoD
SfD
AfE
SID
CmD
AfC
Pr
Soil Map may not be valid at this scale.
Map Scale: 1:10,200 if printed on A landscape (11" x 8.5") sheet.
N
0 150 300 600 900 Meters
0 450 900 1800 2700 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AfC	Aiken loam, 9 to 15 percent slopes, high precip	0.3	3.8%
AfE	Aiken loam, 30 to 50 percent slopes	0.6	7.0%
BoD	Boomer loam, hard bedrock, 7 to 28 percent slopes	2.7	24.9%
BrD	Boomer, hard bedrock - Rock outcrop complex, 5 to 30 percent slopes	0.2	1.9%
BrE	Boomer, hard bedrock - Rock outcrop complex, 15 to 60 percent slopes	1.0	12.8%
CmD	Cohasset loam, backslopes, 5 to 30 percent slopes	1.1	10.3%
Ct	Cut and fill land	1.1	9.1%
Pr	Placer diggings	1.1	8.7%
SfD	Sierra sandy loam, 15 to 30 percent slopes	0.1	0.7%
SlD	Sites silt loam, 15 to 30 percent slopes, N low montane	2.1	20.8%
Totals for Area of Interest		**10.3**	**100.0%**

USDA Soil Mapping Units Descriptions for the Brunswick Area

Brunswick Industrial Site

The USDA Soil Survey Mapper (USDA, 2019) identifies several soil types within the Brunswick Industrial Site. USDA soil mapping for the Brunswick Industrial Site is included in Appendix B and indicates that the Brunswick Industrial Site includes 10 soil types: Aiken loam on 9 to 15 percent slopes (AfC), Aiken loam on 15 to 30 percent slopes (AfD), Aiken loam on 30 to 50 percent slopes (AfE), Alluvial land, clayey (Ao), Cohasset loam, summits, on 2 to 15 percent slopes (CmB), Cohasset loam, shoulders, on 3 to 20 percent slopes (CmC), Cohasset loam, backslopes, on 5 to 30 percent slopes (CmD), Cohasset cobbly loam on 5 to 30 percent slopes (CoD), Placer diggings (Pr), and Sites loam on 15 to 30 percent slopes (SID). These soil types are described in detail below and are shown in Appendix B:

- **Aiken loam on 9 to 15 percent slopes (AfC).** The Aiken series consists of deep, well-drained soils typically occurring on ridgetops and side slopes of andesitic flows. These soils form from the weathering of volcanic rock. Drainage is moderately slow with a medium rate of surface runoff. The Aiken series is not hydric. A typical profile for this series consists of dark to reddish brown (5YR 3/3) loam from 0 to 11 inches. This layer is underlain by a yellowish red (5YR 4/6) loam from 11 to 21 inches. A dark red (2.5 YR 3/6) loam is present from 21 to 29 inches followed by a clay loam layer of the same color from 29 to 42 inches. From 42 to 52 inches is yellowish red (5YR 4/6) clay loam which is underlain by a reddish brown (SYR 4/4) clay loam. This layer is underlain by bedrock.

- **Aiken loam on 15 to 30 percent slopes (AfD).** The description of this soil is the same as the AfC description, only it is found on steeper slopes.

- **Aiken loam on 30 to 50 percent slopes (AfE).** The description of this soil is the same as the AfC description, only it is found on steeper slopes than AfD soils.

- **Alluvial land, clayey (Ao).** This series consists of moderately well-drained soils in floodplains and drainages. These soils formed from alluvium derived from granitic or mixed metabasic rocks. Permeability and runoff are both slow. This is a hydric soil. A typical soil for alluvial soils consists of 3 to 10 inches of sandy loam or loam underlain by 30 to 45 inches of a clay loam.

- **Cohasset loam, summits, on 2 to 15 percent slopes (CmB).** The Cohasset series consists of well drained soils on ridgetops and side slopes. These soils formed from weathered volcanic rock. Drainage is moderate and runoff is slow to rapid.

These soils are not hydric. A typical profile for the Cohasset series consists of pine and fir needles from 0 to 3 inches. This layer is underlain by a dark reddish brown (ranges from 5YR 3/2, 3/3, 3/4) cobbly loam from 0 to 24 inches. This layer is underlain by a dark reddish brown (5YR 3/4 or 4/4) cobbly clay loam from 24 to 96 inches. At 96 inches is a weathered andesitic conglomerate.

- **Cohasset loam, shoulders, on 3 to 20 percent slopes (CmC).** The description of this soil is the same as the CmB description, only it is found on steeper slopes and shoulders.

- **Cohasset loam, backslopes, on 5 to 30 percent slopes (CmD).** The description of this soil is the same as the CmB description above, only it is found on steeper slopes and backslopes.

- **Cohasset cobbly loam on 5 to 30 percent slopes (CoD).** The description of this soil is the same as the CmB description above, only it is found on steeper slopes and is a cobbly loam rather than a Cohasset loam like CmB, CmC, and CmD above, containing a mixture of cobbles within the loamy soil.

- **Placer diggings (Pr).** The Placer diggings series consists of remnant tertiary river deposits associated with hydraulic mining and placer mining operations as well natural deposits within stream channels. Areas with this soil type are 90 to 100 percent rock, cobble or gravel. 50 to 75 percent of these lands have a mixture of rock, cobbles, gravel and soil. This soil contains unnamed hydric inclusions in drainages and depressions.

- **Sites loam on 15 to 30 percent slopes (SID).** The Sites series consists of well drained soils that occur in mountain uplands. The soils formed from weathered residuum of metabasic and metasedimentary rocks. Drainage is moderately soil and runoff is slow to very high. This soil is not hydric. A typical profile for this complex consists of dark reddish brown loam (5YR 3/4) from 0 to 3 inches. This layer is underlain by yellowish red loam (5YR 4/6) from 3 to 12 inches. From 12 to 23 inches is a layer of red (2.5 YR 4/6) clay loam. This layer is underlain by red (10R 4/6) clay from 23 to 56 inches and red (10R 4/8) light clay from 53 to 69 inches. From 68 to 78 inches is a red (2Y 4/8) clay loam underlain at 78 inches by a layer of weathered metasedimentary rock.

East Bennett Road ROW Section of Brunswick Area

The USDA Soil Survey Mapper (USDA, 2019) indicates that the East Bennett Road ROW includes 10 soil types: Aiken loam on 9 to 15 percent slopes (AfC), Aiken loam on 30 to 50 percent slopes (AfE), Boomer loam, hard bedrock, 7 to 28 percent slopes (BoD), Boomer-Rock outcrop complex on 5 to 30 percent slopes (BrD), Boomer-Rock outcrop complex on 30 to 50 percent slopes (BrE), Cohasset loam on 15 to 30 percent slopes (CmD), Cut and fill land (Ct), Placer diggings (Pr), Sierra sandy loam on 15 to 30 percent slopes (SfD), and Sites loam on 15 to 30 percent slopes (SID). These soil types are described in detail below and are shown in Appendix B:

- **Aiken loam on 9 to 15 percent slopes (AfC).** The soil series description for Aiken loam on 9 to 15 percent slopes is above within the descriptions for the Brunswick Industrial Site.

- **Aiken loam on 30 to 50 percent slopes (AfE).** The soil series description for Aiken loam on 30 to 50 percent slopes is above within the descriptions for the Brunswick Industrial Site.

- **Boomer-Rock outcrop complex on 5 to 30 percent slopes (BrD).** The Boomer-Rock outcrop series consists of well-drained soils in upland areas. These soils formed from weathered metavolcanic rock. Drainage is moderately slow and runoff is slow to rapid. These soils are not hydric. A typical profile for this series consists of a brown (5YR 3/4) gravelly loam from 0 to 11 inches. This layer is underlain by a dark reddish brown (2.SYR 3/4) loam from 11 to 18 inches. From 18 to 29 inches is a dark red (2.5YR 3/6) clay loam layer which is underlain by a reddish yellow clay loam to 33 inches. This layer is underlain by a yellowish red (SYR 4/8) clay loam with dark red (2.5 YR 3/6) films from 29 to 37 inches followed by a hard fractured diabase at 47 inches.

- **Boomer-Rock outcrop complex on 30 to 50 percent slopes (BrE).** This soil description is the same as for BrD but is found on steeper slopes.

- **Boomer loam, hard bedroack, 7 to 28 percent slopes (BoD).** This soil description is similar to BrD described above. Runoff is medium to rapid on this soil.

- **Cohasset loam on 15 to 30 percent slopes (CmD).** The soil series description for Cohasset loam on 15 to 30 percent slopes is above within the descriptions for the Brunswick Industrial Site.

- **Cut and fill land (Ct).** This soil type consists of areas that have been altered by activities other than mining of milling such that there are no intact soil characteristics. This soil is not hydric.

- **Placer diggings (Pr).** The soil series description for Placer diggings is above within the descriptions for the Brunswick Industrial Site.

- **Sierra sandy loam on 15 to 30 percent slopes (SfD)**. The Sierra series consists of deep to very deep, well drained soils that formed in material weathered from intrusive igneous rocks. Sierra soils are on foothills and have slopes of 0 to 70 percent. The typical profile for this type of soil from 0 to 8 inches is brown (7.5YR 5/4) coarse sandy loam, dark reddish brown (5YR 3/4) moist; massive; slightly hard, friable; many very fine roots; many very fine and fine pores; moderately acid (pH 5.7); clear smooth boundary. From 8 to 20 inches it is known to be reddish brown (5YR 5/4) loam, yellowish red (5YR 3/6) moist; massive; hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine, common fine, few medium and coarse pores; few thin discontinuous clay films line pores, colloids mainly bridging mineral grains; moderately acid (pH 5.9); gradual smooth boundary.

- **Sites loam on 15 to 30 percent slopes (SID)**. The soil series description for Sites loam is above within the descriptions for the Brunswick Industrial Site.

Appendix C

Vegetation Community Map

and

Vegetation Community Descriptions

Figure. Vegetation Communities Within in the Brunswick Industrial Site

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 36 &
T16N, R9E Section 31

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 500 feet

Legend

- = Brunswick Industrial Site
- Vegetation Type
- Annual Grassland
- Developed
- Disturbed
- Manmade Pond
- Montane Hardwood-Conifer
- Montane Hardwood
- Pondorosa Pine
- Sierran Mixed Conifer
- Wet Meadow

Description of Mapped Vegetation Communities for the Brunswick Area

Developed

The entirety of the East Bennett Road ROW is considered developed given it contains pavement and shoulders that include fill material used as part of the construction of the road. In addition, the area connecting the northwestern end of East Bennett Road with the Centennial Industrial Site is also considered developed given the paved and gravel access as well as the historic industrial uses within that area.

Within the Brunswick Industrial Site, a large portion of the eastern section of the site is mapped as developed given it contains asphalt, gravel, pavement, and historic lumber mill infrastructure. The areas within the Brunswick Industrial Site mapped as developed contain little to no vegetation and the sparse vegetation present is considered ruderal and dominated by non-native and mostly invasive grassland species. The central area of the mapped developed section of the Brunswick Industrial Site contains artificial depressions that include some wetland and riparian species given the ponding of water that occurs within those artificial topographical low areas within the developed eastern section of the site.

Disturbed

A small area within the northeast corner of the Brunswick Industrial Site and a large area within the southern/southeastern section of the Brunswick Industrial Site are mapped as disturbed. Those areas contain a mix of fill material, asphalt, and gravel that have created a mix of non-native ruderal grassland vegetation and areas of barren ground. The southern disturbed area also contains some historic artificial depressions that include some wetland and riparian species given the ponding of water that occurs within those artificial topographical low areas, but those areas are dominated mostly by invasive Himalayan blackberry shrubs (*Rubus armenicus*).

Montane Hardwood

Montane hardwood habitat is identified within the Brunswick Industrial within and adjacent to a drainage area within the northeastern section of the site. Montane hardwood is characterized here by stands of an overstory of native oak trees mixed with some riparian species (*Salix* sp.). There is often homogeneity in the canopy structure, and canopy closure is variable between seasons as the dominant overstories species is deciduous, ranging from 5-45%. Due to the historic disturbance, there is abundant Himalayan blackberry in the understory along with other nonnatives including bristly dogtail (*Cynosurus echinatus)* and hedgenettle (*Torilis arvensis)*.

Montane Hardwood-Conifer

Montane hardwood-conifer habitat in the Sierra Nevada occurs at elevations between 1,000 and 4,000 feet above MSL and is comprised of a mosaic of hardwoods and conifers. The Brunswick Industrial Site is likely a midpoint on the gradient between hardwood forest and conifer forest containing both hardwood and conifer tree species, often in a mosaic pattern with small pure stands of conifers interspersed with small stands of hardwoods. Species associated with montane hardwood-conifer include ponderosa pine, California black oak, canyon live oak, madrone and Douglas fir. This vegetation community has been mapped within the northwestern section of the Brunswick Industrial Site along the South Fork Wolf Creek corridor and in two smaller areas along the southern side of East Bennett Road.

Annual Grassland

Annual grassland are open vegetation types that are dominated by annual plant species, often nonnative. These species can occur within the understory of other vegetation types like oak woodlands, but where annual grasslands are mapped there is little to no overstory or shrub cover. This vegetation type is common within the northwestern section of the Brunswick Industrial Site where there has been historic disturbance and little to no water source other than rainfall. The fall rainfall will spark germination and plants will grow through the cool months and in spring will grow rapidly and flower, fruit and senesce. Common to the environmental setting of this habitat type are yellow star thistle (*Centaurea solstitalis),* garden burnett (*Poterium sanguisorba),* soft chess (*Bromus hordeaceous),* bisnaga (*Ammi visnaga),* and patches of Himalayan blackberry.

Ponderosa Pine

Ponderosa pine (*Pinus ponderosa)* habitat is found within the northeastern corner of the Brunswick Industrial Site. The structure and composition of the ponderosa pine forest varies widely according to the amount of soil moisture available during the summer. The canopy closure tends to be low in the areas ranging from 5-35%. In the Brunswick Industrial Site, California black oak (*Quercus kelloggii)*, madrone (*Arbutus menziesii)*, foothill pine (*Pinus sabieniana)*, and incense cedar (*Calocedrus decurrens)* are common associates of ponderosa pine. A variety of understory shrub species occur throughout the ponderosa pine forest. In the Project areas the more common understory shrubs are white leaf manzanita (*Arctostaphylos viscida* ssp. *viscida)*, poison oak *(Toxicodendron diversilobum)*, and honeysuckle (*Lonicera hispidula)*. These understory shrubs form often dense, impenetrable stands, especially on open rocky slopes, and in areas of recent disturbance.

Sierran Mixed Conifer

The Sierran mixed conifer forest is generally a multi strata forest dominated by conifers with hardwood as a component of the understory. This vegetation type is found along the hillslope on the western and southern portions of the Brunswick Industrial Site. The forest here is more mesic, occurring on mostly east facing slopes. It is dominated by Douglas fir, incense cedar, and black oak. It has high canopy closure. It often has a midstory strata of madrone, hazelnut (*Corylus cornuta ssp. californica)* and younger black oak. The understory has high litter cover and Himalayan blackberry and honeysuckle area common in the understory.

Montane Riparian

A structural gradient generally occurs from neighboring vegetation into montane riparian, resulting in oaks or pines grading in with the more riparian species. This vegetation type is characterized by two different ecological conditions, (1) placer diggings where small depressions within the disturbed and developed mapped areas of the Brunswick Industrial Site pond water long enough for riparian species such as willows (*Salix* sp.) to occur and (2) along a narrow stretch of the South Fork Wolf Creek.

The montane riparian in the placer diggings and areas created from earth movement are characterized by black cottonwood (*Populus tremuloides),* red willow (*Salix laevigata),* arroyo willow *(Salix lasiolepis),* and occasionally ponderosa pine in the overstory. Dense thickets are often resultant with Himalayan blackberry and Baltic rush (*Juncus balticus* ssp. *atar)* in the herbaceous layer.

The montane riparian vegetation along both sides of the South Fork Wolf Creek is dominated by white alder (*Alnus rhombifolia),* red willow (*Salix laevigata), and* arroyo willow *(Salix lasiolepis)* with other overstory species from adjacent vegetation types, including California black oak, pine and Douglas fir. The understory of montane riparian along the stream is dominated by Himalayan blackberry. This vegetation type forms a very narrow band along both sides of the creek between the mapped montane conifer-hardwood and annual grassland and wet meadow vegetation communities.

Wet Meadow

Wet meadows generally contain a single vegetation stratum and are generally dominated by forbs and gramanoids. Shrub and trees are sometimes present but generally make up a small portion of this vegetation type. This is typically a diverse plant community driven by hydrologic influences. The wet meadows in the northwestern section of the Brunswick Industrial Site are within areas mapped as alluvial, clayey soil types. These wet meadows are characterized by *Agrostis, Juncus* spp., Baltic rush, and common velvet grass (*Holcus lanatus*).

Freshwater Emergent Marsh Wetlands

Freshwater emergent marsh wetlands are characterized by hydrophyllic plants and generally standing water. All emergent wetlands have soils that are saturated to the extent that the soils are always anaerobic. There are freshwater emergent marsh wetlands mapped within the Brunswick Industrial Site and is found in small depressional areas mostly within the areas mapped as developed or disturbed. This habitat type within the Brunswick Industrial Site is dominated by arroyo willow, red willow, and pacific rush (*Juncus effuses* ssp. *pacificus)*.

Appendix D

Plants Observed During Site Surveys

VASCULAR PLANTS OCCURRING IN BRUNSWICK AREA

Scientific Name	Common Name	Origin	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Acer macrophyllum	Bigleaf maple	Native	-	FACU	-
Acer negundo	Boxelder	Native	-	FAC	-
Acmispon americanus var. americanus	Spanish lotus	Native	-	FACU	-
Adenocaulon bicolor	Trail plant	Native	-	-	-
Aegilops triuncialis	Goatgrass	non-native (invasive)	-	-	High
Agoseris retrorsa	Spear leaved agoseris	Native	-	-	-
Agrostis sp.	-	-	-	-	-
Ailanthus altissima	Tree of heaven	non-native (invasive)	-	FACU	Moderate
Aira caryophyllea	Silvery hairgrass	non-native (invasive)	-	FACU	-
Alnus rhombifolia	White alder	Native	-	FACW	-
Ammi visnaga	Bisnaga	non-native	-	-	-
Andropogon sp.	-	-	-	-	-
Arbutus menziesii	Madrono	Native	-	-	-
Arctostaphylos viscida	Whiteleaf manzanita	Native	-	-	-
Asyneuma prenanthoides	California harebell	Native	-	-	-
Avena sp.	-	-	-	-	-
Baccharis pilularis	Coyote brush	Native	-	-	-
Berberis aquifolium var. aquifolium	Oregon grape	Native	-	FACU	-
Bromus diandrus	Ripgut brome	non-native (invasive)	-	-	Moderate
Bromus hordeaceus	Soft chess	non-native (invasive)	-	FACU	Limited
Bromus madritensis	Foxtail chess, foxtail brome	non-native	-	FACU	-
Bromus suksdorfii	Suksdorf's bromegrass	Native	-	-	-

Scientific Name	Common Name	Origin	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Bromus tectorum	Downy chess	non-native (invasive)	-	-	High
Calocedrus decurrens	Incense cedar	Native	-	-	-
Calycanthus occidentalis	Spicebush	Native	-	FAC	-
Calystegia occidentalis ssp. occidentalis	Modoc morning glory	Native	-	-	-
Carex feta	Green sheathed sedge	Native	-	FACW	-
Ceanothus integerrimus	Deer brush	Native	-	-	-
Centaurea solstitialis	Yellow starthistle	non-native (invasive)	-	-	High
Chamaebatia foliolosa	Sierran mountain misery	Native	-	-	-
Chondrilla juncea	Skeleton weed	non-native (invasive)	-	-	Moderate
Cichorium intybus	Chicory	non-native	-	FACU	-
Cirsium vulgare	Bullthistle	non-native (invasive)	-	FACU	Moderate
Cornus nuttallii	Mountain dogwood	Native	-	FACU	-
Cornus sericea ssp. occidentalis	Western dogwood	Native	-	FACW	-
Cornus sessilis	Western cornelian cherry	Native	-	FAC	-
Cortaderia jubata	Andean pampas grass	non-native (invasive)	-	FACU	High
Corylus cornuta ssp. californica	Beaked hazelnut	Native	-	FACU	-
Crataegus monogyna	Hawthorn	non-native (invasive)	-	FAC	Limited
Croton setiger	Turkey-mullein	Native	-	-	-
Cynodon dactylon	Bermuda grass	non-native (invasive)	-	FACU	Moderate
Cynosurus echinatus	Dogtail grass	non-native (invasive)	-	-	Moderate
Cyperus eragrostis	Tall cyperus	Native	-	FACW	-
Cytisus scoparius	Scotch broom	non-native (invasive)	-	-	High

Scientific Name	Common Name	Origin	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Dactylis glomerate	Orchardgrass	non-native (invasive)	-	FACU	Limited
Danthonia californica	California oatgrass	Native	-	FAC	-
Deschampsia elongata	Hairgrass	Native	-	FACW	-
Dicentra Formosa	Pacific bleedinghearts	Native	-	FACU	-
Elymus caput-medusae	Medusa head	non-native	-	-	-
Elymus glaucus	Blue wildrye	Native	-	FACU	-
Elymus hispidus	Intermediate wheatgrass	non-native	-	-	-
Epilobium brachycarpum	Willow herb	Native	-	-	-
Epilobium densiflorum	Willow herb	Native	-	FACW	-
Festuca arundinacea	Reed fescue	non-native (invasive)	-	FAC	Moderate
Festuca occidentalis	Western fescue	Native	-	-	-
Fraxinus latifolia	Oregon ash	Native	-	FACW	-
Galium triflorum	Sweet bedstraw	Native	-	FACU	-
Gnaphalium palustre	Lowland cudweed	Native	-	FACW	-
Goodyera oblongifolia	Rattlesnake plantain	Native	-	FACU	-
Hedera helix	English ivy	non-native (invasive)	-	FACU	-
Holcus lanatus	Common velvetgrass	non-native (invasive)	-	FAC	Moderate
Hypericum perforatum ssp. perforatum	Klamathweed	non-native	-	FACU	-
Ilex aquifolium	Holly	non-native (invasive)	-	FACU	Moderate
Juncus balticus ssp. ater	Baltic rush	Native	-	FACW	-
Juncus bufonius	Common toad rush	Native	-	FACW	-
Juncus effusus ssp. pacificus	Pacific rush	Native	-	FACW	-
Kickxia elatine	Sharp point fluellin	non-native	-	FAC	-
Lactuca serriola	Prickly lettuce	non-native (invasive)	-	FACU	-
Lactuca sp.	-	-	-	-	-
Lathyrus latifolius	Sweet pea	non-native	-	-	-

