APPENDIX H

MINE AND RECLAMATION PLAN FOR ROBERTSON'S

UPPER SANTA ANA RIVER WASH
LAND MANAGEMENT AND
HABITAT CONSERVATION PLAN

MINE AND RECLAMATION PLAN
FOR THE
UPPER SANTA ANA RIVER WASH AGGREGATE LANDS
TO BE OPERATED BY
ROBERTSON'S READY MIX

PLUNGE CREEK QUARRY
SILT POND QUARRY
EAST QUARRY SOUTH

Submitted To:

CITY OF HIGHLAND
26985 Base Line Street
Highland, California 92346

CITY OF REDLANDS
35 Cajon Street, Suite 30
Redlands, California 92373

Prepared For:

ROBERTSON'S READY MIX
200 South Main Street
Corona, California 92882

Prepared By:

LILBURN CORPORATION
1905 Business Center Drive
San Bernardino, California 92408

Updated March 2006

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLES

FIGURES

SHEETS

APPENDICES

SANTA ANA RIVER WASH AGGREGATE LANDS
ROBERTSON'S READY MIX
MINE AND RECLAMATION PLANS

INTRODUCTION

This Mine and Reclamation Plan is unique in that it originated from the Upper Santa Ana River Wash Land Management and Habitat Conservation Plan (Wash Plan) overlying two municipal jurisdictions. Within the Wash Plan, lands have been designated for aggregate extraction and processing. Portions of these aggregate lands have been mined for over 80 years and permitted mining operations are ongoing today. Mining will be allowed to continue in existing approved mine areas and expand into adjacent undisturbed areas as part of the overall Wash Plan to balance land uses and habitat conservation.

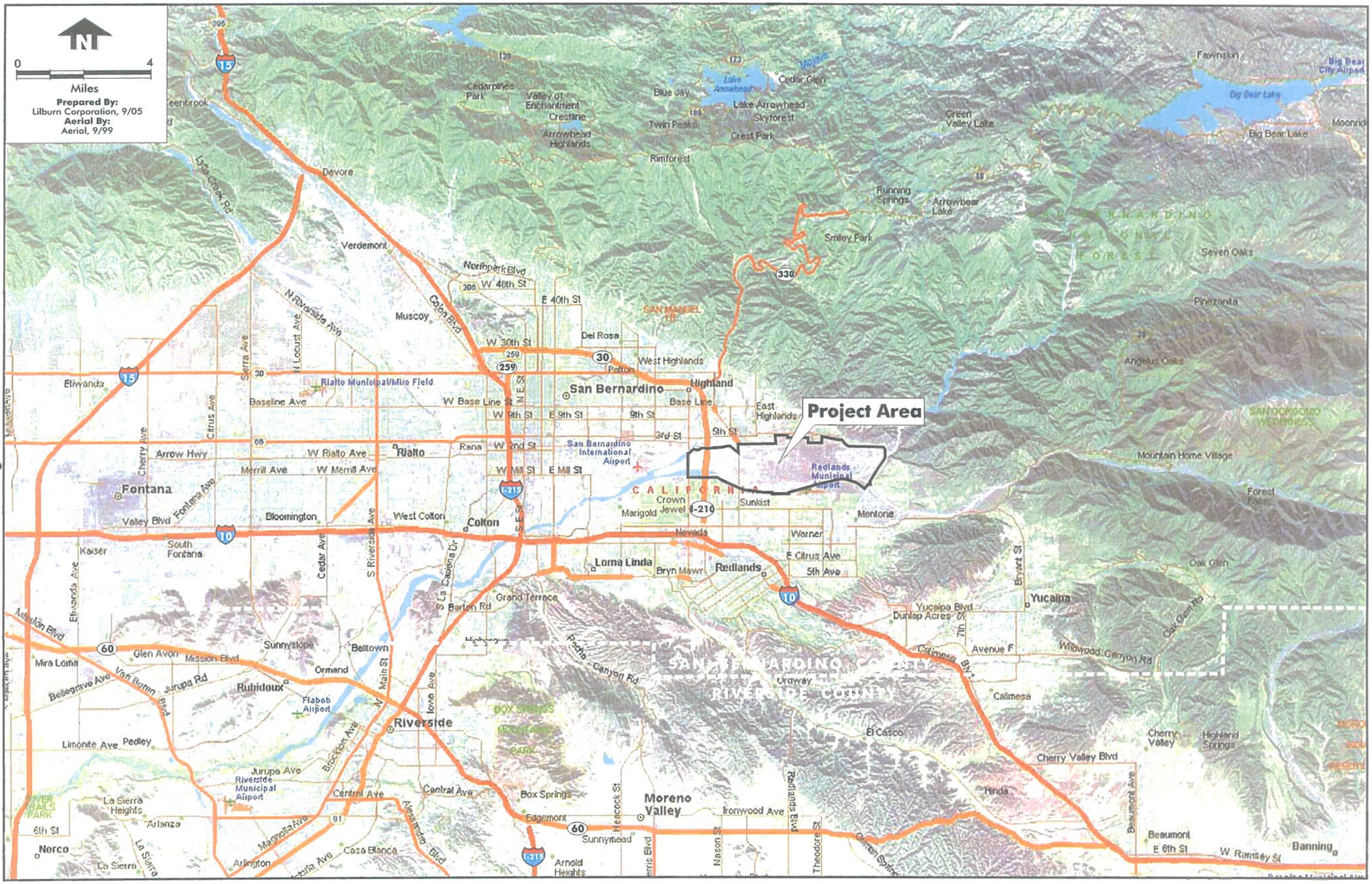
Robertson's Ready Mix (RRM) and Cemex Construction Materials L.P. (Cemex) currently mine portions of the aggregate lands. These two companies have divided the remaining aggregate lands into quarries based on property ownership, lease agreements with the San Bernardino Valley Water Conservation District (SBVWCD), and logistics related to current quarries and processing plants. The SBVWCD and RRM are the underlying property owners of much of the aggregate lands within the Wash Plan.

RRM is submitting this Mine and Reclamation Plan (M/R Plan) for their 482-acre portion of the overall Santa Ana Wash Mine area to be operated and reclaimed by RRM. This M/R Plan has been prepared to be consistent with the Wash Plan and in accordance with the City of Highland Surface Mining and Land Reclamation Regulations (Section 16.36, City of Highland Municipal Code), the City of Redlands' Surface Mining and Reclamation Act (SMARA) ordinance (Chapter 18.266, Redlands Municipal Code) and the California Department of Conservation Surface Mining and Reclamation Act of 1975, Public Resources Code 2770.

Section 1 of this M/R Plan discusses the past and planned mining on each of the three mining areas to be operated by RRM within both the City of Highland and the City of Redlands. RRM's three mining areas include the Plunge Creek Quarry, the Silt Pond Quarry and the East Quarry South to be described in the following report. Section 2 discusses the reclamation, revegetation, and end uses for the three sites. This report will be submitted to both cities for their review and approval. RRM will include an index sheet, five mine sheets or plot plans with cross-sections, and one reclamation sheet. The reclamation sheet will include the entire aggregate lands to be mined and reclaimed including those areas to be reclaimed by Cemex in order to view the reclamation and end use in its entirety.

Land Management and Habitat Conservation Plan

The area of land between the mouth of the Santa Ana River Canyon, down stream of the Seven Oaks Dam, and Interstate 215 on the west, and bounded by the cities of Highland and Redlands to the north and south, is known as the Upper Santa Ana River Wash. A part of that Wash, containing approximately 4,375 acres, from the canyon mouth at Greenspot Road and 6 miles west to Alabama Street (see Figure 1), is known as the Wash Planning Area (WPA).



Legend

SAW Land Management & Habitat Conservation Areas (Wash Plan)

Prepared By: LILBURN CORPORATION

Regional Location Map

Robertson's Santa Ana Wash Mine Areas
Cities of Highland and Redlands, California

Figure 1

Historically, the Wash was a natural flood plain and alluvial fan that provided a place to convey frequently devastating floodwaters and deposit sediment. The alluvial deposit provides excellent geologic conditions to establish settling basins for percolating surface water to the groundwater basin, providing a significant part of the water supply for the local region. These same geologic conditions provide regionally significant deposits of aggregate (or sand and gravel) as classified by the California Department of Conservation that are used to support the local economy. In recent years, the value of the Wash as habitat for a variety of sensitive, threatened, and endangered species has become more apparent due to the decrease in this type of habitat throughout Southern California. Because the Wash is a unique open space and corridor, the County of San Bernardino (County) and the cities of Highland and Redlands are also planning to establish a series of recreational trails in and around the Wash. These important functions within the Wash, water conservation, aggregate extraction and processing, flood control, and wildlife habitat, are often in direct competition for much of the same land. It has been apparent since the early 1980s that a Land Management Plan for the future use of the Wash was necessary in order to maintain other needed public services (water supply facilities, transportation and utility corridors, and recreation/trails), to provide areas for the extraction of valuable construction materials, and to preserve declining sensitive habitats.

In 1993, representatives of numerous agencies, including water, mining, flood control, wildlife and municipal interests, formed a Wash Committee to address local mining issues and other land functions in the Wash. A Policy Action Committee (PAC) was established consisting of elected officials from the County, cities of Highland and Redlands, and the SBVWCD, and the Field Manager from the U.S. Bureau of Land Management (BLM). A Technical Advisory Committee (TAC) was formed with representatives of the PAC agencies and other water, mining, flood control, and wildlife interests.

A general consensus of the TAC was reached and the respective city councils and Boards also endorsed the conceptual land use plan within the WPA, which is the basis of the Land Management and Habitat Conservation Plan (Wash Plan). As expected, the proposed land use designations cross land ownership (three public and two private) and land use authority boundaries (two cities and the County). The TAC determined that mining expansion is best addressed by consolidating the future mining activity into one large area adjacent to existing mining operations within Sections 9, 10, and 11 in the western half of the WPA. This focuses extraction activities on lands currently disturbed by mining and lands with the least long-term wildlife habitat value. Furthermore, the TAC determined that portions of the BLM land designated as Areas of Critical Environmental Concern (ACEC) were either previously disturbed or were fragmented by adjacent mining activities, and thus would be better suited for mining expansion. Preserved habitat areas are located in larger connected areas with intact natural habitat and availability of future fluvial flows. The water conservation activities would passively utilize some habitat areas, continue in areas historically utilized, and be able to use completed mine sites.

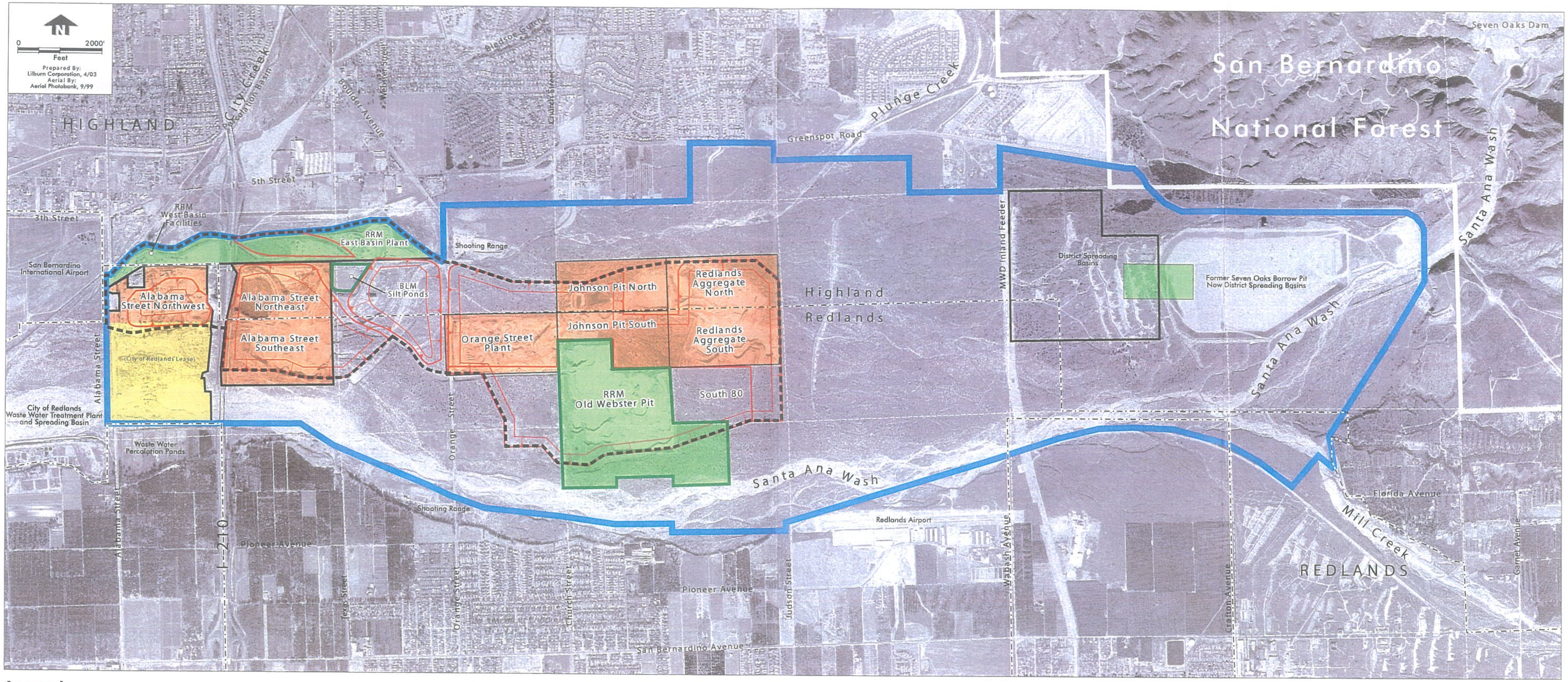
The Wash Plan will coordinate and accommodate existing ongoing and anticipated future activities planned to occur in the WPA, establish habitat preserve areas, and provide recreational trail alignments. Each function will occupy designated specific areas within the WPA best suited for that function and will also accommodate the other competing uses for the overall benefit of the WPA. These existing and future activities include the following:

- Water conservation of both native and (when necessary) imported water resources for groundwater basin replenishment to augment and protect public water supplies;
- Flood control, and management of the Seven Oaks Dam releases;
- Aggregate extraction and processing;
- Protection and conservation of sensitive and listed native species and habitat;
- Recreation planning including a portion of the Santa Ana River trail system; and
- Utilities, transportation, and water supply corridors and facilities.

To facilitate approval of the Wash Plan, the SBVWCD and the BLM are acting as state and federal lead agencies, respectively, for the preparation of a combined Environmental Impact Report/Environmental Impact Statement (EIR/EIS). This document will comply with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). The EIR/EIS will assess potential environmental impacts from all activities within the WPA including the continuation and expansion of aggregate mining and processing and recommend appropriate mitigation.

Aggregate Need in Region

The availability of aggregate for concrete, asphalt and other building materials to construct new buildings, homes, and infrastructure at a competitive price is a key element of the local economy. The WPA has extensive natural sand and gravel resources for highway and building construction necessary to support the expanding economy of the Inland Empire. In 1987, the State of California Department of Conservation, Division of Mines and Geology (CDMG Special Report 143, 1987) identified the high quantity and quality of aggregate resources in the WPA as one of the best aggregate deposits in the State. It was also noted that adjacent regions in Orange, Los Angeles, and Riverside counties had lesser reserves and would likely need to import aggregates from the San Bernardino Valley to meet their local needs, adding to the extended regional importance of aggregate resources in the Inland Empire. It is State policy that when a designation of statewide or regional significance is made within its jurisdiction, a local community shall establish mineral resources management policies to be incorporated in general plans to assist in management of land use, and emphasize the conservation and development of those identified mineral deposits (SMARA Note 26, Article 4, Revised 1/97). In other words, it is State policy to protect the availability of those resources needed to support economic development in the region. Currently, aggregate materials in the WPA are near the expanding markets of the Inland Empire, which reduces the transportation cost of the raw aggregate and end products of ready-mix concrete and asphalt, which affects construction costs. The need to provide areas within the WPA for the availability of aggregate reserves is vital to the local and regional economy.



Legend

- SAW Land Management & Habitat Conservation Areas (Wash Plan)
- Aggregate Lands within Wash Plan
- CEMEX/Robertson's Planned Quarries
- CEMEX Permitted
- CEMEX Vested (claimed)
- Robertson's Permitted
- Robertson's Owned

Existing Quarries

Robertson's Santa Ana Wash Mine Areas
Cities of Highland and Redlands, California

Figure 2

Prepared By
LILBURN CORPORATION

Mining Background

RRM's existing and proposed Wash operations are located in southwestern San Bernardino County within the wash area of the Santa Ana River (see Figure 2). RRM currently owns approximately 254 acres within the aggregate lands and leases approximately 240 acres of District lands within the WPA, but outside the aggregate lands (Cone Camp lease). RRM holds approved land use permits on approximately 284 acres. Table 1 lists the names of the various sites and their status. RRM operates aggregate processing facilities at the East Basin Processing Plant and concrete batch plant at the West Basin Facilities Excavations are currently being conducted in the permitted 215-acre Old Webster Quarry and a 14-acre BLM parcel in Section 10 is being used for silt ponds. The total area owned by RRM (274 acres), currently leased (240 acres), and under permit with the San Bernardino County Flood Control District (SBCFCD) (16 acres) and BLM (14 acres) in the WPA is approximately 544 acres.

