Appendix S:

Updated SP 610 Water Supply Assessment

Update to the

SB 610 Water Supply Assessment

For the

Moody Flats Quarry Project

Shasta County, California

Prepared for:

Moody Flats Quarry, LLC
3M Industrial Mineral Products Division
3M Center
Building 0220-03-E-11
St. Paul, MN 55144-1000

Prepared by:

EMKO Environmental, Inc.
551 Lakecrest Drive
El Dorado Hills, California 95762

August 2012

SB 610 Water Supply Assessment
For the
Moody Flats Quarry Project
Shasta County, California

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Update to the
SB 610 Water Supply Assessment
For the
Moody Flats Quarry Project
Shasta County, California

1.0 INTRODUCTION

Moody Flats Quarry, LLC, a wholly-owned subsidiary of 3M Company (Applicant or Operator), is proposing to develop the Moody Flats Quarry Project (Project), a new hardrock quarry in Shasta County to provide aggregate construction materials to the region. In consideration of the proposed Project, the Shasta County Department of Resource Management – Planning Division (County) is conducting an environmental review under the requirements of the California Environmental Quality Act (CEQA). This report has been prepared to support the environmental review and provides an assessment of water supply adequacy for the proposed Project in accordance with the California Water Code (Water Code).

Water Code Sections 10910 through 10915 were amended by Senate Bill 610 (SB 610) in 2002. SB 610 requires that under specific circumstances, as detailed below, an assessment of available water supplies must be conducted. The purpose of the assessment is to determine if available water supplies are sufficient to serve the demand generated by the Project, as well as the reasonably foreseeable demand in the region over the next 20 years under average normal year, single dry year, and multiple dry year conditions. This report provides the information required for an SB 610 Water Supply Assessment, as described in the October 2003 *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001 to Assist Water Suppliers, Cities, and Counties in Integrating Water and Land Use Planning*, published by the California Department of Water Resources (DWR Guidebook).

This report has been prepared based on the following documents:

- American Water Works Association, Water Use Statistics, http://www.drinktap.org/consumerdnn/Home/WaterInformation/Conservation/WaterUseStatistics/tabid/85/Default.aspx, accessed September 23, 2011.
- Benchmark Resources, Moody Flats Quarry Project, Project Description, revised February 2011a.
- Benchmark Resources, Moody Flats Quarry Project, Reclamation Plan, revised February 2011b.
- Brown and Caldwell. *Field Investigation Report, Hydrology Analysis, 3M Redding Hard-Rock Aggregate Quarry, Shasta County, California.* June 2009.
- Brown and Caldwell. *Addendum, Field Investigation Report, Hydrology Analysis, 3M Redding Hard-Rock Aggregate Quarry, Shasta County, California.* January 2010.
- Brown and Caldwell. *Addendum 2, Field Investigation Report, Hydrology Analysis, 3M Redding Hard-Rock Aggregate Quarry, Shasta County, California.*

May 2011.

- CH2MHILL, Redding Basin Water Resources Management Plan Environmental Impact Report, January 2007.
- Central Valley Regional Water Quality Control Board (CVRWQCB), The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition – 1998, The Sacramento River Basin and The San Joaquin River Basin, 1998.
- City of Redding, 2005 Urban Water Management Plan, March 7, 2006.
- Crawford, Trevor and Andrew A. Kopania, Moody Flats Quarry Stormwater, Erosion Control, and Drainage Plan, Shasta County, California, May 2010.
- Crawford, Trevor and Andrew A. Kopania, Addendum to the Stormwater, Erosion Control, and Drainage Plan, Moody Flats Quarry, Shasta County, California, August 2012.
- Department of Water Resources, Vegetative Water Use in California, 1974, Bulletin 113-3, 1975.
- Department of Water Resources, Evaporation from Water Surfaces in California, Bulletin 73-79, 1979.
- Department of Water Resources, Crop Water Use in California, Bulletin 113-4, 1986.
- Department of Water Resources, California Data Exchange Center, www.cdec.water.ca.gov
- EMKO Environmental. *Hydrology and Water Quality Analysis of the Proposed 3M Moody Flats Quarry Quarry Use Permit and Reclamation Plan, Shasta County, California*. June 2009.
- EMKO Environmental. *Stormwater Evaluation, Proposed Moody Flats Quarry*. May 2010.
- EMKO Environmental. *Update to the Hydrology and Water Quality Analysis of the Proposed 3M Moody Flats Quarry Use Permit and Reclamation Plan, Shasta County, California*. August 2012.
- Lawrence and Associates. *Hydrogeological Conditions and Ground-Water Potential Within the Mt. Gate CWSD Boundary.* March 1992.
- Shasta County Development Standards, 1997.
- Shasta County Water Agency, Coordinated AB 3030 Groundwater Management Plan for the Redding Groundwater Basin, updated May 2007.
- Shasta County Water Agency, AB 3030 Report, June 2010.
- Shasta County Water Agency, AB 3030 Report, June 2011.

Shasta County has also partnered with Butte, Colusa, Glenn, Sutter, and Tehama Counties to develop an Integrated Regional Water Management Plan (IRWMP) for the northern Sacramento Valley. The IRWMP will be developed over the next two years (2011-2013) with grant funding from the California Department of Water Resources.

2.0 PROJECT DESCRIPTION

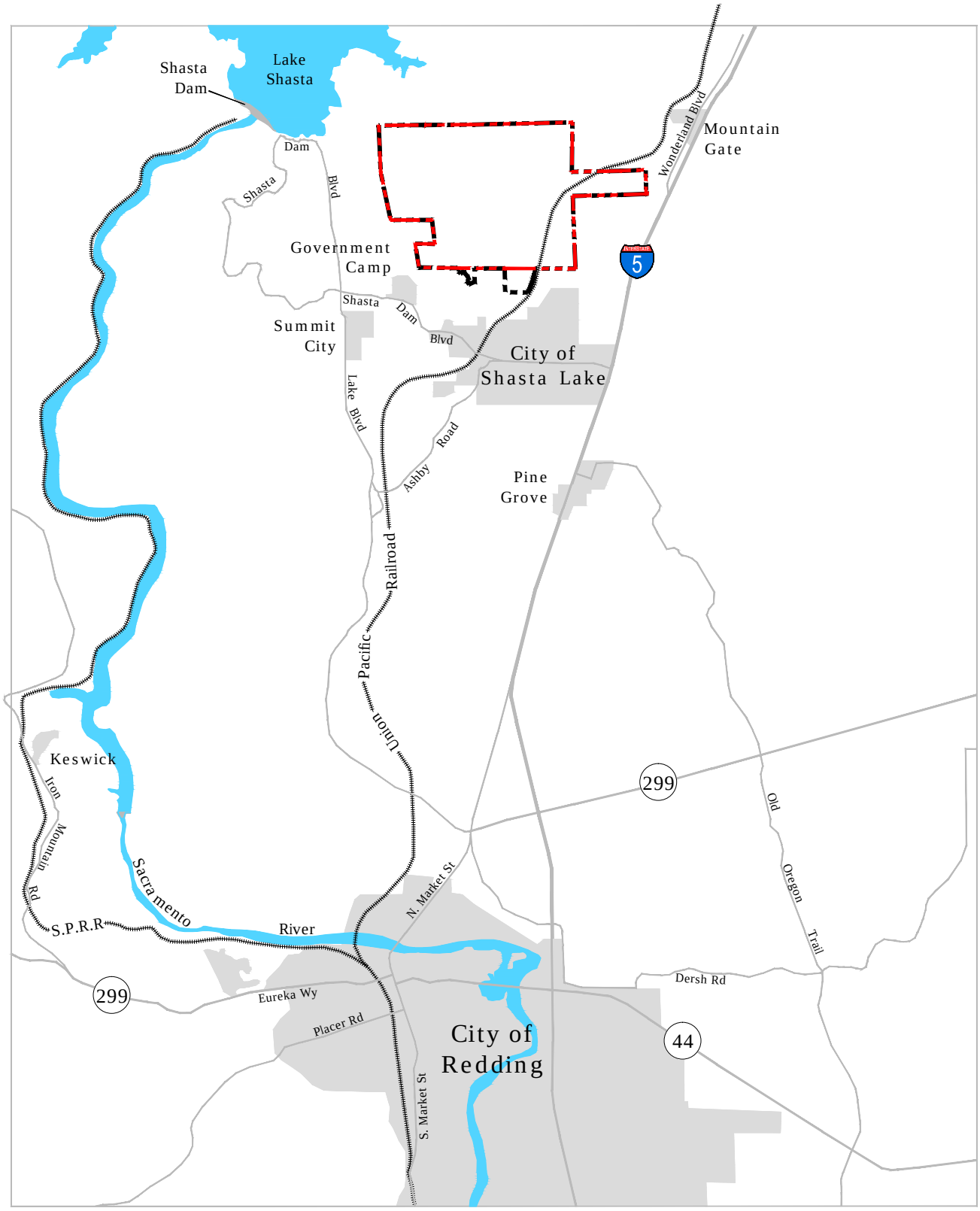
The information presented in this section is based on the Project Description (Benchmark Resources, 2011a) and Reclamation Plan (Benchmark Resources, 2011b) submitted with the Project Application. The Applicant proposes to develop a hardrock quarry, aggregate processing facility, ancillary aggregate product facilities and aggregate truck and railcar loadout facility in western Shasta County. The proposed Project location is shown on Figure 2.0-1, Site Location.