Scientific Name	Common Name	Origin	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Lathyrus nevadensis var. nevadensis	Sierra nevada pea	Native	-	-	-
Lilium humboldtii ssp. humboldtii	Humboldt lily	Native	Rank 4.2	-	-
Lonicera hispidula	Pink honeysuckle	Native	-	FACU	-
Lotus corniculatus	Bird's foot trefoil	non-native (invasive)	-	FAC	-
Lysimachia latifolia	Pacific starflower	Native	-	FACW	-
Madia gracilis	Gumweed	Native	-	-	-
Maianthemum racemosum	Feathery false lily of the valley	Native	-	FAC	-
Marrubium vulgare	White horehound	non-native (invasive)	-	FACU	Limited
Matricaria chamomilla	German chamomile	non-native	-	-	-
Melilotus albus	White sweetclover	non-native (invasive)	-	-	-
Mentha spicata	Spearmint	non-native	-	FACW	-
Mimulus guttatus	Yellow monkey flower	Native	-	OBL	-
Petrorhagia dubia	Windmill pink	non-native	-	-	-
Phytolacca americana var. Americana	American pokeweed	non-native	-	FACU	-
Pinus lambertiana	Sugar pine	Native	-	-	-
Pinus ponderosa	Yellow pine	Native	-	FACU	-
Piperia transversa	Mountain piperia	Native	-	-	-
Plantago lanceolata	Ribwort	non-native (invasive)	-	FACU	Limited
Polygala cornuta	Sierra milkwort	Native	-	FACW	-
Polypogon monspeliensis	Annual beard grass	non-native (invasive)	-	FACW	Limited
Populus fremontii ssp. fremontii	Cottonwood	Native	-	FAC	-
Potamogeton sp.	-	-	-	-	-
Poterium sanguisorba	Garden burnet	non-native	-	UPL	-

Scientific Name	Common Name	Origin	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Prosartes hookeri	Drops of gold	Native	-	-	-
Prunella vulgaris	Self heal	Native	-	FACU	-
Prunus sp.	-	-	-	-	-
Pseudotsuga menziesii var. menziesii	Douglas fir	Native	-	FACU	-
Pteridium aquilinum var. pubescens	Western bracken fern	Native	-	FACU	-
Pyracantha sp.	-	-	-	-	-
Quercus chrysolepis	Gold cup live oak	Native	-	-	-
Quercus kelloggii	California black oak	Native	-	-	-
Ribes roezlii	Sierra gooseberry	Native	-	-	-
Robinia pseudoacacia	Black locust	non-native (invasive)	-	FACU	Limited
Rosa canina	Dog rose	non-native	-	-	-
Rosa gymnocarpa	Wood rose	Native	-	FACU	-
Rosa rubiginosa	Sweet brier	non-native	-	FACW	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	-	FACU	High
Rubus leucodermis	White bark raspberry	Native	-	FACU	-
Rubus parviflorus	Thimbleberry	Native	-	FACU	-
Rubus ursinus	California blackberry	Native	-	FACU	-
Rumex acetosella	Sheep sorrel	non-native (invasive)	-	FACU	Moderate
Rumex crispus	Curly dock	non-native (invasive)	-	FAC	Limited
Salix exigua	Narrowleaf willow	Native	-	FACW	-
Salix gooddingii	Gooding's willow	Native	-	FACW	-
Salix laevigata	Polished willow	Native	-	FACW	-
Salix lasiandra	Pacific willow	Native	-	FACW	-
Salix lasiolepis	Arroyo willow	Native	-	FACW	-
Salix lutea	Yellow willow	Native	-	OBL	-
Sambucus nigra ssp. caerulea	Blue elderberry	Native	-	FACU	-

Scientific Name	Common Name	Origin	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Spartium junceum	Spanish broom	non-native (invasive)	-	-	High
Spiranthes porrifolia	Western ladies tresses	Native	-	FACW	-
Symphoricarpos albus var. laevigatus	Snowberry	Native	-	FACU	-
Taraxacum officinale	Red seeded dandelion	non-native (invasive)	-	FACU	-
Taxus brevifolia	California yew	Native	-	FACU	-
Torilis arvensis	Field hedge parsley	non-native (invasive)	-	-	Moderate
Toxicodendron diversilobum	Poison oak	Native	-	FAC	-
Tragopogon dubius	Goat's beard	non-native (invasive)	-	-	-
Trillium angustipetalum	Narrow petaled wakerobin	Native	-	-	-
Typha domingensis	Cattail	Native	-	OBL	-
Typha latifolia	Boradleaf cattail	Native	-	OBL	-
Verbascum blattaria	Moth mullein	non-native	-	UPL	-
Verbascum thapsus	Woolly mullein	non-native (invasive)	-	FACU	Limited
Vicia villosa	Hairy vetch	non-native (invasive)	-	-	-
Vinca major	Vinca	non-native (invasive)	-	-	Moderate
Woodwardia fimbriata	Western chain fern	Native	-	-	-

Appendix E

Photo Log

Photos of the December 2018 and July/August 2019 Surveys of the Brunswick Site

Photo 1: Looking south and southeast within the Brunswick Industrial Site. Forested area is mapped as Sierran Mixed Conifer vegetation community type.

Photo 2: Southern/southeastern section of the Brunswick Industrial Site. Forested area is mapped as Sierran Mixed Conifer vegetation community type.

Photo 3: Eastern section of the Brunswick Industrial Site looking northeast from southern area of the site. The large area containing mostly asphalt is mapped as developed.

Photo 4: Mapped Wet Meadow Wetland within the area mapped as disturbed within the Brunswick Industrial Site.

Photo 5: Mapped freshwater marsh wetland mapped within the southwestern area of the Brunswick Site. Soils were saturated and contained characteristics of hydric soils.

Photo 6: Mapped freshwater marsh wetland just south of the South Fork Wolf Creek culvert outlet. Wetland area contains standing water and dominated by freshwater marsh wetland hydrophytic vegetation.

Photo 7: Mapped South Fork of Wolf Creek with origination from outside the Brunswick Industrial Site. Water present within the stream channel coming from existing culvert.

Photo 8: Existing culvert daylights within the Brunswick Industrial Site at the South Fork Wolf Creek just upstream from Photo 7.

Photo 9: Large mapped manmade pond within the Brunswick Industrial Site. Historical pond used during operation of the mill.

Photo 10: Area mapped as disturbed within the central west section of the Brunswick Industrial Site. This area contains remnants of historic impacts to the site.

Photo 11: Mapped riparian wetland within the central section of the Brunswick Industrial Site that is mapped as disturbed within the vegetation community map.

Photo 12: Small freshwater marsh wetland within the eastern, developed section of the Brunswick Industrial Site. Water runs off of the adjacent Brunswick Road into the site.

Photo 13: Large area of asphalt within the eastern section of the Brunswick Site is mapped as developed with ponderosa pine vegetation community mapped adjacent.

Photo 14: Mapped wet meadow vegetation community within the northwestern open section of the Brunswick Industrial Site. Photo taken in August 2019.

Photo 15: Wet meadow vegetation community with South Fork Wolf Creek along the left edge of the wet meadow and montane hardwood-conifer vegetation community along left edge of the photo within the northwestern section of the Brunswick Industrial Site.

Photo 16: Edge of mapped annual grassland and montane hardwood vegetation communities and mapped ponderosa pine vegetation community in the distance within the northeastern section of the Brunswick Industrial Site.

Photo 17: Historic mining infrastructure in background is located within the developed northeastern section of the Brunswick Industrial Site with montane hardwood vegetation community in the foreground.

Photo 18: Edge of mapped annual grassland and montane hardwood vegetation communities and mapped ponderosa pine vegetation community in the distance within the northeastern section of the Brunswick Industrial Site.

Photo 19: South Fork Wolf Creek in the northeastern corner of the Brunswick Industrial Site. Suitable habitat present for the foothill yellow-legged frog in this area of the site.

Photo 20: South Fork Wolf Creek below the culvert outfall within the Brunswick Industrial Site. Marginal suitable habitat present for the foothill yellow-legged frog in this area.

Photos of East Bennett Road ROW

Photo 21: Mapped Roadside Wetland along East Bennett Road. Wetland area contained standing water and dominated by hydrophytic vegetation.

Photo 22. East Bennett Road ROW. No drainages or wetlands along this section of Project Area. Entire area is developed and within a ponderosa pine vegetation community.

Photo 23. Manmade drainage along north side of East Bennett Rd. ROW. Drainage located outside of ROW and drains to the south side of East Bennett Rd. ROW.

Photo 24. Riparian wet area adjacent to the East Bennett Rd. ROW on north side of road. ROW is developed within this area of the site.

Photo 25. Northern side of E. Bennett Rd. ROW

Photo 26. South side culvert/drainage along East Bennett Road ROW. Located towards lower end of E. Bennett Road ROW and within the developed part of the ROW.

Appendix F

CNPS Ranked Plants and Special-Status Plant and Wildlife Species Descriptions

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Stebbins' morning-glory *Calystegia stebbinsii*	--/--/1.B2	Gabbroic or serpentinite soils. Openings in chaparral, cismontane woodland, lower montane coniferous forest, from 980-4,330 feet.	Apr- Jul	**Low** Known 4 miles to east on gabbroic chaparral on Oceola Ridge. Gabbroic soils not present in study area. Was not observed during targeted 2019 field surveys.
Sierra arching sedge *Carex cyrtostachya*	--/--/1B.2	Lower montane mesic coniferous forest, meadows and seeps, marshes and swamps, Riparian forests (margin), from 2,000-4,460 feet.	May -Aug	**Low.** Potential for occurrence in mesic forests. Within the known distributional and elevational range for this species, though nearest known occurrence 16 miles to the north. This species was recently described so the full extent of its range and distribution are unlikely yet known. Marginal habitat present in study area, and it was not observed during 2019 field surveys.
Chaparral sedge *Carex xerophila*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 1,400 – 2,525 feet.	Mar- Jun	**Low.** Known 4 miles away on Oceola Ridge in gabbroic chaparral. Gabbroic soils not present in study area. Was not observed during 2019 field surveys.
Red Hills soaproot *Chlorogalum grandiflorum*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 800 – 5,545 feet.	May-Jun	**Low.** Known over 10 miles south in Bunch Canyon south of Colfax, with no known occurrences to north. Gabbroic soils not present in study area. Was not observed during 2019 field surveys.
Pine Hill flannelbush *Fremontodendron decumbens*	FE/CR/1B.2	Chaparral, cismontane woodland on serpentinite and gabbroic substrates, from 1,390 – 2,495 feet.	Apr- July	**Low.** Known from two miles to the north. Gabbroic soils not present in study area. Was not observed during targeted 2019 field surveys.
Butte County fritillary *Fritillaria eastwoodiae*	--/--/3.2	Openings in chaparral, cismontane woodland, and lower montane coniferous forest, sometimes serpentinite, from 160-4,920 feet.	Mar-Jun	**Low.** Potential for occurrence in open areas in the study area. There is a 1979 record for this species on the south side of the South Yuba River canyon approximately 7 miles north of the study area, and other occurrences on the Washington Ridge. Surveys were not conducted during the appropriate phenological period for this species (April-May).

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Finger rush *Juncus digitatus*	--/--/1B.1	Seasonal wet areas, cismontane woodland openings, openings in lower montane coniferous forest, xeric vernal pools, from 2,165-2,590 feet.	Apr-Jun	**Low.** Potential for the occurrence in gravelly, seasonally moist openings. Known less than one mile to the north near the intersection of Idaho Maryland and Brunswick. Was not observed during 2019 field surveys.
Dubious pea *Lathyrus sulphureus* var. *argillaceus*	--/--/3	Cismontane woodland, Lower montane coniferous forest, Upper montane coniferous forest, from 490-3,050 feet.	Apr-May	**Low.** Potential to occur in forested areas. Known within 3 miles of study areas from a 1926 collection. Also known to SW 5 miles away near Wolf Mountain. Plant list from 2006 surveys have a *Lathyrus sulfureus* with no variety designation, but not observed during 2019 surveys.
Cantelow's lewisia *Lewisia cantelovii*	--/--/1B.2	Moist, granitic areas in broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest mesic, sometimes serpentinite seeps, from 1,080-4,495 feet.	May-Oct	**Low.** Potential for occurrence in any rocky outcrops with seeps on the parcel. There are records for this species in the Middle Yuba and South Yuba river canyons within 7 miles of the study area. The preferred habitat for this species in the study area has been disturbed and is of reduced quality. Was not observed during 2019 field surveys.
Cedar Crest popcornflower *Plagiobothrys glyptocarpus* var. *modestus*	--/--/3	Cismontane woodland, valley and foothill grasslands (mesic), from 2,850-2.855 feet.	Apr-Jun	**Moderate.** Known from historic collection potentially from nearby Cedar Ridge. Also known from historic collections in Nevada City. Suitable habitat for this species is present. Was not observed during 2019 field surveys.
Sierra blue grass *Poa sierrae*	--/--/1B.3	Openings in lower montane coniferous forest, 1,195-4,920 feet.	Apr-Jul	**Moderate.** There is only marginal suitable habitat for this species in the study area, primarily in the Sierran mixed conifer, ponderosa pine forest, and in the forested areas along South Fork of Wolf Creek. Known 7 miles to the east of the study area at Steephollow Creek from a collection from 1964. Was not observed during 2019 field surveys.

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Brownish beaked-rush *Rhynchospora capitellata*	--/--/2B.2	Wet areas (marshes, swamps, meadows, and seeps) in montane coniferous forest, from 145-6,560 feet.	Jul-Aug	**Moderate.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.
Scadden Flat checkerbloom *Sidalcea stipularis*	--/CE/1B.1	Marshes and swamps (montane freshwater), from 2,295-2,395 feet.	Jul-Aug	**Moderate.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.

[1]Status explanations:

FE = Federally Endangered
CR = State Rare
CE = State Endangered
-- = no listing.

California Native Plant Society Rare Plant Rank (formerly known as CNPS lists)
1B = Rank 1B species: rare, threatened, or endangered in California and elsewhere.
2B = Rank 2B species: rare, threatened, or endangered in California but more common elsewhere.
3 = Rank 3 species are taxonomically problematic and lack the necessary information to assign them to one of the other ranks.
4 = Rank 4 plants are of limited distribution or infrequent throughout a broader area in California; should be monitored regularly.
Source: CNPS 2019; CNDDB 2019; USFWS 2019, and Calflora 2019.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Amphibians			
California red-legged frog *Rana draytonii*	FT/SSC	Found in permanent and semi-permanent aquatic habitats, such as creeks and ponds, with emergent and submergent vegetation. May aestivate in rodent burrows or cracks during dry periods. Along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats and a large manmade pond within the Brunswick Industrial Site contain marginal suitable habitat for the species.
Foothill yellow-legged frog *Rana boylii*	SCT/SCC	Perennial rocky (pebble or cobble) streams with cool, clear water in a variety of habitats from valley and foothill oak woodland, riparian forest, ponderosa pine, mixed conifer, coastal scrub, and mixed chaparral at elevations ranging from 0 to 6,370 feet. Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet south to Kern County	**Very Low**; however, the South Fork Wolf Creek within the western section of the Brunswick Industrial Site contains marginal suitable habitat for the species.
Reptiles			
Western pond turtle *Emys marmorata*	--/SSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation, below 6,000 feet in elevation. Populations extend throughout the coast and central valley of California.	**High** potential for occurrence in areas near water, including South Fork Wolf Creek and perennial aquatic resources such as the freshwater emergent marsh habitats and manmade pond within the Brunswick Industrial Site.
Coast horned lizard *Phrynosoma blainvillii*	--/SSC	Associated with open patches of sandy soils in washes, chaparral, scrub, and grasslands.	**Moderate** potential for occurrence in areas with appropriate habitat within the Brunswick Industrial Site, including open disturbed areas.
Mammals			
Townsend's big-eared bat *Corynorhinus townsendii*	--/SSC	Associated with lower montane coniferous and mixed conifer forest habitats where abandoned buildings and structures occur for roosting.	**Low** potential for occurrence in areas containing abandoned structures, including the existing mill structure in the Brunswick Industrial Site.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Birds			
California black rail *Laterallus jamaicensis coturiculus*	--/CT	California black rail inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. The species requires water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats within the Brunswick Industrial Site contain marginal suitable habitat for the species.
Cooper's hawk *Accipiter cooperii*	MBTA/CDFW Watch List	Cooper's hawks are forest and woodland birds. These hawks are a regular sight in parks, quiet neighborhoods, over fields, at backyard feeders, and even along busy streets if there are trees present.	**Moderate** potential to occur; within the woodland habitats in the Brunswick Industrial Site. Project area contains suitable nesting habitat for the species.
Invertebrates			
Western bumble bee *Bombus occidentalis*	--/SCT	Western bumble bee was documented approximately 3 miles northeast of Nevada City (4+ miles from the Centennial Site) in 1968. It is known from a single collection on May 20th of that year. This species is of conservation concern and is listed as S1, Critically Imperiled, by NatureServe and is listed on the CNDDB.	**Unlikely to occur** in the Brunswick Industrial Site or surrounding region.

[1]Status explanations:

-- = no listing.

Federal

BCC = federal Bird of Conservation Concern

FPT = federal proposed threatened under the federal Endangered Species
FT = listed as threatened under the federal Endangered Species Act.

State

FP = state fully protected

SCT = state candidate for listing as threatened under the California Endangered Species
SE = listed as endangered under the California Endangered Species Act.

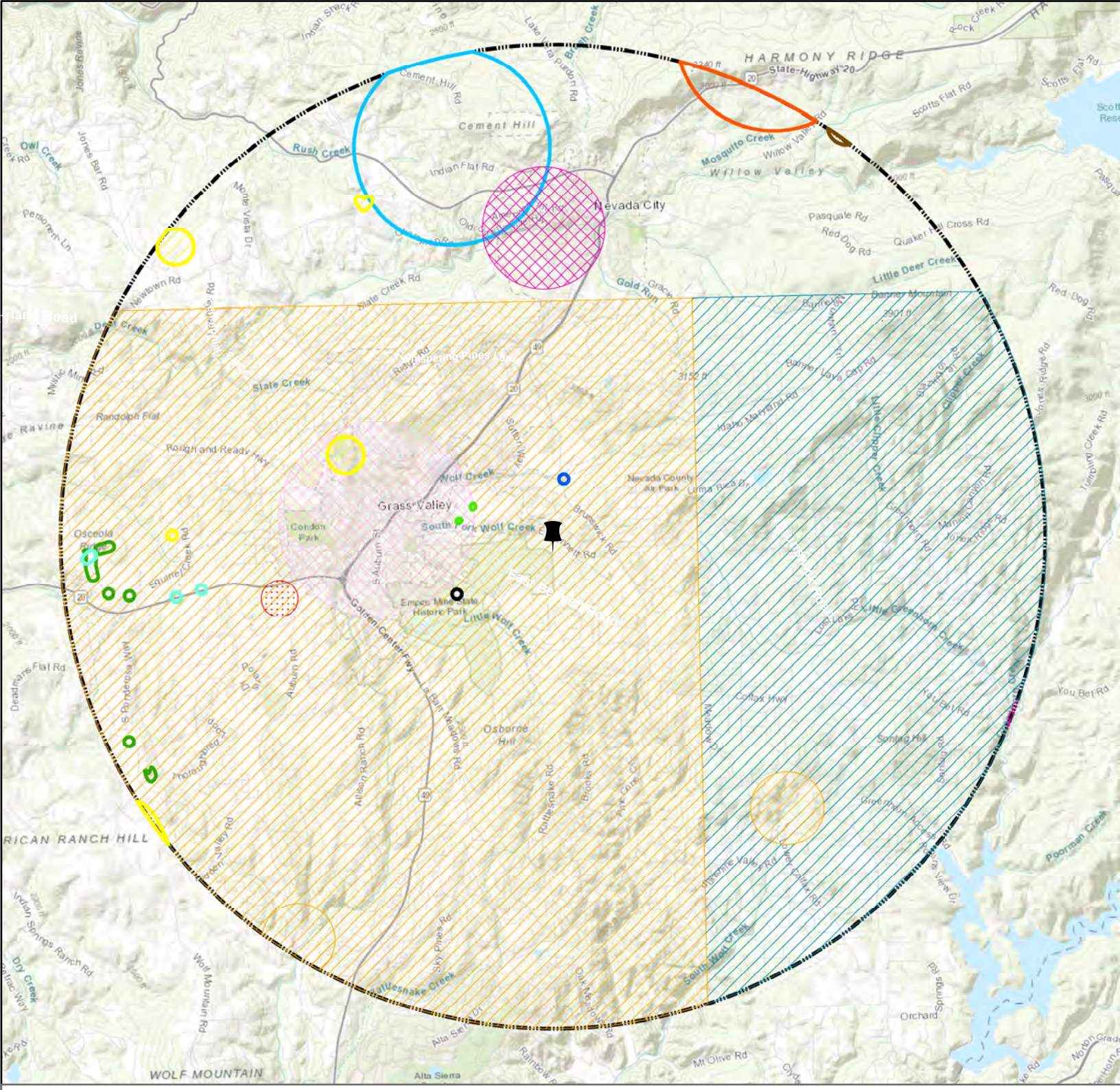
SSC = state species of special concern

ST = listed as threatened under the California Endangered Species Act.

Source: CNDDB 2019 and USFWS 2019

Appendix G

CNDDB 5-Mile Buffer Figure


HARMONY RIDGE
State Highway 20
Cement Hill
Rush Creek
Indian Flat Rd
Nevada City
Mosquito Creek
Willow Valley
Pasquale Rd
Red Dog Rd
Little Deer Creek
Gold Run
Slate Creek
Deer Creek
Newtown Rd
Banner Mountain
Banner Lava Cap Rd
Idaho Maryland Rd
Nevada County Air Park
Grass Valley
South Fork Wolf Creek
Wolf Creek
Empire Mine State Historic Park
Golden Center Freeway
Osborne Hill
Rattlesnake Creek
Skillman Flat Rd
Scotts Flat Rd
Scotts Flat Reservoir
Collins Lake
Collins Lake Rd
Lake of the Pines
Lake of the Pines Rd
Dog Bar Rd
Meadow Dr
Sunlight Hill
Greenhorn Ridge Rd
Poorman Creek
South Wolf Creek
Orchard
Alta Sierra
Mt Olive Rd
WOLF MOUNTAIN
RICAN RANCH HILL
Dry Creek
Wolf Mountain Rd
Indian Springs Ranch Rd
Deadmans Flat Rd
Randolph Flat
Rough and Ready Hwy
Osceola Rd
Squirrel Creek Rd
Auburn Rd
Bear River
Allison Ranch Rd
Bluff Meadows Rd
Sky Pines Rd
Oak Meadow Rd
Brooks Rd
Park Club Dr
Alta Sierra Dr
Rainbow Rd
Jayne Ave
Jayne Ave Ext
Jayne Ave Ext Rd
Jayne Ave Ext Rd
Jayne Ave Ext Rd

Appendix H

Nevada County Erosion Control Plans and Caltrans Native Plant Seed Mixes

CALTRANS Native Plant Erosion Control Methods

Key Considerations in Determining an Application Rate:

Primary consideration - the desired number of mature plants/ft^2:

- A commonly used application range is 80 – 100 seed^{2}s/ft. Adjust this number as required by the mature plant size.
- While 80 monkey flower per square foot may be desirable, 80 giant brush lupine per square foot will lead to vegetation establishment problems.