The designated aggregate lands are situated in the both the jurisdictions of the City of Highland and the City of Redlands, whose common east-to-west boundary bisects the operations areas. The aggregate lands are also generally bisected north to south by Orange Street and to the west by State Route 30 (SR-30), recently designated as Interstate 210 (I-210). The total gross aggregate lands equal approximately 1,205 acres split between Cemex and RRM per prior agreement based on existing land ownership and lease holdings. Note that within the gross aggregate lands are right-of–ways for the existing SR-30 Freeway, Orange Street, and flood control easements.

Table 1 also lists the existing and planned mining areas by operator and city jurisdiction. The former names of the newly named quarries are provided for reference. Figure 3 shows the three planned quarries to be operated by RRM. These are named the Plunge Creek Quarry (east of SR-30), the Silt Pond Quarry (east of SR-30 and west of Orange Street), and the East Quarry (east of Orange Street). The East Quarry is further divided into the East Quarry North to be operated by Cemex and the East Quarry South to be operated by RRM.

Approximately 431 acres in the northern portion of the operational area are located within the City of Highland. Of this total, 257 acres are part of the Cemex operations and 174 acres are part of RRM operations. Approximately 774 acres are within the City of Redlands with 443 acres part of the Cemex operations and 321 acres part of RRM operations.

Table 2 lists RRM's existing and planned mines and processing facilities with estimates acreages for the existing and planned (new) mines, jurisdiction, and whether the area is disturbed or undisturbed.

Those quarry areas to be operated by RRM, the Plunge Creek Quarry, the Silt Pond Quarry and the East Quarry South, totaling 174 acres within the City of Highland and 331 acres within the City of Redlands are the subject of this Mine and Reclamation Plan and are defined as the 505-acre project site.

Table 1
Aggregate Operations And Lands Within The Wash Planning Area

New Site Name (former designation)	Area (acres)	Land Owner (acres)	Jurisdiction	Permit Status	Active/ Inactive
Cemex					
Alabama Street Quarry (Alabama St. NW)	68	Redlands (65) Cemex (3)	Redlands (68)	55 acres Permitted	55 acres - Active
West Quarry (Alabama St. NE, Alabama St. SE, and former BLM)	206	SBVWCD (206)	Highland (70) Redlands (136)	146 acres Permitted	59 ac -Active 58 acres - previously mined
East Quarry North (Orange St., Johnson Pit North /South, Redlands Aggregate North/South, and former BLM)	426	SBVWCD (426)	Highland (187) Redlands (239)	375 acres Permitted	315 acres - Active
Total Cemex Project Area	**700**	**Redlands (65) SBVWCD (632) Cemex (3)**	**Highland (257) Redlands (443)**	**576 acres Permitted**	**429 acres - Active**
Robertson's Ready Mix					
Plunge Creek Quarry (Island)	45	RRM (45 acres)	Highland (45)	Not Permitted	Inactive
Silt Pond Quarry (Former BLM)	102	SBVWCD (102 acres)	Highland (59.7) Redlands (30)	Former BLM	Inactive - Previously mined/graded
East Quarry South (Old Webster Quarry)	289	RRM (164) SBVWCD (105) SBCFCD (20)	Redlands (289)	215 acres Permitted	140 acres - Active
West /East Basin Facilities	55	RRM (52) SBCFCD (3)	Highland (55 acres)	52 acres Permitted	52 acres – Active
Silt Pond	14	BLM	Highland (14)	14 acres Permitted	14 acres – Active
Total RRM Project Area	**505**	**RRM (261) SBVWCD (221) SBCFCD (23)**	**Highland (174) Redlands (331)**	**281 ac - Permitted**	**206 acres – Active**

Sources: Cemex, SBVWCD, RRM, Lilburn Corp., LSA - 2006
Note that BLM lands are assumed to become SBVWCD lands as part of the project.
Areas are subject to revisions.

Table 2
Robertson's Ready Mix
Existing and Planned Mines and Processing Sites

Site	Existing Area	Planned Area	City	Disturbed	Undisturbed	Pit Area	Misc. Uses
East Quarry South							
Old Webster Quarry	215	152	R	152	0	152	
Old Webster Quarry West (west of Sec. 11)	New	70	R	20	50	70	
Old Webster Quarry East (Sec. 11 east)	New	67	R	0	67	67	
East Quarry South Subtotal	215	289	R	172	117	289	
Silt Pond Quarry	New	102	H – 60 R – 42	90	12	90	Roads, setbacks - 12 acres
Plunge Creek Quarry	New	45	H	28	17	34	Roads, setbacks - 11 acres
Mine Sites Totals	**215**	**436**	**H – 105** **R - 331**	**290**	**146**	**413**	
Facilities							
West Basin	17	17	H-17	17	0	0	Process plants, roads
East Basin	38	38	H-38	38	0	0	Process plants, roads
Silt Pond	14	14	H-14	14	0	0	Silt ponds
Facilities Totals	**69**	**69**	**H-69**	**69**	**0**	**0**	**Facilities**
RRM Mines and Facilities Totals	**283**	**505**	**H – 174** **R – 331**	**359**	**146**	**413**	**92**

Sources: Robertson's SBVWCD, Lilburn Corporation, LSA - January 2006
H – City of Highland
R – City of Redlands

RRM owns approximately 261 acres, the SBVWCD owns approximately 221 acres, and the SBCFCD owns about 23 acres of the areas to be mined by RRM. RRM leases 192 acres per a long-term lease agreement with the SBVWCD. This lease will be modified and extended to affect changes in lease areas per the land exchange with the BLM.

RRM and its predecessors have conducted aggregate excavations in the project area since the 1960s. Mining, aggregate process plants, silt ponds, grading, flood control activities, past lumber milling, and access/haul roads have disturbed approximately 359 of the 505 acres of the project site.

The M/R Plan proposes mining and reclamation in the Santa Ana Wash Mine to take place within the aggregate lands consistent with the overall Wash Plan. In addition, the mining depth of 120 feet and new slopes of 2H:1V are consistent with the Wash Plan and the SBVWCD lease requirements. The exception is the Silt Pond Quarry, which is planned to 150 feet in depth with 1H:1V slopes on the north, west, and south with 2H:1V on the east along Orange Street. Mining will remove and reclaim varied slopes, mine to final reclamation contours and slopes as depicted on the Mine and

Reclamation Plan sheets, and implement concurrent and final reclamation and revegetation. This proposed M/R Plan was prepared with the following objectives:

- Provide additional aggregate reserves within the framework of the Wash Plan;
- Provide reclamation and revegetation to impacted mining sites to reduce visual, biological, safety, and hydrological impacts;
- Reclaim the site for an end use compatible with the needs of the land owners, RRM, the SBVWCD, and the SBCFCD and the city with jurisdiction; and
- Comply with the State's and City's SMARA requirements.

Operator: Robertson's Ready Mix
200 South Main Street, Suite 200
Corona, California 92882
951/493-6500

Representative: Lilburn Corporation
1905 Business Center Drive
San Bernardino, California 92408
909/890-1818

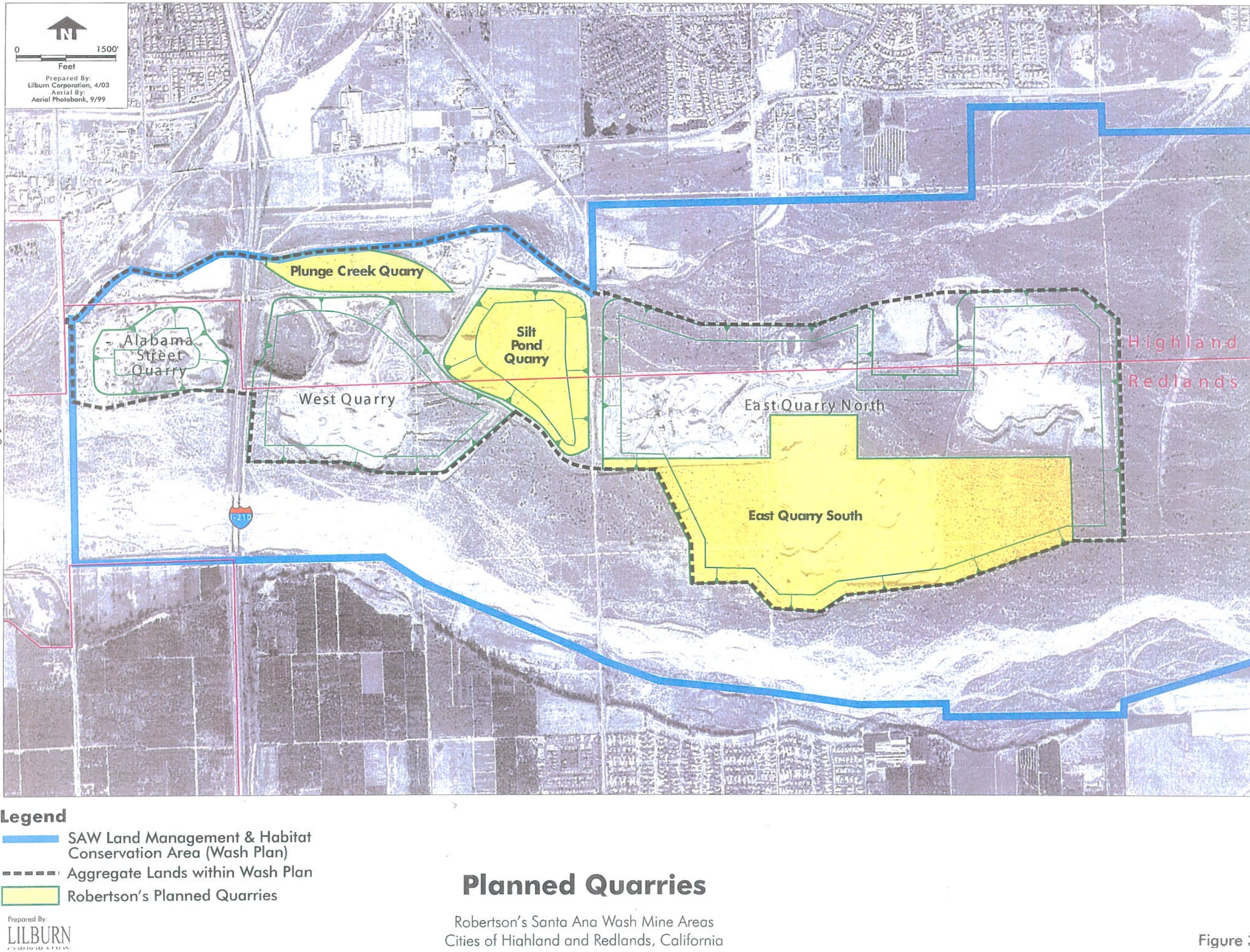
Assessor's Parcel Numbers: 291-122-02: 291-141-01, 04, 07-12, 14-19; 291-181-07, 08, 11, 14, 15, 17; and 291-121-01

General Plan Designation: City of Highland – Open Space
City of Redlands - Flood Control / Construction Aggregate / Conservation / Habitat Preservation

Estimate Operating Life: 60 years

Estimated Mining Termination Date: 2065

Estimated Reclamation Completion: 2070



Planned Quarries

Robertson's Santa Ana Wash Mine Areas
Cities of Highland and Redlands, California

Figure 3

1.0 MINE PLAN

1.1 <u>OPERATIONS</u>

Plunge Creek Quarry
(Entirely Within the City of Highland)

Existing Conditions

The proposed Plunge Creek Quarry consists of approximately 45 acres located east of the SR-30 Freeway, south of Plunge Creek and north of the West Quarry within the City of Redlands (refer to Figure 3 and Sheets 1 and 6 of 7). The site was previously part of a larger SBCFCD lease/permit to remove seasonal deposition of aggregates in the Plunge and City creeks as directed by SBCFCD. The Plunge Creek Quarry and the East Basin Processing Plant areas were purchased and are now owned by RRM. Approximately 28 acres of the planned quarry is disturbed, being used for product storage and roads.

Existing surrounding land uses to the west consist of SR-30 and the RRM Highland Plant facilities; to the north lies Plunge Creek; to the east RRM East Basin Processing Plant; and to the south the existing Cemex Alabama Street Northeast Quarry or the planned West and Silt Pond quarries.

Planned Mining

The Plunge Creek Quarry Mine Plan depicts the existing conditions and planned mining operations for the site (refer to Sheet 6 of 7). Mining will remove approximately 20 feet of material to form a drainable basin that will enhance the capacity of the East Basin Flood Control Basin. The site will be graded at one percent to the Plunge Creek invert so that the basin is drainable. No "pit" with slopes is planned for this site.

A berm will be constructed on the south side of the site with the top of berm to be a minimum 1.5 feet above the 100-year flood design flow. This berm will be constructed of compacted fill to a typical height of 12 feet above the channel invert with 30-foot wide top.

Mining operations are planned to excavate material using standard mining techniques, removing material with a dozer, shovel, and loader. Haul trucks with a capacity of up to 120 tons will transport material to the adjacent East Basin Processing Plant via existing haul roads. Equipment used will not differ (other than technological advancements or replacement equipment) from that currently being used for mining at Old Webster Quarry. Excavations may be limited at times due to seasonal flooding with no operations allowed in standing ground water. Approximately half the site is undisturbed and soil and plant salvaging are planned prior to mining undisturbed areas.

Aggregate reserves for the Plunge Creek Quarry are estimated at approximately one million cubic yards (cy) or 1.5 million tons. The site will be mined to its final reclamation contours as depicted on Sheet 6. The timing for completion of mining and reclamation will depend on market demand and aggregate quality.

Prior to mining the undisturbed area on the site, the operator will remove yucca, cacti, and other unique species deemed suitable for transplanting by qualified personnel. The removed plants will either be directly replanted to slopes ready for revegetation or be maintained for future revegetation activities. As an area is cleared for mining, the site's vegetation will be chipped and surface material to a depth of six inches will be scraped and moved directly to an area ready for reclamation. This will preserve any seed bank, which is present within the surface material and is an important factor for a successful revegetation effort. In addition, any measures required in the EIS/EIR and Habitat Conservation Plan (HCP) for the overall implementation of the Wash Plan will be undertaken.

Reclamation of the site will consist of grading to design contours to allow drainage into Plunge Creek to the north. Finished grade will be one percent to the north and a berm will be constructed prior to the completion of mining as described above. Reclamation will consist of final contouring, ripping compacted areas, covering slopes with available salvaged soil, and revegetation of the slopes and berm.

Monitoring and maintenance of reclamation efforts in the Plunge Creek Quarry will be initiated once excavated areas reach final grade. The end use for the Quarry will be for enhanced flood control of Plunge Creek in conjunction with the existing East and West Basin flood control basins. The completed quarry will be a shallow basin that will provide additional conveyance for seasonal floodwaters. During most years, the site will be open space vegetated with native species capable of supporting RAFSS and associated wildlife though it may be affected by seasonal runoff. Detailed reclamation plans for the site are discussed in Section 2.0.

Silt Pond Quarry
(60 acres in Highland, 42 acres in Redlands)

Existing Conditions

This area consists of approximately 102 acres currently on public lands administered by the BLM. This area is expected to be exchanged for other lands with the SBVWCD and become part of the Wash Plan aggregate lands. RRM holds a long-term lease with the SBVWCD for other lands within the Wash that would be exchanged in part for mining rights on this property.

The western half of the site consists of a previously excavated pit to an average depth of 80 feet with 1H:1V slopes on an area of approximately 35 acres. RRM haul road from its Old Webster Quarry outlines the site on the south and west, on the east is Orange Street, and to the north is another access road, the East Basin Flood Control Basin, and the RRM processing plant. Cemex's haul road connecting its Orange Street Plant and Alabama Street facilities cuts through the east central portion of the site before connecting to the main access road shared by both operators. Per prior agreement, Cemex will utilize the existing haul road tunnel under Orange Street for future haul road traffic.

Sometime during the 1970s, a 20-foot wide overflow channel with a total disturbed width of 60 feet was constructed through the site to provide additional flood control for Plunge Creek due to seasonal flooding downstream. The remainder of the site was graded and cleared in the early 1980s in preparation of additional mining, which did not occur. This area has naturally revegetated over the past 20 years. Approximately 12 acres bordered by the haul roads and Orange Street are considered undisturbed.

Other operators have conducted mining operations within the site during the 1960 and 1970s. Past mining operations consisted of aggregate excavation and removal from the pits as the operator extended mining from the west to east. At present, there is one existing pit separated on the west by RRM haul road, which was constructed on material backfilled into the pit. The excavated slopes are generally about 1H:1V with a pit depth of approximately 80 feet.