The Project site is located about 1 mile west of Interstate 5, north of the City of Shasta Lake, and 9 miles north of the City of Redding. The site includes parts of Sections 13, 24, and 25 of Township 33N, Range 5W; and Sections 18, 19, 20, and 30 of Township 33N, Range 4W of the Shasta Dam and Project City, California 7.5 U.S. Geological Survey topographic map.

The proposal includes recycling, ready-mix, and asphalt batch plants, which are ancillary uses to aggregate mining and processing. The Applicant owns approximately 1,900 acres of undeveloped land, of which approximately 430 acres will be developed for the Project. Mining will occur in two separate areas. The North pit will encompass approximately 220 acres and the South pit will encompass 65 acres. An overburden fill site will cover 60 acres, while the processing and load-out areas will require a total of 75 acres. Access and maintenance roads will cover 10 acres. The remaining 1,470 acres would act as a buffer between the mining and processing areas and surrounding land uses. The Project facilities are shown on Figure 2.0-2, Site Plan.

The maximum proposed annual aggregate production during the Project's 100-year life is 2 million tons per year. Total aggregate reserves for the Project are approximately 175 million tons. Actual production rates will vary, depending largely upon aggregate consumption demands in the local and regional markets. Although sales would not exceed 2 million tons per year, annual sales in some years could be substantially less than proposed maximum annual levels. It is also anticipated that the initial phase of operations will begin at approximately 500,000 tons per year and production capacity will be increased to 2 million tons per year over five to 15 years.

Water will be needed for the proposed Project for dust control in the quarry and the processing area, washing and processing the aggregate, and manufacturing of concrete. Water will also be lost to evaporation and percolation from settling and water retention ponds. As discussed in more detail below, water will be provided by a combination of collection and retention of storm water runoff and from groundwater wells located on property owned by the Applicant.



SOURCE: DeLorme TopoUSA 2.0

Property Ownership
Site Boundary

N

0 1 1/2 miles

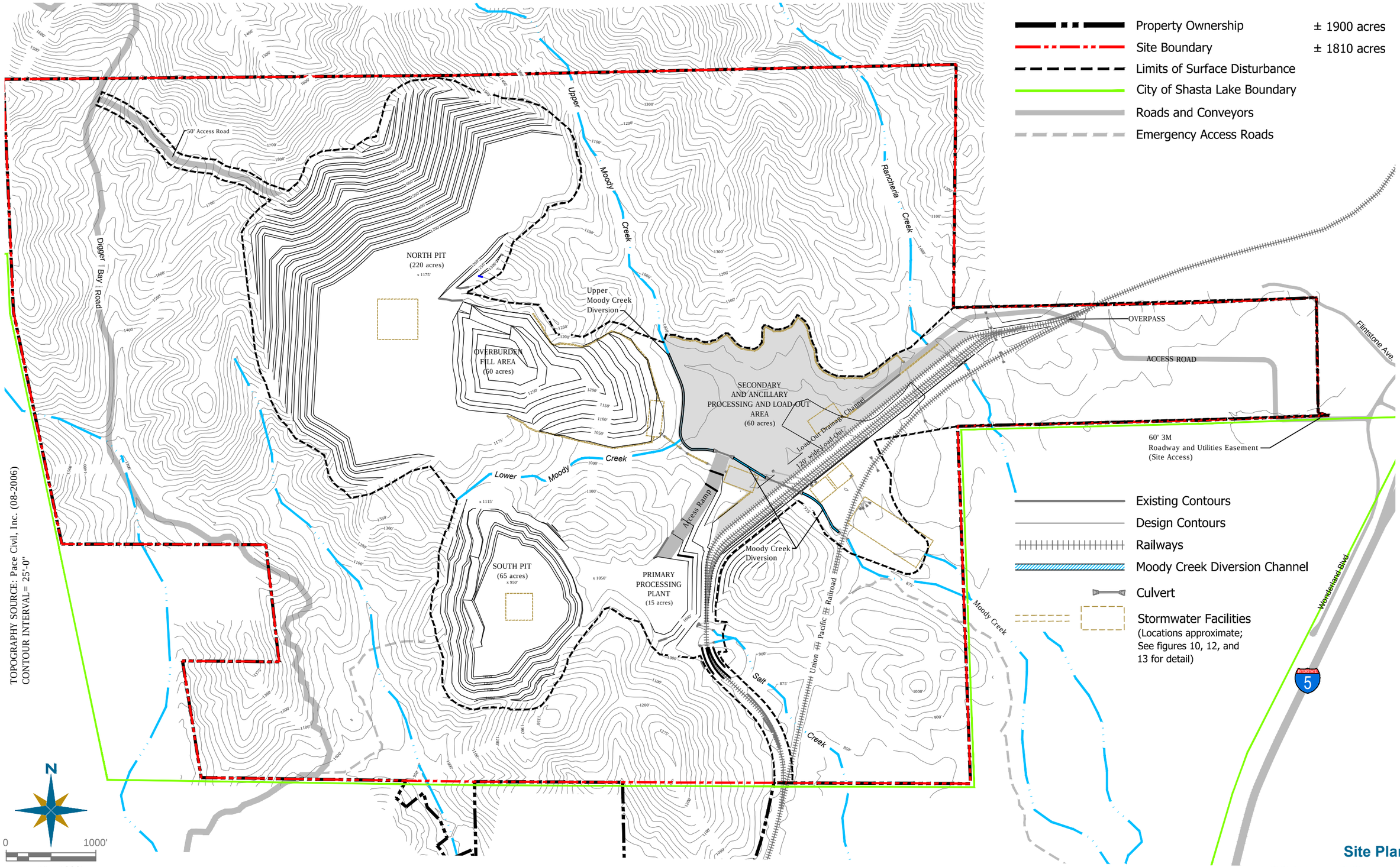
SCALE: 1" = 1 1/2 miles

BENCHMARK RESOURCES

Site Location

MOODY FLATS QUARRY

Figure 2.0-1



Site Plan

MOODY FLATS QUARRY

BENCHMARK RESOURCES

Figure 2.0-2

The following primary entitlements and discretionary actions are anticipated for the Project:

- A Conditional Use Permit to quarry identified aggregate resources, process those materials on-site (including asphalt and ready-mix concrete plants and a recycled construction materials plant), and stockpile and loadout processed aggregate via truck and rail.
- A Reclamation Plan designed in conformance with the California Surface Mining and Reclamation Act and applicable County General Plan and Zoning designations to provide for an open space use of the land post-mining;
- A General Plan amendment to change the existing General Plan designation of Suburban Residential or Rural Residential A on certain parcels to Mineral Resource; and
- A rezone of certain parcels from Interim Rural Residential or Community Commercial and Design Review District to Mineral Resource District.