- Seed species size & weight:
  - Remember, seed size and weight varies greatly by species.
  - 1 pound of Desert Bluebells = 2,000 seeds
  - 1 pound of Monkey flower = 54,000,000 seeds

- Ease of germination for that species

- Seeding method:
  - Drill seeding requires half the application rate as hydroseeding or hand seeding.

Calculation Example:

We want a seed density of 100 seeds/ft^2 for our site. The seeds will be hydroseeded or hand seeded (same recommended application rate, 80 – 100 seeds/ft^2). Calculate the application rate (lb PLS/ac) for the seed mix listed in Table 1.

Given:

Total seed density = 100 seeds/ft^2
1 acre = 43,560 ft^2

Table 1 - Seed Mix Species and Seeding Density

Scientific Name	Desired seeding density (seeds/ft^2)	Average pure seed weight (seeds/lb PLS)
Lotus purshianus	11	108,500
Nassella cernua	11	215,200
Bromus carinatus	23	72,600
Festuca rubra molate	22	391,800
Hordeum californicum	22	135,700
Leymus triticoides	11	153,000
Total	**100**	

Solution:

a. Equation

$$\text{lb PLS/ac} = \frac{\text{Seed density (seeds/ft}^2\text{) x 43,560 ft}^2\text{/ac}}{\text{Avg pure seed weight (seeds/lb PLS)}}$$

b. Calculations

Lotus purshianus: $\frac{11 \text{ seeds/ft}^2 \times 43{,}560 \text{ ft}^2\text{/ac}}{108{,}500 \text{ seeds/lb PLS}} = 4.4 \text{ lb PLS/ac}$

Nassella cernua: $\frac{11 \text{ seeds/ft}^2 \times 43{,}560 \text{ ft}^2\text{/ac}}{215{,}200 \text{ seeds/lb PLS}} = 2.2 \text{ lb PLS/ac}$

Bromus carinatus: $\frac{23 \text{ seeds/ft}^2 \times 43{,}560 \text{ ft}^2\text{/ac}}{72{,}600 \text{ seeds/lb PLS}} = 13.8 \text{ lb PLS/ac}$

Repeat for the remaining species (see Table 2 for results).

Table 2 - Seed Application Rates

Scientific name	Application rate (lb PLS/ac)
Lotus purshianus	4.4
Nassella cernua	2.2
Bromus carinatus	13.8
Festuca rubra molate	2.4
Hordeum californicum	7.1
Leymus triticoides	3.1
Total	**33.0**

Total seed application rate on the Erosion Control Legend should be 33.0 lb PLS/ac.

COUNTY OF NEVADA
COMMUNITY DEVELOPMENT AGENCY
950 MAIDU AVENUE NEVADA CITY, CA 95959-8617
(530) 265-1222 FAX (530) 265-8794 mynevadacounty.com

EROSION AND SEDIMENT CONTROL PLANS

What is an Erosion /Sediment Control Plan?

- An erosion/sediment control plan includes specific construction techniques identified on the site plan or grading plan, to ensure that no sediment leaves the construction site.

Information on Erosion/Sediment Control Plans:

- Location of proposed building site
- Property lines
- Existing slope direction and grade identified.
- Proposed contour lines (if grading permit required)
- Location and any needed details of erosion/sediment control measures
- Construction entrance/exit
- Drainage plan with details of drainage control devices
- Limits of land disturbance
- Septic and leach field
- Re-vegetation plan to include all disturbed soils shall be seeded and covered with mulch

NOTE:

- Straw bales are not recommended for steep sloping site
- Silt fencing is recommended for bottom of steep sites
- Straw rolls/wattles are recommended for gently sloping site with lots of grading
- Erosion control blankets are recommended for steep slopes with gradients over 3”1.
- Land disturbance of one acre (43,560 SF) or more requires filing of a Notice of Intent (NOI) with the State.

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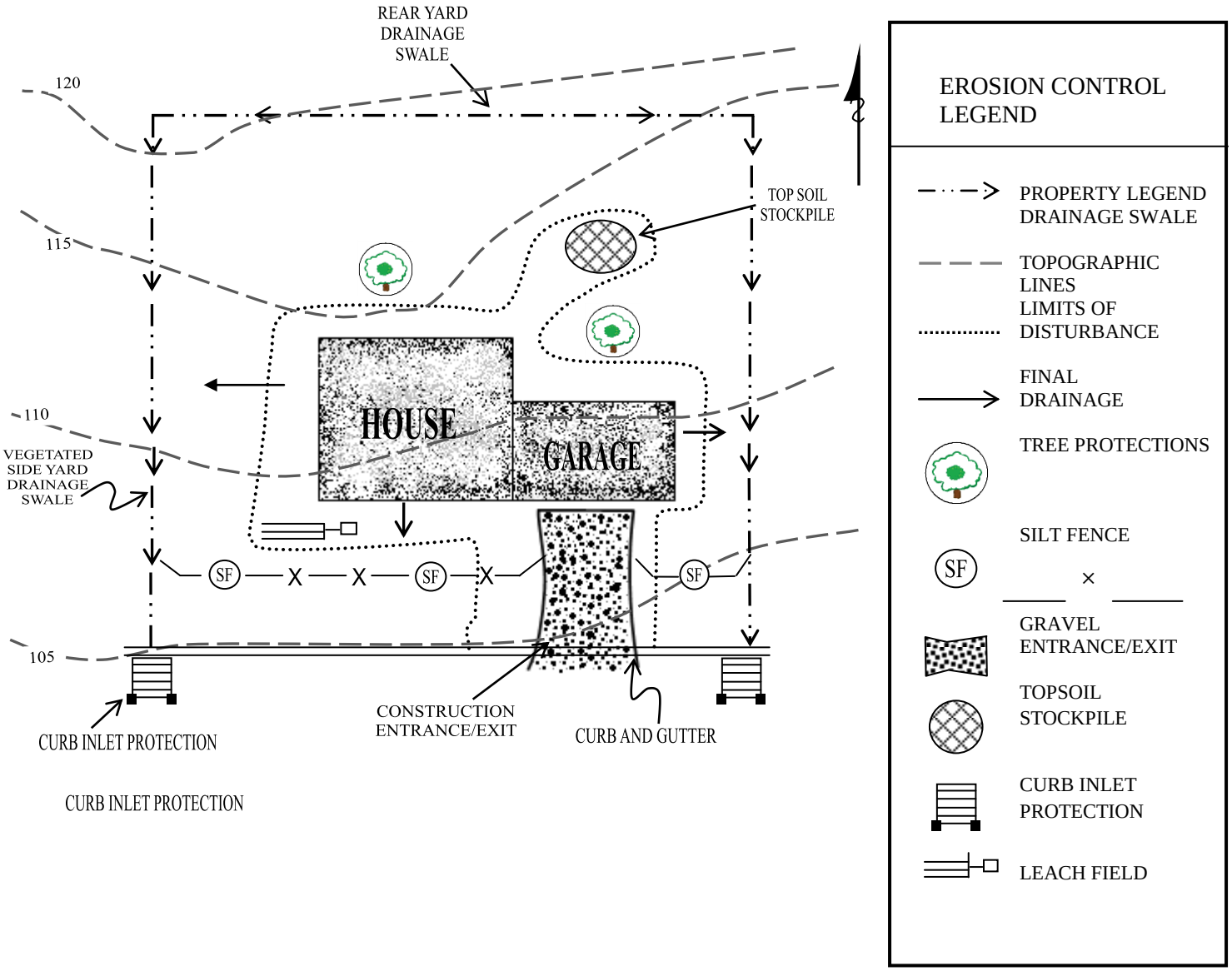
SAMPLE EROSION /SEDIMENT CONTROL PLAN FOR A SINGLE FAMILY RESIDENCE UNDER CONSTRUCTION



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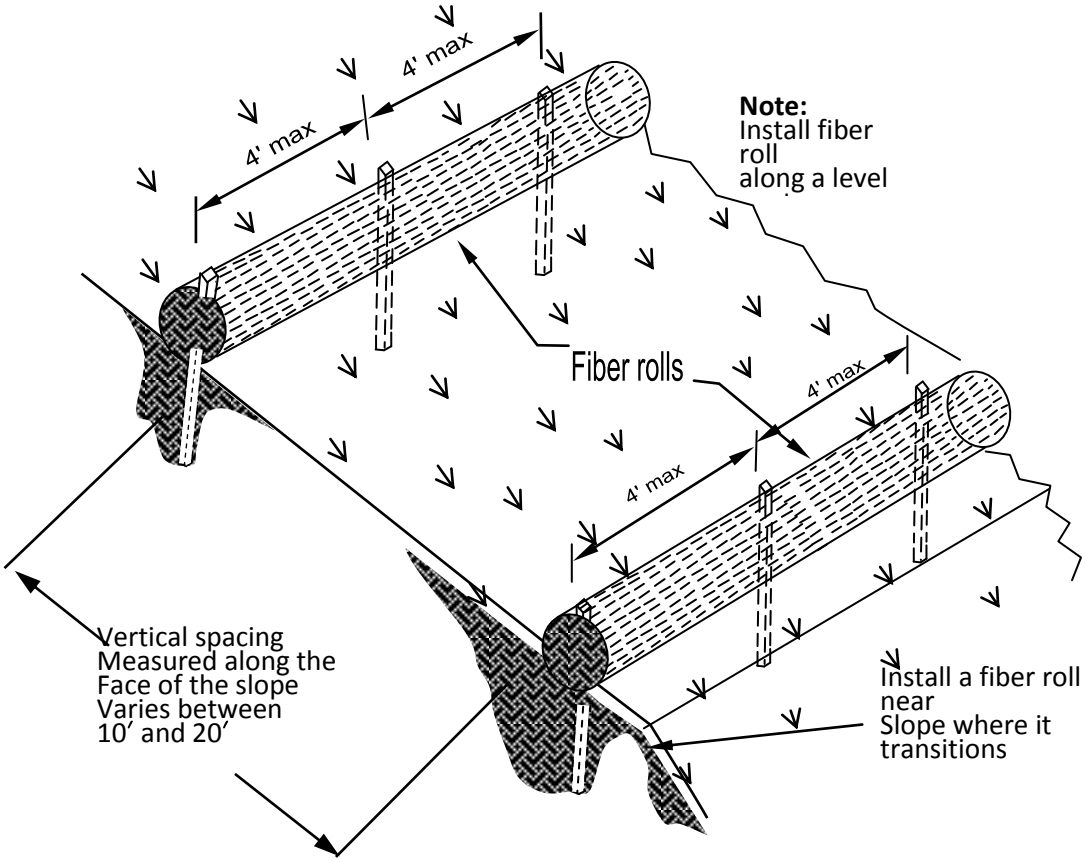
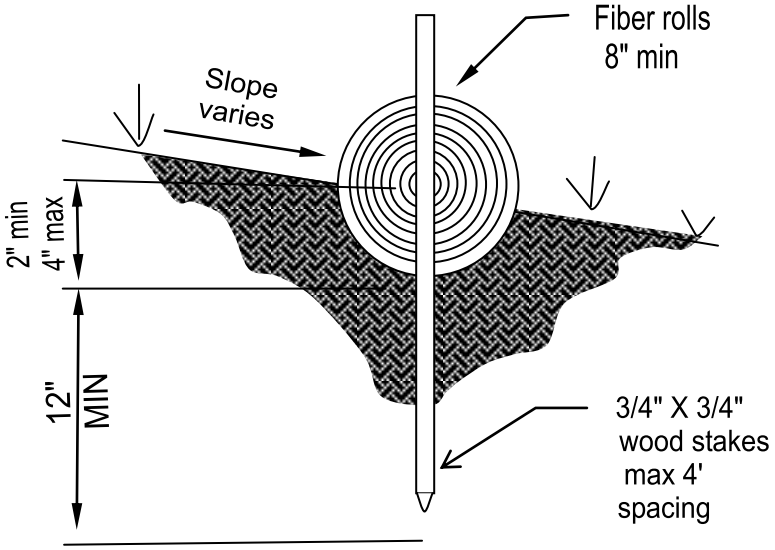


TYPICAL FIBERT ROLL INSTALLATION

N.T.S.

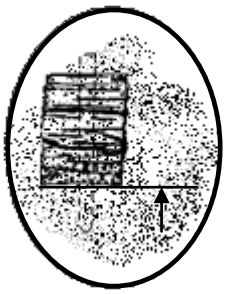


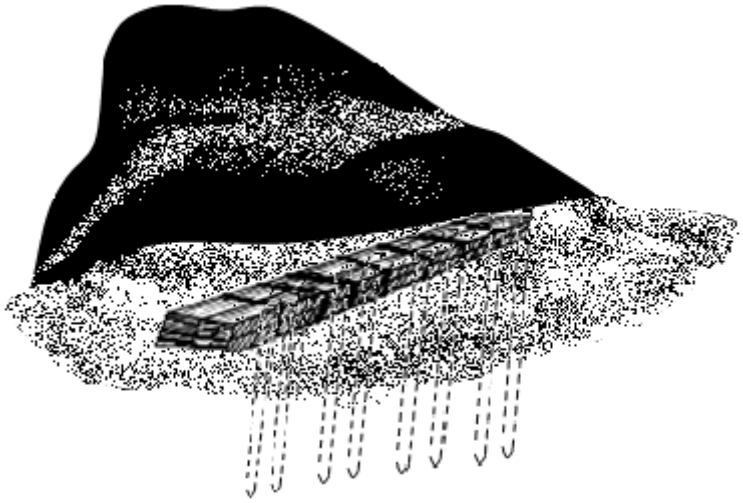
ENTRENCHMENT DETAIL

N.T.S.

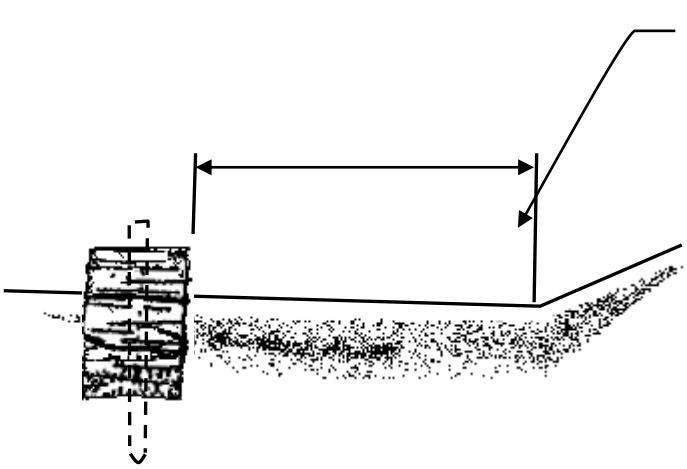
California Storm water BMP Handbook
Construction
www.cabmphandbooks.com

Printed on Recycled Paper





SOIL NOTE:
EMBED
STRAW BALE
4'' MIN. INTO



1

STRAW BALE DIKE

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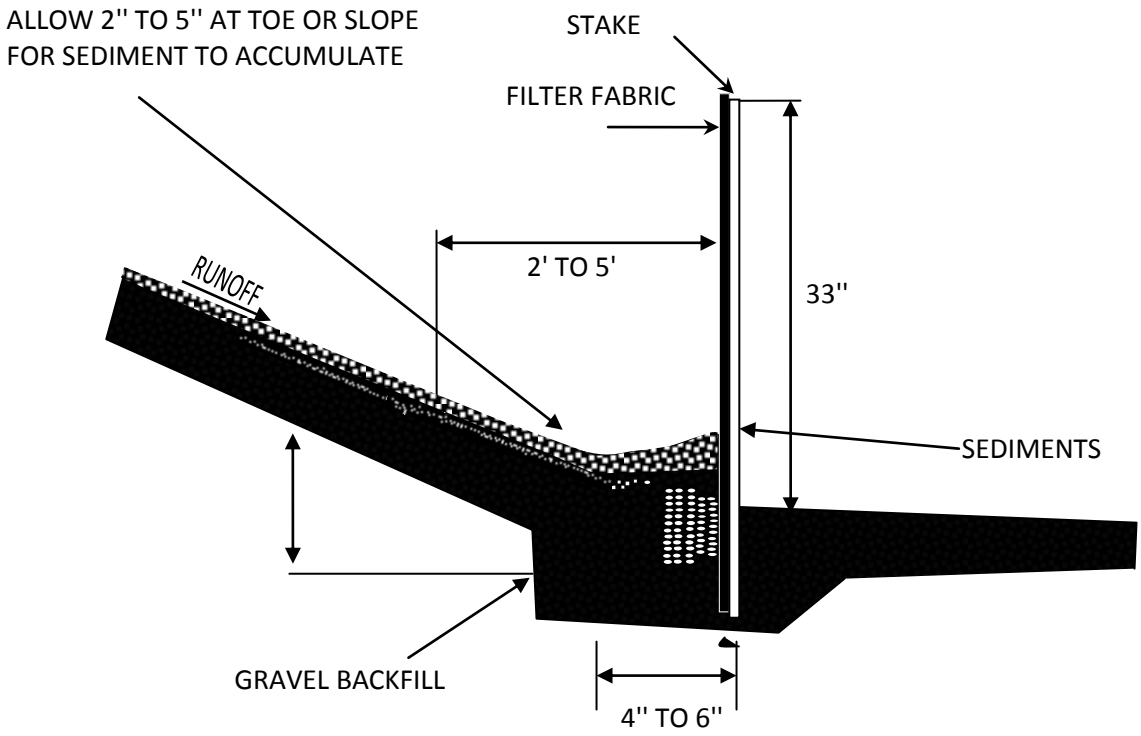
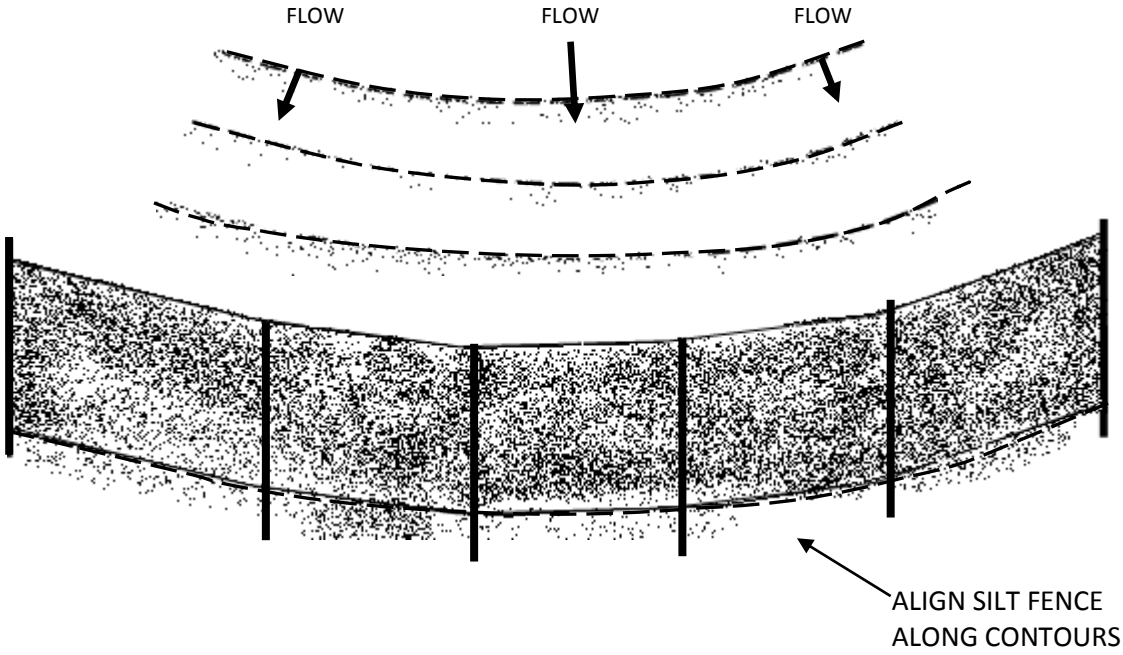


RECOMMENDED INSTALLATION OF SILT FENCE



NOTE: Erosion and sediment control measures must remain functional and be maintained throughout the winter season. Failure to adequately maintain erosion and sediment control measures constitute a violation of the issued building or other permit. Maintain positive drainage away from all structures. Seed and cover all disturbed soil with mulch.

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Seeding Mixtures for Temporary Cover
Foothill Areas Mix

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1)	Annual Rye	1 24
or		
2)	Briggs Barley	4 180

Mountainous Conifer Area

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1)	Cereal Rye	2 90
or		
2) Briggs Barley	4	180

Seeding Mixtures for Permanent Cover
Foothill Areas

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1) Zorro annual fescure	0.2	6
Rose clover *	0.2	9
Shallow soil w/south		
or		
west exposure		
or		
2) Blando brome	0.3	12
Rose clover*	0.2	9
(deeper soils or		
north exposure)		
3) Blando brome	0.3	12
Lana woollypod vetch*	0.4	45
(Deeper soils-		
Forage for grazing)		

Mountainous Conifer Zone

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1) Luna pubescent wheatgrass	0.6	24
Palestine orchard grass	0.2	8
"Sherman" big bluegrass	0.2	6
"Durar" hard fescue	0.2	6

Legume seed must be inoculated with proper nitrogen fixing bacteria.

The application of mulch is necessary to reduce the impact of rainfall, help hold soil in place, and provide a moist soil surface for seed germination. The mulch should be applied in such a manner that 80-100% of the surface is covered to a depth of 1-2 inches. The most common mulch used is clean grain straw. It should be applied at the rate of 2 tons per acre. This rate is equivalent to:

Mulch	Bales/1000 Sq. Ft.	Bales/Acre
Straw	1	50
(3 wire-80 Pound Bales)		

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APPENDIX J

CENTENNIAL INDUSTRIAL SITE, IDAHO MARYLAND MINE PROJECT, WATERCOURSE/WETLANDS/RIPARIAN AREAS MANAGEMENT PLAN

Centennial Industrial Site
Idaho-Maryland Mine Project

Watercourse / Wetlands / Riparian Areas Management Plan

Prepared for:
Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Prepared by:
Greg Matuzak, Principal Biologist
Greg Matuzak Environmental Consulting LLC
471 Sutton Way, Suite #210
Grass Valley, CA 95945
Email: gmatuzak@gmail.com

January 2021

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1 REPORT COVER

Report Date: January 2021

Report Preparer: Mr. Greg Matuzak
Greg Matuzak Environmental Consulting LLC

Project Site: Centennial Industrial Site
Idaho-Maryland Mine Project

Project Site Location: SECTION 26, T.16N, R.8E

CENTENNIAL INDUSTRIAL SITE		
Assessor Parcel Number	**Site Address**	**Lot Size (Acres)**
009-550-032	N/A	20,908 SF (0.48 AC)
009-550-037	10344 Centennial Drive	4.47 AC
009-550-038	10350 Centennial Drive	40.1 AC
009-550-039	10344 Centennial Drive	42,668 SF (0.98 AC)
009-550-040	N/A	5,662 SF (0.13 AC)
009-560-036	10350 Centennial Drive	10.25 AC
Centennial Industrial Site - Land Total:		**56.41 AC**

Property Owner / Applicant: Rise Grass Valley, Inc.
PO Box 271
Grass Valley, CA 95945

Principal Investigators: Greg Matuzak, Principal
Greg Matuzak Environmental Consulting LLC
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Grass Valley, CA 95945
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21802 Purdon Road
Nevada City, CA 95959
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2 INTRODUCTION

2.1 Introduction

At the request of Rise Grass Valley Inc. ("Rise Grass Valley" or "Rise"), Mr. Greg Matuzak was retained to prepare a Watercourse / Wetlands / Riparian Areas Management Plan ("Management Plan" or "Aquatic Resources Management Plan") for the Idaho-Maryland Mine Project ("IMM Project") at the Centennial Industrial Site located in Nevada County, California (see Project Overview Figure in Appendix A). The Centennial Industrial Site ("Centennial Site") is 56.41 acres. This Management Plan references and incorporates the findings of three stand-alone reports completed for the Centennial Site:

- Centennial Industrial Site Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020).
- Centennial Industrial Site Biological Resources Assessment (Greg Matuzak Environmental Consulting LLC, 2021a).
- Technical Memorandum for Centennial Industrial Site: Idaho-Maryland Mine Project - Biological Resources Impact Assessment (Greg Matuzak Environmental Consulting LLC, 2021b).