Planned Mining

The Silt Pond Quarry Mine Plan depicts the existing conditions and planned mining operations for the site (refer to Sheet 5 of 7). Approximately 60 acres of the Quarry are in Highland and 42 acres are in Redlands. Mining will take place in the 102-acre Silt Pond Quarry to a maximum depth of 150 feet with slopes of 2H:1V on the east side along Orange Street and 1H:1V slopes along the north, west, and south perimeters. The steeper slopes and greater depth are planned to provide additional volume for the deposition of silts into the completed quarry. The areas west from Orange Street are all within the aggregate lands with no public access. Aggregate reserves for the Silt Pond Quarry are estimated at approximately 13.6 million cy or 19.9 million tons.

The pit rim varies in elevation and ranges from approximately 1,280 feet to 1,250 feet msl. The corresponding pit floor will be established at from about 1,130 feet to 1,100 feet msl and graded slightly to the west for interior pit drainage. The planned mining will maintain a setback of approximately 68 to 100 feet from the Orange Street ROW along the east side based on current ROW widths. A paved 30-foot wide access road allowing street-legal haul trucks to travel from the Cemex Orange Street Plant to 5th Street and/or Alabama Street is proposed on the northwest and north sides of the quarry within the east side setback. On the north, west, and south, the pit lies adjacent to mining haul roads and no setbacks would be established.

Prior to mining the naturally revegetated areas outside the existing pit, the operator will remove yucca, cacti, and other unique species deemed suitable for transplanting by qualified personnel. The removed plants will either be directly replanted to slopes ready for revegetation or be maintained for future revegetation activities. As an area is cleared for mining, the site's vegetation will be chipped, and surface material to a depth of six inches will be scraped and moved directly to an area ready for reclamation. This will preserve any seed bank which is present within the surface material and is an important factor for a successful revegetation effort. In addition, any measures required in the EIS/EIR and Habitat Conservation Plan (HCP) for the overall implementation of the Wash Plan will be undertaken.

Excavations will be phased within the pit at varied elevation levels in order to avoid the potential of high ground water levels and recharge activities that fluctuate year to year. Lease conditions also require excavations to be phased with depth. Timing of phasing will depend on the quality and demand of material and mining conducted at other sites within the wash with an estimated 3 to 5 years per phase, generally as follows:

- Phase 1 - Mine the northeastern quarter of the pit to an overall depth of about 80 feet
- Phase 2 - Mine the central portion to an overall depth of 80 feet
- Phase 3 – Mine the southeast area to a depth of 80 feet
- Phase 4 – Mine the site to a depth of 100 feet
- Phase 5 – Excavate the site to 125 feet
- Phase 6 – Excavate the site to 150 feet
- Phase 7 – Initiate silt backfilling followed by final reclamation.

Mining operations are planned to excavate material using standard open pit mining techniques of pushing material with a dozer to a working level, removing and loading material with a shovel and/ or loader into haul trucks, and transporting material to the East Basin Processing Plant. Equipment used will not differ (other than technological advancements or replacement equipment) from that currently being used for mining onsite.

Mining will be restricted to 20 feet from ground water with no operations allowed in standing ground water. Existing SBVWCD monitoring wells and other nearby wells will be used as ground water monitoring wells to determine the depth to ground water. This will be coordinated with the expected property owner, the SBVWCD.

Mining and reclamation activities will be conducted concurrently and are estimated to continue intermittently for the life of the permit depending on market demand and aggregate quality. The site is located where RRM can excavate material on an as-needed basis. Mining operations will move within the quarry and from site to site depending on actual aggregate quality and on the type of material in demand at that time.

Safety features in the form of 3-strand wire fencing and a landscaped screen with warning signs will be constructed along Orange Street upon mining initiation. Wire fencing with posted signs will be placed along the south and north sides of the quarry where there is a potential for public access. The pit slopes will be mined to the reclamation design contours. Upon completion of mining, the site will be used for the deposition of silts created during the processing operations. Final reclamation will consist of proper grading of surface and revegetation. Final end use will be open space or other uses determined by the landowner and the City with jurisdiction.

East Quarry South
(289 acres in Redlands)

Existing Operations

RRM and previous operators have conducted mining in the Old Webster Quarry area since the 1920s. RRM currently owns and holds a permit to mine aggregate on up to 215 acres of this site under the name of the Old Webster Quarry. The Old Webster Quarry was approved by the County of San Bernardino and started operations in 1989. In November 2001, the City of Redlands approved CUP No. 597 (Revision No. 2) to allow mining to a depth of 120 feet. Approximately 140 acres of the 215-acre permitted site are disturbed by mining to a depth of up to 120 feet. The excavated slopes are comprised of 1.5H:1V slopes. The planned mining area west of the existing pit was the site of an old lumber mill, which extended west to Orange Street. Of the proposed 289-acre East Quarry South, approximately 152 acres have been disturbed by past and existing mining and 20 acres by the past lumber mill.

Material excavated from the site is transported to the East Basin Processing Plant by off-road haul trucks of various sizes up to 120-ton haul trailers via a 60-foot wide haul road. The haul road utilizes the tunnel under Orange Street to avoid using or crossing any public roads.

The surrounding areas to the west consist of a portion of the habitat conservation area and Orange Street; to the north, Cemex's Orange Street Plant and several pits comprising the planned East Quarry North, which will daylight with the East Quarry South; and to the east and south, habitat conservation lands and woollystar preserve areas. The East Quarry North and East Quarry South will daylight with each other and combine to form one large excavation, the only reason for the north and south designations being for the two different operators.

Planned Mining

The East Quarry South Mine Plan depicts the existing excavations and planned mining operations for the site (refer to Sheet 2 of 7). Mining will take place in the 289-acre East Quarry South to a maximum depth of 120 feet with slopes at 2H:1V. The pit rim varies in elevation due to the over 7,775-foot east to west width of the site, decreasing to the west from 1,420 feet to 1,310 feet msl. The corresponding pit floor will range from about 1,300 feet in the east to 1,190 feet msl in the west and graded at 1.8 percent to the west for interior pit drainage. Aggregate reserves for the East Quarry South are estimated at approximately 44.3 million cy or 64.9 million tons. The planned quarry abuts only habitat conservation lands to the south and daylights with the East Quarry North on the north, therefore no setbacks would be established.

Undisturbed areas to be mined include approximately 50 acres to the west and 67 acres to the east of the existing Old Webster Quarry. Prior to mining any undisturbed areas outside the existing pit, the operator will remove yucca, cacti, and other unique species deemed suitable for transplanting by qualified personnel. The removed plants will either be directly replanted to slopes ready for revegetation or be maintained for future revegetation activities. As an area is cleared for mining, the site's vegetation will be chipped, and surface material to a depth of six inches will be scraped and moved directly to an area ready for reclamation. This will preserve any seed bank which is present within the surface material and is an important factor for a successful revegetation effort.

In addition, any measures required in the EIS/EIR and Habitat Conservation Plan (HCP) for the overall implementation of the Wash Plan will be undertaken.

Excavations will be phased within the pit at varied elevation levels in order to avoid the potential of high ground water levels and District ground water recharge activities that fluctuate year to year. Timing of phasing will depend on the quality and demand of material and mining conducted at other sites within the wash with an estimated 5 to 10 years per phase, generally as follows:

- Phase 1 - Mine the western portion of the pit to an overall depth of about 80 feet
- Phase 2 - Mine the eastern portion to an overall depth of 80 feet
- Phase 3 – Mine the west half of the site to a depth of 100 feet
- Phase 4 – Mine the east half of the site to 100 feet
- Phase 5 –Mine the west half to 120 feet
- Phase 6 –Mine the east half to 120 feet
- Phase 7 – Final reclamation.

Mining operations are planned to excavate material using standard open pit mining techniques of creating benches every 20 to 25 feet in height with a dozer and shovel, removing material and loading the haul trucks with the shovel, and transporting material to the East Basin Processing Plant. Mining will be restricted to 20 feet from ground water with no operations allowed in standing ground water. Existing SBVWCD monitoring wells will be used as ground water monitoring wells to determine the depth to ground water. This will be coordinated with the SBVWCD.

Mining and reclamation activities will be conducted on the finished upper slopes concurrently and are estimated to continue intermittently for the life of the permit depending on market demand and aggregate quality. Equipment used will not differ (other than technological advancements or replacement equipment) from that currently being used for mining onsite.

Mining operations may move within the quarry depending on actual aggregate quality and the type of material in demand at that time. During mining, the maximum extent of the planned pit rim adjacent to undisturbed areas on the west, south, and east will be prominently marked and staked to establish the excavation boundary and limit any offsite disturbance. Safety features in the form of a 3-strand wire fence with warning signs placed every 300 feet will be constructed around the quarry rim as it reaches its maximum limit to the west and south where there is a potential for public access as depicted on Sheet 2. The remainder of the quarry boundary daylights with the East Quarry North. Reclamation of finished 2H:1V slopes will begin as mine phases are completed or portions of the quarry slopes reach finished grade. Reclamation will consist of ripping compacted floors and slopes parallel to the contour, slope contouring, and revegetation of the upper slopes with native Wash species.

Monitoring and maintenance of reclamation efforts will be initiated once excavated areas reach final grade. The end use for the East Quarry North will be a ground water storage or recharge basin, open space, or other acceptable uses such as recreation as determined by the landowner and the city involved. Detailed reclamation plans for the site are discussed in Section 2.

1.2 MINE WASTE

Mining activities produce unusable materials consisting of boulders and clay or silt of approximately 5 percent. Boulders not sold or crushed would be stockpiled onsite and regraded into the final reclamation of the sites. The silt or fines are by-products of material washing at the East Basin Processing Plant and are deposited into the existing silt ponds on BLM land just southwest of the plant. In future years, both RRM and Cemex would use the Silt Pond Quarry located to the south of the East Basin Plant for the deposition of silts. This material could also be sold or used for reclamation activities, revegetation and haul roads. No water contaminants are associated with the aggregate operations.

All domestic refuse is collected in approved trash bins and hauled to the nearest approved landfill for disposal. Equipment is be maintained at the Highland shop to the west near Alabama Street and 3rd Street. Used oils, fuels and solvents are collected in accordance with the Department of Toxic Substance and Control regulations and picked up by an approved hauler for recycling. The current operations maintain a Business Emergency, Hazard Communication and Training Plan with the County Environmental Health Services Agency. The site has been included in the approved storm water permit from the State Water Resources Control Board. In addition, the operator has an approved permit as a hazardous material generator.

1.3 PROCESSING

Excavated materials may be initially screened by a portable grizzly screen that moves with the mining inside the quarry to separate large boulders. The material is then transported via haul truck to a surge pile at the East Basin Processing Plant. RRM utilizes their tunnel under Orange Street for truck travel between the East Quarry South (Old Webster) and the existing East Basin Processing Plant. This eliminates the crossing of Orange Street.

Processing at the approved 38-acre East Basin Processing Plant consists of a variety of primary, secondary, and tertiary crushing, wet and dry screening to produce specification grade, sized concrete and asphalt aggregate, sands, and road base. The crushed and sized material is mainly transported to other regional Robertson's ready mix facilities and to the concrete batch plant at the West Basin or Highland Facilities with some product shipped to various other end users.

The existing aggregate plant and concrete batch plant have approved air quality permits from the South Coast Air Quality Management District (SCAQMD). The East Basin Processing Plant is planning to produce a maximum of 3.0 MT per year. Dust control equipment on the plants includes water sprays, enclosed operations, and baghouses. In addition to these permits, the operator complies with the SCAQMD Rule 403 and 1157 to control fugitive dust emissions, which will be extended to include all active operations. Dust control measures include watering of haul roads, active mining and processing areas, and stockpiles of fine materials; limiting truck speeds; use of chemical stabilizers on haul roads as needed; and routine maintenance of equipment and trucks. Wash racks for highway trucks are utilized and any spillage onto public paved roads is cleaned-up. The mining operations will generally be within the pits protected from direct winds though mining is restricted when winds exceed 25 MPH.

In addition, the operator shall comply with all existing and future California Air Resources Board and SCAQMD regulations related to diesel-fueled trucks and equipment, which may include among others: (1) meeting more stringent emission standards; (2) retrofitting existing engines with particulate traps; (3) use of low sulfur fuel; and (4) use of alternative fuels or equipment.

1.4 PRODUCTION WATER

Water consumption for the aggregate plant and washing and dust control at the East Basin Plant and for ready mix production at the Highland facility is approximately 350 acre-feet per year or about 1 to 1.25 acre-feet per operating day. Water usage depends on actual production and extraction and weather conditions. Water is supplied from existing wells located in the west and east basins of the Highland and East Basin facilities. Water use during mining consists of wetting the excavation areas and haul roads. During reclamation, water will be necessary for dust control on roads and for grading during preparation of the slopes and occasional wetting of revegetated slopes if necessary.

1.5 EROSION AND SEDIMENTATION CONTROL

The Plunge Creek Quarry is designed to become a part of the East Basin flood control basin and as such is susceptible to flooding during mining. The mine plan calls for the construction of a flood control berm on the south side of this quarry to control Plunge Creek flood flows. The berm design will be reviewed and approved by the SBCFCD. The other two mine sites are outside the Santa Ana River and Plunge Creek 100-year floodplains as assessed by the ACOE.

The Silt Pond Quarry is bordered on the north by a berm and the Plunge Creek east basin constructed for flood control; on the east by Orange Street and upstream quarries; to the south by vacant land and the Santa Ana River; and to the west by additional quarries. The completion of the Seven Oaks Dam limits future flooding in the wash. All of these facilities will greatly reduce and likely eliminate any significant natural runoff into the Silt Pond Quarry.

The East Quarry South is bordered by the remainder of the East Quarry North on the north, numerous SBVWCD berms and basins to the east, and the Santa Ana River channel to the south. The Seven Oaks Dam upstream greatly reduces the likelihood of any significant natural runoff onto the East Quarry.

Minor local sheet and surface runoff that may drain into the excavations would percolate rapidly into the porous alluvium material. Any locations where runoff is entering the pit will be reinforced with rock or rip-rap as necessary to eliminate potential erosion. The planned slope revegetation will also aid in preventing slope erosion.

To safeguard against potential future erosion, the operator will conduct erosion monitoring after each major storm event or at least once per month during the rainy season defined as between October 1 and May 31. A major storm event is defined as precipitation totals of 0.5 inches per 24-hour period. The operator will visually inspect the perimeter of the excavations and berm to observe any drainage that may be entering the pit and document the observed and potential erosion occurring. The inspector shall note the occurrence and severity of any sheet, rill or gully erosion and any evidence of surficial instability. If erosion or the potential for substantial erosion is evident, the operator shall implement appropriate erosion control measures. A small berm or an interceptor ditch along the pit rim could be constructed depending on the observed flow and/or erosion. If the operator determines to allow other flows to enter the pit, then down slope drains may be installed. The down slope drains would typically be constructed with one of the following: rock reinforced with energy dissipaters; a corrugated metal pipe (CMP); or a flexible conduit of heavy-duty fabric.

1.6 BLASTING

No blasting will be conducted for mining these quarries.

2.0 RECLAMATION

2.1 LAND USE

This M/R Plan is part of the proposed Upper Santa Ana River Wash Land Management Plan and Habitat Conservation Plan (Wash Plan) overlying two municipal jurisdictions. All planned quarries described above are within the area designated for aggregate extraction and processing by the Wash Plan. Portions of this area have been mined for over 80 years and permitted mining operations are ongoing today. Mining will be allowed to continue in existing approved mine areas and expand into adjacent undisturbed areas as part of the overall Wash Plan to balance land uses including habitat conservation.

The project area is located within the Upper Santa Ana Production Area, which was the subject of a study conducted by the State Mining and Geology Board in accordance with SMARA. SMARA requires the Board to locate and designate lands in California, which are threatened by uses incompatible with aggregate mining operations. The site was classified as a "regionally significant construction aggregate resource area" by the Board. The objective of this classification and designation process is to insure that mineral deposits of statewide or regional significance would be available as needed.

Existing surrounding land uses of the aggregate lands consist of the following, starting in the northwest corner and moving clockwise around the site:

- West – Alabama Street, vacant land, San Bernardino International Airport
- North – Plunge Creek West and East Basins, shooting range, Plunge Creek habitat conservation area, MWD Inland Feeder Pipeline
- East – Vacant lands for habitat conservation and spreading basins
- South – Santa Ana River Woolly Star preserve, flood control within the active Santa Ana River, habitat conservation areas
- Internally - SR-30 Freeway, Orange Street, active mining and processing plants, silt ponds, and haul roads.