The requested entitlements and discretionary actions require approvals by the County, triggering compliance with CEQA and the preparation of an EIR.

3.0 WATER SUPPLY PLANNING UNDER SB 610

SB 610, effective January 1, 2002, amends Sections 10910 through 10915 of the Water Code by requiring preparation of a Water Supply Assessment (WSA) for development projects subject to CEQA and other criteria, as discussed below. SB 610 also amends Section 10631 of the Water Code, which relates to Urban Water Management Plans (UWMPs). The WSA process under SB 610 is designed to rely on the information typically contained in UWMPs, where available. The first steps in the WSA process are to determine whether SB 610 applies to the proposed Project. If so, then documentation of available water supplies, anticipated Project demand, and the sufficiency of supplies must be conducted. These issues are summarized by the following questions, as outlined in the DWR Guidebook:

1. Is the proposed Project subject to CEQA?
2. Is the proposed Project a “Project” under SB 610?
3. Is there a public water system that will service the proposed Project?
4. Is there a current UWMP that accounts for the project demand?
5. Is groundwater a component of the supplies for the Project?
6. Are there sufficient supplies to serve the Project over the next twenty years?

Each of these issues are discussed in the following sections as they relate to the proposed Moody Flats Quarry Project

3.1 Is the Proposed Project Subject to CEQA?

The first step in the SB 610 process is to determine whether the proposed project is subject to CEQA. Water Code Section 10910(a) states that any city or county that determines that an application meets the definition of "project", per Water Code Section 10912 (see Section 3.2, below), and is subject to CEQA, shall prepare a water supply assessment for the project. CEQA applies to projects requiring issuance of a discretionary permit by a public agency, projects undertaken by a public agency, or projects funded by a public agency. The Moody Flats Quarry Project requires several discretionary permits including the issuance of a Conditional Use Permit, as described in Section 2.0, by Shasta County, a public agency. Therefore, the Project is subject to CEQA. As stated in Section 1.0, above, this SB 610 WSA has been prepared to support the environmental review being conducted by Shasta County under CEQA.

3.2 Is the Proposed Project a "Project" Under SB 610?

The second step in the SB 610 process is to determine if the proposed Project meets the definition of "project" under Water Code Section 10912(a). Under Section 10912(a) a "project" is defined as meeting any of the following criteria:

1. a proposed residential development of more than 500 dwelling units;
2. a proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space;
3. a proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space;
4. a proposed hotel or motel, or both, having more than 500 rooms;
5. a proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area;
6. a mixed-use project that includes one or more of the projects defined above; or
7. a project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

As discussed in Section 2.0, above, the Project includes two quarry pits that will eventually encompass 285 acres, a 60-acre overburden fill site, 75 acres for processing and loadout, and 10 acres of roads, for a total disturbance area of approximately 430 acres. The Project does not include any residential development, will not employ more than 1,000 persons, does not include any structures with more than 500,000 square feet of floor space, and does not include any hotel or motel structure.

The City of Redding 2005 Urban Water Management Plan provides details on residential water use in the Redding area of Shasta County. The average residential water use in the region is equivalent to 0.72 acre-feet (AF) of water per household per year. For a 500 dwelling unit project, the total water use would be 360 AF per year. As discussed in Section 5.0, below, the maximum anticipated water use for the Project is

260 AF per year. Thus, the anticipated water use for the Project is less than the amount of water required by a 500 dwelling unit project in the Redding area.

Based on the above discussion, the Moody Flats Quarry Project meets the definition of "project" under Water Code Section 10912(a) based solely on the Project acreage. Therefore, the remainder of this document presents the WSA for the Project based on the Water Code definition of "project" under SB 610.

3.3 Is There a Public Water System That Will Service the Proposed Project?

Section 10912(c) of the Water Code identifies a public water system as a system for the provision of piped water to the public for human consumption that has 3,000 or more service connections. The property is currently not served by a public water system. In addition, since this is an industrial Project, only a fraction of the Project's anticipated water use will be for human consumption. Therefore, the Applicant will develop and provide its own source of water, specifically to serve the Project. The Project water supply will not be a public water system and will not serve any users outside of the Project boundary. Accordingly, this WSA has been prepared to define and verify the Project water supply in accordance with statutory requirements.

3.4 Is There a Current Urban Water Management Plan That Accounts for the Project Demand?

The Water Code requires that all public water systems providing water for municipal purposes to more than 3,000 customers, or supplying more than 3,000 acre feet per year, must prepare an UWMP. Because the Project application is for a new use on the property, not previously identified in planning documents, there is not a current UWMP that accounts for the Project demand. The DWR Guidebook (page iii) states that SB 610 repeatedly refers to the UWMP as a planning document that can be used to meet the standards set forth in the statute, and that UWMPs act as a foundation to fulfill the requirements of the statute. Since the proposed Project area is not currently served by a public water system, and thus does not have an UWMP, this WSA is based upon all the available and relevant information, including literature, public documents, the technical studies and assessments conducted for the CEQA environmental analysis of the proposed Project, and other relevant documents, as cited in Section 1.0, above, and Section 8.0, below. Since this SB 610 WSA has been prepared for use by the CEQA lead agency, this document includes an evaluation of whether the total projected water supplies, determined to be available during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed Project, in addition to existing and planned future uses, including agricultural and manufacturing uses, in accordance with Water Code § 10910(c)(4).

3.5 Is Groundwater a Component of the Supplies for the Project?

Water Code Section 10910(f), paragraphs 1 through 5, must be addressed if groundwater is a source of supply for the proposed Project. As discussed in more detail below, the majority of the water supply for the Project will come from storm water

retained onsite but some fraction of the water may be supplied from groundwater (Benchmark Resources, 2011a). Water Code Section 10910(f), paragraphs 1 through 5 state that:

> (f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water assessment:
>
> > (1) A review of any information contained in urban water management plan relevant to the identified water supply for proposed project.
> >
> > (2) A description of any groundwater basin or basins from which the proposed project will be supplied. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.
> >
> > (3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.
> >
> > (4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.
> >
> > (5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.

Paragraph (1) requirements for review of information contained in an UWMP does not apply because there is no UWMP available.

Paragraph (2) requirements that a WSA provide a description of any groundwater basin or basins from which the proposed Project will be supplied are addressed in Section 4.2, below, including a description of the groundwater basin and groundwater conditions.

Paragraph (3) requirements that a WSA include a detailed description and analysis of the amount and location of groundwater pumped by the public water system do not apply because there is no public water system and the County does not pump any water in the Project vicinity. However, a discussion of groundwater pumping in the Project vicinity is included in Section 4.2, below.

To address paragraph (4), Sections 4.3 and 5.0, below, include a discussion of the amount and location of groundwater that is projected to be pumped by the Applicant for the proposed Project.

Analysis of the sufficiency of the groundwater from the basin or basins from which the proposed Project will be supplied to meet the projected water demand associated with the proposed Project as required pursuant to Paragraph (5) is provided in Sections 4.3, 5.0, and 6.0, below.