2.2 Nevada County Land Use and Development Code

Per the Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.17 (Ordinance Number 2033) requires a Watercourses, Wetlands, and Riparian Areas Management Plan be prepared for projects in non-disturbance buffers, including areas that are within 100 feet of the high water mark of perennial streams, watercourses, and wetlands, 50 feet from the high water mark of intermittent watercourses, and 100 feet upslope or 20 feet downslope from an NID canal (Nevada County Code, 2000). Therefore, this Aquatic Resources Management Plan was developed due to the proposed future impacts to protected aquatic resources and their non-disturbance buffers within the Centennial Site IMM Project area. The development of this Management Plan meets the requirements of the Nevada County Land Use and Development Code for the proposed development within aquatic features mapped within the Centennial Site for the IMM Project area, as well as potential disturbance within the non-disturbance buffers of the aquatic features.

2.3 Project Statement

This Management Plan was developed pursuant to Sec. L-II 4.3.17 of Nevada County Zoning Regulations, required for development projects that will result in disturbance of sensitive aquatic resources. Table 1.0 below outlines the proposed permanent disturbance impacts to aquatic resources subject to Nevada County regulations within the Centennial Site for the IMM Project.

A maximum of ~0.033 acres of permanent impacts to ephemeral streams (E-3 and E-4) and subject to 50-foot non-disturbance buffers will occur from the implementation of the proposed IMM Project at the Centennial Site.

The proposed IMM Project will have no permanent or temporary impact on the perennial Wolf Creek located within the Centennial Site as currently designed; however, temporary disturbance or encroachment may occur within the 100-foot non-disturbance buffer to Wolf Creek due to construction activities though such disturbance is not currently being proposed.

Direct and permanent impacts to two ephemeral streams (E-3 and E-4) and their 50-foot non-disturbance buffer areas, as well as potential temporary impacts to the 100-foot non-disturbance buffer of the perennial stream (Wolf Creek), is the focus of this Management Plan. The disturbance impacts are based on the Project Description outlined in Section 5 of this Management Plan, the Site Plan (Figure 1), and Aquatic Resources Delineation (Figure 2).

TABLE 1.0 PERMANENT DISTURBANCE IMPACTS TO AQUATIC RESOURCES

Maximum Direct & Permanent Disturbance Impacts			
Size	**Impact Type**	**Mapped Feature ID**	**Non-Disturbance Buffer**
~0.017 acres	Permanent fill impact to ephemeral stream	E-3	50 ft
~0.018 acres	Permanent fill impact to ephemeral stream	E-4	50 ft

3 SUMMARY OF MANAGEMENT PLAN CONCLUSIONS AND RECOMMENDATIONS

Permanent and temporary impacts to stream and wetland resources mapped within the IMM Project area at the Centennial Site will be included in regulatory agency permits. The regulatory agency permits as outlined in Section 7 .1 of this Management Plan will include required measures to minimize and mitigate for impacts to such resources.

Additionally, Section 7 of this Management Plan includes mitigation measures to ensure that potential impacts to stream and wetland resources, as well as their non-disturbance buffer areas, are minimized. The recommended measures of mitigation include the following:

- Limit construction to periods of extended dry weather and the dry summer season, if feasible;
- Establishing the areas around active stream channels and wetlands as Environmentally Sensitive Area (ESA) where those areas will not be impacted by construction or thereafter;
- No fill or dredge material will enter or be removed from any wetlands or streams except for those identified in Table 4.0 in this Management Plan during construction and thereafter;
- Use appropriate machinery and equipment to limit disturbance within and directly adjacent to these areas;
- Placement of soil erosion control devices (such as wattles, hay bales, etc.) between the protected aquatic resources (wetlands and streams) and the areas to be graded and disturbed to limit potential runoff and sedimentation into such protected resources; and
- Implement Best Management Practices during and following construction.

Additional mitigation measures are incorporated by reference from the Biological Resources Impact Assessment Technical Memorandum developed for the Centennial Site of the IMM Project specifically for special-status wildlife and plant species that have the potential to occur within the proposed disturbance areas (Matuzak, 2021b).

4 PROPERTY DESCRIPTION

4.1 Project Setting

The Management Plan includes a full coverage assessment of the 56.41-acre Centennial Site, see Appendix A for a Centennial Site Overview Figure and Figure 1 for the Centennial Site Plan. The recorded owner of the surface land which comprises the Centennial Site is Rise Grass Valley.

The Centennial Site is part of the original land holdings of the historic Idaho-Maryland Mine, which operated between approximately 1851 and 1956. The Project Area was the location of the mine tailings storage area for the larger mine site. The site discharged water into the main stem of Wolf Creek via a decant tower, which is still in place in the northwest portion of the site. During the 1930s, the Idaho-Maryland Mine operated a mineral processing plant, located adjacent and to the east of the Project Area. The results of historic mine tailing deposition in the Project Area can still be seen in the soils within the site, some of which have the appearance of many layers of deposited material of varying color.

The Centennial Site is bordered by Idaho Maryland Road on the northern boundary, Centennial Drive along the northeast boundary, DeMartini RV Sales along the western boundary, commercial development along the eastern boundary, and privately-owned industrial land along the southern boundary. Overall, the Centennial Site is surrounded by private commercial and industrial land use and zoning.

The Centennial Site includes the main stem of Wolf Creek, a perennial stream. The main stem of Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Site. A Project Area Overview Figure is included in Appendix A.

4.2 Centennial Industrial Site Characterization

The Centennial Site has been disturbed by historic mining and lumber mill practices, public access, and ongoing management for many years which is now considered baseline condition for the Centennial Site. Within the Centennial Site, the dumping of soils, landscape materials, and other miscellaneous items has also occurred for many decades and the current circumstances are now considered baseline or "normal" conditions given the decades that such disturbance has occurred within the Centennial Site. Areas not subject to this regular type of disturbance are dominated by native habitat and, therefore, are also the "normal" conditions within those areas of the Centennial Site. The presence of sandy loam soils within the northwestern section of the Centennial Site classifies that area as a potential *Problematic Wetland Situation area* as

defined by the Corps Supplement (Version 2.0), and careful attention was paid while evaluating onsite soils within this area.

4.3 Centennial Industrial Site Aquatic Resources

The Aquatic Resources Delineation Report for the Centennial Site (Matuzak, 2020) evaluated and mapped the location and extent of "waters of the United States", including wetlands and "waters of the State of California". A summary of the aquatic resource delineation results for the Centennial Site are presented in Table 2.0 (see Figure 2 for an overview of the Aquatic Resources mapped within the Centennial Site).

TABLE 2.0 SUMMARY OF AQUATIC RESOURCES DELINEATION RESULTS

Wetland/Stream Type	No. of Features	Size (Acres)	Length (Linear Feet)
Wetlands			
Meadow Wetland	14	2.88	
Freshwater Emergent Marsh Wetland	2	0.31	
Riparian Wetland	1	1.18	
"Other Waters of the U.S"			
Perennial Stream	1	0.38	1,262
Intermittent Stream	2	0.17	1,616
Ephemeral Stream	5	0.05	1,090
Total	**25**	**4.97**	**3,968**

The key findings of the Aquatic Resources Delineation (Matuzak, 2020) included the following:

- A total of 4.97 acres of "waters of the U.S.," including wetlands, and "waters of the State of California" was identified and mapped within the Centennial Site. The 4.97 acres of wetland-waters includes 4.37 acres of mapped wetlands and 0.60 acres of mapped "other waters of the U.S.," including the main stem of Wolf Creek, as well as several intermittent and ephemeral streams.

The key findings of the Centennial Site Biological Resources Assessment (Matuzak, 2021a) and the Centennial Site Biological Resources Impact Assessment (Matuzak, 2021b) included the following:

- Perennial marsh wetlands within the eastern section of the Centennial Site contain potentially suitable habitat for several special-status aquatic wildlife species, including the California State ESA (CESA) listed threatened California black rail (*Laterallus jamaicensis coturiculus*) and the federally ESA listed California red-legged frog (*Rana aurora draytonii*). None of these species have been observed

within the Centennial Site and they are considered to have a very low potential to occur within the Centennial Site.

- The main stem of Wolf Creek along the northern boundary of the Centennial Site includes a perennial stream and riparian vegetation. The perennial stream contains marginal suitable habitat for the foothill yellow-legged frog (*Rana boylii*), a California State listed species under CESA. This species has never been observed within the Centennial Site and it is considered to have a very low potential to occur within the Centennial Site.
- Pine Hill flannelbush (*Fremontodendron decumbens*), a species listed on the federal Endangered Species Act (ESA), has been potentially identified and mapped within the southern portion of the Centennial Site. Sixty individual mature and flowering plants occupy an absolute area of 0.22 acres over approximately 4.5 acres of the Centennial Site.
- The Centennial Site contains two (2) unlisted plant species. Neither species is rare nor threatened. The two California Native Plant Society (CNPS) Lists the species at "List 4 Species", including the Humboldt lily (*Lilium humboldtii ssp. humboldtii*) and the Sierra brodiaea (*Brodiaea sierra*). A large population with thousands of individual Sierra brodiaea covering almost a quarter of the Centennial Site was mapped during 2019 field surveys and a single occurrence of the Humboldt lily consisting of 10 individuals in an area less than 110 sq. feet was also documented in the Centennial Site during 2019 field surveys. Impacts to these species (CNPS List 4) do not require mitigation under CEQA Guidelines Section 15380.
- Woodlands and grasslands within the Centennial Site contain suitable nesting habitat for some raptors and birds. None of these species have been observed within the Centennial Site and they are considered to have a moderate to high potential to occur and nest within the Centennial Site.

Descriptions of biological resources, as excerpted from the Centennial Site Biological Resources Assessment (Matuzak, 2021a), are included as reference material in the following Appendices:

Appendix B – USDA Soils Maps and Descriptions

Appendix C – Vegetation Community Map and Descriptions

Appendix D – Plant Species Observed During Site Surveys

Appendix F – CNPS Ranked Plants and Special-Status Plants and Wildlife Species Descriptions

5 PROJECT DESCRIPTION

5.1 Project Description

Rise proposes to reinitiate underground mining and ore processing of the Idaho-Maryland Mine in Nevada County, CA. The proposed facilities and operations to support underground mining will be located on Rise's 119-acre Brunswick Industrial Site. As a component of the mine project, Rise proposes to grade the Centennial Site to create usable industrial property for potential future development. Grading of the Centennial Site will utilize engineered fill material produced from mining operations at the Brunswick Industrial Site. Development of the Centennial Site into an industrial subdivision is not part of the proposed Centennial Site IMM Project and is not proposed by Rise.

The Centennial Site is located in Nevada County, CA and borders the City of Grass Valley city limits. Zones within the approximate 56-acre Centennial Site contain elevated metal concentrations from historical land use. Rise is working with the California Department of Toxic Substances Control (DTSC) to fully remediate the site by developing a plan that consolidates and caps the contaminated soils in a manner consistent with current federal and state regulations.

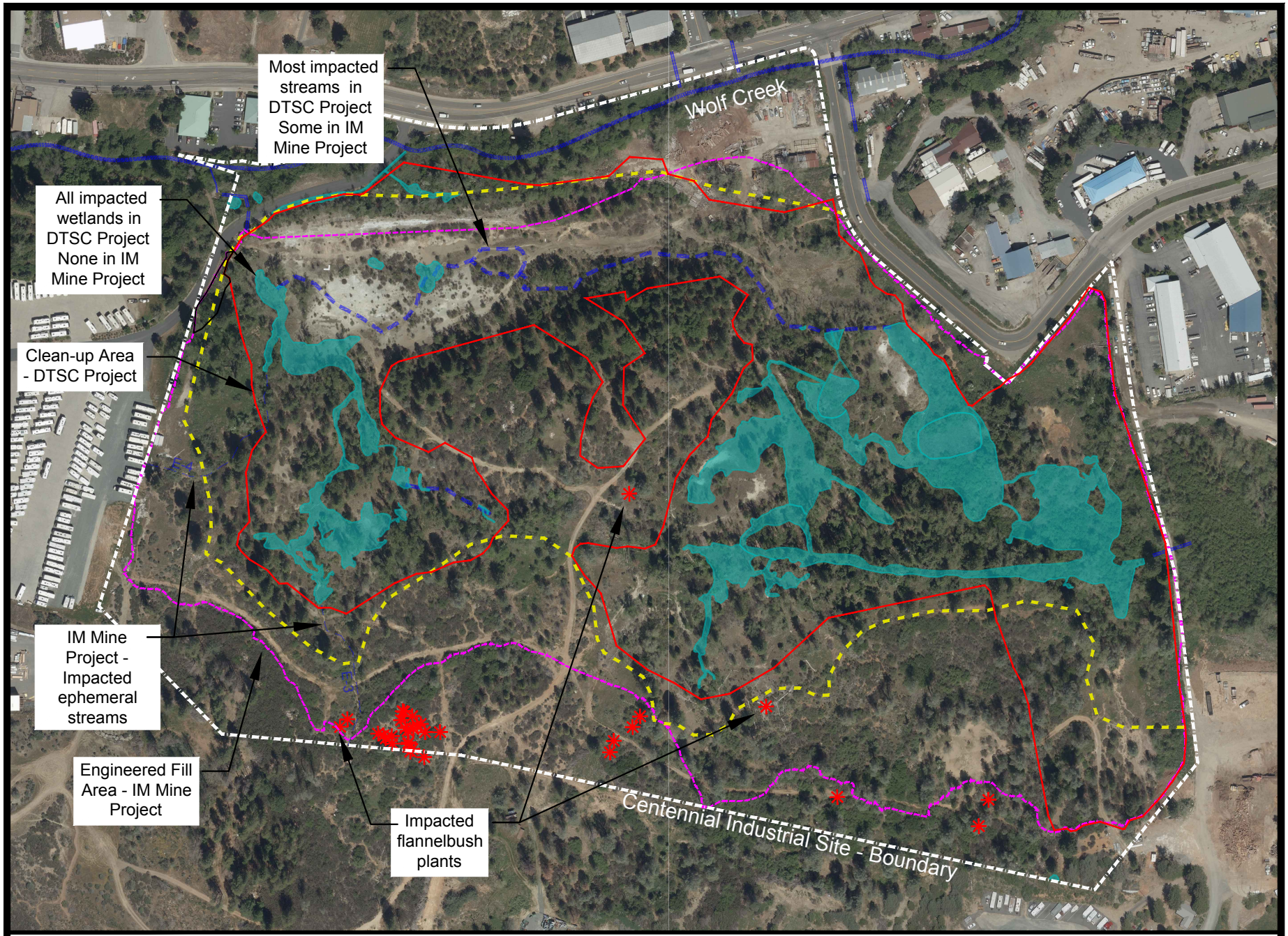
It is estimated that the cleanup program will cause a surface disturbance of 26.56 acres, inside the area of disturbance for the IMM Project, which will incorporate impacts to approximately 4.35 acres of mapped wetlands and 0.19 acres of mapped streams within the Centennial Industrial Site. Therefore, the impacts and associated mitigation of approximately 4.54 acres of wetlands and streams within the Centennial Industrial Site will be incorporated into the DTSC voluntary cleanup project and is outside the scope of the IMM Project.

After the environmental cleanup work at the Centennial Industrial Site is complete, Rise proposes to truck engineered fill from the Brunswick Industrial Site to the Centennial Industrial Site. The engineered fill, composed of barren rock and sand, will be placed, graded, and compacted. Concurrent with fill and grading activities, the fill slopes will be revegetated to control erosion and ensure slope stability. Grading activities associated with the IMM Project will cause a surface disturbance of approximately 43.71 acres including the previously disturbed area from the DTSC cleanup project and an additional 17.15 acres. The IMM Project would disturb approximately 0.033 acres to mapped streams.

The base of the engineered fill will extend approximately 43.71 acres across the site, although much of the area will have experienced surface disturbance by site remediation efforts. Disturbance and engineered fill placement will be avoided on the remaining 12.7 acres, which includes the main stem of Wolf Creek, the 100-foot non-disturbance buffer of Wolf Creek, and an undisturbed zone containing Pine Hill

flannelbush, a special-status plant species protected under the federal Endangered Species Act (see the attached appendices for the proposed IMM Project Site Plan).

IMM Project development at the Centennial Site will permanently impact approximately 6.0% of the Centennial Site streams: ~0.033 acres of "waters of the U.S." (streams) impacted of the total 0.6 acres of mapped perennial, intermittent, and ephemeral streams within the Centennial Site. Temporary disturbance or encroachment within the 100-foot non-disturbance buffer to Wolf Creek within the Centennial Site may occur due to construction activities.



LEGEND

- Centennial Industrial Site - Boundary
- Stream - Perennial
- Stream - Intermittent
- Stream - Ephemeral
- Wetland mapped on Centennial Site
- Boundary of historic tailings placement (approximate)
- Boundary of DTSC Clean-up Project (approximate)
- Boundary of IM Mine Project Engineered Fill placement
- Pine Hill Flannelbush

FIGURE
DISTURBANCE AREA
SHOWING 2017 AIR PHOTO

Scale 1 inch = 300 ft

6 ANALYSIS OF POTENTIAL IMPACTS

Background biological resources surveys and technical reporting developed for the Centennial Site that form the basis for this Management Plan include the following:

- Centennial Industrial Site Aquatic Resources Delineation of Waters of the United States and State of California (Greg Matuzak Environmental Consulting LLC, 2020).
- Centennial Industrial Site Biological Resources Assessment (Greg Matuzak Environmental Consulting LLC, 2021a).
- Technical Memorandum for Centennial Industrial Site: Idaho-Maryland Mine Project - Biological Resources Impact Assessment (Greg Matuzak Environmental Consulting LLC, 2021b).

6.1 Reconnaissance-level Biological Resources Field Surveys

Reconnaissance-level biological resources field surveys were conducted on foot for the entirety of the Centennial Site (56.41 acres) by Greg Matuzak, Principal Biologist and owner of Greg Matuzak Environmental Consulting LLC, and Wendy Boes, a local Nevada County botanist, on December 9th through 12th and 17th and 18th, 2018. Follow up reconnaissance-level biological resources field surveys were conducted by Greg Matuzak for potential special-status wildlife species habitats on December 30th, 2018 and by Wendy Boes for the CNPS ranked plant and special-status plant species habitat on January 3rd, 2019. The purpose of the surveys completed in December 2018 and January 2019 was to identify habitat and vegetation types and to determine the potential for any CNPS ranked plants and special-status plant and wildlife species identified in the desktop analysis and background research to occur within the Centennial Site. Further evaluation of the Centennial Site was conducted on July 1st, 10th, and 14th, 2019 by Ms. Boes who implemented protocol-level botanical surveys within the entirety of the Centennial Site during the time of year when the target CNPS ranked plants and special-status plant species with potential to occur within the Centennial Site are known to be in bloom and identification of each is most likely.

The presence of streams and wetlands within the Centennial Site that could be regulated by state and/or federal agencies were identified and mapped simultaneously and independently from the development of the Centennial Site Biological Resources Assessment (Greg Matuzak Environmental Consulting LLC, 2021a). See the stand-alone Aquatic Resources Delineation reporting for the Centennial Site (Greg Matuzak Environmental Consulting LLC, 2020, results located in Figure 2). The entirety of the Centennial Site was surveyed on foot and a list of plant species observed during the field

surveys was compiled (see Appendix D for species lists). A Photo Log is included in Appendix E, which documents the Centennial Site during the field surveys.

6.2 Environmental Setting

Vegetation communities within the Centennial Site are typical of the lower Sierra Nevada foothills. However, the terrain within the Centennial Site is not typical of the lower Sierra Nevada foothills that normally vary between flat ridges and valleys to gently and moderately sloping hillsides. The Centennial Site elevation ranges from approximately 2,500 to 2,600 feet above mean sea level (MSL) and much of the Centennial Site has been impacted due to historical mining and lumber mill practices, which has included the placement of large amounts of mine tailings within the Centennial Site and the removal of vegetation, among other disturbances. The Centennial Site is located along the main stem of Wolf Creek and the interior of the site is dominated by mixed hardwood-conifer forests, with areas of montane riparian woodland, mixed chaparral, mixed wetland types, and annual grassland.

The Centennial Site includes a perennial stream, the main stem of Wolf Creek. The main stem of Wolf Creek generally runs parallel to and immediately south of Idaho Maryland Road along the northern boundary of the Centennial Site. In addition, the Centennial Site contains several ephemeral and intermittent streams that connect with the main stem of Wolf Creek within the northwestern section of the Centennial Site. The drainages and streams located within the Centennial Site are described in the Aquatic Resources Delineation Report (Greg Matuzak Environmental Consulting LLC, 2020). Drainage patterns within the Centennial Site drain towards the main stem of Wolf Creek located along the northern boundary of the Centennial Site (see Figure 2).

6.3 Centennial Industrial Site Soil Types

The soil types mapped within the Centennial Site are included in Appendix B with a description of each.

6.4 Centennial Industrial Site Area Vegetation Communities

The vegetation communities identified within the Centennial Site and their associated acreages mapped are presented in Table 3.0. Appendix C includes a map and descriptions of the vegetation communities within the Centennial Site.

TABLE 3.0 VEGETATION COMMUNITIES AND ACREAGES

Vegetation Community	Acres within Centennial Site
Montane Hardwood-Conifer	5.29
Montane Hardwood	0.48
Wolf Creek and Montane Riparian	20.07
Mixed Chaparral	16.24
Annual Grassland	9.74
Freshwater Emergent Marsh Wetland	0.58
Wet Meadow	4.01
Total	**56.41**

6.5 Special-Status Species

Appendix F includes an evaluation of the CNPS ranked plants and special-status plant and wildlife species with potential to occur within the Centennial Site and those species are represented within Table 5.0 below.

6.6 Centennial Industrial Site IMM Project Disturbance Impacts to Sensitive Biological Resources

It is estimated that the DTSC cleanup program will cause a surface disturbance of 26.56 acres, inside the area of disturbance for the IMM Project, which will incorporate impacts to approximately 4.35 acres of mapped wetlands and 0.19 acres of mapped streams within the Centennial Industrial Site. Therefore, the impacts and associated mitigation of approximately 4.54 acres of wetlands and streams within the Centennial Industrial Site will be incorporated into the DTSC voluntary cleanup project and is outside the scope of the IMM Project.