2.2 VISIBILITY

The project site consists of a series of pits and aggregate processing operations extending from the SR-30 Freeway east to the existing pits in Section 11, east of Orange Street. The Wash Plan defined the aggregate lands for the purpose of consolidating the future mining activity into one large area adjacent to existing mining operations within Sections 9, 10, and 11 in the western half of the WPA. This focuses extraction activities on lands currently disturbed by mining and lands with the least long-term wildlife habitat value. The BLM lands were either previously disturbed or were fragmented by adjacent mining activities, and thus would be better suited for mining expansion. Preserved habitat areas are located in larger connected areas with intact natural habitat and availability of future fluvial flows. The water conservation activities would passively utilize some habitat areas, continue in areas historically utilized, and be able to use reclaimed mine sites.

The consolidation of mining activities where it is currently taking place limits the additional impacts from the quarry expansions. Mining operations will occur below grade in an area previously mined. Visual impacts of the existing and planned quarries would be reduced by removal of highwalls and remaining debris, and reclamation and revegetation of slopes with local native plants.

The principal views of the site are by drivers on the SR-30 Freeway in the west and on Orange Street to the east. Views from SR-30 are more prominent due to its raised alignment and include mostly Cemex operations with more distant views of the East Basin Plant and eventually the Plunge Creek Quarry. The Plunge Creek Quarry would look like a shallow basin with no steep slopes and would become part of the larger existing flood control basins. Mining will not further degrade the existing conditions. The planned mining and reclamation will remove the unsightly highwalls with concrete washout, grade the slopes and pit floor, remove any remaining stockpiles, and hydroseed and revegetate the slopes to decrease visual impacts from the barren pits now visible.

Views from Orange Street are less prominent as this road is at grade. Landscape screens consisting of landscape vegetation will be planted along the west side of Orange Street by RRM and along the east side of Orange Street (north of the Plant) by Cemex as operations adjacent to the street are initiated.

2.3 VEGETATION

RRM, Cemex, and their predecessors have conducted aggregate excavations in the project area since the 1920s. Mining, aggregate process plants, silt ponds, past grading, and access roads have disturbed approximately 359 of the 505 acres of the project site. The existing active onsite pit has been completely disturbed by current mining activities. The principal undisturbed areas to be mined by RRM are part of the planned East Quarry South. These include approximately 50 acres west of the existing Old Webster Quarry, 67 acres east of the Old Webster Quarry, and approximately 17 acres in the planned Plunge Creek Quarry. These areas support an assemblage of Riversidean Alluvial Fan Sage Scrub (RAFSS).

Riversidian Alluvial Fan Sage Scrub is a sensitive habitat of limited distribution in California. The listed endangered Santa Ana River woollystar and slender-horned spineflower have been observed on the undisturbed portions of the site. Due to this sensitive habitat with listed plant species, compliance with the Federal and California Endangered Species Acts is a part of the overall Wash Plan. The planned mining in the designated aggregate lands that will impact undisturbed areas will be compensated by the establishment of permanent habitat conservation lands within the framework of an overall Wash Plan and the development and implementation of a Habitat Conservation Plan (HCP).

The Wash Plan's EIR/EIS will include a complete description of the plant communities, habitats, and sensitive and listed plant species and their occurrence, an assessment of potential impacts, and recommended mitigation measures for the entire WPA. Integral parts of the Wash Plan are the designation of habitat conservation lands for listed species and sensitive plant communities and the preparation of the HCP.

2.4 WILDLIFE

Wildlife associated with the Wash habitat is generally common to alluvial and foothill environments in southern California. Over 80 vertebrate species have been observed or detected during biological surveys conducted during the past ten years on portions of the WPA. The majority of these species are common throughout the urban, sage scrub, and chaparral communities of southern California and among others include: western fence lizard, side-blotched lizard, mourning dove, northern mockingbird, greater roadrunner, California quail, California ground squirrel, Botta's pocket gopher, and coyote.

Many sensitive vertebrate species considered "Species of Special Concern" (CSC) by the California Department of Fish and Game (CDFG) have been previously identified in the WPA. One of these species, the San Bernardino kangaroo rat (*Dipodomys merriami parvus*) (SBKR), is Federally listed as endangered. The SBKR occupies gravelly soils as well as sandy washes on the coastal slopes of southern California. It occurs at various locations in the WPA in alluvial scrub, historic braided river channels, adjacent to active water channels, and sandy alluvial deposits.

The EIR/EIS will include a complete description of the wildlife and their occurrence, plant communities, and sensitive habitats, an assessment of potential impacts, and recommended mitigation measures for the entire WPA. Integral parts of the Wash Plan are the designation of habitat conservation lands for listed species and sensitive habitat and the preparation of the HCP.

2.5 RECLAMATION

Reclamation will be in compliance with reclamation standards recommended by SMARA regulations in 14 CCR. Reclamation of the Santa Ana Wash Mine sites will be undertaken concurrently with mining as excavated slopes are completed. Time frames for reclamation are dependent on the fluctuation of product demand among the mining sites operated by RRM in the Wash. During the review of this section, the Reclamation Plan (see Sheet 7 of 7) and Cross Sections should be referenced.

The reclamation plans for RRM's three quarries are different with respect to actual reclamation and end use. The <u>Plunge Creek Quarry</u> will be mined to drain north into the existing Plunge Creek channel and flood control basin in which the completed quarry will become a part of after mining is completed. A flood control berm sized to handle the project design flood, will be constructed along the south side of the quarry. The quarry slopes would be ripped and revegetated with the expectation of being flooded during heavy seasonal runoff.

The <u>Silt Pond Quarry</u> will be mined to depth with slopes excavated to meet the design of 1H:1V on the north, west, and south slopes, and 2H:1V on the east side. Reclamation during mining would consist of maintaining stable slopes. The completed quarry would be used to deposit the silt-laden water from RRM East Basin Processing Plant and in the future, Cemex's silts from the Orange Street

Plant. The quarry would gradually fill with settled silts, will be covered with surface material, revegetated with native species, and returned to open space.

Reclamation at the East Quarry South will be undertaken concurrently with mining operations within the project site. Reclamation will be ongoing until final reclamation is completed after termination of excavations. As mining progresses, contouring and sculpting of the final perimeter quarry walls will be undertaken and compacted slopes will be ripped parallel to the slope. Final reclamation of the lower slopes will lag towards the end of mining. The excavated 2H:1V slopes will meet performance standards as stated in Article 9, Reclamation Standards §3704(d) in 14 CCR. These slopes are acceptable gravel slopes with regard to their angle of repose and stability. Slope stability is discussed in Section 2.9. End use of this quarry would be for groundwater recharge and/or water storage and possibly recreation in agreement with the land owner and the city with jurisdiction.

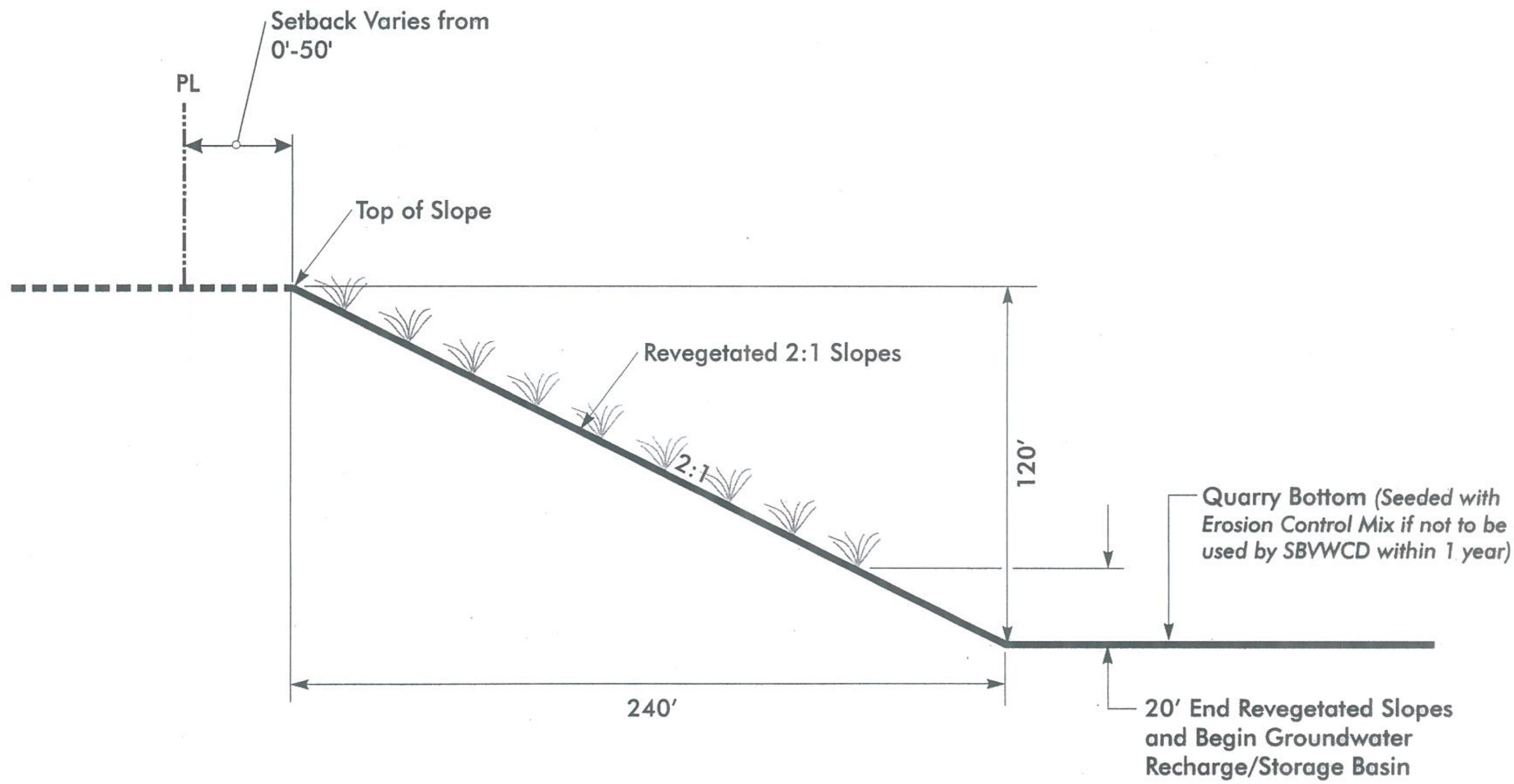
Revegetation of completed 2H:1V slopes as well as monitoring of revegetation activities will be initiated upon completion of final grades along portions of the pit slope. Slopes will be rough graded along the contour (parallel to the rim) to allow for collection of seeds and water. Slopes will also be sculptured and with some variations of slope gradients in order to reduce visual lines. Compacted areas will be scarified to a depth necessary to promote plant growth, typically to a depth of 12 inches. Any available surface material would be placed on the prepared slopes and broadcast seeded.

The lower 20 feet of the slopes and the quarry bottoms will not be revegetated due to typical operational requirements of ground water storage or recharge basins (see Figure 4). The pit floors used for ground water recharge will be ripped to a depth of two feet. If the property owner does not plan on utilizing the basin floor within one year of mining termination, then the operator will one time seed the basin floor with an acceptable erosion control grass mix of local native grasses to reduce possible wind erosion. Revegetation plans are discussed in Section 2.6.

Haul roads that provide access into the quarries will remain in place for the reclamation/revegetation effort, for revegetation monitoring and remediation, and for future use of the site for ground water recharge or water storage activities. Other roads not needed will be reduced to a width of 22 feet or eliminated, scarified, and revegetated.

Process plants, mining equipment, stockpiles, and refuse will be removed. If the operator decides to continue the operation of the process plants, then those operations would need to be permitted prior to the expiration of this permit. Compacted areas will be ripped to a depth of 1 to 2 feet and the area seeded with native seeds. Locked gates and fencing as needed along specified quarries' rims with signs posted every 300 feet, will protect access into the quarries.

Upon final reclamation, the Plunge Creek Quarry will be used for flood control and open space, the Silt Pond Quarry will be revegetated open space, and the East Quarry will consist of basins suitable for use as water storage or recharge basins by the SBVWCD or possibly recreational uses. Final grading of the basin floor would be coordinated with the landowner to facilitate the designated end use. The basin slopes will be revegetated with appropriate native plant species and returned to open space/habitat.



Typical Slope Detail

Robertson's Santa Ana Wash Mine Areas
Cities of Highland and Redlands, California

Prepared By: LILBURN CORPORATION

Figure 4

2.6 REVEGETATION

Prior to mining relatively undisturbed areas outside the existing pits, specific plants and soil will be salvaged from undisturbed areas. The operator will remove yucca, cacti, and other unique species deemed suitable for transplanting by qualified personnel. The removed plants will either be directly replanted to slopes ready for revegetation or be maintained for future revegetation activities. As an area is cleared for mining, the site's vegetation will be chipped, and surface material to a depth of six inches will be scraped and moved directly to an area ready for reclamation. This will preserve any seed bank which is present within the surface material and is an important factor for a successful revegetation effort.

In addition, any measures required in the EIS/EIR and HCP for the overall implementation of the Wash Plan will be undertaken.

Future revegetation efforts will consist of revegetating the final basin slopes in the East Quarry South and the backfilled Silt Pond Quarry. The lower 20 feet of the slopes and the pit bottoms will not be revegetated due to the operational needs of a ground water recharge or storage basin. The goal of this revegetation program is to reduce potential erosion and visual impacts, and to reestablish native habitat compatible with that currently found in the area. Only native species, which currently occur adjacent to the site, will be utilized and the genetic balance of the area will be maintained by avoiding the introduction of foreign species from outside the immediate vicinity.

Note that the endangered Santa Ana River woolly star may occur on adjacent areas outside of the final quarry rim. Seed collection that may be conducted in these areas and any disturbance of this listed plant or collection of its seed will require prior review by the USFWS and/or the CDFG in the framework of the HCP.

Baseline Data

Scott White Biological Consulting conducted initial baseline vegetation sampling for the Wash Plan areas to provide future baseline and success criteria. His reports are included as Appendix A and are summarized below.

West Wash Area

Eleven plant transects were completed to establish the vegetation cover, species richness, and shrub density of each perennial plant species (see Table 3). To measure species density and cover, plant transects were conducted on undisturbed areas (as undisturbed as possible due to natural flooding and offroad vehicle use) representative of the Wash west of SR-30. Each line transect sample was 50 meters long and ten meters wide in which every species were recorded. In addition, densities were estimated at each transect by censusing each perennial species within a 25 m^2 area at the origin point of each transect. The shrub density data were taken at an additional 12 – 25 square meter (m^2) plots. The transect data provides baseline data to determine seed, planting type, and rates, and is used to determine success criteria for future revegetation. Analyses of the samples indicate that they

Table 3
Summary of Plant Transect Data
Western Wash Area

SPECIES	Ground Cover (%)	Relative Cover (%)	Relative Cover (%) Cumulative
Scalebroom, *Lepidospartum squamatum*	11	38	38
California buckwheat, *Eriognonum fasciculatum*	7	24	62
Golden aster, *Heterotheca sessilifolia*	3	10	72
San Joaquin matchweed, *Gutierrezia californica*	2	7	79
Deerweed, *Lotus scoparius*	2	7	86
Groundsel, *Senecio flaccidus*	1	3	89
Santa Ana River woolly star, *Eriastrum densifolium* ssp. *Sanctorum*	1	3	92
Coastal prickly pear, *Opuntia littoralis*	<1	<1	93
Our Lord's candle, *Yucca whipplei*	<1	<1	94
hairy yerba santa, *Eriodictyon trichocalyx*	<1	<1	95
California croton, *Croton californicus*	<1	<1	96
Others	<2	<4	100
Total	29	100	100

Source: Alabama Street Baseline Vegetation Data – Scott White Biological Consulting, March 2000

statistically meet SMARA guidelines of an 80 percent confidence level. Complete data tables are included in Appendix A.

Much of the site assessed has evidently been flood scoured within the past 10 to 20 years and the most common and generally dominant species are scalebroom, California buckwheat, golden aster, and San Joaquin matchweed, which account for over 79 percent of the cover. This is consistent with early-successional alluvial scrub.

East Wash Area

Eleven plant transects were also completed to establish the vegetation cover, species richness, and shrub density of each perennial plant species for the east portion of the aggregate lands (see Table 4 and report in Appendix A). To measure species density and cover, plant transects were conducted on undisturbed areas representative of the eastern portion of the aggregate lands in Section 11. Similar data collection methods as described above were employed. Complete data tables are included in Appendix A.

In contrast to the western site, the eastern site has not been flooded recently. Successional changes have evidently shifted from a scalebroom and golden aster dominated community toward a more dense California juniper woodland with California buckwheat, Yerba santa, and prickly pear the most common shrubs accounting for 60 percent of the cover. This pattern is consistent with succession of alluvium scrub vegetation. Total shrub cover totaled 49 percent compared to 29 percent for the western site. Note that California juniper occurs at relatively low density but is visually dominant and has significant cover (12%).