3.6 Are There Sufficient Supplies to Serve the Project Over the Next Twenty Years?

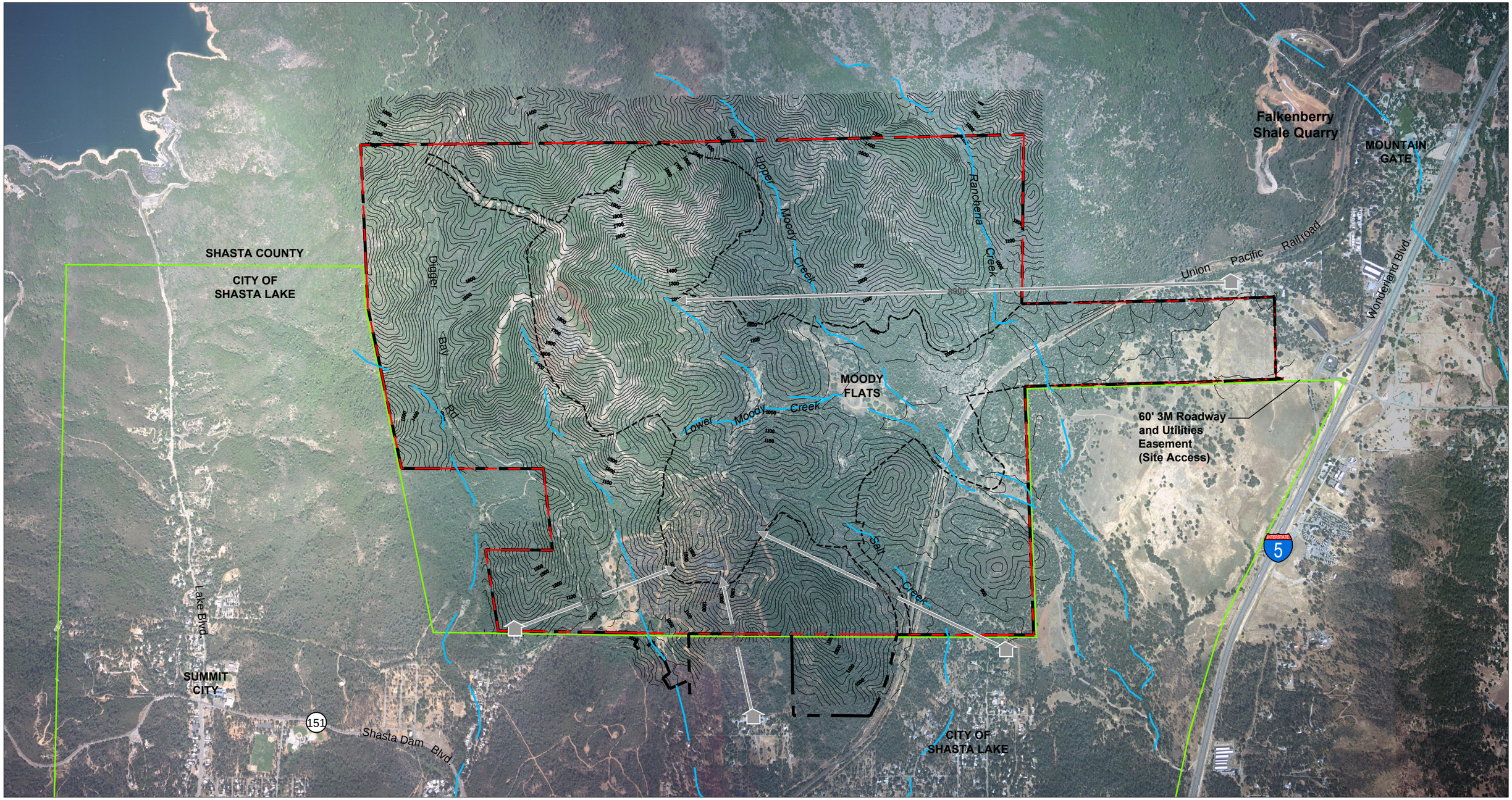
Water Code Section 10910(c)(4) requires the WSA to "*include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and future planned uses, including agricultural and manufacturing uses.*" The sufficiency of water supply for the proposed Project is addressed in Section 7.0, below.

4.0 PROPOSED PROJECT WATER SUPPLY

Water for the proposed Project will be developed onsite and supplied by the Applicant. Water will come primarily from storm water runoff that will be retained onsite and secondarily from groundwater from wells located or to be located on the Project site. Estimates of the amount of storm water runoff that can be captured and retained have been prepared as part of the documents submitted to the County as part of the application for the Project (Crawford and Kopania, 2010 and 2012). Since part of the supply will come from groundwater, information regarding the groundwater basin is also provided in this section, along with an estimate of the amount of groundwater that is available from existing wells and potential future wells on the Project site.

4.1 Storm Water Retention

Moody Flats Quarry is located on undeveloped land dominated by Montane Hardwood-Conifer and Montane Hardwood vegetative habitats. Moody Creek, Rancheria Creek, and Salt Creek transverse the center and eastern portions of the Project site (see Figure 4.1-1, Existing Conditions Aerial Photograph). The Project will not affect the Shasta Lake watershed in any way. The Moody Flats Quarry site is underlain by metamorphic bedrock. On the Project site, surface elevations range from about 900 feet above mean sea level (ft msl), to over 2,000 ft msl.



AERIAL PHOTOGRAPH SOURCE: Pace Civil, Inc. (08-2006)

N

0 1500'

SCALE: 1" = 1500'

BENCHMARK RESOURCES

LEGEND

Property Ownership	± 1900 acres	City of Shasta Lake Boundary	
Site Boundary	± 1810 acres	Residence	
Limits of Surface Disturbance	± 760 acres		

Existing Conditions Aerial Photograph

MOODY FLATS QUARRY

Figure 4.1-1

Areas of the Project site to be disturbed by the Project consist of exposed bedrock in the quarry pits and compacted bare soil or pavement in the processing areas and roadways, as shown on Figure 2.0-2. Overall, the Project is anticipated to decrease the amount of storm water runoff on the property. Currently, much of the precipitation is intercepted by vegetation or is stored in shallow soils, and then subsequently lost to evapotranspiration. Removal of the vegetation and soils, and creation of compacted or paved surfaces will increase the volume of storm water runoff within the quarry pits. The site-wide storm water management system, however, is designed to retain the additional runoff and will make it available for Project use. As described in Section 3.0 of the Addendum to the Stormwater, Erosion Control, and Drainage Plan (Crawford and Kopania, 2012), the stormwater control system will reduce the peak runoff from the Project area during a 25-year 24-hour storm from 633 cubic feet per second (cfs) to 213 cfs.

The precipitation for the Project site is based on rainfall data from the Shasta Dam and Mountain Gate areas, as depicted by Shasta County Water Agency (2007, Figure 4). Annual average rainfall is approximately 64 inches per year. The 25-year 24-hour storm event is approximately 9.03 inches. The 25-year six-hour storm event is approximately 4.6 inches. (Shasta County Development Standards, 1997, Chapter 2, Attachment Nos. 5 and 8).

Additional precipitation data is available from the California Data Exchange Center (www.cdec.water.ca.gov) for Shasta Dam. It is important to note that the average annual rainfall varies substantially across Shasta County and is highly dependent on elevation. For example, while the average annual rainfall at the Project site is 64 inches, in Redding the average annual rainfall is approximately 40 inches and south of Anderson the average annual rainfall is less than 25 inches per year (Shasta County Water Agency, 2007, Figure 4).

The property is within four watersheds, Shasta Lake, Moody Creek, Rancheria Creek and Salt Creek. Salt Creek is a tributary of Churn Creek. Moody Creek and Rancheria Creek are tributaries of Stillwater Creek. Both Churn Creek and Stillwater Creek join theSacramento River at Anderson, approximately eight miles south of Redding. Project disturbance will not occur in the Shasta Lake watershed.

Soils at the site are defined primarily as Auburn Loam (AnB and AnD) and Auburn Very Stony Clay Loam (AtE2), as defined by the NRCS soil survey maps. These soil types are classified as being part of Hydrologic Soil Group D on Attachment No. 2 in Chapter 2 of the Shasta County Development Standards (1997).

Crawford & Kopania (2010 and 2012) prepared detailed evaluations of stormwater runoff for the Project based on *Shasta County Development Standards, Chapter 2, Section F - Drainage* (reprinted December 1997), the California State Water Resources Control Board (SWRCB) *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Appendix D: Sediment Basin Sizing*, and the HydroCAD model utilizing SCS TR-20 Methodology.