The focus of this Management Plan is direct and permanent impacts to a single intermittent stream, two ephemeral streams, and their associated 50-foot non-disturbance buffer areas, as well as potential temporary impacts to the 100-foot non-disturbance buffer of the perennial stream (Wolf Creek). Though no disturbance is proposed within Wolf Creek or within the 100-foot non-disturbance buffer to Wolf Creek, minimization and mitigation measures are included in this Management Plan that would cover any potential temporary disturbance within the Wolf Creek 100-foot non-disturbance buffer if they were to occur during construction.

An evaluation of impacts to the aquatic resources and their subsequent non-disturbance buffer zones covered under this Management Plan are provided below.

6.6.1 Project Impact Tables

Based on the Project Description for the IMM Project, Table 4.0 includes the estimated disturbance within the Centennial Site to mapped streams per the Aquatic Resources Delineation of Waters of the United States and State of California (Matuzak, 2020). The IMM Project will have no impact on mapped wetlands within the Centennial Site as impacts to mapped wetlands will occur as part of the DTSC remediation project, which is a separate project (refer to Section 5.1 for distinction between the IMM Project and DTSC Project). Therefore, Table 4.0 only includes proposed permanent disturbance to mapped streams within the IMM Project area based on the Centennial Site Plan (Figure 1) and the Aquatic Resources Delineation (Figure 2).

TABLE 4.0 AREA OF PERMANENT DISTURBANCE TO MAPPED STREAMS WITHIN THE IMM PROJECT AREA

No.	Stream Type	Wetland ID Number	Size (Acres)	Impact by IMM Project (Acres)
1	Perennial Stream	Wolf Creek – 1	0.377	-
2	Intermittent Stream	I – 1	0.161	Removed in DTSC cleanup
3	Intermittent Stream	I – 2	0.006	Removed in DTSC cleanup
4	Ephemeral Stream	E – 1	0.002	Removed in DTSC cleanup
5	Ephemeral Stream	E – 2	0.005	Removed in DTSC cleanup
6	Ephemeral Stream	E – 3	0.015	0.015
7	Ephemeral Stream	E – 4	0.018	0.018
8	Ephemeral Stream	E – 5	0.011	Removed in DTSC cleanup
8		**TOTAL**	**0.6**	**0.033**

Special-status species associated with the vegetation communities mapped within the Centennial Site are included in Table 5.0 below. Each of the vegetation communities in Table 5.0 contain the wetlands and streams and/or their non-disturbance buffers that are covered under this Management Plan.

TABLE 5.0 SPECIAL-STATUS SPECIES ASSOCIATED WITH VEGETATION COMMUNITIES

Vegetation Community	Associated Special-Status Species
Montane Hardwood-Conifer	Chaparral sedge (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2)
	Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Montane Hardwood	Brandegee's clarkia (Rank 1B.2), Chaparral sedge (Rank 1B.2), Red Hills soaproot (Rank 1B.2), Sierra blue grass (Rank 1B.3), Cantelow's lewisia (Rank 1B.2)
	Cooper's hawk and other nesting raptors and migratory birds (CDFW)
Wolf Creek and Montane Riparian	Sierra blue grass (Rank 1B.3)
	Foothill yellow-legged frog (CSC), Western pond turtle (CSC), nesting migratory birds (CDFW)
Mixed Chaparral	Pinehill flannelbush (FE/CR), Stebbins' morning glory (FE/CE), finger rush (Rank 1B.1), Chaparral sedge (Rank 1B.2), Cantelow's lewisia (Rank 1B.2), Red Hills soaproot (Rank 1B.2)
	Coast horned lizard (CSC) and nesting migratory birds (CDFW)
Annual Grassland	Brownish beaked-rush (Rank 2B.2)

Freshwater Emergent Marsh Wetland	Scadden Flat checkerbloom (FT/CT) and Brownish beaked-rush (Rank 2B.2)
	California red-legged frog (FT, CSC), Western pond turtle (CSC), and California black rail (CT)
Wet Meadow	Brownish beaked-rush (Rank 2B.2) and finger rush (Rank 1B.1)

6.6.2 Evaluation of Impacts

The proposed IMM Project within the Centennial Site will create surface impacts to sensitive aquatic resources as outlined in Section 5. The proposed IMM Project would have no impact on mapped wetlands within the Centennial Site as any fill or dredge of mapped wetlands within the Centennial Site will occur as part of the site remediation project through DTSC prior to the development of the IMM Project.

IMM Project development at the Centennial Site will permanently impact approximately 6.0% of the Centennial Site streams: ~0.033 acres of "waters of the U.S." (streams) of the total 0.6 acres of mapped perennial, intermittent, and ephemeral streams within the Centennial Site (see Table 4.0). Only mapped ephemeral streams would be impacted by the IMM Project.

Project development may cause temporary disturbance or encroachment within the 100-foot non-disturbance buffer to Wolf Creek though there is no proposed disturbance within Wolf Creek or its 100-foot non-disturbance buffer as part of the current design. No permanent impacts will occur to Wolf Creek (perennial creek) as the creek will be avoided completely.

The specific impacts to aquatic resources are detailed as follows:

IMPACT 1: Permanent fill to streams from construction and grading of engineered fill industrial pad.

Construction and grading from the engineered fill industrial pad on the Centennial Site will cause permanent impacts to two (2) mapped stream features (E-3 and E-4) and their associated 50-foot non-disturbance buffer zone. The 2 features consist of 2 ephemeral streams. It is estimated that a maximum of ~0.033 acres of streams will be permanently filled.

The impacted stream features convey site drainage in developed or disturbed areas or immediately adjacent to developed and disturbed areas of the Centennial Site. The ephemeral stream feature E-3 transmits site drainage from the southern area of the Centennial Site towards the north. Ephemeral stream feature E-4 drains from the hills along the western edge of Centennial Site, coming from runoff off of the DeMartini RV Sales site and flowing northeast until it connects with the large wet meadow wetland (WM-5).

IMPACT 2: Site construction activities may encroach on 100-ft non-disturbance buffer of Wolf Creek.

Pre-construction activities and grading near the toe of the engineered fill industrial pad on the Centennial Site may cause temporary impacts to the 100-ft non-disturbance buffer of Wolf Creek (perennial creek).

All construction activities will remain outside the Special Flood Hazard Area as per Federal Emergency Management Agency (FEMA) regulations which is covered under a separate Management Plan prepared by Nevada City Engineering, Inc. for the IMM Project.

No temporary or permanent impacts will occur to Wolf Creek from project development; however, this potential temporary impact is being included within this Management Plan in the case that temporary encroachment within the Wolf Creek 100-foot non-disturbance buffer be required as part of construction.

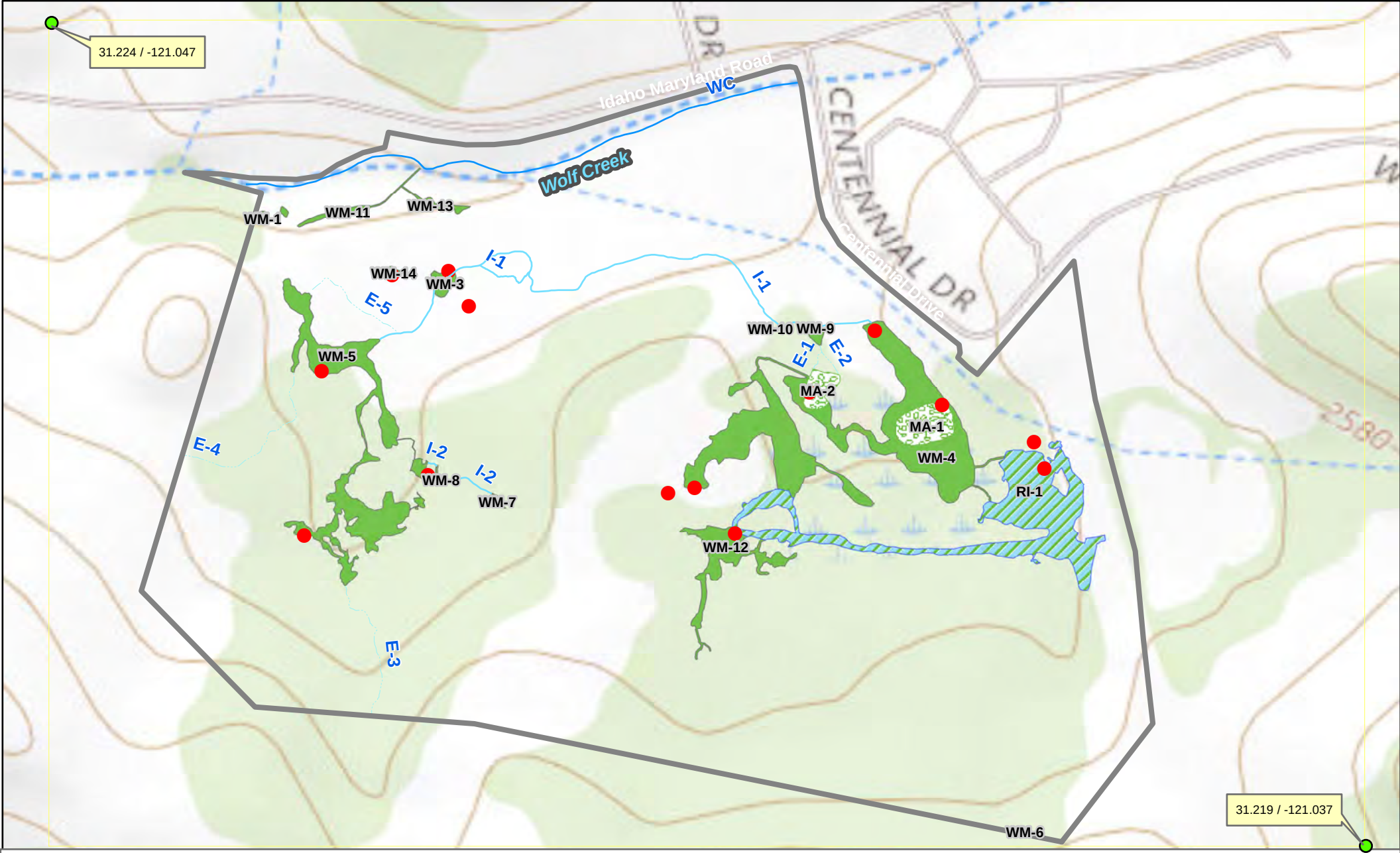


Figure. Centennial Industrial Site Study Area, Aquatic Resource Overview, USGS basemap.

Grass Valley, CA (APNs 009-550-037-000, 009-550-036-000, 009-550-032-000 & 009-550-038-000)
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 275 feet

0 55 110 220 330 440
Feet

This delineation has been conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual and the Western Mountains Regional Supplement (2010). The identification of ordinary high water mark (OHWM) was based on A Guide to Ordinary High Water Mark (OHWM) for Non-Perennial Streams in the Western Mountains (2014).

Created August 31, 2020.

Legend

= Study Area, 56.4 ac.

Streams
=Ephemeral, 1,090 ft., 0.05 ac.
=Intermittant, 1,616 ft., 0.17 ac.
=Perennial,1,262 ft., 0.38 ac.

= Data point

Wetlands
= Marsh (MA), 0.31 acres
= Meadow (WM), 2.88 acres
= Riparian (RI), 1.18 acres

7 RECOMMENDED MITIGATIONS AND CONDITIONS

Recommended mitigations and conditions for the IMM Project at the Centennial Site are based on an impact assessment of the Project Description outlined in Section 5 and the vegetation communities and aquatic resources mapped within the Centennial Site project area (see Appendix C and Figure 2). It is estimated that the DTSC cleanup program will cause a surface disturbance of 26.56 acres, inside the area of disturbance for the IMM Project, which will incorporate impacts to approximately 4.35 acres of mapped wetlands and 0.19 acres of mapped streams within the Centennial Industrial Site. Therefore, the impacts and associated mitigation of approximately 4.54 acres of wetlands and streams within the Centennial Industrial Site will be incorporated into the DTSC voluntary cleanup project and is outside the scope of the IMM Project.

The proposed disturbance within the Centennial Site will have both direct and permanent impacts to ephemeral and intermittent aquatic resources and their non-disturbance buffers (see Table 4.0). Site construction may also cause temporary encroachment (disturbance) within the 100-ft non-disturbance buffer of Wolf Creek.

Minimization and mitigation measures are proposed to ensure that direct, indirect, permanent, and/or temporary disturbances do not cause a significant impact to the sensitive aquatic resources (watercourses, wetlands, and riparian areas) as defined by the Nevada County Land Use and Development Code. Therefore, with the implementation of the following minimization and mitigation measures, such impacts to the mapped aquatic resources and their non-disturbance buffers, as well as any special-status plant and wildlife species that associate with such aquatic resources, within the Centennial Site would be fully mitigated.

7.1 Mitigation Requirements for Aquatic Resources Protected Under the Federal Clean Water Act

7.1.1 Clean Water Act (CWA) Sections 404 and 401 Compliance

Each of the mapped wetland features and stream features included as part of the Centennial Site Aquatic Resources Delineation Report (Matuzak, 2020) are assumed to fall under Corps jurisdiction pursuant to Section 404 of the CWA. The RWQCB pursuant to Section 401 of the CWA also has jurisdiction over areas subject to regulation by the Corps under Section 404 of the CWA. As detailed in the CWA, any proposed action that would place fill or dredge material within areas identified as Corps jurisdictional wetlands or waters would require a Department of the Army Section 404 permit and a RWQCB Section 401 Water Quality Certification, or waiver thereof, prior to the placement of fill or dredge material within such features. Fill or dredge impacts to any features regulated under Sections 404 and 401 of the CWA would be required to be mitigated at a minimum

of a 1:1 ratio. Compensatory mitigation would be included as a Section 404 and Section 401 permit condition to be implemented prior to the placement of such dredge and fill material within a "waters of the U.S.," including wetlands, and would ensure the no net loss of such features within the Centennial Site.

Project Related Impacts

Disturbance within the Centennial Site for the proposed IMM Project is estimated to fill a maximum of 0.033 acres of ephemeral streams mapped within the Centennial Site (see Table 4.0).

No proposed fill or dredge material will occur within the main stem of Wolf Creek (perennial stream) as part of the IMM Project.

Nationwide Permit

Under the CWA, any fill within "waters of the U.S.," including wetlands of 0.5 acres or greater would not meet the general conditions of any previously authorized Nationwide Permit and therefore, an Individual Permit would be required prior to the filling of 0.5 acres or greater of such CWA regulated features. Typically, an Individual Permit has a longer timeline than a Nationwide Permit for approval given it includes a 404(b)(1) alternatives analysis that demonstrates that the proposed project has minimized and reduced impacts to the aquatic environment. However, given the proposed IMM Project would fill only 0.033 acres of mapped streams within the Centennial Site, which is less than 0.5 acre trigger for an Individual Permit, the proposed IMM Project disturbance within the Centennial Site would most likely fit under a pre-authorized Nationwide Permit (potentially a Nationwide Permit 44 for Mining Activities or Nationwide Permit #39 for Commercial and Institutional Developments).

Once an application is deemed complete for a Nationwide Permit (generally the submission of a Pre-Construction Notification and supplemental materials) by the Corps Sacramento District, the Corps will process the mapping associated with the Aquatic Resources Delineation and the permit application. As part of the Nationwide Permit process, it is recommended that a functional assessment of the wetlands and waters to be impacted by the proposed site disturbance should be developed. Based on the results of the functional assessment and coordination with the Corps, an approved Compensatory Mitigation Plan that mitigates for impacts to such CWA regulated features at a minimum of a 1:1 ratio is required. Compensatory mitigation can include but is not limited to the following: onsite and/or offsite creation of "waters of the U.S." (stream habitat) and/or restoration, payment of an in-lieu fee, and/or purchase of mitigation credits at an approved Corps mitigation or conservation bank.

7.2 Mitigation Measures for Potential Impacts to Stream and Riparian Zones Under CDFW Jurisdiction

Perennial, intermittent, and ephemeral streams within the Centennial Site would likely fall under CDFW jurisdiction as these areas each contain a bed and bank. Any substantial alteration of the bed or bank of any stream within the Centennial Site would most likely require a Streambed Alteration Agreement from the CDFW pursuant to Section 1600 *et. seq.* of the California Fish and Wildlife Code prior to construction, including any disturbance within the main stem of Wolf Creek or other mapped streams within the Centennial Site.

Project Related Impacts

The proposed IMM Project disturbance within the Centennial Site would cause an estimated 0.033 acres of permanent impacts to mapped streams within the Centennial Site. Specific to the main stem of Wolf Creek, no impacts to the creek itself are proposed. Therefore, the proposed disturbance within the mapped stream zones within the Centennial Site would be subject to CDFW jurisdiction and a Streambed Alteration Agreement from the CDFW pursuant to Section 1600 *et. seq.* of the California Fish and Wildlife Code would be required prior to disturbance within such CDFW jurisdiction.

For impacts to any stream that includes the removal of native trees within the stream would require prior consultation and approval by CDFW for native trees with a diameter at breast height of 4 inches or greater. A site revegetation plan would be required to be developed and approved by CDFW as part of a Streambed Alteration Agreement permit condition and native trees planned for removal with a diameter at breast height of 4 inches or greater would need to be mitigated for through planting of native riparian trees within adjacent stream zones not being impacted by the IMM Project, with clear success criteria identified, monitoring and reporting required, and corrective actions to be taken if mitigation measures do not meet the proposed success criteria.

7.3 Compliance with the Nevada County Land Use and Development Code

Aquatic Resources Management Plan

This Management Plan has been developed for the Centennial Site of the IMM Project to comply with Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.17 (Ordinance Number 2033) requiring such a Management Plan be prepared for projects in non-disturbance buffers, including areas that are within 100 feet of the high water mark of perennial streams, watercourses, and wetlands, 50 feet from the high water mark of intermittent watercourses, and 100 feet upslope or 20 feet downslope from an NID canal (Nevada County 2000. Land Use and Development Code,

Chapter II: Zoning Regulations. Effective July 27, 2000). Therefore, the development of such a Management Plan is required for the proposed IMM Project as the proposed development impacts such aquatic resources and their non-disturbance buffers. This Management Plan would meet the requirements of the Nevada County Land Use and Development Code, Chapter II; Zoning Regulations, Section L-II 4.3.17 (Ordinance Number 2033) for the proposed IMM Project within the Centennial Site.

7.4 Subsequent Potential Impacts to Special-Status Species that Associate with Impacted Aquatic Resources

Several special-status species are known to associate with the types of wetland and stream habitats identified and mapped within the Centennial Site as well as their non-disturbance buffer areas. Those special-status wildlife species include nesting birds, the western pond turtle, California black rail, foothill yellow-legged frog, and California red-legged frog. Additionally, special-status plant species, such as the Sierra arching sedge, finger rush, brownish-beaked rush, and Scadden Flat checkerbloom are known to associate with the types of wetlands and stream habitats mapped within the Centennial Site as well as their non-disturbance buffer areas (see Appendix F for a description of special-status species and their likelihood to occur within the Centennial Site).

None of these special-status wildlife or plant species that associate with the mapped wetlands and streams within the Centennial Site were identified during the field surveys conducted as part of the development of the Biological Resources Assessment for the Centennial Site (Matuzak, 2021a) and the Technical Memorandum for Centennial Site: Idaho-Maryland Mine Project - Biological Resources Impact Assessment (Matuzak, 2021b). Due to the minimal area of permanent impacts to the two ephemeral streams covered under this Management Plan, there is very low potential for any of the CNPS ranked plants and special-status plant and wildlife species to occur within the Centennial Site IMM Project area and the results of which are included in this Management Plan.

However, as these species have at least a limited potential to occur within the mapped streams of the Centennial Site and their non-disturbance buffers, mitigation measures outlined for those species within the Technical Memorandum for Centennial Site: Idaho-Maryland Mine Project - Biological Resources Impact Assessment (Matuzak, 2021b) are incorporated by reference as part of this Management Plan and will be implemented should any of those species be found by pre-construction surveys prior to any proposed disturbance within the mapped streams and their non-disturbance buffers to ensure that potential impacts to special-status species are avoided, minimized, and fully mitigated.

7.5 Management Plan Best Management Practices (BMPs)

ENCROACHMENT INTO THE NON-DISTURBANCE BUFFERS

Temporary impacts to ephemeral, intermittent, and perennial features, as well as their non-disturbance buffers, within the Centennial Site IMM Project area include soil disturbance and potential erosion along the adjacent slopes. If such project related disturbance occurs within 50 feet of any ephemeral or intermittent stream not being filled or impacted by the Centennial Site IMM Project or within 100 feet of Wolf Creek (perennial stream), then specific measures have been developed as part of this Management Plan to protect the non-disturbance buffers to such resources within the Centennial Site IMM Project area. The mitigation measures outlined below should be implemented to avoid and minimize such impacts to the non-disturbance buffers of such resources, to the extent feasible. All mapped wetlands within the Centennial Site IMM Project area will be filled and impacted prior to the initiation of the Centennial Site IMM Project and therefore, wetlands are not included as part of this Management Plan. The applicant intends to construct all components of the proposed Centennial Site IMM Project in compliance with State and Federal laws, as well as in compliance with Nevada County and the Nevada County Building Code.

Protected non-disturbance buffers are associated with areas directly adjacent to the permanent impacts to the ephemeral and intermittent stream resources within the Centennial Site IMM Project area, as outlined within Figure 2 and in Table 4.0. Encroachment into the non-disturbance buffers of such resources that will not be completely filled or impacted by the proposed Centennial Site IMM Project, including any potential temporary disturbance within the 100-foot non-disturbance buffer to Wolf Creek, could have an indirect impact on such protected resources and therefore, mitigation for encroachment into such non-disturbance buffers within the Centennial Site IMM Project area is a requirement of this Management Plan.

MITIGATION FOR ENCROACHMENT INTO THE NON-DISTURBANCE BUFFERS

The mitigation measures listed below are intended for inclusion within the entirety of the proposed development (direct permanent and temporary impacts to protected aquatic resources) and/or disturbances within the non-disturbance buffers during and after construction. The intent of these measures is to minimize direct and indirect impacts to water quality during and following construction and the negative impacts that sedimentation and other hazardous substances can have on such protected aquatic resources. Such protections will be accomplished by implementing the following during and following construction:

- Limit construction to periods of extended dry weather and the dry summer season, if feasible;

- Establishing the areas around active stream channels and wetlands as Environmentally Sensitive Area (ESA) where those areas will not be impacted by construction or thereafter;
- No fill or dredge material will enter or be removed from any streams except for those identified in Table 4.0 in this Management Plan during construction;
- Use appropriate machinery and equipment to limit disturbance within and directly adjacent to these areas;
- Placement of soil erosion control devices (such as wattles, hay bales, etc.) between the protected aquatic resources (wetlands and streams) and the areas to be graded and disturbed to limit potential runoff and sedimentation into such protected resources; and
- Implement Best Management Practices during and following construction.