Table 4
Summary of Plant Transect Data
Eastern Wash Area

SPECIES	Shrub Cover (%)	Relative Cover (%)	Relative Cover (%) Cumulative
California juniper, *Juniperus californica*	12	24	24
California buckwheat, *Eriognonum fasciculatum*	7	14	38
Yerba santa, *Eriodictyon trichocalyx*	6	12	50
Coastal prickly pear, *Opuntia littoralis*	5	10	60
Deerweed, *Lotus scoparius*	4	8	68
San Joaquin matchweed, *Gutierrezia californica*	3	6	74
Our Lord's candle, Yucca whipplei	3	6	80
Chamise, *Adenostoma fasciculatum*	2	4	84
Scalebroom, *Lepidospartum squamatum*	2	4	88
Valley cholla, *Opuntia parryi*	1	2	90
Santa Ana River woolly star, *Eriastrum densifolium* ssp. *Sanctorum*	<1	<1	91
Golden aster, *Heterotheca sessilifolia*	<1	<1	92
Others	<4	<8	100
Total	49	100	100

Source: Johnson and Redlands Aggregate Baseline Vegetation Data – Scott White Biological Consulting, March 2000

Site Preparation

Areas of revegetation for the East Quarry South will include the side slopes of the pits or basins from the original surface down to twenty feet from the basin floor (see Sheet 7). The slopes of the Plunge

Creek Quarry and the backfilled surface of the Silt Pond Quarry will also be revegetated. Approximately 146 acres of undisturbed areas will provide some salvaged plants and soil for use as a seed bank. Prior to revegetation, a soil analysis will be conducted on the areas to be reclaimed to determine the presence or absence of essential elements as compared to natural local soils. Soil amendments will be added if required to duplicate existing soil conditions. The backfilled quarry and slopes to be reclaimed will be graded along the contour to break up compacted alluvium where necessary in order to leave a rough surface and the dozer tracks will aid in the natural accumulation of seeds and precipitation. Available salvaged surface material will be used in areas where additional growth media is necessary due to rocky or clay conditions.

Revegetation Methods

Broadcast seeding or imprinting are planned to revegetate the areas designated for revegetation. Seed collection from nearby undisturbed areas will augment the broadcast seed mix. Collection will occur under the supervision of qualified personnel and within the framework of the HCP. Commercially available seeds of native species may also be used to supplement the local seeds due to variations in natural seed availability. Seeding would take place between October and December to take advantage of winter precipitation and eliminate the need for irrigation. Seed will only be collected within one year of planned reseeding.

Utilizing the data and the notes taken in the field, the site previously supported early to intermediate Riversidean Alluvial Fan Sage Scrub perennial elements including: scalebroom (*Lepidospartum squamatum*), California buckwheat (*Eriogonum fasciculatum*), golden aster *(Heterotheca sessilifolia),* deerweed (*Lotus scoparius*), San Joaquin matchweed (*Gutierrezia californica*), California croton *(Croton californicus),* Our Lord's candle (*Yucca whipplei*) and yerba santa (*Eriodictyon trichocalyx*). Without future water flows, the site will be planted with an intermediate seed mix of Riversidean sage scrub. California buckwheat and golden aster are common pioneering species on disturbed areas and will quickly grow in such areas. These species will later be displaced by the intermediate species of yerba santa, juniper, lemonade berry, prickly pear cactus, and goldenbush. Other perennial species are comparatively rare.

The disturbed areas will be broadcast seeded with the species and rates shown in Table 5. Note that the species seeded will be augmented with native annuals as recommended in the Baseline Study. Only native seeds tolerant to existing soil and rainfall conditions will be used. The average precipitation in the area should be sufficient for seed germination and root establishment of native species. Irrigation of the site will not be used to avoid encouraging non-native invasive plants.

In addition, the operator shall establish at a minimum four one-acre test plots as well as two control or no seed areas. The plot areas shall be representative of a disturbed mining slope. The test plots will be maintained and monitored. Tests are being conducted to refine planting techniques and seeding rates. Additional tests will be conducted if the initial tests and any active revegetation are not successful and may include various types and amounts of seeds, different soil preparation, and fertilization trials. The initial tests will compare imprinting techniques and broadcast seeding and two rates of seed application. Similar methods have been tested in the Wash area and have been shown by others to be more successful than natural revegetation or broadcast seeding only.

Table 5
Proposed Seeding Rates For Perennial Species
Santa Ana Wash Mine

SPECIES	SEEDING RATE (Pounds of Pure Live Seed/Acre)
California buckwheat	3
Hairy yerba santa	2
Our Lord's candle	0.5
Deerweed	2
Golden yarrow	0.5
California croton	1
Goldenbush	1
California sagebrush	1
Lemonadeberry	0.25
White sage	0.5
Laurel sumac	0.25

Weed Control Plan

The purpose of the weed control plan is to reduce or eliminate the occurrence of non-native plant species that may invade the site where mining activities have removed the native plant cover and where active and natural revegetation is taking place. Non-native invasive species (weeds) can compete with native plant species for available moisture and nutrients and consequently interfere with revegetation of the site.

Weed or non-native species of concern at the site may include some or all of the following:

Arundo donax	giant reed, arundo
Avena barbata	slender wild oat
A. fatua	wild oat
Bromus diandrus	ripgut brome
B. madritensis	red brome
B. tectorum	cheat grass, downy brome
Cortaderia spp.	pampas grass
Eucalyptus spp.	gum tree, eucalyptus

Lepidium latifolium	pepperweed
Nicotiana glauca	tree tobacco
Ricinus communis	castor bean
Salsola tragus	Russian thistle, tumbleweed
Schinus molle	pepper tree
Tamarix spp.	tamarisk, salt cedar

The occurrence of weeds on site shall be monitored by visual inspection. The goal is to prevent weeds from becoming established and depositing seeds in areas to be revegetated at a later date. No areas will be allowed to have more than 20 percent of the ground cover provided by non-native plant species. If inspections reveal that weeds are becoming or have established on site, then removal will be initiated. Inspections shall be made in conjunction with revegetation monitoring.

Weed removal will be accomplished through manual, mechanical or chemical methods depending on the specific circumstances. For example, solitary or limited numbers of tree and tree-like species (eucalyptus, tree tobacco, castor bean, or tamarisk) will be manually removed (chopped) and the stumps sprayed with an approved weed killer such as Round-Up. Smaller plants (wild oats and bromes) that cover more area may be sprayed, scraped with a tractor, or chopped by hand, depending upon the size of the area of infestation and the number of desired native plants in proximity or mixed in with the weeds.

Reports of inspections and weed control implementation shall be part of the annual revegetation monitoring kept on file by the operator.

Monitoring

The Biological Monitoring Plan will be an ongoing effort to assess the results of revegetation on the disturbed areas of the site. The monitoring plan will be followed annually to monitor and assess completed revegetated areas and areas where revegetation is being planned or just beginning. A Biological Monitoring Report submitted by the operator to the lead agency will be part of the overall compliance with conditions. Revegetated areas will be assessed utilizing success criteria with successful methods being implemented for future revegetation.

Revegetation efforts will be monitored annually for five years after seeding or until revegetation meets the success criteria and is self-sustaining. Revegetation observations will be summarized annually as part of the overall-monitoring program. This schedule may be revised depending on the results of the revegetation effort and the meeting of the success criteria. Monitoring and revegetation results will be reported to the appropriate city in its annual monitoring report and to the State Office of Mine Reclamation in its annual mining operation report.

Success Criteria

Success criteria will be based on the overall quality of the revegetation results compared to the recorded baseline vegetation data. From completion of the revegetation for a specific area, the surviving perennial plant species shall be evaluated annually by the consulting botanist for relative growth as determined by diversity and density. Individual specimens or areas shall receive appropriate remedial attention as necessary. Remedial actions include removing invasive weed species or reseeding. The above procedure will be repeated annually thereafter for a total of five years.

Success will be a measure of the species density and diversity based on the baseline or control areas. The west area is more indicative of early successional alluvial scrub and would act as the baseline for revegetated areas. The existing baseline transect data for the west area indicated approximately 30 percent cover by about 12 perennial plant species. Successful revegetation based on USFWS recommendations would be achieved when the reseeded areas have achieved the following:

- 15 percent cover by native species (or 50% of existing cover);
- A minimum of 6 out of the 12 perennial shrub species represented by at least five dominant or codominant native plant species;
- Less than 20 percent cover of non-native plant species; and
- Recruitment of seedlings of native pant species must occur demonstrating a positive trend in cover and diversity.

2.7 CLEANUP

Upon the mine's termination, plant facilities, equipment, stockpiles, and other debris will be removed from the project site. Any remaining refuse will be disposed of at an appropriate disposal facility.

2.8 POST RECLAMATION AND FUTURE MINING

Upon completion of reclamation, the Plunge Creek Quarry will be a shallow basin that will provide additional conveyance for seasonal floodwaters from Plunge Creek. The end use will be for enhanced flood control of Plunge Creek in conjunction with the existing East and West Basin flood control basins.

The completed Silt Pond Quarry would be used to deposit the silt-laden water from RRM East Basin Processing Plant and Cemex's Orange Street Plant. The quarry would gradually fill with settled silts, will be covered with surface material, revegetated with native species, and returned to open space. The use of the quarry for silt deposition would preclude this site from future mining.

The completed East Quarry South will consist of a basin with revegetated side slopes suitable for use as a ground water recharge or storage basin to increase future public water supplies or other appropriate uses such as recreation to be determined by the landowner in consultation with the City. Minor changes to the final grading of the slopes or basin floor for other uses agreed upon by RRM (the partial landowner), the SBVWCD, and the City would be amenable with RRM. The use of the site as ground water percolation or storage basins would not preclude future mining of available aggregates at depth.

2.9 SLOPES AND SLOPE TREATMENT

CHJ Incorporated prepared a slope stability investigation of the existing Old Webster Quarry (now East Quarry South) and to the west of the Silt Pond Quarry as well as the proposed slopes. Based on their analysis, new cut slopes and new cut slopes from the existing depths of 40 to 60 feet down to 120 and 150 feet and inclined no steeper than 2:1 are expected to be stable against gross failure from long-term conditions including seismic shaking, standing water, and rising ground water. No slope stability analysis has been conducted on the 1H:1V slopes planned for the Silt Pond Quarry. However, the end use of the site is for the deposition of silts and the pit will eventually be backfilled. Slopes along the eastern side of this quarry along Orange Street are designed at 2H:1V to preclude any slope failure adjacent to the public road.

During excavation, actively mined inner slopes may temporarily be as steep as 90 degrees. Upon excavation to the maximum depth, the final new perimeter slopes will be contoured to a maximum of 2H:1V for the East Quarry South. Since no structural end use is contemplated, slope compaction will not be needed to maintain slope stability. The mined slopes should be conducive to reestablishment of natural plant species which will aid in the stabilization of the slopes.

2.10 PONDS

In the overall Wash Mine Plans, RRM will mine a 90-acre pit in the east portion of Section 10 to be used for the future deposition of silts by both RRM and Cemex. The quarry will be reclaimed by RRM upon the completion of mining in the Wash. In the near term, RRM will continue to utilize an existing 14-acre pit as a silt basin for its East Basin Process Plant under an approved BLM Right-of-Way grant (CACA 36490 - 1996). The grant requires RRM to backfill the pit with silts over an approximate 10-year period up to near the existing grade, cover the silts with 2-3 feet of material, and revegetate.

2.11 SOILS AND SILT

Soils in the area consist of Soboba Association and Riverwash Association soils. Soboba Association soils are located along the terraced banks of creeks and washes. These soils were formed within alluvium or the outwash of streams where gentle to moderate slopes prevail. Soboba soils have a cobbly, coarse loamy sand surface underlain by pale brown, single grain, loose stratified, very gravelly and cobbly sand and loamy sand subsoils. These soils are excessively drained and exhibit very high permeability; runoff is very slow. Water holding capacity is 2 to 3 inches. Inherent fertility is very low. Under natural conditions, these soils are subject to flooding during winter rainstorms. Normally, the frequency at which overflow waters reach any particular river terrace is a function of the distance from and of its elevation above the main stream channel. However, for the project sites, upstream flood control facilities now protect many of these terraces from flooding.

Riverwash Association soils form along the main washes and creek beds. These consist of river-deposited sand, gravels, cobbles, and stones in the active channels. Inundation occurs frequently and is accompanied by scouring, deposition, and removal. For reclamation and revegetation of the upper slopes, sandy slopes will be graded along the contour to hold moisture and seeds and to create suitable habitat for native species.

Soil samples were taken from five locations at Santa Ana River Wash facilities and were analyzed by E.S. Babcock & Sons, Inc. in 2002 for the following plant growth factors: acidity/alkalinity, nitrogen, phosphorous, and potassium content. The samples were taken from two areas that have been reseeded and in three unmined areas adjacent to the existing mine locations. The samples were analyzed with the intent to gather basic soil information to ascertain similarities between revegetated and undisturbed areas to guide future revegetation and any necessary remedial efforts.

The results indicate that the soil is relatively low in primary plant nutrients in both the revegetated and unmined locations. The soils are psamments and fluvents, which are actively deposited and reworked by fluvial action. They are cobbly and sandy and generally low in plant nutrients. Soils that are periodically disturbed by flooding and fluvial action are expected to be lower in plant nutrients than more stable and more highly developed soils common in agricultural settings. The use of native plant species collected from the area is intended to accommodate the relatively low fertility of the soils. The mined areas have lower plant nutrient content than the adjacent undisturbed soil. This difference does not appear to be interfering with plant growth at this time.

Mining activities produce unusable materials consisting of boulders and clay or silt of approximately 5 percent. Boulders not sold or crushed would be stockpiled onsite and regraded into the final reclamation of the sites. The silt or fines are by-products of material washing at the East Basin Processing Plant and are deposited into the existing silt ponds on BLM land just southwest of the plant. In future years, both RRM and Cemex would use the Silt Pond Quarry located to the south of the East Basin Plant for the deposition of silts. This material could also be sold or used for reclamation activities, revegetation and haul roads. No water contaminants are associated with the aggregate operations.

2.12 DRAINAGE AND EROSION CONTROLS

The Plunge Creek Quarry is designed to become part of the flood control basins designated the East Basin and the West Basin Flood Control Basins.

Upon final excavation, the Silt Pond Quarry will be used for the deposition of silts and will eventually be backfilled. Sheet and surface runoff that may drain into this excavated quarry would be allowed to percolate into the sidewalls or evaporate. The potential for any offsite flow to enter the pit is unlikely. The site is outside the 100-year floodplain of the Santa Ana River and Plunge Creek as recently assessed by the ACOE. The Plunge Creek east and west basins constructed for flood control, the upstream existing and planned quarries and SBVWCD recharge basins, the Plunge Creek overflow channel, the Santa Ana River main channel to the south, and the Seven Oaks Dam greatly reduce the likelihood of any significant natural runoff onto the site or into the excavated area. Any locations where runoff is entering the pit will be reinforced with rock or rip-rap as necessary to eliminate potential erosion.

For the East Quarry Basin, sheet and surface runoff that may drain into this excavated quarry would be allowed to percolate into the basin floor or evaporate. The potential for any offsite flow to enter the pit is unlikely. The site is outside the 100-year floodplain of the Santa Ana River as recently assessed by the ACOE. The upstream existing and planned SBVWCD recharge basins, the Santa Ana River main channel to the south, and the Seven Oaks Dam greatly reduce the likelihood of any significant natural runoff into the excavated area. Any locations where runoff may enter the pit will be reinforced with rock or rip-rap as necessary to eliminate potential erosion. The planned slope revegetation will also aid in preventing slope erosion.

Extraction and reclamation activities will be conducted to protect onsite and downstream beneficial uses of water in accordance with the Porter-Cologne Water Quality Control Act and the Federal Clean Water Act.

2.13 PUBLIC SAFETY

No refuse or dangerous material will remain onsite. Most slopes will be mined at 2H:1V to protect public safety except for the interior slopes of the Silt Pond Quarry, which will be protected, by fencing and signs. Three-strand wire fencing and locked gates will block public access onto the property, much of which is located in isolated, inaccessible portions of the wash. The perimeter of the quarries where it is potentially accessible to the public will be fenced with warning signs posted every 300 feet to deny unlawful access.

2.14 MONITORING AND MAINTENANCE

Revegetation and reclamation efforts will be monitored pursuant to SMARA requirements and according to the approved Reclamation Plan and Cities' conditions. Cemex will be required under SMARA (Public Resources Code Section 2207) to submit an annual status report on forms provided by the Mines and Geology Board (Board). SMARA (Section 2774(b)) requires the lead agency to conduct an inspection of the mining operation within six months of receipt of the required Annual Report. The cities require the operator to submit an annual monitoring report submitted to the Community Development Director with information as listed in the approved conditions.

2.15 RECLAMATION ASSURANCE

In addition to the monitoring through inspections and reporting, RRM is required to assure reclamation of the sites in accordance to the approved Reclamation Plan in compliance with Section 2773.1 of SMARA. The financial assurances may be in the form of surety bonds, an irrevocable letter of credit, trust funds or other forms of financial assurances approved by each city.