The updated stormwater evaluations conducted by Crawford & Kopania (2012) identified, among other things, the basin sizes necessary to retain the runoff from a 25-year, 24-hour storm event. As noted above, such a storm has a rainfall total of 9.03 inches. Table 4.1-1, Stormwater Design Parameters, summarizes the parameters developed for each watershed at the site, including the weighted curve number (CN), runoff from the 25-year 24-hour storm (R-24), total runoff volume from the 25-year 24-hour storm (V-24), and the time of concentration (Tc). The data in Table 4.1-1 demonstrate that a stormwater retention basin with a capacity of at least 181 acre-feet (AF) will need to be constructed in the North pit area and a basin with a capacity of at least 78 AF will need to be constructed in the South pit area to retain the runoff from a 25-year, 24-hour storm event. The basin capacities, however, will be double the volume of the runoff from the 25-year 24-hour storm to provide for storage of runoff for Project use, as described in the Addendum to the Stormwater, Erosion Control, and Drainage Plan (Crawford and Kopania, 2012). The storm water control system for the Project is depicted on Figure 4.1-2, Storm Water Control and Facilities Flowchart.

Table 4.1-1
Storm Water Design Parameters

1. North Pit						
Area	**Soil Type**	**Weighted CN**	**P-24**	**R-24**	**V-24**	**Tc**
263 Acres	D	93	9.03	8.25	181 ac-ft	n/a
2. South Pit (Includes Primary Processing Area)						
Area	**Soil Type**	**Weighted CN**	**P-24**	**R-24**	**V-24**	**Tc**
113 Acres	D	93	9.03	8.25	78 ac-ft	n/a
3. Overburden Stockpile Area						
Area	**Soil Type**	**Weighted CN**	**P-24**	**R-24**	**V-24**	**Tc**
39 Acres	C/D	90	9.03	7.75	25 ac-ft	32.7 min
4. Northeast Load-Out and Plant Area						
Area	**Soil Type**	**Weighted CN**	**P-24**	**R-24**	**V-24**	**Tc**
59 Acres	D	89	9.03	7.7	38 ac-ft	15.6 min
Weighted CN Calculation						
Areas	**CN**	**Description**				
18 ac	93	Plant Areas				
5 ac	98	Roads				
19 ac	79	Undeveloped				
17 ac	93	Load-out Facility				

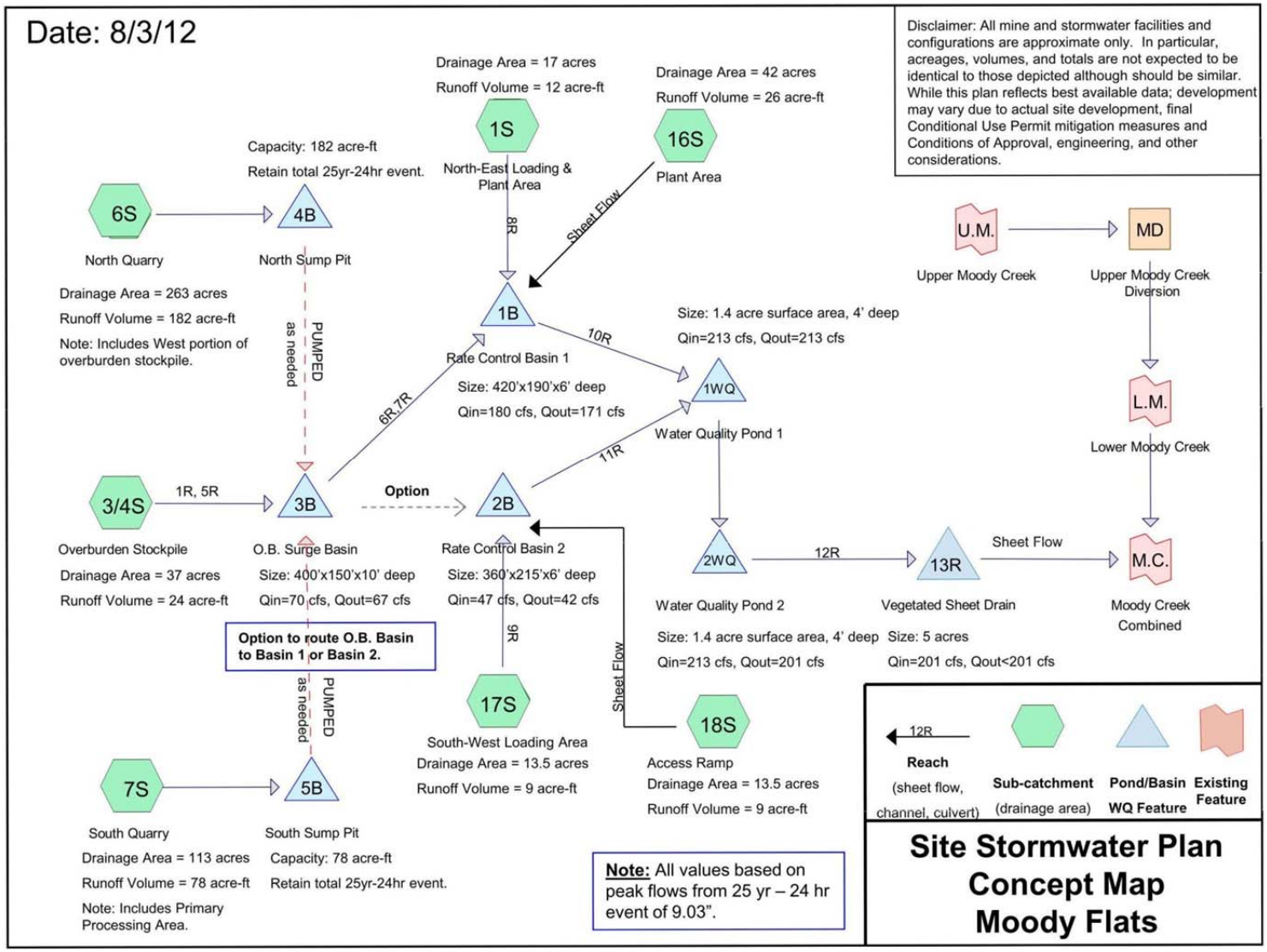
5. Southeast Load-Out						
Area	**Soil Type**	**Weighted CN**	**P-24**	**R-24**	**V-24**	**Tc**
27 Acres	D	86	9.03	7.25	17 ac-ft	26.2 min

Weighted CN Calculation		
Areas	**CN**	**Description**
13.5 ac	93	Load-out Facility/Access Ramp
13.5 ac	79	Undeveloped

Notes:
CN = Curve Number
P-24 = Total rainfall from 25-yr 24-hr storm
R-24 = Inches of rainfall that will runoff
V-24 = Volume of runoff from a 25-yr 24-hr storm
Tc = Time of Concern

Removal of vegetation and overburden throughout the disturbed area of the Project, exposure of bedrock in the quarry pits, and the creation of compacted and/or paved surfaces in the processing and load-out areas will create additional storm water runoff than that which currently occurs from the site. Due to the exposed bedrock in the quarries, and resulting high runoff curve numbers, it is expected that 40 percent or more of the annual rainfall in each quarry pit will become stormwater runoff, based on the HydroCAD modeling presented in the Addendum to the Stormwater, Erosion Control, and Drainage Plan (Crawford and Kopania, 2012). As shown in Table 4.1-1, the area of the North pit is about 263 acres and the area of the South pit is about 113 acres. At an average annual rainfall of 64 inches per year, the annual runoff from these two areas will be approximately 560 AF and 241 AF, respectively, which is more than enough to fill the stormwater retention basins each year. As discussed in Section 6.0, below, the driest winter ever recorded in the area occurred in 1976-1977, with 26.57 inches of rainfall recorded at Shasta Dam. Even under those conditions, the runoff from the two quarry areas will be approximately 224 AF and 96 AF, respectively.

The storm water retention basins developed for the Project (Crawford and Kopania, 2012) will be constructed to retain sufficient runoff for the Project, accounting for evaporative losses and seepage, while still maintaining adequate volume and freeboard to contain a 25-year, 24-hour storm event, in accordance with the design requirements of the RWQCB (www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/draft/draftconst_att_d_sed_basin.pdf).