REMEDIATION AND RESTORATION OF AREAS ADJACENT TO IMPACTED STREAMS

It is recommended that any areas within the 100-foot non-disturbance buffer to Wolf Creek that may be impacted by development at the Centennial Site by the IMM Project should be restored to pre-construction contours and revegetated immediately following construction. Any other areas of impacts within the 50-foot non-disturbance buffer to any ephemeral or intermittent stream not being filled by the proposed development should also be restored to pre-construction contours where feasible and replanted with native vegetation.

The following is recommended to remediate and restore areas adjacent to Wolf Creek and within its 100-foot non-disturbance buffer if such temporary impacts are to occur within those areas within the Centennial Site IMM Project Area. These measures would also be included in any 50-foot non-disturbance buffer to an ephemeral or intermittent stream not being filled by the Centennial Site IMM Project. Where native vegetation and trees will be removed within the non-disturbance buffers within the Centennial Site IMM Project area, the following shall be implemented:

- Placement of rock and rip rap along the embankment of Wolf Creek should be avoided given the proposed Centennial Site IMM Project will not encroach into Wolf Creek;

- Some rock and rip rap can be placed at the top of the embankment of the ephemeral and intermittent streams within the Centennial Site IMM Project, if needed, to protect the embankment(s) from erosion after construction is completed. This would potentially be implemented for ephemeral and intermittent streams that will not be completely filled or impacted and occur directly adjacent to the proposed fill of those streams; and

- Plant willow cuttings from the adjacent willow trees and other native shrubs and riparian trees along the embankments of streams not being impacted and filled as needed. A revegetation plan will be a requirement of the CDFW Streambed Alteration Agreement that will include impacts to the bed and bank, of any stream within the Centennial Site IMM Project Area. Implementation of General and Project Specific Conditions will be required for all permits for the proposed project.

IMPLEMENTATION OF BEST MANAGEMENT PRACTICES DURING CONSTRUCTION

To protect the perennial aquatic resource (Wolf Creek) and its 100-foot non-disturbance buffer area, as well as water quality and downstream water resources, the applicant shall implement standard Best Management Practices during and after construction. These measures should include, but are not limited to:

- Minimize the number and size of work areas for equipment and spoil storage sites in the vicinity of any streams and wetlands that will not be disturbed by project development. Place staging areas and other work areas outside of the 50-foot non-disturbance buffers of ephemeral and intermittent aquatic resources and 100-foot non-disturbance buffers of perennial aquatic resources.

- The applicant shall exercise reasonable precaution to protect the aquatic resources within the Centennial Site as well as the adjacent non-disturbance buffers of such aquatic resources from pollution with fuels, oils, and other harmful materials. Construction byproducts and pollutants such as oil, cement, and wash water shall be prevented from discharging into or near these resources and shall be collected for removal off the site. All construction debris and associated materials and litter shall be removed from the work site immediately upon completion.

- No equipment for vehicle maintenance or refueling shall occur within the 50-foot and 100-foot non-disturbance buffers. The contractor shall immediately contain and clean up any petroleum or other chemical spills with absorbent materials such as sawdust or kitty litter. For other hazardous materials, follow the cleanup instruction on the label.

Post Construction Erosion Control

Exposed bare soil along the embankment of Wolf Creek or any of the ephemeral and intermittent streams within the Centennial Site, including their 50-foot and 100-foot non-disturbance buffers, should be protected against loss from erosion by the seeding of an erosion control mixture and restored with native grasses and mulching per Nevada County and regulatory agency guidelines (to be included in required permits prior to such disturbance within protected aquatic resources, see Appendix H for a potential native seed mix from Caltrans and the Nevada County Erosion Control Plan Standards).

Non-native species that are known to invade wild lands, such as orchard grass, velvet grass, rose clover, winter and spring vetch, and wild oats should not be used as they displace native species.

Provide Copies of Mitigation Measures to Contractors

To ensure the proper and timely implementation of all mitigation measures contained in this Management Plan, as well as the terms and conditions of any other required permits, the applicant shall distribute copies of these mitigation measures and permit requirements to the contractors prior to grading and construction within the non-disturbance buffers. All contractors shall be completely familiar with the mitigation measures contained above and with the terms and conditions of all permits.

8 JUSTIFICATION TO SUPPORT MANAGEMENT PLAN

Consistent with the provisions of Sec. L-II 4.3.3.B, total avoidance of protected aquatic resources is not feasible given the constraints of the Centennial Site IMM Project area and the history of the Centennial Site with past historic mining operations that have occurred. However, the disturbed and developed nature of the Centennial Site is being taken advantage of as the largest percentage of the site to be impacted will be located within the areas of the Centennial Site that have been the most disturbed by historic land uses and will already be impacted by the DTSC clean-up project.

Based on the topography, off-site drainage onto the property, history of mining activities, and existing level of disturbance and development within the Centennial Site, total avoidance of sensitive aquatic resources is not feasible. A single intermittent stream and two small ephemeral streams will be permanently impacted by the proposed project. However, no disturbance will occur to Wolf Creek or its adjacent floodplain located within the Centennial Site.

Alternative project designs and their feasibility were considered as part of the overall Centennial Site IMM Project design. Several alternative project designs would have had greater levels of impact on aquatic resources within the Centennial Site. The selected project design both minimizes impacts to aquatic resources and the permanent impacts are mostly proposed to occur within a largely disturbed area of the site. Fewer and smaller stream features will be disturbed from the implementation of the proposed project compared to other project designs that have been considered within the Centennial Site. Avoidance of impacts to Wolf Creek on the Centennial Site was an important component in determining the optimal project design. The IMM Project design proposed satisfies this project goal.

9 STATEMENT OF QUALIFICATIONS

Mr. Greg Matuzak, Principal and owner of Greg Matuzak Environmental Consulting LLC is a wetlands ecologist and wildlife biologist with 20 years of experience conducting aquatic resources delineations and biological resources assessments in Northern California. Mr. Matuzak is 40-hour Wetland Delineation Certified (Wetland Training Institute) and has conducted aquatic resources delineations for 100's of linear miles of projects and 1000s of acres of site development projects. Additionally, Mr. Matuzak has implemented special-status biological resources surveys and developed biological resources assessments and management plans for dozens of projects in Nevada County. Mr. Matuzak has lived and worked in Nevada County for over 13 years. Ms. Wendy Boes is a local Nevada County botanist and most recently worked for the Tahoe National Forest as a botanist. Ms. Boes is an independent consultant, GIS specialist, and conducts field data collection and GIS mapping for field related projects. Mr. Matuzak and Ms. Boes were responsible for the field data collection and assessment developed as part of the development of this Management Plan. Both Mr. Matuzak and Ms. Boes are on the Nevada County Planning Department's list of Qualified Biological Resources Consultants.

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Appendix A

Project Overview Area Figure

Figure. Centennial Industrial Site

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

SCALE: 1 inch = 300 feet

Legend

Centennial Industrial Site Study Area, 56.41 ac.

Appendix B

USDA Soils Maps

and

USDA Soils Descriptions

Map Scale: 1:4,360 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Nevada County Area, California
Survey Area Data: Version 11, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 20, 2017—Aug 8, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ct	Cut and fill land	1.1	2.2%
Pr	Placer diggings	43.2	76.4%
RrE	Rock outcrop-Dubakella complex, 5 to 50 percent slopes	1.8	3.1%
ScE	Secca-Rock outcrop complex, 2 to 50 percent slopes	10.31	18.4%
Totals for Area of Interest		**56.41**	**100.0%**

USDA Soil Mapping Units Descriptions for the Centennial Industrial Site

Centennial Industrial Site

The USDA Soil Survey Mapper (USDA, 2019) indicates that the Centennial Site includes 4 soil types: Cut and fill land (Ct), Placer diggings (Pr), Rock outcrop-Dubakella coplex on 5 to 50 percent slopes (RrE), and Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE). These soil types are described in detail below and their presence, as identified by the USDA online mapper:

- **Cut and fill land (Ct).** This soil type consists of areas that have been altered by activities other than mining such that there are no intact soil characteristics. This soil is not hydric.
- **Placer diggings (Pr).** The Placer diggings series consists of remnant tertiary river deposits associated with hydraulic mining and placer mining operations as well natural deposits within stream channels. Areas with this soil type are 90 to 100 percent rock, cobble or gravel. 50 to 75 percent of these lands have a mixture of rock, cobbles, gravel and soil. This soil contains unnamed hydric inclusions in drainages and depressions.
- **Rock outcrop-Dubakella complex on 5 to 50 percent slopes (RrE).** The Rock outcrop-Dubakella complex consists of well-drained soils on mountains. This complex is made up of 50 percent Dubakella gravelly loam, 40 percent rock outcrop and 10 percent included soils. These soils formed from weathered rocks with a large amount of serpentinitic minerals. Drainage is slow and runoff is very high. These soils are not hydric. A typical profile for this complex consists of dark brown (7.5 YR 3/2) gravelly loam from 0 to 2 inches underlain by a reddish brown (5YR 3/4) gravelly clay loam from 2 to 10 inches. This layer is underlain by a variegated yellowish brown (10YR 4/4) and reddish brown (7.5YR 4/4) very cobbly clay from 11 to 21 inches. This layer underlain by a blue green, hard, fractured and partly weathered serpentinized layer at 21 inches. Several special-status plant species have the potential to occur on the gabbro soils of the Dubakella and Secca-Rock complex soils within the Centennial Site (Boes 2019, see Section 4.4 below).
- **Secca-Rock outcrop complex on 2 to 50 percent slopes (ScE).** This complex consists of moderately well-drained soils on gently sloping to steep mountain terrain. These soils formed from basic igneous and metamorphic rock. Drainage is slow and runoff is slow to rapid. These soils are not hydric. A typical profile for Secca-Rock outcrop complex consists of brown (5YR 3/4) gravelly silt loam from 0 to 6 inches. This layer is underlain by a reddish brown (5YR 3/4) gravelly silt loam

from 6 to 15 inches. This layer is underlain by dark reddish brown (5YR 3/4) cobbly silty clay loam from 15 to 22 inches. From 22 to 36 inches is a strong brown (7.5YR 4/4) cobbly clay, which is underlain by a yellowish brown (10YR 5/6) cobbly clay from 36 to 45 inches. At 45 inches is weathered metabasic rock.

Appendix C

Vegetation Community Map

and

Vegetation Community Descriptions

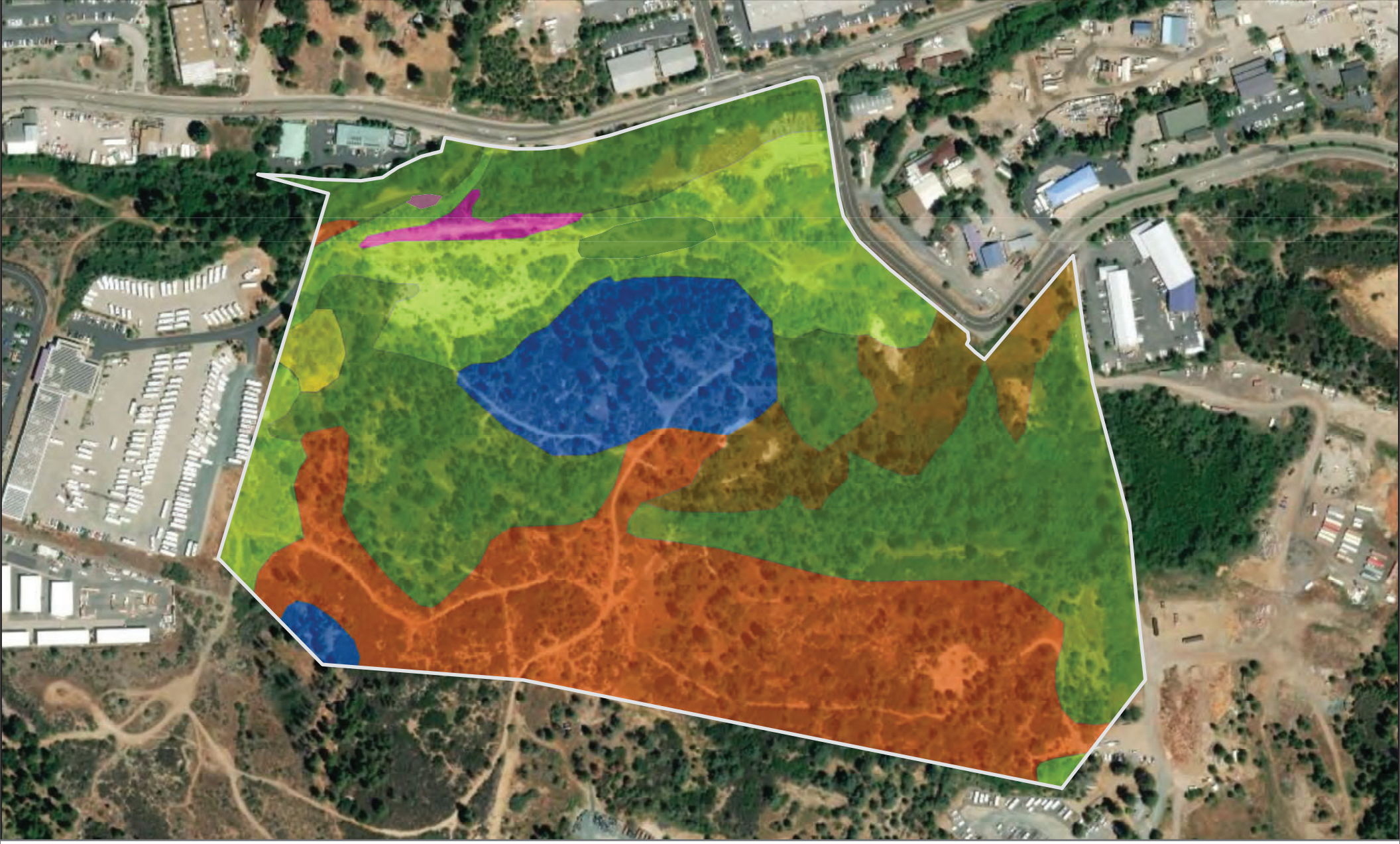

Figure. Vegetation Communities within the Centennial Industrial Site

Legend

- Centennial Industrial Site Study Area

Vegetation Type

- Annual Grassland
- Fresh Emergent Wetland
- Mixed Chaparral
- Montane Hardwood-Conifer
- Montane Hardwood
- Montane Riparian
- Wet Meadow

SCALE: 1 inch = 300 feet

Grass Valley, CA
Grass Valley 7.5 minute USGS quadrangle
T16N, R8E Section 26

Coordinate System: NAD 83 Zone 10N
Projection: Transverse Mercator
Datum: D_North_American_1983

Description of Mapped Vegetation Communities for the Centennial Industrial Site

Vegetation communities within the Centennial Site include the following vegetation community types as described below.

Montane Hardwood

Montane hardwood habitat is identified within the Centennial Site in small, localized stands. Montane hardwood is characterized here by stands of an overstory of California black oak and occasionally canyon live oak (*Quercus chrysolepis)*. There is often homogeneity in the canopy structure, and canopy closure is variable between seasons as the dominant overstories species is deciduous, ranging from 5-45%. Due to the historic disturbance, there is abundant Himalayan blackberry (*Rubus armenicus)* in the understory along with other nonnatives including bristly dogtail (*Cynosurus echinatus)* and hedgenettle (*Torilis arvensis)*.

Montane Hardwood-Conifer

Montane hardwood-conifer habitat in the Sierra Nevada occurs at elevations between 1,000 and 4,000 feet above MSL and is comprised of a mosaic of hardwoods and conifers. The Centennial Site is likely a midpoint on the gradient between hardwood forest and conifer forest containing both hardwood and conifer tree species, often in a mosaic pattern with small pure stands of conifers interspersed with small stands of hardwoods. Species associated with montane hardwood-conifer include ponderosa pine, California black oak, canyon live oak, madrone and Douglas fir.

Mixed Chaparral

Mixed chaparral is identified within the Centennial Site. Mixed chaparral is primarily associated with the gabbro soils of the Secca and Dubekella complexes that are known to occur within the southwestern section of the site. In the gabbro, this vegetation type is relatively intact and is characterized by whiteleaf manzanita, buck brush (*Ceanothus cuneatus),* Oregon white oak (*Quercus garryana* var. *semota),* chaparral pea (*Pickeringia montana), and* occasionally scattered foothill pine. McNab cypress (*Hesperocyparis macnabiana)* is occasional in the southwestern portions of the Centennial Site. With the exception of occasional natural and manmade openings within this habitat type, mixed chaparral forms almost continuous stands. Mixed chaparral is also present in heavily disturbed areas, both recent and historic disturbances. In the ruderal habitats there is a scattered formation of chaparral, usually characterized by whiteleaf manzanita with buck brush and coyote brush (*Baccharis pilularis)*.

Annual Grassland

Annual grassland are open vegetation types that are dominated by annual plant species, often nonnative. These species can occur within the understory of other vegetation types like oak woodlands, but where annual grasslands are mapped there is little to no overstory or shrub cover. This vegetation type is common within the Centennial Site where there has been historic disturbance and little to no water source other than rainfall. The fall rainfall will spark germination and plants will grow through the cool months and in spring will grow rapidly and flower, fruit and senesce. Common to the environmental setting of this habitat type are yellow star thistle (*Centaurea solstitalis),* garden burnett (*Poterium sanguisorba),* soft chess (*Bromus hordeaceous),* bisnaga (*Ammi visnaga),* and patches of Himalayan blackberry.

Montane Riparian

A structural gradient generally occurs from neighboring vegetation into montane riparian, resulting in oaks or pines grading in with the more riparian species. This vegetation type is characterized by two different ecological conditions, (1) placer diggings and (2) along the stretch of the main stem of Wolf Creek.

The montane riparian in the placer diggings and areas created from earth movement are characterized by black cottonwood (*Populus tremuloides),* red willow (*Salix laevigata),* arroyo willow *(Salix lasiolepis),* and occasionally ponderosa pine in the overstory. Dense thickets are often resultant with Himalayan blackberry and Baltic rush (*Juncus balticus* ssp. *atar)* in the herbaceous layer.

The montane riparian vegetation along both sides of the main stem of Wolf Creek is dominated by white alder (*Alnus rhombifolia)* with other overstory species from adjacent vegetation types, including California black oak, pine and Douglas fir. The understory of montane riparian along the stream is dominated by Himalayan blackberry.

Wet Meadow

Wet meadows generally contain a single vegetation stratum and are generally dominated by forbs and gramanoids. Shrub and trees are sometimes present but generally make up a small portion of this vegetation type. This is typically a diverse plant community driven by hydrologic influences. The wet meadows in the Centennial Site are typically created where extreme disturbance has occurred in the past or the presence of placer diggings. These wet meadows are characterized by *Agrostis, Juncus* spp. and Baltic rush.

Freshwater Emergent Marsh Wetlands

Freshwater emergent marsh wetlands are characterized by hydrophyllic plants and generally standing water. All emergent wetlands have soils that are saturated to the

extent that the soils are always anaerobic. There are fresh emergent wetlands identified within the Centennial Site. This habitat type within the Centennial Site is dominated by cattails (*Typha* spp.), arroyo willow, and pacific rush (*Juncus effuses* ssp. *pacificus)*.

Appendix D

Plants Observed During Site Surveys

VASCULAR PLANTS OCCURRING IN CENTENNIAL SITE

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Acer macrophyllum	Bigleaf maple	native	Tree	-	FACU	-
Agoseris retrorsa	Spear leaved agoseris	native	perennial herb	-	-	-
Agrostis gigantea	Creeping bentgras	non-native	perennial grass	-	FAC	-
Ailanthus altissima	Tree of heaven	non-native (invasive)	Tree	-	FACU	Moderate
Aira caryophyllea	Silvery hairgrass	non-native (invasive)	annual grass	-	FACU	-
Allium amplectens	Narrow leaved onion	Native	perennial herb (bulb)	-	-	-
Alnus rhombifolia	White alder	Native	Tree	-	FACW	-
Ammi visnaga	Bisnaga	non-native	annual, biennial herb	-	-	-
Anaphalis margaritacea	Pearly everlasting	Native	perennial herb	-	FACU	-
Andropogon virginicus var. virginicus	Broomsedge bluestem	non-native	perennial grass	-	FAC	-
Arbutus menziesii	Madrono	Native	Tree	-	-	-
Arctostaphylos mewukka ssp. mewukka	Indian manzanita	Native	Shrub	-	-	-
Arctostaphylos viscida ssp. viscida	Smooth white leaf manzanita	Native	tree, shrub	-	-	-
Artemisia douglasiana	California mugwort	Native	perennial herb	-	FACW	-
Asclepias sp.	-	-	-	-	-	-
Asclepias speciosa	Showy milkweed	Native	perennial herb	-	FAC	-
Avena sp.	-	-	-	-	-	-
Baccharis pilularis	Coyote brush	Native	Shrub	-	-	-
Berberis aquifolium var. repens	Creeping oregon grape	Native	Shrub	-	FACU	-
Brodiaea minor	Low brodiaea	Native	perennial herb	-	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Brodiaea sierrae	Sierra foothills brodiaea	Native	perennial herb	Rank 4.3	-	-
Bromus hordeaceus	Soft chess	non-native (invasive)	annual grass	-	FACU	Limited
Bromus madritensis	Foxtail chess, foxtail brome	non-native	annual grass	-	FACU	-
Calocedrus decurrens	Incense cedar	Native	Tree	-	-	-
Calycadenia multiglandulosa	Rosin weed	Native	annual herb	-	-	-
Carex feta	Green sheathed sedge	Native	perennial grasslike herb	-	FACW	-
Ceanothus cuneatus	Buck brush	Native	Shrub	-	-	-
Ceanothus integerrimus	Deer brush	Native	Shrub	-	-	-
Ceanothus lemmonii	Lemmon's ceanothus	Native	Shrub	-	-	-
Centaurea solstitialis	Yellow starthistle	non-native (invasive)	annual herb	-	-	High
Centaurium tenuiflorum	Slender centaury	non-native	annual herb	-	FACW	-
Centranthus sp.	-	-	-	-	-	-
Centromadia fitchii	Spikeweed	Native	annual herb	-	FACU	-
Chlorogalum pomeridianum	Amole	Native	perennial herb	-	-	-
Chondrilla juncea	Skeleton weed	non-native (invasive)	perennial herb	-	-	Moderate
Cichorium intybus	Chicory	non-native	perennial herb	-	FACU	-
Cirsium vulgare	Bullthistle	non-native (invasive)	perennial herb	-	FACU	Moderate
Cornus nuttallii	Mountain dogwood	Native	Shrub	-	FACU	-
Cornus sericea	American dogwood	Native	Shrub	-	FACW	-
Cortaderia jubata	Andean pampas grass	non-native (invasive)	perennial grass	-	FACU	High
Crataegus monogyna	Hawthorn	non-native (invasive)	Shrub	-	FAC	Limited
Croton setiger	Turkey-mullein	Native	perennial herb	-	-	-
Cynodon dactylon	Bermuda grass	non-native (invasive)	perennial grass	-	FACU	Moderate
Cynosurus echinatus	Dogtail grass	non-native (invasive)	annual grass	-	-	Moderate
Cyperus eragrostis	Tall cyperus	Native	perennial grasslike herb	-	FACW	-
Dactylis glomerata	Orchardgrass	non-native (invasive)	perennial grass	-	FACU	Limited