The financial assurance is reviewed annually by the operator and lead agency to determine if operations or reclamation during the past year and planned operations during the upcoming year would require adjustments to the amount of the estimate. Financial assurances for each of RRM approved projects are on file with the appropriate city. Updated financial assurances to meet the planned operations of the described reclamation plan will be provided upon completion of additional planning reports as part of overall Wash Plan.

2.16 GEOLOGY

The project site is located in the broad fluvial plain formed by the deposition of the Santa Ana River and City Creek as they flow southwest from the San Bernardino Mountains. The EIR/EIS will describe the geological conditions in detail, assess potential impacts and provide mitigation measures as necessary.

Several fault bounded structural blocks saddle the general site area. The down dropped San Bernardino Valley block underlies the site and represents a buried rift between the San Andreas Fault to the northeast, and the San Jacinto Fault to the southwest. As the block subsided, alluvium derived from the San Bernardino Mountains filled the resulting depression, causing a maximum alluvial thickness of 600 to 1,200 feet east of the San Bernardino International Airport. It is this alluvium that is mined throughout the Wash. The alluvial deposit is of the Quaternary Age and consists of igneous and metamorphic clasts whose rocks are found in the mountains and at Crafton Hills. The clasts' sizes vary from that of fine size to boulders in size. All materials on the project site are classified in the Soboba Series, specifically Soboba Stony loamy sand.

The site is subject to ground shaking from earthquakes but is not located within an Alquist-Priolo special studies zone. The area is level and is not subject to landslide hazards. Depth to ground water fluctuates with season and recharge activities. The area is subject to liquefaction though this is not considered hazardous for mine or reclamation activities. Wind erosion is controlled through roadway watering and water spraying. Water erosion is controlled through containment and percolation of surface water and through the use of reinforced berms and down drains on slopes where necessary.

The project site is located downstream of the Seven Oaks Dam which is designed to control flooding along and downstream on the Santa Ana River. The project site is outside the post-dam 100-year overflows as assessed by the ACOE (Final Biological Assessment Seven Oaks Dam, June 2000).

2.17 HYDROLOGY/GROUND WATER

The EIR/EIS will describe the surface water and ground water conditions in detail, assess potential impacts and provide mitigation measures as necessary.

Climate - The San Bernardino Valley is characterized by a climate of long dry summers and short wet winters. Annual average daily temperatures range from a low of 49° F. to an average high of 80° F. The average rainfall is about 15.6" per year, with approximately 90 percent falling from November through March.

Drainage – The site lies in the broad historic wash of the Santa Ana River and south of City and Plunge Creeks. The site is outside the ACOE's 100-year floodplain delineation due to the Seven Oaks Dam (Final Biological Assessment Seven Oaks Dam, ACOE 2000). Surface drainage in the area is east to west-southwest. Surface flows upstream are cut off by SBVWCD spreading basins and berms, Orange Street, SR-30, the Plunge Creek overflow channel, and the Seven Oaks Dam. No alteration of major drainages is proposed.

Ground water - The project site overlies the Bunker Hill Ground Water Basin. The Bunker Hill Basin is one of the largest ground water basins in the Santa Ana River Basin and is a ground water recharge zone. This basin, whose boundaries are generally defined by earthquake faults, which effectively act as subsurface dams trapping ground water, is bounded on the north and east by the San Bernardino Mountains, on the southeast by the Crafton Hills and the Badlands, and on the west by the San Jacinto fault. Because faults can act as barriers to the movement of ground water, the faults in the vicinity of the SBVWCD Mill Creek recharge facilities may restrict the movement of water into the larger Bunker Hill basin. Three subareas within the Bunker Hill Basin have been identified. These are commonly referred to as Bunker Hill I, Bunker Hill II, and the Pressure Zone. The project site overlies the Bunker Hill II subarea. The Pressure Zone to the west is an area where high ground water levels have historically existed.

Many natural and artificial phenomena such as rainfall, natural stream inflow, evaporation, ground water extractions through wells, and spreading operations for replenishment of the water supply influence ground water levels in the Bunker Hill Basin. The Bunker Hill Basin is artificially recharged by several agencies. Included are surface stream diversions made for ground water replenishment by the SBVWCD on the Santa Ana River and Mill Creek, and facilities operated by the SBCFCD on Devil Creek, Twin Creek, Waterman Creek, and Sand Creek, which may also be used for ground water recharge. The SBVWCD and its predecessors have been diverting water from the Santa Ana River and Mill Creek for over 90 years.

The primary proprietor for ground water in this area is the SBVWCD. SBVWCD serves an area of 50,000 acres, and operates recharge facilities on Mill Creek and the Santa Ana River. SBVWCD recharges water generally during the winter rainy season and in the spring when Mill Creek and the Santa Ana River are flowing. In order to meet future consumptive demands, SBVWCD is planning for development of additional conveyance channels and basins for ground water recharge within the Wash area through the overall Wash Plan. The proposed basins would incorporate the planned quarries.

APPENDIX A
BASELINE VEGETATION DATA REPORTS

SCOTT WHITE
BIOLOGICAL CONSULTING

8 March 2000

Paul Kielhold
LILBURN CORPORATION
1905 Business Center Dr.
San Bernardino, CA 92408

Reg. CEMEX Redlands baseline vegetation data: Johnson (south) and Redlands Aggregate (south)

Dear Paul:

I have completed data collection and analysis at the CEMEX Redlands Johnson (south) and Redlands Aggregate (south). Methods and results are summarized here.

METHODS

Data collection: Field work was completed by Scott D. White and Tasha LaDoux between 14 January and 19 February 2000. We collected quantitative vegetation data on 11 transects. Data collection was slightly modified from methods described by Sawyer and Keeler-Wolf (1995, Appendix, p. 416 and following, "CNPS field sampling protocol"). Plot locations were scattered throughout the site and were selected to represent the range of typical vegetation occurring on the property. Plant species touching a vertical line, at ½-m intervals along 50-m line transects were recorded as "hits" and used to estimate cover by species on each transect. Every species occurring within a 10 m x 50 m belt along the transect line was recorded. In addition, densities of perennial plants were estimated at each transect site by censusing each perennial species within a 25 m^2 (5m x 5m square) area at the origin point of each transect. Shrub density data were taken at an additional 12 5m x 5m plots. All data are attached.

Analysis: Mean values were calculated for selected vegetation cover, species richness, and density variables (Table 1). Density estimates were converted from plants / 25 m^2 to plants / acre for results shown in this report but not in the data analysis shown in the appendices.

The California Surface Mining and Reclamation Act (SMARA) requires that baseline sample sizes "must be sufficient to produce at least an 80% confidence level." I used methods described by Bonham (1988: p 66) to determine sample size adequacy for estimated vegetation cover, species richness, and shrub density variables. Note, however, that the statistical approach assumes that plot sites are randomly selected, and that variables are normally distributed. These assumptions are violated here and I am not aware of a practical alternative. This compromise is common in vegetation sampling and analysis methods.

99 East C Street • No. 206 • Upland, CA 91786 • (909) 949-3686 • Fax (909) 949-8337
email swhite@cyberg8t.com

In effect, Bonham's formula determines a minimum sample size (*n*) to determine with 80% certainty that the average vegetation cover, species richness, and shrub densities in sample plots differ from the vegetation's actual average cover and richness by no more than 5%, 10%, or 20%, depending on maximum error selected.

RESULTS

Average vegetation cover, species richness, and shrub density are shown in Table 1. Note that the survey dates prevented identification of most native annual species, and that they are poorly represented in the data set. I recommend using the shrub species richness data here as a baseline for revegetation. Total species richness values reported here are low estimates because spring surveys would have identified more annuals, and total species richness would have been much higher. I recommend including locally-occurring native annual plants in the revegetation program if seed is commercially available, but emphasizing shrub species richness in revegetation success criteria and monitoring. Locally occurring annual species fluctuate widely seasonally and annually, so that variance in cover or density data is too high to effectively evaluate success.

The site has not been flooded recently. Successional changes have evidently shifted from scalebroom (*Lepidospartum squamatum*) and goldenaster (*Heterotheca sessilifolia*) dominated riverwash toward a California juniper (*Juniperus californica*) woodland with California buckwheat (*Eriogonum fasciculatum*), Yerba santa (*Eriodictyon trichocalyx*) and prickly pear (*Opuntia littoralis*) the most common shrubs. Scalebroom and a few other large shrubs occur regularly in scattered patches, and golden aster is nearly absent. This pattern is consistent with succession of alluvial scrub vegetation described by Smith (1980). Note that California juniper occurs at relatively low density (plants/area) but at significant cover (12%). Juniper is visually the most dominant plant on the site. I recommend including California juniper in revegetation efforts if nursery stock or seed is commercially available.

Sample size: Analysis indicates that these samples provide an adequate sample size, with an 80% confidence interval and 80% to 95% precision (5% to 20% maximum allowable error) for vegetation cover, shrub species richness, shrub densities, and densities of some dominant species (Table 2). State Mining and Geology Board personnel normally recommend a 10% - 20% maximum error for species richness and density estimates, though Board recommendations do not specify this (Gail Newton, pers. comm.). These calculations indicate that all critical cover and species richness variables meet these recommendations. I conclude that the data presented here meet the intent of the SMARA requirement for pre-disturbance vegetation sampling.

Sincerely,

Scott White

Table 1. Mean values for Johnson (south) and Redlands Aggregate (south) vegetation data.

Shrub species richness (10m x 50 m belt)	10.1	
Total native species richness	13.4	
Total shrub cover	49%	
Adenostoma fasciculatum cover	2%	
Eriastrum densifolium cover	<1%	
Eriodictyon trichocalyx cover	6%	
Eriogonum fasciculatum cover	7%	
Gutierrezia californica cover	3%	
Heterotheca sessilifolia cover	<1%	
Juniperus californica cover	12%	
Lepidospartum squamatum cover	2%	
Lotus scoparius cover	4%	
Opuntia littoralis cover	5%	
Opuntia parryi cover	1%	
Yucca whipplei cover	3%	
Total cover of other species (none > 1%)	< 4%	
Total shrub density (per 5m x 5m plot at left, per acre at right)	24.5	3970
Eriastrum densifolium ssp. sanctorum density	0.8	130
Eriodictyon trichocalyx density	5.1	820
Eriogonum fasciculatum density	2.8	450
Gutierrezia californica density	3.1	500
Heterotheca sessilifolia density	0	0
Juniperus californica density	0.2	32
Lepidospartum squamatum density	0.2	32
Lotus scoparius density	1.0	160
Opuntia littoralis density	4	650
Total density of other shrubs (none > 0.8 / 5m x 5m quadrat)	10.9	1770

Table 2. Minimum sample sizes needed to reach estimate mean values with an 80% confidence interval (Johnson [south] and Redlands Aggregate [south]).

	Sample size	Estimated no. of plots needed for given maximum acceptable error			Precision of sample average
		5%	10%	20%	(80% confidence interval)
Shrub species richness	15	**6**	**1**	**0**	> 95%
Total shrub cover	15	30	**7**	**1**	> 90%
Total shrub density (per 5m x 5m plot)	30	**30**	7	1	>95%
Yerba santa density	30	212	53	**13**	> 80%
Prickly pear density	30	100	49	**12**	> 80%

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Sawyer, J.O., Jr. and Todd Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento.

Smith, R.L. 1980. Alluvial scrub vegetation of the San Gabriel River floodplain, California. Madrono 27:126-138.

Appendix: Johnson (south) and Redlands Aggregate (south) transect data

Sunwest Redlands Project: veg plots for Orange St. sites																		
Plot #	1	2	3	4	5	6	7	8	9	10	11	c1	c2	c3	c4	n	mean	variance
Species richness																		
shrub species richness	10	10	10	9	12	9	10	10	11	9	11	10	8	9	14	15	10.133	2.12381
native annuals species rich.	3	2	0	6	1	3	5	1	3	4	2	6	7	1	5			
Total Native Species Richne	**13**	**12**	**10**	**15**	**13**	**12**	**15**	**11**	**14**	**13**	**13**	**16**	**15**	**10**	**19**	15	13.4	5.685714
Shrub cover																		
Adenostoma fasciculatum	0	0	0	0	0	0	0.19	0	0	0	0	0.06	0	0	0.005		0.017	
Artemisia californica	0.01	0	0	0	0	0	0.005	0	0	0	0	0.07	0	0	0.02		0.007	
Bebbia juncea	0	0	0	0	0	0	0	0	0.005	0	0.005	0	0	0	0		0.0007	
Croton californicus	0	0	0	0	0	0	0.01	0	0	0	0	0.01	0.005	0	0		0.0017	
Eriastrum densifolium ssp. san	0.005	0.005	0	0	0	0	0	0	0	0	0.03	0	0	0	0		0.0027	
Ericameria linearifolia	0	0	0	0	0	0	0	0	0.005	0	0.04	0	0	0	0		0.003	
Eriodictyon trichocalyx	0.12	0.05	0.13	0.04	0.01	0.01	0.09	0.005	0.02	0.01	0.08	0.16	0.07	0.03	0.1		0.0617	
Eriogonum fasciculatum	0.07	0.12	0.06	0.06	0.15	0.04	0	0.01	0.3	0.03	0.12	0.02	0.005	0.06	0.005		0.07	
Gutierrezia californica	0.005	0.03	0.06	0.02	0.02	0	0.05	0.005	0.06	0.02	0.04	0.09	0	0.01	0.01		0.028	
Heterotheca sessilifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.005		0.0003	
Juniperus californica	0	0	0.05	0	0.34	0.31	0	0.3	0.03	0.27	0	0	0.26	0.11	0.18		0.1233	
Lepidospartum squamatum	0	0	0	0.03	0	0.01	0	0	0.12	0.05	0.12	0	0	0	0.005		0.0223	
Lotus scoparius	0.02	0.005	0.03	0.005	0.005	0	0.3	0.05	0.01	0.02	0.07	0.01	0.01	0.005	0.08		0.0413	
Mirabilis californica	0	0	0	0.03	0.02	0	0	0.02	0	0	0	0	0	0	0.01		0.0053	
Opuntia littoralis	0.13	0.04	0.07	0.16	0.17	0.005	0.12	0.03	0.005	0.01	0.01	0.005	0.005	0.03	0.01		0.0533	
Opuntia parryi	0.005	0.005	0.005	0.04	0.005	0.005	0.005	0.04	0.005	0.005	0.005	0.005	0.01	0.005	0.005		0.01	
Phoradendron sp.	0	0.005	0	0	0.02	0.005	0	0.005	0	0	0	0	0	0	0.01		0.003	
Rhamnus crocea	0	0	0.05	0	0.03	0	0	0	0	0	0	0	0	0	0		0.0053	
Salvia apiana	0	0	0.005	0	0.005	0.005	0.005	0.01	0	0	0	0	0	0	0		0.002	
Senecio flaccidus	0.01	0.005	0	0	0	0	0	0	0	0	0	0	0	0.005	0		0.0013	
Yucca whipplei	0.07	0.005	0.04	0.005	0.06	0.03	0.005	0	0.01	0.02	0.14	0.01	0.005	0.07	0.03		0.0333	
Total shrub cover	**0.445**	**0.27**	**0.5**	**0.39**	**0.835**	**0.42**	**0.78**	**0.475**	**0.57**	**0.435**	**0.66**	**0.44**	**0.37**	**0.325**	**0.475**	15	0.4927	0.025096

Plot #	1	2	3	4	5	6	7	8	9	10	11	c1	c2	c3	c4
Native annual cover															
Cirsium californicum							0.005				0.005				
Cryptantha sp.		0.005		0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Dichelostemma capitatum				0.005											
Eriogonum gracile/davidsonii	0.005	0.005		0.005		0.005	0.005			0.005			0.005		0.005
Erodium cicutarium						0.005						0.005	0.005		
Hemizonia sp.				0.005								0.005			
Lessingia sp.	0.005			0.005			0.005					0.005	0.005		
Microseris sp.													0.005		
Phacelia sp.	0.005														
Salvia columbariae									0.005	0.005					0.005
Stephanomeria virgata				0.005			0.005		0.005	0.005		0.005	0.005		0.005
Stipa speciosa					0.005										
Total native annual cover	**0.015**	**0.01**	**0**	**0.03**	**0.005**	**0.015**	**0.025**	**0.005**	**0.015**	**0.02**	**0.01**	**0.025**	**0.03**	**0.005**	**0.02**
Alien spp.															
Avena sp.														0.005	
Brassica geniculata=Hirschfeldia incana														0.005	0.005
Brassica nigra	0.005	0.005		0.005								0.005	0.005		0.005
Centaurea melitensis												0.005	0.005		0.005