SOURCE: HydroCAD Modeling Conducted by Trevor Crawford, 3M Facilities Engineering

Stormwater Control and Facilities Flowchart
MOODY FLATS QUARRY

BENCHMARK RESOURCES

Figure 4.1-2

4.2 Groundwater Basin

The Project site is located on metamorphic bedrock and is not part of an identified groundwater basin. The nearest significant groundwater basin is the Redding Basin, located south of the City of Redding near the town of Anderson (CH2MHILL 2007; Shasta County Water Agency, 2007), approximately 15 to 20 miles south of the Project site. The Mountain Gate Community Services District (Mountain Gate CSD) produces groundwater from two wells located in the Spring Branch Creek watershed, one mile to the north of the Project site.

The information discussed in this paragraph was developed by Lawrence and Associates (1992). The Mountain Gate CSD wells are approximately 200 feet to 300 feet deep and located within approximately 300 feet of each other. They are completed in a geologic bedrock unit called the Kennett Formation. The Kennett Formation is highly fractured, faulted, and sheared in the vicinity of the Mountain Gate CSD wells, providing the necessary porosity and permeability within the bedrock to allow both deep percolation of rainfall runoff and production of groundwater.

Lawrence and Associates (1992) indicate that during the five year period from the fall of 1986 through the summer of 1991, rainfall averaged 22 percent to 40 percent below normal, constituting an extended period of drought. During this five-year period, the Mountain Gate CSD wells produced an average of 350 acre-feet (AF) of water per year, which is equivalent to a combined pumping rate from the two wells of about 220 gallons per minute (gpm). Information on the production capacity of the wells during normal rainfall periods is not available, but Lawrence and Associates (1992) estimates that the rate of groundwater recharge during normal periods may be almost three times greater than the rate of groundwater recharge during the five-year drought period from 1986 to 1991.

4.3 Available Groundwater Supply

There are three main geologic units on the Project site, as shown on Figure 4.3-1, Geologic Map and Recommended Test Well Locations. The Bass Mountain Diabase and Copley Greenstone are both metamorphosed volcanic rocks that are classified as dense greenstone material. Both of these units will be mined for aggregate production as part of the Project. The Kennett Formation consists of metamorphosed sandstone, siltstone, and limestone units (Brown & Caldwell, 2010 and 2011).

Based on the information presented in Section 4.2, above, groundwater within the bedrock units in the region primarily occurs within the Kennett Formation in locations where significant fracturing, faulting, and shearing are observed and where there is a large upslope watershed to provide adequate recharge. A field investigation was conducted to evaluate whether such conditions exist at the Project site Brown & Caldwell, 2009, 2010, 2011). Based on analysis of aerial photographs and field mapping, a major shear zone was identified in the Kennett Formation along Moody Creek at the westernmost “Proposed Production Well” symbol shown on Figure 4.3-1 (Brown & Caldwell, 2010). In November 2009, water was observed flowing within the

creek in the area of the shear zone, but there was no flow in other segments of the creek on the Project site, indicating that groundwater is discharging to this segment of Moody Creek from the shear zone in the Kennett Formation (Brown & Caldwell, 2010).

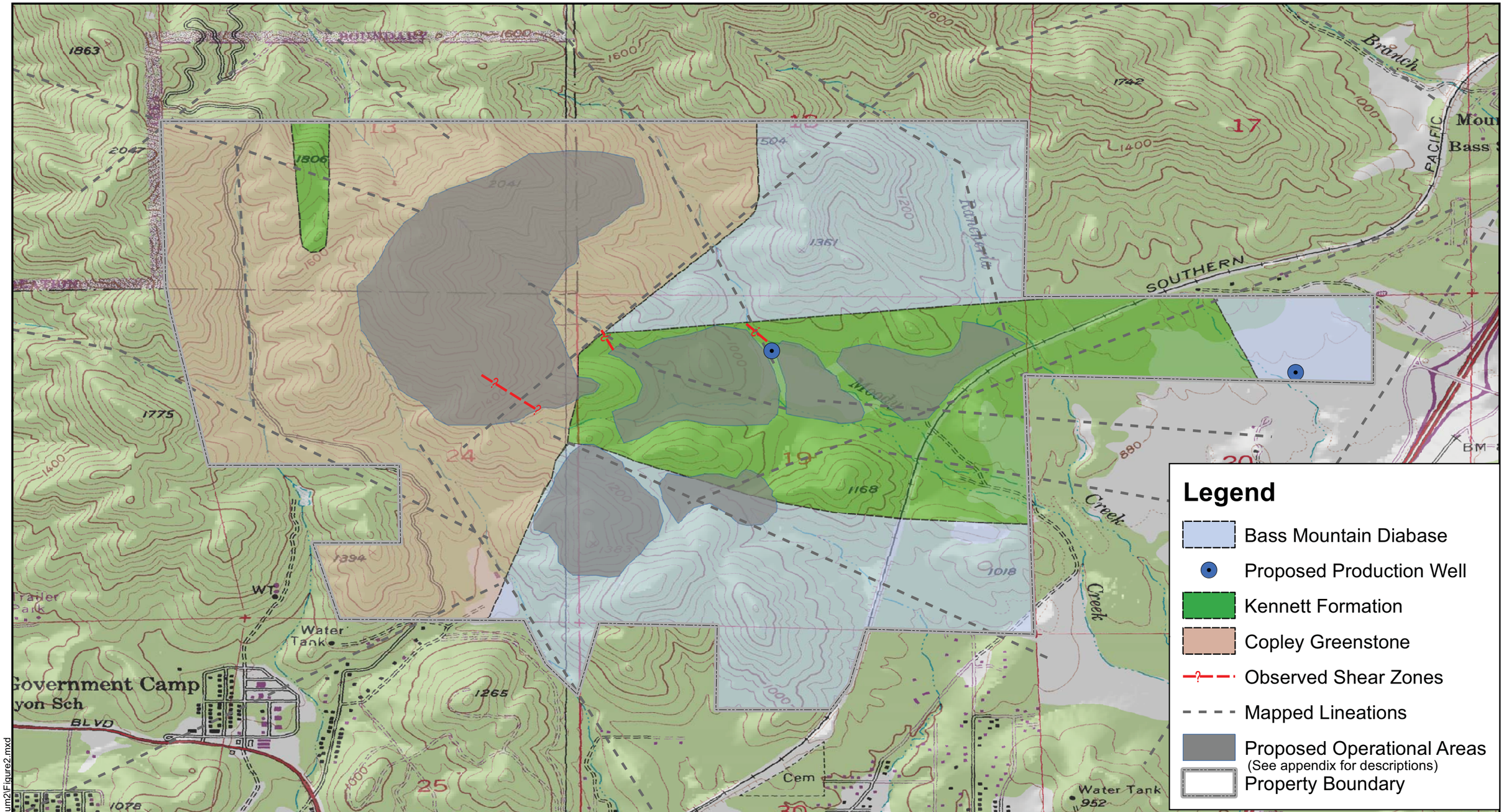
The mapping and field investigation indicate that the shear zone in the Kennett Formation along Moody Creek has the same characteristics as the Kennett Formation in the area of the Mountain Gate CSD wells in the Spring Branch Creek watershed to the north. Thus, the location of the Kennett Formation shear zone along Moody Creek is the target drilling location for future groundwater supply wells for the Project. The Kennett Formation along Moody Creek is geologically separated from that along Spring Branch Creek by a large outcrop of the Bass Mountain Diabase, as depicted on Figure 4.3-1. Therefore, the two areas of Kennett Formation (Moody Creek and Spring Branch Creek) are geologically separated and pumping from the Kennett Formation along Moody Creek will not affect wells in the same formation in the Spring Branch Creek watershed.

The Applicant is currently working with Union Pacific Railroad (UPRR) to obtain access across the UPRR mainline on the Project site. Access across the mainline is necessary for the Project overall, and not just for well-drilling purposes. Once access is obtained, the Applicant may drill one or more groundwater wells in the area of fractured and sheared Kennett Formation, as depicted on Figure 4.3-1.