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Danthonia californica	California oatgrass	Native	perennial grass	-	FAC	-
Deschampsia elongata	Hairgrass	Native	perennial grass	-	FACW	-
Elymus caput-medusae	Medusa head	non-native	annual grass	-	-	-
Elymus elymoides	Squirrel tail grass	Native	perennial grass	-	FACU	-
Elymus hispidus	Intermediate wheatgrass	non-native	perennial grass	-	-	-
Epilobium sp.	-	-	-	-	-	-
Epipactis gigantea	Stream orchid	Native	perennial herb	-	OBL	-
Eriodictyon californicum	Yerba santa	Native	Shrub	-	-	-
Eriophyllum lanatum	Wooly sunflower	Native	perennial herb	-	-	-
Euthamia occidentalis	Western goldenrod	Native	perennial herb	-	FACW	-
Festuca arundinacea	Reed fescue	non-native (invasive)	perennial grass	-	FAC	Moderate
Festuca idahoensis	Blue fescue	Native	perennial grass	-	FACU	-
Festuca microstachys	Small fescue	Native	annual grass	-	-	-
Ficus sp.	-	-	-	-	-	-
Frangula californica ssp. tomentella	Hoary coffeeberry	Native	Shrub	-	-	-
Frangula rubra	Red buckthorn	Native	Shrub	-	-	-
Fremontodendron decumbens	Pine hill flannelbush	Native	Shrub	FE, SR, Rank 1B.2	-	-
Galium porrigens	Climbing bedstraw	Native	vine, shrub	-	-	-
Gamochaeta sp.	-	-	-	-	-	-
Garrya fremontii	Fremont's silk tassel	Native	Shrub	-	-	-
Grindelia camporum	Gumweed	Native	perennial herb	-	FACW	-
Grindelia sp.	-	-	-	-	-	-
Hedera helix	English ivy	non-native (invasive)	vine, shrub	-	FACU	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Hemizonella minima	Opposite leaved tarweed	Native	annual herb	-	-	-
Hesperocyparis macnabiana	Macnab cypress	Native	tree, shrub	-	-	-
Hirschfeldia incana	Mustard	non-native (invasive)	perennial herb	-	-	Moderate
Holcus lanatus	Common velvetgrass	non-native (invasive)	perennial grass	-	FAC	Moderate
Hypericum perforatum ssp. perforatum	Klamathweed	non-native	perennial herb	-	FACU	-
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	-	FACU	Moderate
Juncus articulatus ssp. articulatus	Jointed rush	Native	perennial grasslike herb	-	OBL	-
Juncus balticus ssp. ater	Baltic rush	Native	perennial grasslike herb	-	FACW	-
Juncus confusus	Colorado rush	Native	perennial grasslike herb	-	FAC	-
Juncus effusus ssp. pacificus	Pacific rush	Native	perennial grasslike herb	-	FACW	-
Juncus trilocularis	-	Native	annual grasslike herb	-	-	-
Lactuca serriola	Prickly lettuce	non-native (invasive)	annual herb	-	FACU	-
Lathyrus latifolius	Sweet pea	non-native	perennial herb	-	-	-
Leontodon saxatilis	Hawkbit	non-native	annual herb	-	FACU	-
Leucanthemum vulgare	Oxe eye daisy	non-native (invasive)	perennial herb	-	FACU	Moderate
Lilium humboldtii ssp. humboldtii	Humboldt lily	Native	perennial herb	Rank 4.2	-	-
Lonicera hispidula	Pink honeysuckle	Native	vine, shrub	-	FACU	-
Lonicera interrupta	Chaparral honeysuckle	Native	vine, shrub	-	-	-
Lotus corniculatus	Bird's foot trefoil	non-native (invasive)	perennial herb	-	FAC	-
Lysimachia arvensis	Scarlet pimpernel	non-native	annual herb	-	FAC	-
Madia gracilis	Gumweed	Native	annual herb	-	-	-
Melica californica	California melic	Native	perennial grass	-	-	-
Melilotus albus	White sweetclover	non-native (invasive)	annual, biennial herb	-	-	-
Muhlenbergia rigens	Deergrass	Native	perennial grass	-	UPL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Panicum sp.	-	-	-	-	-	-
Parthenocissus sp.	-	-	-	-	-	-
Penstemon heterophyllus	Foothill penstemon	Native	perennial herb	-	-	-
Pickeringia montana	Chaparral pea	Native	Shrub	-	-	-
Pinus ponderosa	Yellow pine	Native	Tree	-	FACU	-
Pinus sabiniana	Bull pine	Native	Tree	-	-	-
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	-	FACU	Limited
Polygala cornuta	Sierra milkwort	Native	perennial herb	-	FACW	-
Polypogon sp.	-	-	-	-	-	-
Populus fremontii ssp. fremontii	Cottonwood	Native	Tree	-	FAC	-
Poterium sanguisorba	Garden burnet	non-native	perennial herb	-	UPL	-
Prunella vulgaris	Self heal	Native	perennial herb	-	FACU	-
Prunus subcordata	Sierra plum	Native	tree, shrub	-	-	-
Pyracantha sp.	-	-	-	-	-	-
Quercus garryana var. semota	Oregon white oak	Native	Tree	-	FACU	-
Rhamnus crocea	Redberry	Native	Shrub	-	-	-
Rosa canina	Dog rose	non-native	Shrub	-	-	-
Rubus armeniacus	Himalayan blackberry	non-native (invasive)	Shrub	-	FACU	High
Rubus leucodermis	White bark raspberry	Native	Shrub	-	FACU	-
Rumex crispus	Curly dock	non-native (invasive)	perennial herb	-	FAC	Limited
Salix exigua	Narrowleaf willow	Native	tree, shrub	-	FACW	-
Salix laevigata	Polished willow	Native	Tree	-	FACW	-
Salix lasiolepis	Arroyo willow	Native	tree, shrub	-	FACW	-
Salvia sonomensis	Sonoma sage	Native	perennial herb	-	-	-
Schoenoplectus acutus var. occidentalis	Tule	Native	perennial grasslike herb	-	OBL	-

Scientific Name	Common Name	Origin	Form	Rarity Status	Wetland Status (WMVC 2014)	CAL-IPC Status
Scutellaria tuberosa	Dannie's scullcap	Native	perennial herb	-	-	-
Solidago sp.	-	-	-	-	-	-
Toxicodendron diversilobum	Poison oak	Native	vine, shrub	-	FAC	-
Tragopogon dubius	Goat's beard	non-native (invasive)	perennial herb	-	-	-
Trichostema lanceolatum	Vinegarweed	Native	annual herb	-	FACU	-
Trifolium hirtum	Rose clover	non-native (invasive)	annual herb	-	-	Limited
Trifolium sp.	-	-	-	-	-	-
Triteleia hyacinthina	Wild hyacinth	Native	perennial herb	-	FAC	-
Typha domingensis	Cattail	Native	perennial herb	-	OBL	-
Verbascum blattaria	Moth mullein	non-native	perennial herb	-	UPL	-
Verbascum thapsus	Woolly mullein	non-native (invasive)	perennial herb	-	FACU	Limited
Vitis californica	California wild grape	Native	vine, shrub	-	FACU	-
Wyethia angustifolia	Narrow leaved mule ears	Native	perennial herb	-	FACU	-
Wyethia bolanderi	Bolander's wyethia	Native	perennial herb	-	-	-

Appendix E

Photo Log

Photos of the Field Surveys of the Centennial Industrial Site

Photo 1. Spring associated with WM-8 in the western section of the Centennial Industrial Site.

Photo 2. Wetland area WM-3 in the northwestern section of the Centennial Industrial Site.

Photo 3. Mapped drainage connecting WM-10 with WM-3 in the northern/northwestern section of the Centennial Industrial Site.

Photo 4. Roadside wetland WM-11 in the western section of the Centennial Industrial Site.

Photo 5. Wetland area WM-2 in the northwestern section of the Centennial Industrial Site.

Photo 6. Narrow wetland area of WM-5 in the western section of the Centennial Industrial Site.

Photo 7. Wetland area WM-12 in the central section of the Centennial Industrial Site.

Photo 8. Marsh wetland (MA-1) in the eastern section of the Centennial Industrial Site.

Photo 9. Wetland area MA-1 in the eastern section of the Centennial Industrial Site.

Photo 10. Wetland area (WM-4) in the eastern section of the Centennial Industrial Site.

Photo 11. Large riparian area (RI-1) in the eastern section of the Centennial Industrial Site.

Photo 12. Edge of large riparian area (RI-1) in the eastern section of the Centennial Industrial Site.

Photo 13. Previously delineated wetland area in the western section of the Centennial Industrial Site. No hydrophytic vegetation or hydric soils were present in this area in December 2018. Soil data point taken immediately southeast of mapped wetland WM-3 (see attached delineation figures).

Photo 14. Frozen, sandy loam hydric soil associated with WM-3 in the western section of the Centennial Industrial Site. Wetlands WM-3 and WM-4 were associated with sandy soils.

Photo 15. Hydric soils associated with wetland WM-5 in the western section of the Centennial Industrial Site. The northwestern section of this project area contained varied soil types.

Photo 16. Sandy loam hydric soils associated with wetland WM-3 in the western section of the Centennial Industrial Site.

Appendix F

CNPS Ranked Plants and Special-Status Plant and Wildlife Species Descriptions

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Stebbins' morning-glory *Calystegia stebbinsii*	--/--/1.B2	Gabbroic or serpentinite soils. Openings in chaparral, cismontane woodland, lower montane coniferous forest, from 980-4,330 feet.	Apr- Jul	**Low.** Potential for occurrence in openings and under chaparral in gabbroic soils. Known 4 miles to east on gabbroic chaparral on Oceola Ridge. Was not observed during targeted 2019 field surveys.
Sierra arching sedge *Carex cyrtostachya*	--/--/1B.2	Lower montane mesic coniferous forest, meadows and seeps, marshes and swamps, Riparian forests (margin), from 2,000-4,460 feet.	May -Aug	**Low.** Potential for occurrence in mesic forests. Within the known distributional and elevational range for this species, though nearest known occurrence 16 miles to the north. This species was recently described so the full extent of its range and distribution are unlikely yet known. Marginal habitat present in study area, and it was not observed during 2019 field surveys.
Chaparral sedge *Carex xerophila*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 1,400 – 2,525 feet.	Mar- Jun	**Low.** Potential for occurrence in openings and under chaparral in gabbroic soils. Known 4 miles away on Oceola Ridge in gabbroic chaparral. Was not observed during 2019 field surveys.
Red Hills soaproot *Chlorogalum grandiflorum*	--/--/1B.2	Chaparral, cismontane woodland, lower montane coniferous forests on serpentinite and gabbroic substrates, from 800 – 5,545 feet.	May-Jun	**Low.** Potential for occurrence in openings and under chaparral in gabbroic soils. Known over 10 miles south in Bunch Canyon south of Colfax, with no known occurrences to north. Was not observed during 2019 field surveys.
Pine Hill flannelbush *Fremontodendron decumbens*	FE/CR/1B.2	Chaparral, cismontane woodland on serpentinite and gabbroic substrates, from 1,390 – 2,495 feet.	Apr- July	**High.** Potential for occurrence in openings and under chaparral in gabbroic soils in Idaho Maryland study area. Known from study area from CNDDB Occurrence #14. Field surveys in 2019 expanded boundaries of known occurrence.

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Butte County fritillary *Fritillaria eastwoodiae*	--/--/3.2	Openings in chaparral, cismontane woodland, and lower montane coniferous forest, sometimes serpentinite, from 160-4,920 feet.	Mar-Jun	**Low.** Potential for occurrence in open areas in the study area. There is a 1979 record for this species on the south side of the South Yuba River canyon approximately 7 miles north of the study area, and other occurrences on the Washington Ridge. Surveys were not conducted during the appropriate phenological period for this species (April-May), but fruits would have been visible for individuals from this genus and they were not observed during 2019 field surveys.
Finger rush *Juncus digitatus*	--/--/1B.1	Seasonal wet areas, cismontane woodland openings, openings in lower montane coniferous forest, xeric vernal pools, from 2,165-2,590 feet.	Apr-Jun	**Low.** Potential for the occurrence in gravelly, seasonally moist openings. Known less than one mile to the north near the intersection of Idaho Maryland and Brunswick. Was not observed during 2019 field surveys.
Dubious pea *Lathyrus sulphureus* var. *argillaceus*	--/--/3	Cismontane woodland, Lower montane coniferous forest, Upper montane coniferous forest, from 490-3,050 feet.	Apr-May	**Low.** Potential to occur in forested areas. Known within 3 miles of study areas from a 1926 collection. Also known to SW 5 miles away near Wolf Mountain. Plant list from 2006 surveys have a *Lathyrus sulfureus* with no variety designation, but not observed during 2019 surveys.
Cantelow's lewisia *Lewisia cantelovii*	--/--/1B.2	Moist, granitic areas in broadleaf upland forest, chaparral, cismontane woodland, lower montane coniferous forest mesic, sometimes serpentinite seeps, from 1,080-4,495 feet.	May-Oct	**Low.** Potential for occurrence in any rocky outcrops with seeps on the parcel. There are records for this species in the Middle Yuba and South Yuba river canyons within 7 miles of the study area. The preferred habitat for this species in the study area has been disturbed and is of reduced quality. Was not observed during 2019 field surveys.
Cedar Crest popcornflower *Plagiobothrys glyptocarpus* var. *modestus*	--/--/3	Cismontane woodland, valley and foothill grasslands (mesic), from 2,850-2.855 feet.	Apr-Jun	**Moderate.** Known from historic collection potentially from nearby Cedar Ridge. Also known from historic collections in Nevada City. Suitable habitat for this species is present. Was not observed during 2019 field surveys.

Common and Scientific Name	Legal Status[1] Federal/State/ CNPS	Habitat Association	Identification Period	Potential for Species/Habitat Presence
Sierra blue grass *Poa sierrae*	--/--/1B.3	Openings in lower montane coniferous forest, 1,195-4,920 feet.	Apr-Jul	**Low.** There is only marginal suitable habitat for this species in the study area, primarily in the ponderosa pine forest, and in the forested areas along Wolf Creek. Known from Steephollow Creek from a collection from 1964. Was not observed during 2019 field surveys.
Brownish beaked-rush *Rhynchospora capitellata*	--/--/2B.2	Wet areas (marshes, swamps, meadows, and seeps) in montane coniferous forest, from 145-6,560 feet.	Jul-Aug	**Low.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.
Scadden Flat checkerbloom *Sidalcea stipularis*	--/CE/1B.1	Marshes and swamps (montane freshwater), from 2,295-2,395 feet.	Jul-Aug	**Low.** Suitable habitat for this species in the perennial marsh wetlands. It is known 3 miles to the west near the Nevada County Fairgrounds from a report in 1973. Was not observed during 2019 field surveys.

[1]Status explanations:

FE = Federally Endangered
CR = State Rare
CE = State Endangered
-- = no listing.

California Native Plant Society Rare Plant Rank (formerly known as CNPS lists)
1B = Rank 1B species: rare, threatened, or endangered in California and elsewhere.
2B = Rank 2B species: rare, threatened, or endangered in California but more common elsewhere.
3 = Rank 3 species are taxonomically problematic and lack the necessary information to assign them to one of the other ranks.
4 = Rank 4 plants are of limited distribution or infrequent throughout a broader area in California; should be monitored regularly.
Source: CNPS 2019; CNDDB 2019; USFWS 2019, and Calflora 2019.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Amphibians			
California red-legged frog *Rana draytonii*	FT/SSC	Found in permanent and semi-permanent aquatic habitats, such as creeks and ponds, with emergent and submergent vegetation. May aestivate in rodent burrows or cracks during dry periods. Along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehama County to Fresno County.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats within the eastern section of the Centennial Site contain marginal suitable habitat for the species.
Foothill yellow-legged frog *Rana boylii*	SCT/SCC	Perennial rocky (pebble or cobble) streams with cool, clear water in a variety of habitats from valley and foothill oak woodland, riparian forest, ponderosa pine, mixed conifer, coastal scrub, and mixed chaparral at elevations ranging from 0 to 6,370 feet. Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet south to Kern County	**Very Low**; however, the main stem of Wolf Creek within the northern section of the Centennial Site contains marginal suitable habitat for the species.
Reptiles			
Western pond turtle *Emys marmorata*	--/SSC	Thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation, below 6,000 feet in elevation. Populations extend throughout the coast and central valley of California.	**High.** Potential for occurrence in areas near water, including Wolf Creek and perennial aquatic resources such as the freshwater emergent marsh habitats within the eastern section of the Centennial Site.
Coast horned lizard *Phrynosoma blainvillii*	--/SSC	Associated with open patches of sandy soils in washes, chaparral, scrub, and grasslands.	**Moderate**. Potential for occurrence in areas with appropriate habitat within the Centennial Site, including open chaparral habitats.
Mammals			
Townsend's big-eared bat *Corynorhinus townsendii*	--/SSC	Associated with lower montane coniferous and mixed conifer forest habitats where abandoned buildings and structures occur for roosting.	**Low.** Potential for occurrence in areas containing abandoned structures, including the existing decant structure in the northwestern section of the Centennial Site.

Common and Scientific Name	Legal Status[1] Federal/State	Habitat Requirements	Potential for Species/Habitat Presence
Birds			
California black rail *Laterallus jamaicensis coturiculus*	--/CT	California black rail inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. The species requires water depths of approximately 1 inch that does not fluctuate during the year and dense vegetation for nesting habitat.	**Very Low**; however, the perennial aquatic resources such as the freshwater emergent marsh habitats within the eastern section of the Centennial Site contain marginal suitable habitat for the species.
Cooper's hawk *Accipiter cooperii*	MBTA/CDFW Watch List	Cooper's hawks are forest and woodland birds. These hawks are a regular sight in parks, quiet neighborhoods, over fields, at backyard feeders, and even along busy streets if there are trees present.	**Moderate**; however, the woodland habitats within the Centennial Site contain marginal suitable habitat for the species.
Invertebrates			
Western bumble bee *Bombus occidentalis*	--/--	Western bumble bee was documented approximately 3 miles northeast of Nevada City (4+ miles from the Centennial Site) in 1968. It is known from a single collection on May 20th of that year. This species is of conservation concern and is listed as S1, Critically Imperiled, by NatureServe and is listed on the CNDDB.	**Very Low.** Unlikely to occur in the Centennial Site or surrounding region.

[1]Status explanations:

-- = no listing.

Federal

BCC = federal Bird of Conservation Concern

FPT = federal proposed threatened under the federal Endangered Species FT
= listed as threatened under the federal Endangered Species Act.

State

FP = state fully protected

SCT = state candidate for listing as threatened under the California Endangered Species SE
= listed as endangered under the California Endangered Species Act.

SSC = state species of special concern

ST = listed as threatened under the California Endangered Species Act.

Source: CNDDB 2019 and USFWS 2019

Appendix G

CNDDB 5-Mile Buffer Figure

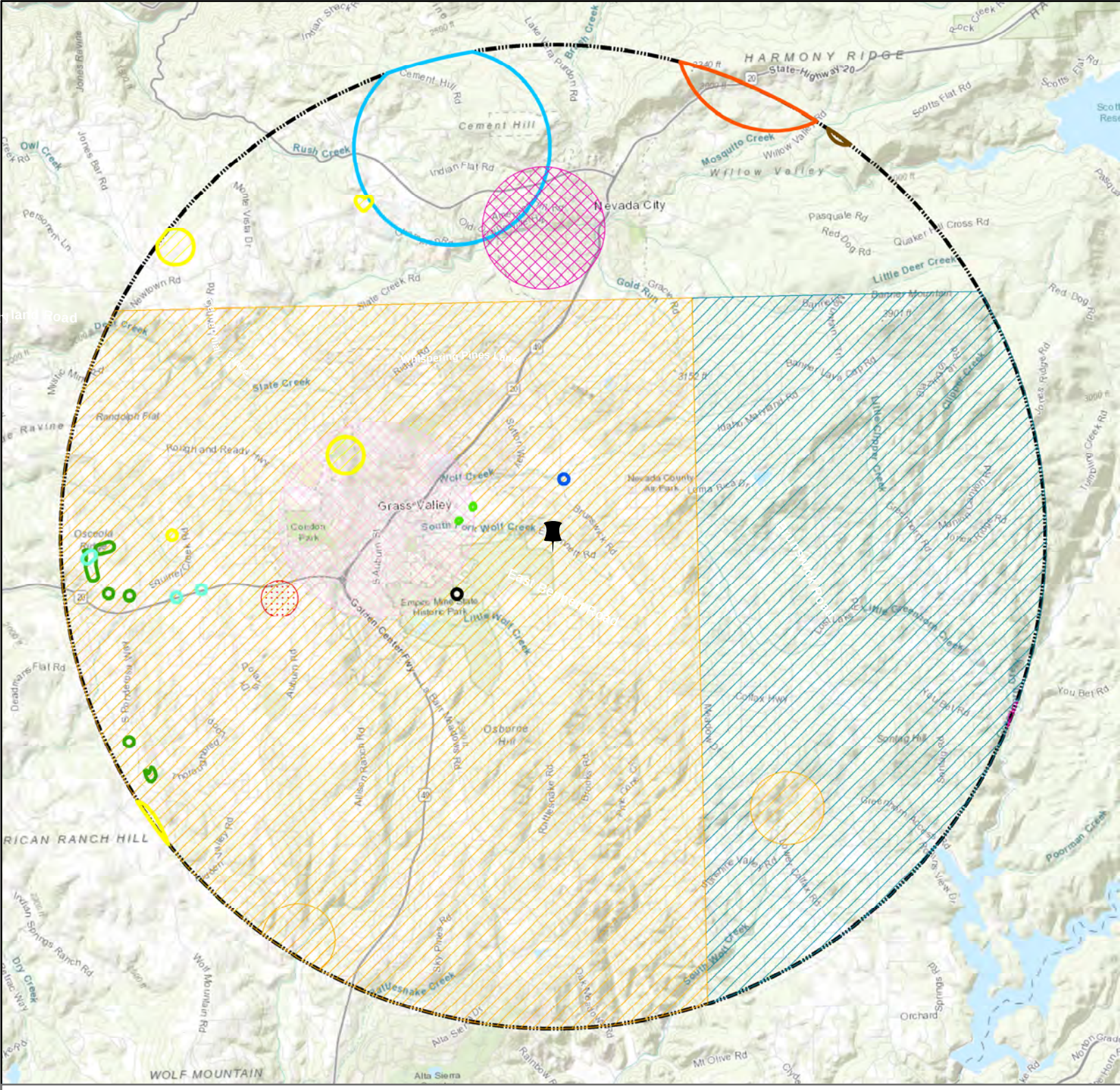

Figure. Known Occurrences of Special Status Species within 5 Miles of the Centennial Site

Legend

FiveMileProjectBuffer

Project Area

Common Name, Scientific Name, FESA, CESA, CNPS

- Brandegee's clarkia, Clarkia biloba ssp. brandegeeae, none, none, 4.2
- California black rail, Laterallus jamaicensis coturniculus, none, Threatened
- Cooper's hawk, Accipiter cooperii, none, none
- Pine Hill flannelbush, Fremontodendron decumbens, Endangered, Rare, 1B.2
- Scadden Flat checkerbloom, Sidalcea stipularis, none, Endangered, 1B.1
- Stebbins' morning-glory, Calystegia stebbinsii, Endangered, Endangered, 1B.1
- Townsend's big-eared bat, Corynorhinus townsendii, none, none
- brownish beaked-rush, Rynchospora capitellata, none, none, 2B.2
- chaparral sedge, Carex xerophila, none, none, 1B.2
- coast horned lizard, Phrynosoma blainvillii, none, none
- dubious pea, Lathyrus sulphureus var. argillaceus, none, none, 3
- finger rush, Juncus digitatus, none, none, 1B1
- foothill yellow-legged frog, Rana boylii, none, Candidate Threatened
- western bumble bee, Bombus occidentalis, none, none

0 1 2 Miles

1 in = 1 miles

Appendix H

Nevada County Erosion Control Plans and Caltrans Native Plant Seed Mixes

CALTRANS Native Plant Erosion Control Methods

Key Considerations in Determining an Application Rate:

Primary consideration - the desired number of mature plants/ft^2:

- A commonly used application range is 80 – 100 seed^{2}s/ft. Adjust this number as required by the mature plant size.
- While 80 monkey flower per square foot may be desirable, 80 giant brush lupine per square foot will lead to vegetation establishment problems.