Appendix: Johnson (south) and Redlands Aggregate (south) transect data

	mean	var.	t2	t2s2	.05x	.1x	.2x	(.05x)2	(.1x)2	(.2x)2	n (.05)	n (.1)	n (.2)
Shrub species richness	10.133	2.124	0.75	1.593	0.5067	1.0133	2.027	0.2567	1.0268	4.107	6	1	0
Total native species richness	13.4	5.686	0.75	4.265	0.67	1.34	2.68	0.4489	1.7956	7.182	9	2	0
Total shrub cover	0.493	0.025	0.75	0.019	0.0247	0.0493	0.099	0.0006	0.0024	0.01	30	7	1
Total shrub density (per 25 sq. m)	19.37	62.38	0.729	45.48	0.9685	1.937	3.874	0.938	3.752	15.01	48	12	3
Eriodictyon density (per 25 sq. m)	5.1	22.02	0.729	16.05	0.255	0.51	1.02	0.065	0.2601	1.04	246	61	15
Eriogonum density (per 25 sq. m)	2.77	5.91	0.729	4.308	0.1385	0.277	0.554	0.0192	0.0767	0.307	224	56	14
Opuntia littoralis density (per 25 sq	3.37	10.93	0.729	7.968	0.1685	0.337	0.674	0.0284	0.1136	0.454	280	70	17

Appendix: Johnson (south) and Redlands Aggregate (south) shrub density data

Orange St. shrub density (per 25 sq. m)																																	
plot no.	1	2	3	4	5	6	7	8	9	10	11	c1	c2	c3	c4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	n	avg.	var.
Artemisia californica	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.1333	0.3264
Croton californicus	0	0	0	0	0	0	9	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.3333	2.7126
Eriastrum densifolium ssp. sa	1	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0		0.8333	12.626
Ericameria linearifolia	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0.0333	0.0333
Eriodictyon trichocalyx	11	10	5	7	2	1	12	3	0	5	3	10	2	0	7	12	2	16	11	11	0	0	9	0	0	5	3	3	3	0		5.1	22.024
Eriogonum fasciculatum	0	5	5	3	6	1	0	1	7	7	3	0	0	3	0	2	1	0	1	0	6	4	0	1	4	4	3	6	6	4		2.7667	5.9092
Gutierrezia californica	13	1	1	4	12	0	0	1	3	7	2	6	0	0	3	5	4	0	1	0	6	2	1	0	4	6	4	1	4	2		3.1	11.128
Juniperus californica	0	1	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0		0.2	0.1655
Lepidospartum squamatum	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0		0.1667	0.5575
Lotus scoparius	3	1	0	1	0	0	1	0	3	4	0	3	1	0	0	3	0	0	0	0	2	2	0	0	0	1	0	0	0	4		0.9667	1.8264
Mirabilis californica	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	3	0	0	0	1	1	0	1	0	0		0.3667	0.5161
Opuntia littoralis	4	6	3	16	9	3	1	1	1	1	0	0	0	3	0	2	4	4	3	6	4	0	0	6	3	3	5	3	6	4		3.3667	10.93
Opuntia parryi	1	0	2	0	0	2	1	1	0	1	1	0	0	0	0	2	2	0	0	0	0	1	0	0	0	3	0	0	0	0		0.5667	0.7368
Phoradendron sp.	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	5	0	0	0	0	0		0.4	1.3517
Rhamnus crocea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0		0.0333	0.0333
Salvia apiana	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	2	1	0		0.2333	0.323
Senecio flaccida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0		0.0667	0.0644
Stipa speciosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0.0333	0.0333
Yucca whipplei	0	1	1	0	1	2	0	0	0	0	0	1	0	1	1	2	0	0	1	1	0	0	2	0	0	1	0	0	2	2		0.6333	0.5851
total density / 25 sq. m	33	28	17	32	33	11	25	8	15	25	15	20	5	7	14	29	16	20	18	23	22	9	31	11	20	24	15	16	22	16	31	19.333	62.437

SCOTT WHITE
BIOLOGICAL CONSULTING

8 March 2000

Paul Kielhold
LILBURN CORPORATION
1905 Business Center Dr.
San Bernardino, CA 92408

Reg. CEMEX Redlands baseline vegetation data: Alabama St.

Dear Paul:

I have completed data collection and analysis at the CEMEX Redlands Alabama St. site. Methods and results are summarized here.

METHODS

Data collection: Field work was completed by Scott D. White and Tasha LaDoux between 14 January and 19 February 2000. We collected quantitative vegetation data on 11 transects. Data collection was slightly modified from methods described by Sawyer and Keeler-Wolf (1995, Appendix, p. 416 and following, "CNPS field sampling protocol"). Plot locations were scattered throughout the site and were selected to represent the range of typical vegetation occurring on the property. Plant species touching a vertical line, at ½-m intervals along 50-m line transects were recorded as "hits" and used to estimate cover by species on each transect. Every species occurring within a 10 m x 50 m belt along the transect line was recorded. In addition, densities of perennial plants were estimated at each transect site by censusing each perennial species within a 25 m^2 (5m x 5m square) area at the origin point of each transect. Shrub density data were taken at an additional 12 5m x 5m plots. All data are attached.

Analysis: Mean values were calculated for selected vegetation cover, species richness, and density variables (Table 1). Density estimates were converted from plants / 25 m^2 to plants / acre for results shown in this report but not in the data analysis shown in the appendices.

The California Surface Mining and Reclamation Act (SMARA) requires that baseline sample sizes "must be sufficient to produce at least an 80% confidence level." I used methods described by Bonham (1988: p 66) to determine sample size adequacy for estimated vegetation cover, species richness, and shrub density variables. Note, however, that the statistical approach assumes that plot sites are randomly selected, and that variables are normally distributed. These assumptions are violated here and I am not aware of a practical alternative. This compromise is common in vegetation sampling and analysis methods.

99 East C Street • No. 206 • Upland, CA 91786 • (909) 949-3686 • Fax (909) 949-8337
email swhite@cyberg8t.com

In effect, Bonham's formula determines a minimum sample size (*n*) to determine with 80% certainty that the average vegetation cover, species richness, and shrub densities in sample plots differ from the vegetation's actual average cover and richness by no more than 5%, 10%, or 20%, depending on maximum error selected.

RESULTS

Average vegetation cover, species richness, and shrub density are shown in Table 1. Note that the survey dates prevented identification of most native annual species, and that they are poorly represented in the data set. I recommend using the shrub species richness data here as a baseline for revegetation. Total species richness values reported here are low estimates because spring surveys would have identified more annuals, and total species richness would have been much higher. I recommend including locally-occurring native annual plants in the revegetation program if seed is commercially available, but emphasizing shrub species richness in revegetation success criteria and monitoring. Locally occurring annual species fluctuate widely seasonally and annually, so that variance in cover or density data is too high to effectively evaluate success.

Much of the Alabama St. site has evidently been flood scoured within about the past 10-20 years and the most common and generally dominant species are scalebroom (*Lepidospartum squamatum*), California buckwheat (*Eriogonum fasciculatum*), and golden aster (*Heterotheca sessilifolia*). This is consistent with early-successional alluvial scrub vegetation described by Smith (1980). Species more common in later-successional alluvial scrub, including prickly pear cactus (*Opuntia littoralis*) and yerba santa (*Eriodictyon trichocalyx*) occur at only low cover and density.

Sample size: Analysis indicates that these samples provide an adequate sample size, with an 80% confidence interval and 80% to 95% precision (5% to 20% maximum allowable error) for vegetation cover, shrub species richness, shrub densities, and densities of some dominant species (Table 2). State Mining and Geology Board personnel normally recommend a 10% - 20% maximum error for species richness and density estimates, though Board recommendations do not specify this (Gail Newton, pers. comm.). These calculations indicate that all critical cover and species richness variables meet these recommendations. I conclude that the data presented here meet the intent of the SMARA requirement for pre-disturbance vegetation sampling.

Sincerely,

Scott White

Table 1. Mean values for Alabama St. vegetation data.

Shrub species richness (10m x 50 m belt)	7.6	
Total native species richness	11.5	
Total shrub cover	29%	
Eriastrum densifolium ssp. sanctorum	1%	
Eriodictyon trichocalyx cover	< 1%	
Eriogonum fasciculatum cover	7%	
Gutierrezia californica cover	2%	
Heterotheca sessilifolia cover	3%	
Lepidospartum squamatum cover	11%	
Lotus scoparius cover	2%	
Opuntia littoralis cover	< 1%	
Senecio flaccidus cover	1%	
Other species total cover (none > 1%)	<4%	
Total shrub density (per 5m x 5m plot at left, per acre at right)	18	2910
Eriastrum densifolium ssp. sanctorum density	3.3	530
Eriodictyon trichocalyx density	0	0
Eriogonum fasciculatum density	2.2	360
Gutierrezia californica density	1.3	210
Heterotheca sessilifolia density	5.2	840
Lepidospartum squamatum density	1	160
Opuntia littoralis density	0.3	48
Other species total density (all < 1 / 5m x 5m plot)	13.3	760

Table 2. Minimum sample sizes needed to reach estimate mean values with an 80% confidence interval (Alabama St. site).

	Sample size	Estimated no. of plots needed for given maximum acceptable error			Precision of sample average
		5%	10%	20%	(80% confidence interval)
Shrub species richness	11	16	**4**	**1**	> 90%
Total shrub cover	11	40	**10**	**2**	> 90%
Total shrub density (per 5m x 5m plot)	23	**15**	3	0	> 95%
Santa Ana River woollystar density	23	94	**23**	**5**	> 90%
Calif. buckwheat density	23	140	35	**8**	> 80%
Matchweed density	23	245	61	**15**	> 80%
Golden aster density	23	56	**14**	3	> 90%
Scalebroom density	23	306	76	**19**	> 80%

LITERATURE CITED

Bonham, C.D. 1988. Measurements for Terrestrial Vegetation. John Wiley and Sons, New York.

Hickman, J. (editor). 1993. The Jepson Manual: Higher Plants of California. University of California Press, Berkeley, California.

Sawyer, J.O., Jr. and Todd Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society, Sacramento.

Smith, R.L. 1980. Alluvial scrub vegetation of the San Gabriel River floodplain, California. Madrono 27:126-138.

Sunwest Redlands Project: veg plots for Alabama St. site														
Plot #	1	2	3	4	5	6	7	8	9	10	11	n	mean	variance
Species Richness														
shrub species richness	6	8	10	10	6	9	5	9	6	8	7	11	7.6364	3.05454545
native annuals species rich.	6	6	3	4	2	3	2	5	1	3	7			
Total Native Species Richnes	**12**	**14**	**13**	**14**	**8**	**12**	**7**	**14**	**7**	**11**	**14**	**11**	11.455	8.07272727
Shrub cover														
Croton californicus	0.01	0.02	0.005		0.005	0.005	0.005	0.01					0.0079	
Eriastrum densifolium ssp. sanc	0	0.01	0.02	0.005	0	0.01	0	0.02	0.02	0.01	0.02		0.0105	
Eriogonum fasciculatum	0.005	0.05	0.06	0.09	0	0.06	0.02	0.03	0.26	0.13	0.05		0.0686	
Gnaphalium canescens	0	0	0	0.005	0	0	0	0	0	0	0		0.0005	
Gutierrezia californica	0	0	0.05	0.03	0	0	0	0	0.01	0.05	0.03		0.0155	
Heterotheca grandiflora	0.005	0	0	0	0	0	0	0.01	0	0	0		0.0009	
Heterotheca sessilifolia	0.005	0.07	0.02	0.03	0.06	0.005	0.07	0.03	0.02	0.01	0.03		0.0318	
Lepidospartum squamatum	0.13	0.08	0.12	0.07	0.02	0.21	0	0.19	0.16	0.09	0.17		0.1127	
Lotus scoparius	0.07	0.05	0.03	0.01	0.005	0.08	0.005	0.01	0.005	0.005	0.005		0.0245	
Opuntia littoralis	0	0.005	0.005	0.005	0	0.005	0	0.01	0	0.005	0		0.0027	
Senecio flaccidus	0	0.005	0.005	0.005	0.07	0.01	0.01	0.01	0	0.01	0.005		0.0118	
Yucca whipplei	0	0	0.005	0.005	0.005	0.05	0	0	0	0	0		0.0059	
Total shrub cover	**0.225**	**0.29**	**0.32**	**0.255**	**0.165**	**0.435**	**0.11**	**0.3**	**0.475**	**0.31**	**0.31**	**11**	0.2905	0.01105227
Native annuals cover														
Camissonia sp.	0.005	0.005												
Centaurea melitensis								0.01						
Cryptantha sp.	0.005	0.005	0.005	0.005		0.005	0.005	0.01			0.005			
Descuraina pinata											0.005			
Eriogonum gracile/davidsonii	0.005			0.005	0.005	0.005		0.01		0.005	0.005			
Erodium cicutarium	0.005	0.005	0.005					0.01			0.005			
Filago sp.	0.005	0.005		0.005				0.01		0.005	0.005			
Lessingia sp.	0.005	0.005	0.005			0.005								
Salvia columbariae				0.005	0.005		0.005		0.005	0.005	0.005			
Stipa speciosa											0.005			
Stylocline gnaphalioides		0.005												
Total native annual cover	**0.03**	**0.03**	**0.015**	**0.02**	**0.01**	**0.015**	**0.01**	**0.03**	**0.005**	**0.015**	**0.035**			

Plot #	1	2	3	4	5	6	7	8	9	10	11			
Alien species cover														
Avena sp.	0.005			0.005	0.005						0.005			
Brassica geniculata=Hirschfeldia incana		0.005	0.005		0.005			0.01			0.005			
Brassica nigra	0.005	0.005				0.005	0.005	0.01		0.005	0.005			
Nicotiana glauca								0.01						

	mean	var.	t2	t2s2	.05x	.1x	.2x	.05x2	.1x2	.2x2	n (.05)	n (.1)	n (.2)
Shrub species richness	7.636	3.054	0.773	2.36074	0.3818	0.764	1.5272	0.1458	0.5831	2.332	16	4	1
Total Native Species Richness	11.46	8.073	0.773	6.24043	0.5728	1.146	2.291	0.328	1.3122	5.249	19	4	1
Total shrub cover	0.29	0.011	0.773	0.0085	0.0145	0.029	0.058	0.0002	0.0008	0.003	40	10	2
Total shrub density (per 25 sq. m)	18	17.4	0.736	12.8064	0.9	1.8	3.6	0.81	3.24	12.96	15	3	0
Eriastrum densifolium ssp. sanctorum	3.3	3.49	0.736	2.56864	0.165	0.33	0.66	0.0272	0.1089	0.436	94	23	5
Eriogonum fasciculatum	2.2	2.31	0.736	1.70016	0.11	0.22	0.44	0.0121	0.0484	0.194	140	35	8
Gutierrezia californica	1.3	1.41	0.736	1.03776	0.065	0.13	0.26	0.0042	0.0169	0.068	245	61	15
Heterotheca sessilifolia	5.2	5.23	0.736	3.84928	0.26	0.52	1.04	0.0676	0.2704	1.082	56	14	3
Lepidospartum squamatum	1	1.04	0.736	0.76544	0.05	0.1	0.2	0.0025	0.01	0.04	306	76	19

Alabama St. shrub density (25 sq. m)																												
plot no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	avg.	var.			
Artemisia dracunculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.1				
Croton californicus	0	1	0	0	0	1	0	0	0	0	0	2	1	0	0	1	1	0	0	0	1	0	0	0.3				
Eriastrum densifolium ssp. sa	0	9	11	0	0	0	0	0	1	4	0	8	10	11	0	14	1	3	1	0	0	0	4	3.3	3.49		3.3	3.49
Eriogonum fasciculatum	0	1	1	5	0	2	1	0	3	1	2	1	0	1	9	2	2	6	0	0	2	11	1	2.2	2.31		2.2	2.31
Gutierrezia californica	0	0	0	4	0	0	0	0	0	7	7	0	0	3	0	1	2	2	2	0	0	0	3	1.3	1.41		1.3	1.41
Heterotheca sessilifolia	5	0	0	0	6	15	6	6	4	2	19	0	3	25	3	6	0	3	8	0	9	0	0	5.2	5.23		5.2	5.23
Lepidospartum squamatum	0	0	3	2	0	0	0	1	0	0	0	1	0	0	0	1	5	1	2	4	0	0	3	1	1.04		1	1.04
Lotus scoparius	16	10	7	0	0	9	0	0	0	0	1	2	9	0	0	0	1	0	0	0	0	6	3	2.8				
Opuntia littoralis	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3				
Senecio flaccidus	0	0	1	0	3	1	1	0	0	2	0	0	2	0	0	1	0	0	0	0	7	0	1	0.8				
Yucca whipplei	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1				
total density / 25 sq. m	**21**	**21**	**29**	**11**	**9**	**28**	**8**	**7**	**8**	**16**	**29**	**14**	**25**	**40**	**12**	**27**	**12**	**15**	**13**	**4**	**19**	**17**	**19**	18	17.4		18	17.4

Appendix B
Slope Stability Analyses

C.H.J. INCORPORATED

P.O. Box 231, Colton, CA 92324-0231 • 1355 E. Cooley Dr., Colton, CA 92324-3954 • Phone (909) 824-7210 • Fax (909) 824-7209

January 15, 2002

Robertson's Ready Mix
P.O. Box 33140
Riverside, California 92519
Attention: Mr. Craig Phillips

Job No. 011029-3

Dear Mr. Phillips:

Attached herewith is the Slope Stability Investigation report, prepared for the Revision 2 Mine Plan for the Old Webster Quarry located within the City of Redlands, California.