Additional information provided by a local drilling contractor suggested that fractured zones in the Bass Mountain Diabase may also produce appreciable quantities of groundwater (Brown & Caldwell, 2011).

Based on that information, and the lack of access to the Kennett Formation shear zone, a test well, designated OW-1, was drilled in June 2011 in an area of mapped fractures in the Bass Mountain Diabase on the eastern part of the Project site (east of the UPRR mainline), at the location indicated on Figure 4.3-1. The borehole was drilled to a total depth of 405 feet below ground surface (ft bgs) and water production of seven gpm was measured. The borehole was cased with 2-inch diameter PVC to a total depth of 400 ft bgs, with a screened interval from 100 ft bgs to 400 ft bgs and a sanitary seal from the ground surface to 50 ft bgs, in accordance with state and county requirements. Most of the initial water production in the borehole prior to installing the well casing was occurring from the upper 50 feet. Thus, after the casing and sanitary seal were installed, the final production in the cased well decreased to two gpm. Two gpm is equivalent to 2,880 gallons per day.

According to the American Water Works Association (http://www.drinktap.org/consumerdnn/Home/WaterInformation/Conservation/WaterUseStatistics/tabid/85/Default.aspx), water use in a commercial setting (i.e. toilets and faucets using water-efficient fixtures) is approximately 20 gallons per worker per day. It is anticipated that between 25 and 50 people will be employed by the Project (Benchmark Resources, 2011a).



Scale: 1:18,000 Or 1 inch = 1,500 feet

0 750 1,500 3,000 4,500 6,000 Feet

N

Note:
Base map adapted from USGS 1:24000 Scale Topographic Map.

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SITE
Proposed 3M Quarry
Moody Creek, CA

GEOLOGIC MAP AND RECOMMENDED TEST WELL LOCATIONS

BROWN AND CALDWELL

FIGURE 4.3-1

Therefore, the anticipated potable water demand is anticipated to be between 500 gallons per day and 1,000 gallons per day. With the use of a storage tank, the production rate measured in test well OW-1 will be sufficient to supply the potable water needs of the office and restrooms. Test well OW-1 may be fitted with the appropriate pumps and equipment to convert it to a production well, or a new production well or wells may be drilled in the future.

Based on the number of employees anticipated for the site, the potable water system will need to be permitted as a non-transient non-community public water system with the California Department of Public Health. To meet water-quality criteria, the potable water system may require water treatment, as described in Sections 6.0 and 7.0 of the Update to the Hydrology and Water Quality Analysis (EMKO Environmental, 2012).

5.0 PROJECT WATER DEMAND

Water use for the proposed Project has previously been estimated (EMKO Environmental, 2009) at 260 AF/yr. This estimate was based on a comparison of water use at other hard-rock quarries in California. To confirm this estimate, a more detailed summary of water usage is presented below.

The proposed Project will require water for various components of the operation. In the processing operations, water consumption occurs by water retained in the product after washing, water used to manufacture concrete, water used for processing recycled material, water used for truck washing (aggregate, concrete, and asphalt trucks), misters on conveyor belts to control dust, and evaporation from the retention basins. In addition to these water uses in the processing area, water will also be used for dust control in the quarry and on the haul roads. Water will also be required for onsite employees.

Table 5.0-1, Estimated Net Water Use provides the estimated water usage for each of these items. The total volume of water used in the processing of aggregate for the Project each year is estimated to be 206 AF. An additional 48 AF will be used annually for dust control in the quarry and on the haul roads. Thus, the total estimated water use at full production is approximately 254 AF/yr. This detailed estimate of water usage agrees very well with the initial estimate of 260 AF/yr.

Table 5.0-1
Estimated Net Water Use

Dust Control in Quarry (1)	
5,000	gal water truck
10	times/day
50000	gal/day dust control
315	days/year
15,750,000	gal/year
7.48	gal/cu ft
2,105,615	cu ft/year
43,560	cu ft/ AF
48	Annual Dust Control Water Use, in AF

Dust Control in Processing Area (2)	
5,000	gal water truck
4	times/day
20000	gal/day plant misters
40000	gal/day dust control
315	days/year
12,600,000	gal/year
7.48	gal/cu ft
1,684,492	cu ft/year
43,560	cu ft/ AF
39	Annual Dust Control Water Use, in AF

Product	
2,000,000	ton/year washed product
0.05	weight-fraction water
100,000	tons water/year in washed product
2000	pounds/ton
62.4	pounds/cu ft water
43,560	cu ft/AF
74	Annual Water Content of Product, in AF

Concrete	
280,000	ton/year aggregate for concrete
1.6	tons aggregate/cu yd concrete
32	gal water/cu yd concrete
5,600,000	gal water/year in concrete
7.48	gal/cu ft water
43,560	cu ft/AF
17	Annual Water Used for Concrete, in AF

Evaporative Loss	
871,200	sq ft area of water recycling pond
46.2	inches of lake evaporation/year
12	inches/foot
3,354,120	cu ft of evaporation from recycling pond
43,560	cu ft/AF
77	Annual Evaporative Loss, in AF

Total Net Annual Water Usage	
206	AF for Processing Area
48	AF for Quarry Dust Control

Notes:
(1) = Includes dust control for active mining area and haul roads.
(2) = Includes dust control for conveyor belts, aggregate wash plant, asphalt plant, concrete batch plant, recycling plant and truck washing.

As discussed in Section 2.0, the Project will initially operate at a rate of approximately 500,000 tons per year. Production will be increased to full capacity over five to 15 years. As discussed in Section 4.1, storm water retention basins with the capacity to retain not only the runoff from a design storm event but also sufficient quantity to supply the Project water demand will be constructed in the North and South pits. Additional storm water retention and settling basins will also be constructed on the Project site. The average annual runoff from the North and South pit areas alone will be over 800 AF/yr. Thus, retention of storm water runoff from the Project site will be more than sufficient to operate the Project. The updated storm water system design (Crawford and Kopania, 2012) provides the retention capacity necessary for the Project.

Potable water for the office area will be provided by a groundwater well, either by converting existing well OW-1 to a production well, or installing one or more new wells. The two gallons per minute production of well OW-1 is sufficient to supply the needs of both office and bathroom uses on the site. If the Applicant drills additional supply wells in the future, as discussed in Section 4.3, then these wells will provide additional capacity. Any new wells drilled may provide either primary or reserve water-supply capacity. Although not needed to supply the Project with adequate water, based on production by Mountain Gate CSD in the Spring Branch Creek watershed to the north, the Kennett Formation at the Project site alone has the potential to provide sufficient groundwater to supply the entire Project demand. Thus, the Applicant may potentially have two available sources of supply, both with independent anticipated capacity sufficient to supply all the Project's water-supply needs.

6.0 DRY YEAR SUPPLY

To evaluate the amount and sustainability of dry-year water supply for the Project, rainfall data and nearby groundwater production were evaluated. The nearest publicly-available rainfall gauge is located at Shasta Dam, approximately three miles from the Project site. Rainfall data at Shasta Dam have been recorded since October 1943 and

are available from the California Data Exchange Center (www.cdec.water.ca.gov, stations SHO and SHA).

The annual rainfall recorded at Shasta Dam since 1943 is shown on Figure 6.0-1, Water-Year Rainfall at Shasta Dam. All rainfall data presented in this document are for a water year, not a calendar year. A water year begins on October 1 and extends to September 30 of the next calendar year. This time period better-represents the seasonal rainfall patterns in California than does a calendar year. Figure 6.0-1 also shows the average annual water-year rainfall at Shasta Dam, which is 61.9 inches. The average annual rainfall at Shasta Dam (61.9 inches) is slightly less than the average annual rainfall at the Project site (64 inches) due primarily to slightly higher elevations at the Project site in comparison to Shasta Dam.