- Seed species size & weight:
  - Remember, seed size and weight varies greatly by species.
  - 1 pound of Desert Bluebells = 2,000 seeds
  - 1 pound of Monkey flower = 54,000,000 seeds

- Ease of germination for that species

- Seeding method:
  - Drill seeding requires half the application rate as hydroseeding or hand seeding.

Calculation Example:

We want a seed density of 100 seeds/ft^2 for our site. The seeds will be hydroseeded or hand seeded (same recommended application rate, 80 – 100 seeds/ft^2). Calculate the application rate (lb PLS/ac) for the seed mix listed in Table 1.

Given:

Total seed density = 100 seeds/ft^2
1 acre = 43,560 ft^2

Table 1 - Seed Mix Species and Seeding Density

Scientific Name	Desired seeding density (seeds/ft^2)	Average pure seed weight (seeds/lb PLS)
Lotus purshianus	11	108,500
Nassella cernua	11	215,200
Bromus carinatus	23	72,600
Festuca rubra molate	22	391,800
Hordeum californicum	22	135,700
Leymus triticoides	11	153,000
Total	**100**	

Solution:

a. Equation

$$\text{lb PLS/ac} = \frac{\text{Seed density (seeds/ft}^2\text{) x 43,560 ft}^2\text{/ac}}{\text{Avg pure seed weight (seeds/lb PLS)}}$$

b. Calculations

Lotus purshianus: $\frac{11 \text{ seeds/ft}^2 \times 43{,}560 \text{ ft}^2\text{/ac}}{108{,}500 \text{ seeds/lb PLS}} = 4.4 \text{ lb PLS/ac}$

Nassella cernua: $\frac{11 \text{ seeds/ft}^2 \times 43{,}560 \text{ ft}^2\text{/ac}}{215{,}200 \text{ seeds/lb PLS}} = 2.2 \text{ lb PLS/ac}$

Bromus carinatus: $\frac{23 \text{ seeds/ft}^2 \times 43{,}560 \text{ ft}^2\text{/ac}}{72{,}600 \text{ seeds/lb PLS}} = 13.8 \text{ lb PLS/ac}$

Repeat for the remaining species (see Table 2 for results).

Table 2 - Seed Application Rates

Scientific name	Application rate (lb PLS/ac)
Lotus purshianus	4.4
Nassella cernua	2.2
Bromus carinatus	13.8
Festuca rubra molate	2.4
Hordeum californicum	7.1
Leymus triticoides	3.1
Total	**33.0**

Total seed application rate on the Erosion Control Legend should be 33.0 lb PLS/ac.

COUNTY OF NEVADA
COMMUNITY DEVELOPMENT AGENCY
950 MAIDU AVENUE NEVADA CITY, CA 95959-8617
(530) 265-1222 FAX (530) 265-8794 mynevadacounty.com

EROSION AND SEDIMENT CONTROL PLANS

What is an Erosion /Sediment Control Plan?

- An erosion/sediment control plan includes specific construction techniques identified on the site plan or grading plan, to ensure that no sediment leaves the construction site.

Information on Erosion/Sediment Control Plans:

- Location of proposed building site
- Property lines
- Existing slope direction and grade identified.
- Proposed contour lines (if grading permit required)
- Location and any needed details of erosion/sediment control measures
- Construction entrance/exit
- Drainage plan with details of drainage control devices
- Limits of land disturbance
- Septic and leach field
- Re-vegetation plan to include all disturbed soils shall be seeded and covered with mulch

NOTE:

- Straw bales are not recommended for steep sloping site
- Silt fencing is recommended for bottom of steep sites
- Straw rolls/wattles are recommended for gently sloping site with lots of grading
- Erosion control blankets are recommended for steep slopes with gradients over 3”1.
- Land disturbance of one acre (43,560 SF) or more requires filing of a Notice of Intent (NOI) with the State.

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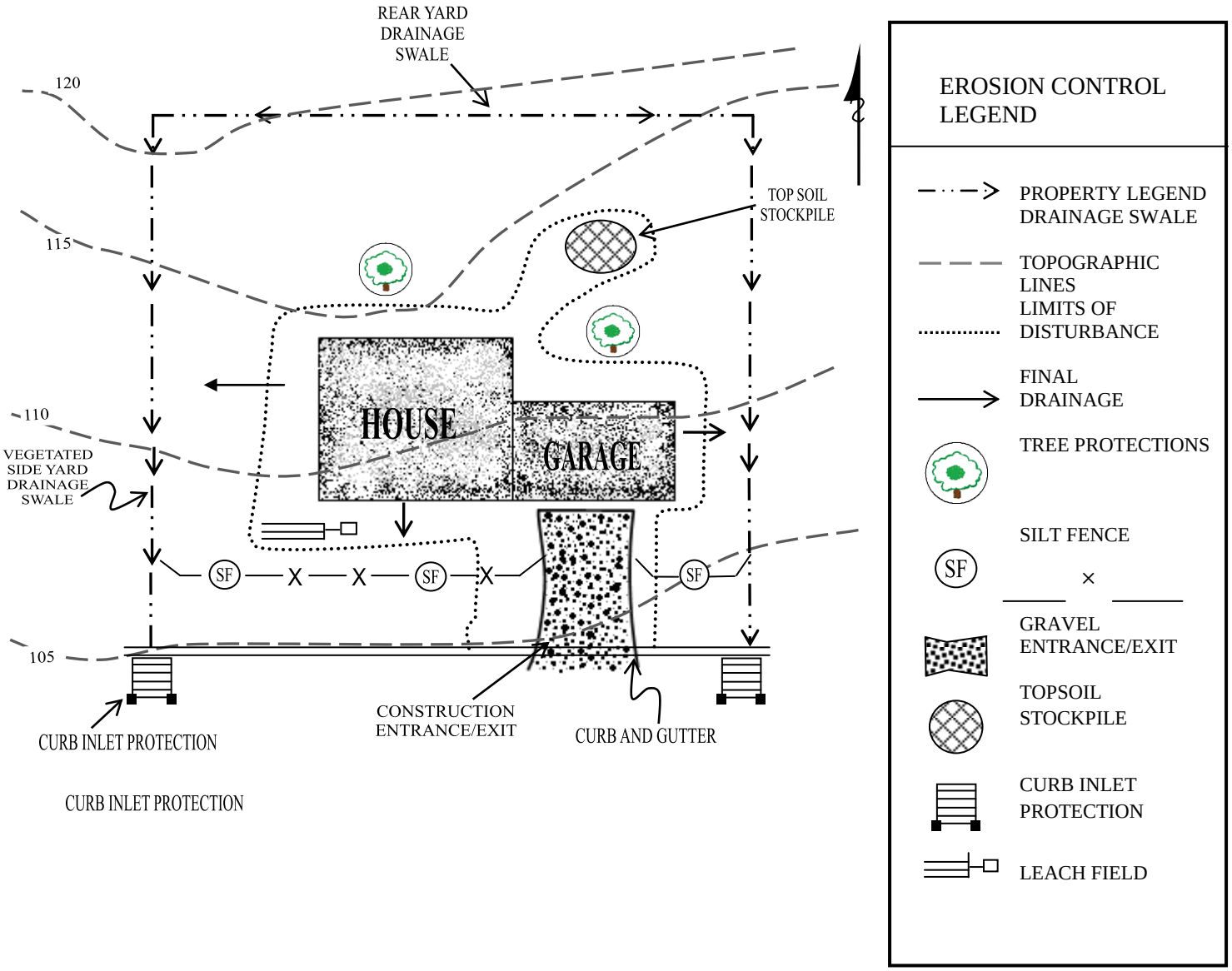
SAMPLE EROSION /SEDIMENT CONTROL PLAN FOR A SINGLE FAMILY RESIDENCE UNDER CONSTRUCTION



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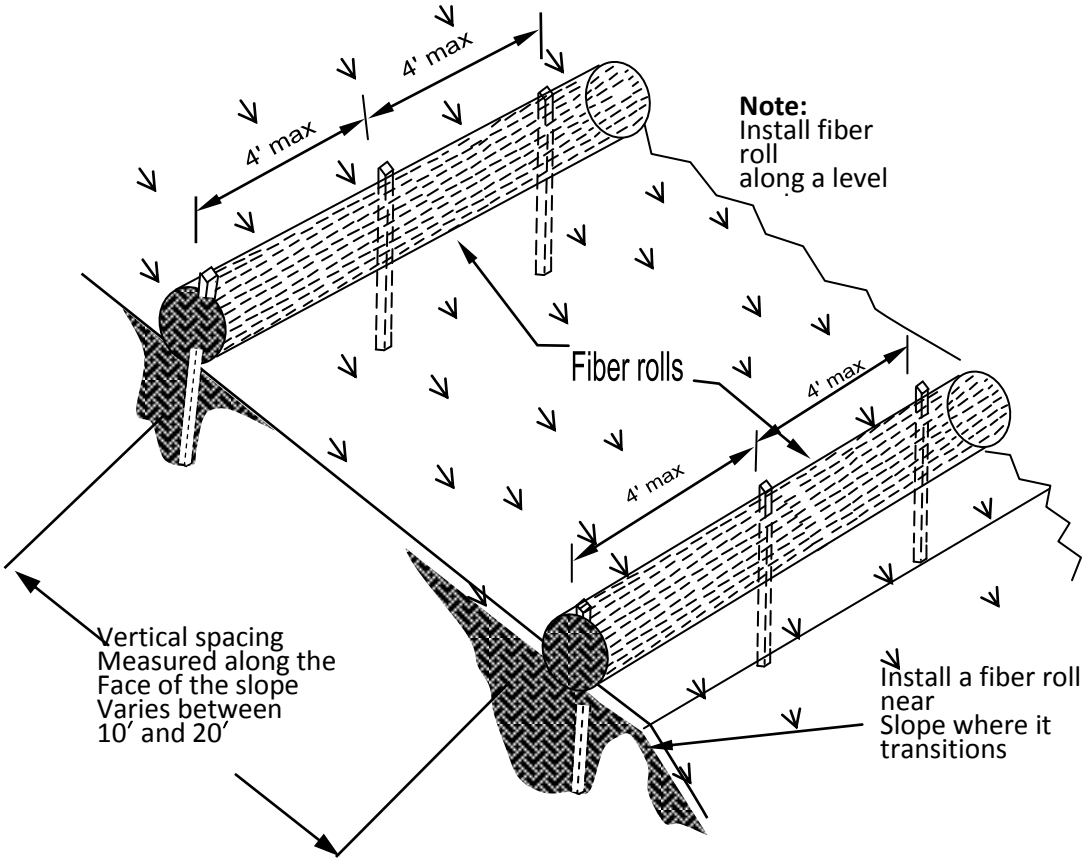
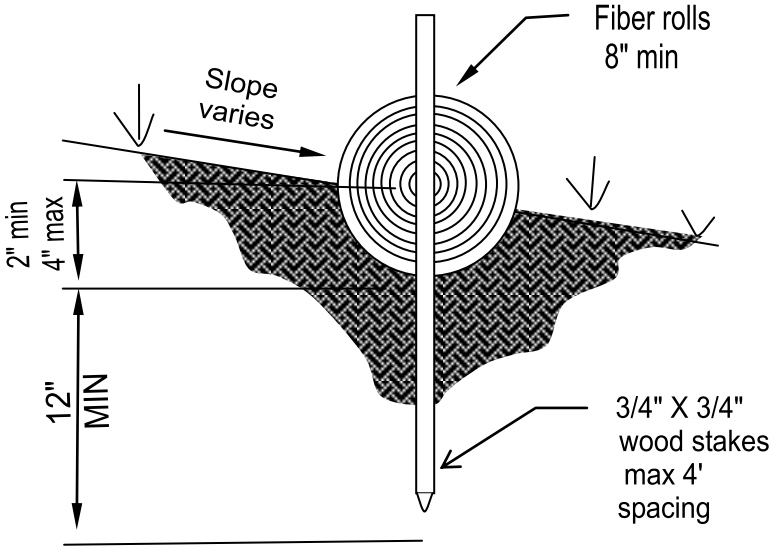


TYPICAL FIBERT ROLL INSTALLATION

N.T.S.



ENTRENCHMENT DETAIL

N.T.S.

California Storm water BMP Handbook
Construction
www.cabmphandbooks.com

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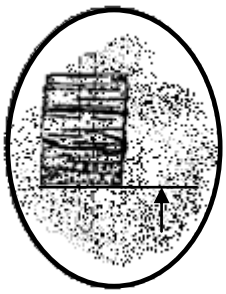
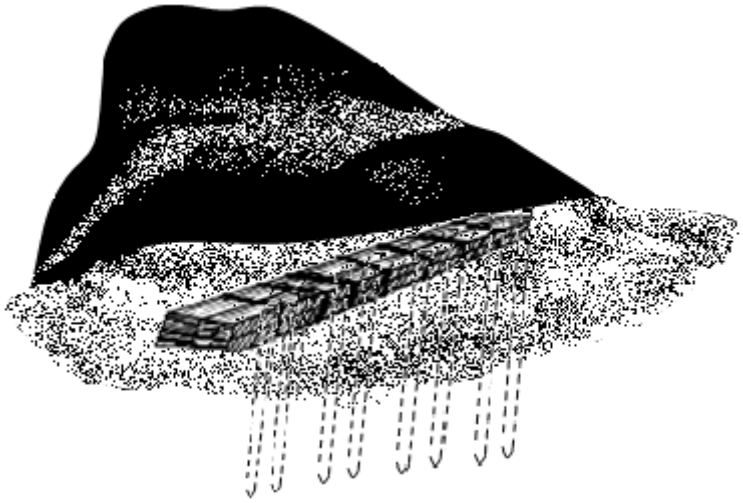
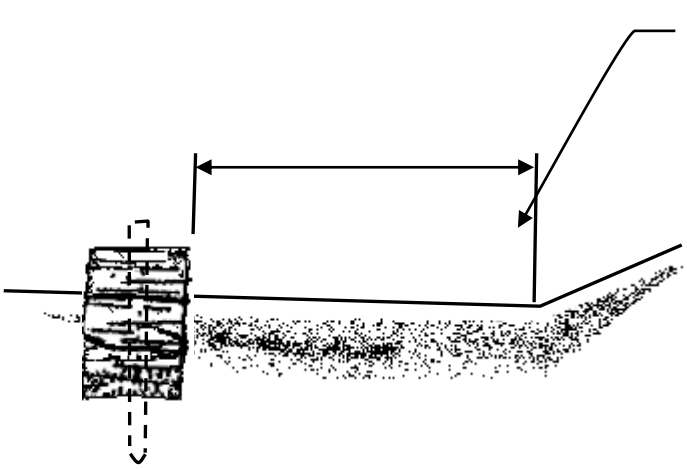




SOIL NOTE:
EMBED
STRAW BALE
4'' MIN. INTO



1

STRAW BALE DIKE

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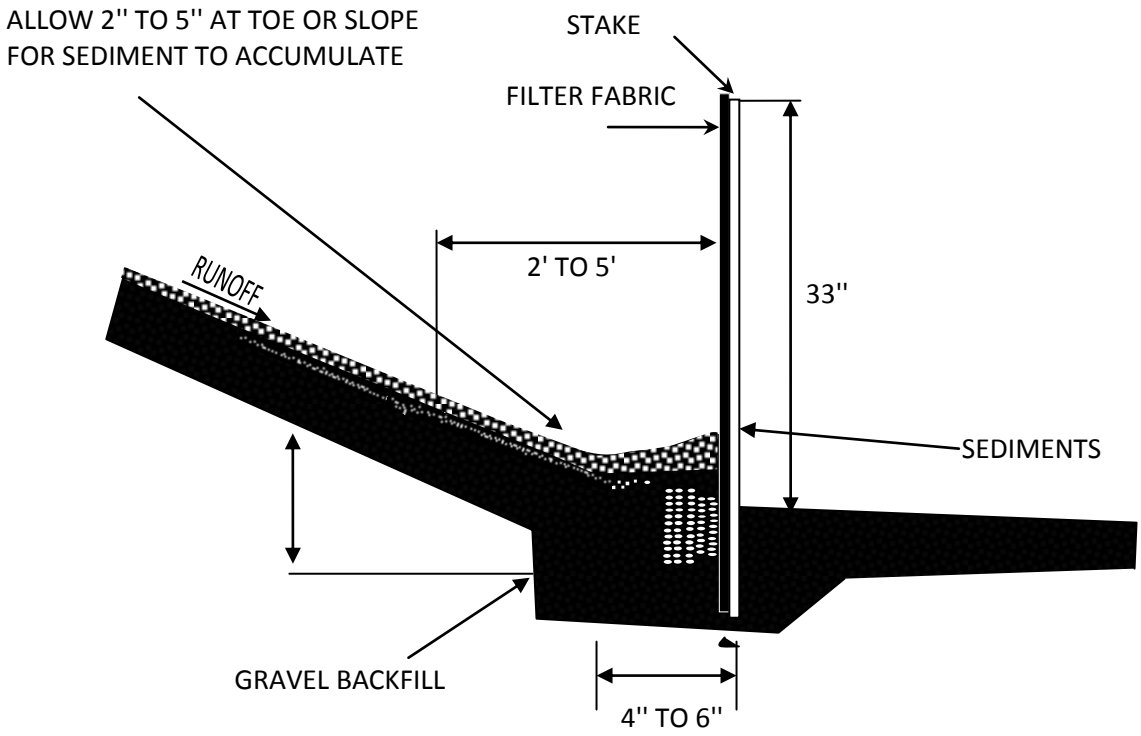
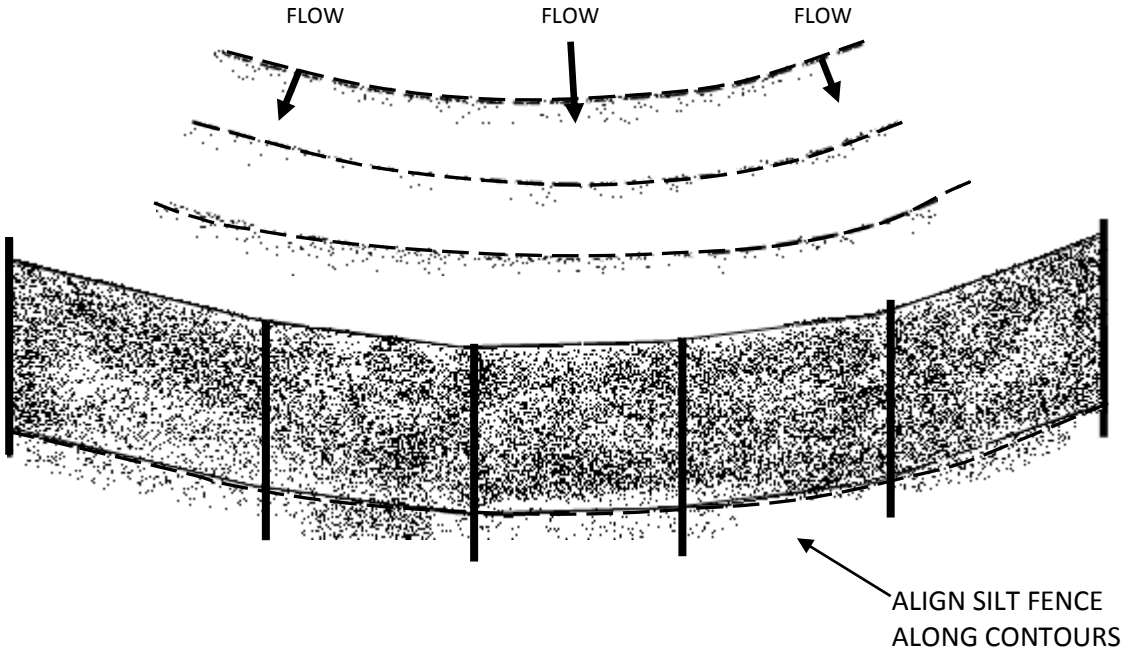


RECOMMENDED INSTALLATION OF SILT FENCE



NOTE: Erosion and sediment control measures must remain functional and be maintained throughout the winter season. Failure to adequately maintain erosion and sediment control measures constitute a violation of the issued building or other permit. Maintain positive drainage away from all structures. Seed and cover all disturbed soil with mulch.

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Seeding Mixtures for Temporary Cover
Foothill Areas Mix

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1)	Annual Rye	1 24
or		
2)	Briggs Barley	4 180

Mountainous Conifer Area

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1)	Cereal Rye	2 90
or		
2) Briggs Barley	4	180

Seeding Mixtures for Permanent Cover
Foothill Areas

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1) Zorro annual fescure	0.2	6
Rose clover *	0.2	9
Shallow soil w/south		
or		
west exposure		
or		
2) Blando brome	0.3	12
Rose clover*	0.2	9
(deeper soils or		
north exposure)		
3) Blando brome	0.3	12
Lana woollypod vetch*	0.4	45
(Deeper soils-		
Forage for grazing)		

Mountainous Conifer Zone

Mixture	Lbs/1000 Sq. Ft.	Lbs/Acre (Broadcast)
1) Luna pubescent wheatgrass	0.6	24
Palestine orchard grass	0.2	8
"Sherman" big bluegrass	0.2	6
"Durar" hard fescue	0.2	6

Legume seed must be inoculated with proper nitrogen fixing bacteria.

The application of mulch is necessary to reduce the impact of rainfall, help hold soil in place, and provide a moist soil surface for seed germination. The mulch should be applied in such a manner that 80-100% of the surface is covered to a depth of 1-2 inches. The most common mulch used is clean grain straw. It should be applied at the rate of 2 tons per acre. This rate is equivalent to:

Mulch	Bales/1000 Sq. Ft.	Bales/Acre
Straw	1	50
(3 wire-80 Pound Bales)		

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