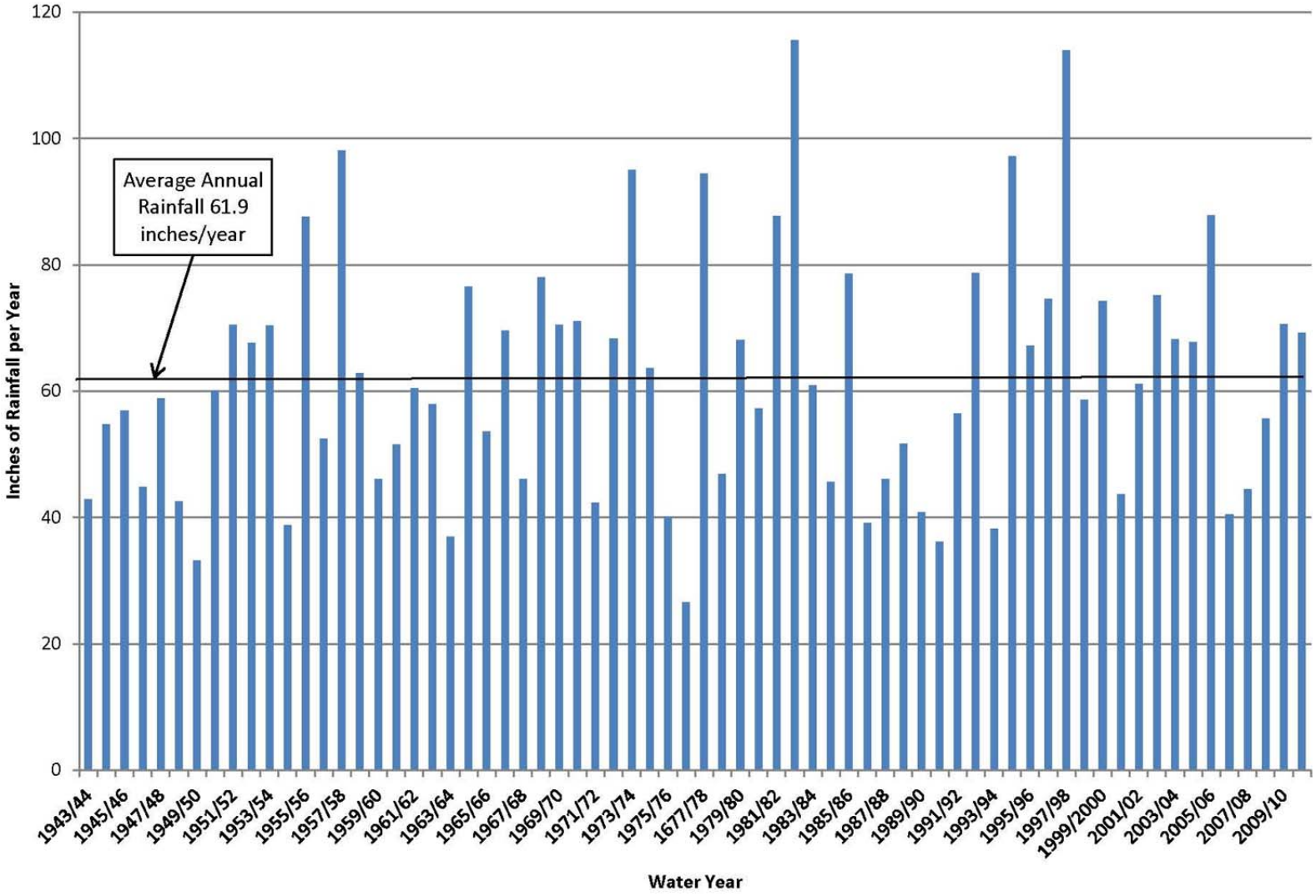
Table 6.0-1, Dry Year Comparisons, shows the total, average annual, and percent of normal rainfall for various dry periods between 1943 and 2010. The single driest water year during that time was 1976-1977, with only 43 percent of normal rainfall. It should be noted that during 1976-1977, 26.57 inches of rain were recorded at Shasta Dam. In many other parts of California, including part of Shasta County south of Anderson, that rainfall total would constitute a wetter-than-normal year. Thus, although 26.57 inches of rainfall is below normal for the site, it is still more than sufficient to generate appreciable runoff.

Table 6.0-1
Dry Year Comparisons

	Driest Single Year	Driest Two-Year Period	Driest Three-Year Period	Driest Multi-Year Period	Longest Period Below Average
Water Years	1976-1977	1975-1977	1988-1991	1986-1992	1943-1951
Duration	1 year	2 years	3 years	6 years	8 years
Rainfall	26.57	66.69	128.76	270.43	394.05
Annual Average	26.57	33.35	42.92	45.07	49.26
Percent of Normal	43%	54%	69%	73%	80%

The driest two-year period recorded at Shasta Dam was from 1975 to 1977, with 54 percent of normal rainfall. The driest three-year period occurred from 1988 to 1991, with 69 percent of normal rainfall. The driest continuous period of successive years of below normal rainfall occurred during the six years from 1986 to 1992, with 73 percent of normal rainfall on average during that period. The longest period of below normal rainfall occurred over eight years from 1943 to 1951, with 80 percent of normal rainfall on average during that period.

Figure 6.0-1. Water-Year Rainfall at Shasta Dam



As discussed in Section 4.1, the primary non-potable water supply for the proposed Project will come from storm water runoff retained onsite.

Under average conditions, it is estimated that over 800 AF/yr of runoff will occur from the North and South pit areas, combined, and additional runoff will be generated from the overburden storage area, and the processing and loadout areas. During dry periods, the runoff may be reduced to as low as 320 AF/yr from the North and South pit areas. The amount of water available from runoff during two-year, three-year, and multiple dry year conditions lasting more than three years, may range from 400 AF/yr to 600 AF/yr.

As discussed in Section 5.0, the net water demand for the proposed Project is 260 AF/yr at full production, but will initially be approximately 65 AF/yr and increase over five to 15 years as the rate of aggregate production is increased. There is more than adequate storm water runoff from the Project site, and capacity within the storm water retention basins, to provide the necessary water for the Project under normal and dry-year conditions.

As discussed in Section 4.3, potable supply for the Project (i.e. for the office and restrooms) will be supplied by a well or wells onsite. Additional groundwater wells may also be drilled onsite to provide greater operational flexibility, once access across the UPRR mainline is obtained. Any additional wells will be drilled in the area of the fractured and sheared Kennett Formation, as shown on Figure 4.3-1. Based on comparable geologic and hydrologic conditions in the Spring Branch Creek watershed, one mile to the north, there is a reasonable potential that groundwater production of at least 300 AF/yr during drought periods can be established on the Project site. If the Applicant or Operator decides to pursue this option in the future, then they will be required to obtain the appropriate permits for the drilling and completion of groundwater supply wells.

7.0 FINDINGS

This SB610 WSA has been prepared to support the CEQA environmental review and provides an assessment of water supply adequacy for the proposed Project in accordance with Water Code Sections 10910 through 10915, as amended in 2002.

Water for the proposed Project will be provided primarily by retention of storm water runoff. Potable supply will be provided by a groundwater supply well. Additional groundwater wells may be drilled in the future but retention of storm water runoff will provide an adequate supply for the Project. The potable water system will need to be permitted as a non-transient non-community public water system by the California Department of Public Health. Total Project demand will initially be approximately 65 AF/yr and is estimated to increase to 260 AF/yr over five to 15 years. In normal years, at least 800 AF of storm water runoff is available from the North and South pit areas, with additional runoff occurring from the overburden storage, processing, and load-out areas. Runoff from the North and South pit areas could be reduced to as low as 320 AF/yr in a single dry year, and to as low as 400 AF/yr to 600 AF/yr on average during

multiple dry year periods. Even during these dry conditions, there will be more than adequate storm water runoff captured from the North and South pits alone to operate the Project.

There are currently no existing water users or Projects for which applications have been submitted that may potentially use storm water runoff or groundwater from the Moody Creek watershed.

Therefore, there is more than adequate water available to supply the proposed Project throughout its life, without interfering with existing or future surface water or groundwater uses. The Project water supplies are sufficient to serve the demand generated by the Project, as well as the reasonably foreseeable demand in the region over the full life of the Project under average normal year, single dry year, and multiple dry year conditions.

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