This report was based upon a scope of services generally outlined in our proposal dated December 3, 2001, and other written and verbal communications.

We appreciate this opportunity to provide geotechnical services for this project. If you have questions or comments concerning this report, please contact this firm at your convenience.

Respectfully submitted,
C.H.J., INCORPORATED

Todd R. Wyland, R.C.E.
Project Engineer

TRW/JJM/RJJ:sra

Distribution: Robertson's Ready Mix (8)

TABLE OF CONTENTS

C·H·J·

SLOPE STABILITY INVESTIGATION
REVISION 2 MINE PLAN
OLD WEBSTER QUARRY
REDLANDS, CALIFORNIA
PREPARED FOR
ROBERTSON'S READY MIX
JOB NO. 011029-3

INTRODUCTION

During December of 2001 and January of 2002, this firm performed a slope stability investigation for the subject Revision 2 Mine Plan of the existing sand and gravel mine known as the Old Webster Quarry, located within the City of Redlands, California. The purpose of this investigation was to characterize the site geology in order to adequately analyze and evaluate the gross stability of both the temporary mining excavations and the planned final reclaimed slopes under various foreseeable conditions, including strong seismic shaking, potential rising groundwater, and pit ponding.

A 200-scale Revision 2 Mine Plan, prepared by Robertson's Ready Mix, dated May 15, 2001, and a 200-scale untitled Topographic Map were provided for our use. The Mine Plan included the proposed final topography, the existing topography of the surrounding areas, typical cross-sections, and various notes explaining the planned excavation technique and mining procedure. The Topographic Map reflected the relatively recent pit topography and surface features and was requested for the purposes of our field investigation and back calculations of strengths of the existing pit slopes. For the purposes of this investigation, the site was considered to be the approximately 211-acre area covered by the Revision 2 Mine Plan and does not include the additional areas being considered within the "Plan B" or other adjoining Robertson's Ready Mix property. The approximate location of the site is shown on the attached Index Map (Enclosure "A-1").

The gross stability of the planned 120-foot deep final slopes inclined at 1.5 horizontal to 1 vertical [1.5(h):1(v)] was previously verified with a brief slope stability analyses performed by our project engineer (C.H.J., Incorporated, November 2, 2001). The calculations included with that letter were performed utilizing strength parameters determined by direct shear testing and general back analysis of the near-vertical existing pit slopes, which were both observed at the site and supported by the Topographic Map. That Slope Stability Analyses letter was prepared with the understanding that it would be followed by a more comprehensive investigation report, including geology and additional, more detailed slope stability analyses. This report is intended to serve that purpose. Because this report presents the information from our previous letter in more detail, this report entirely supercedes our previous letter.

The procedures and results of our slope stability investigation are discussed in this report, together with our conclusions and recommendations. Our supporting maps, cross-sections, and laboratory data are presented in the appendices along with our slope stability calculations.

SCOPE OF SERVICES

The scope of services provided during this slope stability investigation included the following:

- Review of published and unpublished literature and maps
- Review and analysis of single and stereoscopic aerial photographs flown in 1949, 1969, 1971, 1978, 1986, and 1991
- Geologic mapping of the site and observation of existing slope inclinations
- Logging and sampling of the existing quarry walls
- Direct shear testing to provide frictional strength parameters for our slope stability calculations
- Back calculation of the existing quarry slopes to estimate the overall full-scale cohesive strength of the native materials existing at the site
- Slope stability calculations of both the proposed temporary mining excavations and final reclamation slopes under various conditions including strong seismic shaking, potential rising groundwater, and pit ponding
- Evaluation of the geotechnical data and calculated factors of safety to determine whether the planned mining and final reclaimed slopes would be adequately safe against gross failure, and, if necessary, to provide appropriate recommendations for slope construction and reclamation

PROJECT CONSIDERATIONS

Information furnished this office indicates that the existing quarry site is planned to be deepened by additional mining. The site will ultimately be reclaimed. The final reclaimed quarry, as currently proposed, will be approximately 120 feet in depth with continuous 1.5(h):1(v) typical slope inclinations as shown on the Revision 2 Mine Plan enclosed in Appendix "A". A noted exception is the 2(h):1(v) side slopes proposed adjacent to the "Plan B" boundary near the southwest corner of the site.

A nominal 50-foot setback was indicated between the top of the final slopes and the property line.

SITE DESCRIPTION AND AERIAL PHOTOGRAPH REVIEW

The subject 211± acre site is located within Santa Ana River Wash and is entirely within the City of Redlands, California. Most of the site is occupied by an existing sand and gravel quarry with near-vertical bench walls typically 30± feet high. The mining started before the1949 aerial photographs, and subsequent aerial photographs show the site as being intermittently mined or used for ore processing. A portion of the site was used for an apparent poultry farm.

At the time of this investigation, the existing quarry slopes were typically comprised of near-vertical upper walls with a colluvial wedge and/or stockpiled bouldery material along the base. Haul roads associated with the mining activity were present across most of the site. Fill piles of unprocessed material and boulders too large for the crushers were present throughout the quarry.

The area to the south of the site is the Santa Ana River Wash, portions of which are set aside as environmental mitigation areas for the Seven Oaks Dam. The areas to the east are vacant and include numerous earthen dikes or berms placed for drainage and flood control purposes. Portions of this area are presently designated as Santa Ana River Woolly Star habitat and are not to be disturbed. West of the site, the Mine Plan shows predominately vacant land of the San Bernardino County Flood Control District and the Bureau of Land Management. An active mining and materials processing area abuts the northern portion of the western site boundary. San Bernardino Valley Water Conservation District property was indicated northeast of the site.

The site was accessible by the haul road connecting the active mining area to the materials processing plants west of the site. An old dirt road existed above the quarry around the perimeter of the site.

The site is located within the active flood plain of the Santa Ana River, and portions of the site were flooded in 1969. The major flood hazard to the existing quarry has been mitigated by the Seven Oaks Dam on the Santa Ana River; however, some hazard still exists from Plunge Creek, Mill Creek, and from other tributaries to the Santa Ana River that are downstream from the Seven Oaks Dam.

FIELD OBSERVATIONS

The exposed quarry walls permitted observations, sampling, and testing of the soil and geologic conditions of the upper soils across the site. Our observations indicated that the subject site is located entirely within river deposits consisting of sand, gravels, cobbles, and boulders typically as large as 5± feet in dimension. The soil profile exposed by the existing pit walls observed at the site was essentially comprised of a single clast-supported geologic unit without the presence of a significant finer-grained matrix-support upper unit. The cobbles and boulders observed within this pit were predominantly granitic and distinctively round. The hardness and persistent nature of the granite have apparently enabled the larger clasts to survive without breaking during transport. The roundness of the clasts provides for their close packing which, based upon our field experience, effectively contributes to the stability of such clast-supported materials.

LABORATORY TESTING

In order to determine appropriate strength parameters necessary for our slope stability calculations, various samples representative of the native materials exposed at the site were obtained by our project engineer and returned to our laboratory for direct shear testing (ASTM D 3080) and further evaluation. Of the samples obtained, three were subjected to testing and are being reported. Sample No. 1 was selected from a 2± foot thick lense of cemented sandy material located just above the colluvial wedge. This disturbed sample was obtained for strength modeling of the anticipated backfills and disturbed soils of the final slope surface. Sample No. 2 was obtained from a colluvial wedge at the base of the existing slopes and is considered to be more representative of the gravelly materials of the overall slope (less cobbles and boulders). Sample No. 3 was obtained by chipping pieces of cemented sandy material selected from an undisturbed lense exposed in the existing pit. The approximate sample locations are indicated on the attached Plat (Enclosure "A-3"). Sieve analyses were performed on Sample Nos. 1 and 2 for classification and potential correlation purposes. The plotted gradation curves are attached as Enclosure "B-1".

In an attempt to obtain undisturbed test specimens to model the in-situ strengths for gross stability evaluations, brass sampling rings were pressed into chunks of the dry cemented sandy material of Sample No. 3. Due to the brittle nature and lack of confinement of the soil, it was difficult to obtain neatly trimmed test specimens. Because the remaining voids were filled with loose dry soil, we referred to these specimens as "semi-disturbed", and our results are considered conservative. Specimens of disturbed material from Sample No. 1 were remolded and tested under various conditions. To evaluate the "peak" in-situ strength and effects of wetting, the specimens were typically initially sheared at field moisture content prior to inundation.

Our ultimate direct shear results are presented on Enclosure "B-2".

SITE GEOLOGY

The site is located within the Bunker Hill - San Timoteo Basin portion of the San Bernardino Valley, at the northern edge of the Peninsular Ranges Geomorphic Province. The Bunker Hill - San Timoteo Basin is a subsiding series of horsts and grabens bounded on the northeast by the San Andreas fault and on the southwest by the San Jacinto fault. Coalesced alluvial fans emanating from the San Bernardino Mountains to the north and, to a lesser extent, from the San Timoteo Badlands to the south are filling the basin as it subsides and have formed the alluvial plain of the San Bernardino Valley floor. Because of the irregular surface of the basin floor, the depth of the in-filling sediments is exceedingly variable. Fife and others (1976) mapped a depth to the base of the water-bearing alluvium as approximately 600 feet.

The site is located within a broad fluvial plain known as the Santa Ana River Wash. The Santa Ana River Wash includes various coalescing stream channels associated with drainages emanating from the San Bernardino Mountains to the north. In the area of the site, the wash includes the Santa Ana River, immediately south of the site, and the Plunge Creek wash, north of the site (Morton, 1978). The main confluence of Plunge Creek and the Santa Ana River is west of the site (Morton, 1978, Enclosure "A-4"); however, aerial photographs show that overflow channels cross between the primary river beds in numerous places. Some of these overflow channels crossed the site.

Published geologic mapping shows most of the surficial materials at the site as pebbly to bouldery alluvium (Morton, 1978). The southern portion of the site includes part of the main Santa Ana River channel and is mapped as sandy to bouldery alluvium (Morton, 1978). Most of the original ground surface at the site has been removed by mining.

Geologic mapping performed to support the slope analysis revealed one major lithologic unit at the site. This unit is a young alluvium (Qya) consisting of river channel deposits and is mapped in cross-section (Enclosure "A-5"). This cross-section coincides with the cross-section B-B in the proposed mine plan, Enclosure "A-2." The unit is coarse grained, consisting of bouldery gravels and sands with lenses of finer sands containing some silt. The unit is predominantly clast supported with maximum clast sizes of several feet. Carbonate cement binds the material into a cohesive mass when undisturbed. The cross-section shows a measured 41± foot cliff that in places has almost 2 feet of overhang. Boulders weathering out of the face were observed and manually determined to be stable with more than half their mass is exposed and overhanging (Enclosure "A-3" inset). A significant amount of fill exists on site in the form of stockpiled material, piles of boulders too large for processing, earthen berms, and roadway embankments.

FAULTING

The site does not lie within, or immediately adjacent to, an Alquist-Priolo Earthquake Fault Zone designated by the State of California to include traces of suspected active faulting. No active or potentially active faults are shown on, or in the immediate vicinity of, the site on published geologic maps. No evidence for active faulting on, or immediately adjacent to, the site was observed during the geologic field reconnaissance or on the aerial photographs reviewed.

The tectonics of the Southern California area are dominated by the interaction of the North American plate and the Pacific plate, which are apparently sliding past each other in a translational manner. Although some of the motion may be accommodated by rotation of crustal blocks such as the western Transverse Ranges (Dickinson, 1996), the San Andreas fault zone is thought to represent the major surface expression of the tectonic boundary and to be accommodating most of the translational motion between the Pacific plate and the North American plate. However, some of the plate motion is apparently also partitioned out to the other northwest-trending strike-slip faults that are thought to be related to the San Andreas system, such as the San Jacinto fault and the Elsinore fault. Local compressional or extensional strain resulting from the translational motion along this boundary is accommodated by left-lateral, reverse, and normal faults such as the Cucamonga fault, the Crafton Hills fault zone, and the blind thrust faults of the Los Angeles Basin (Matti and others, 1992; Morton and Matti, 1993).

The site is located on a structural feature known as the San Bernardino Valley block. This block is bounded along the northeast by the San Andreas fault and along the southwest by the San Jacinto fault. The most significant fault to the site with respect to seismic shaking is the San Andreas fault. The San Andreas fault is located along the southwest margin of the San Bernardino Mountains, approximately 2 miles northeast of the site. The toe of the mountain front in the San Bernardino area roughly demarcates the presently active trace of the San Andreas fault, which is characterized by youthful fault scarps, vegetational lineaments, springs, and offset drainages. The Working Group on California Earthquake Probabilities (1995) tentatively assigned a 28 percent (±13 percent) probability to a major earthquake occurring on the San Bernardino Mountains segment of the San Andreas fault between 1994 and 2024.

The main trace of the San Jacinto fault is located approximately 6 miles southwest of the site (Dutcher and Garrett, 1963; Morton, 1978). The San Jacinto fault zone is a system of northwest-trending, right-lateral, strike-slip faults. More large historic earthquakes have occurred on the San Jacinto fault than any other fault in Southern California (Working Group on California Earthquake Probabilities, 1988). Based on the data of Matti and others (1992), the San Bernardino Valley segment of the San Jacinto fault may be accommodating much of the motion between the Pacific Plate and the North American Plate in this area. Matti and others (1992) suggest this motion is transferred to the San Andreas fault in the Cajon Pass region by "stepping over" to parallel fault strands, which include the Glen Helen fault. The Working Group on California Earthquake Probabilities (1995) tentatively assigned a 37 percent (±17 percent) probability of a major earthquake on the San Bernardino Valley segment of the San Jacinto fault for the 30-year interval from 1994 to 2024.

A probabilistic seismic hazard analysis is beyond the scope and purpose of this investigation. Based on the proximity to two major active faults, the site can be expected to be subject to severe ground shaking during the lifetime of the project. The hazard of significant ground shaking was taken into account during our slope stability analyses, discussed later in this report.

GROUNDWATER

The site is located within Santa Ana River Wash, an area of relatively shallow historical groundwater levels. No evidence of springs or shallow groundwater was observed at the site during our field investigation. The minimum depth to groundwater in the area of the site during the period 1973 to 1983 is shown by Matti and Carson (1991) as between 30 and 50 feet.

Current and historical groundwater depths in the site area were researched in order to determine reasonable depths to be considered in our analyses. The current depth to groundwater below the site is estimated to be approximately 100 feet based on recent data from State Well No. T1S/R3W 10J02S, located less than 1/4 mile west of the site, and State Well No. T1S/R3W 11H01S, located less than 1/4 mile east of the site (Western Municipal Water District, 2000). Data available from Western Municipal Water District for State Well No. T1S/R3W 10J02S, dating from the present back to 1992, show a minimum depth to water of 78 feet in 1995. This corresponds to an elevation of 1,229 feet. Review of groundwater data dating from 1942 to 1987 from State Well Nos. T1S/R3W 9E01 and T1S/R3W 9E02 (1 mile west of the site) shows a minimum depth to groundwater of 30 feet in 1945 and a maximum depth of 231 feet in 1965 (California Department of Water Resources, 1990).

The groundwater data reviewed indicate that the depth to groundwater in the site area has fluctuated significantly in the past. These fluctuations were largely a result of regional changes in recharge and extraction of groundwater. Based on the available data, it appears that groundwater may encroach upon the deeper portions of the proposed mine during the project lifetime. The potential for groundwater in the quarry was taken into account during our slope stability analyses, discussed later in this report.

LIQUEFACTION

The site is located within an area of liquefaction susceptibility designated by Matti and Carson (1991). Liquefaction is a process in which strong ground shaking causes saturated soils to lose their strength and behave as a fluid (Matti and Carson, 1991). Ground failure associated with liquefaction can result in lateral spreading and slope failure. Three geologic conditions must be simultaneously present for liquefaction to occur: 1) shallow groundwater; 2) unconsolidated sandy soils; and 3) strong ground shaking.

Based upon the findings of this investigation, all three geologic conditions for liquefaction may exist at or adjacent to the site. Sustained shallow groundwater would most likely be present within the lower portion of the quarry. The majority of the soils on the site, in their natural state, are carbonate cemented bouldery gravels. These soils are not normally conducive to liquefaction. The reclamation process, flooding of the pit during high water periods, and other factors may leave some portions of the site with locally unconsolidated fill soils. The site's location between the San Andreas and San Jacinto faults provide ample potential for strong ground shaking.

Regarding the native materials, liquefaction would most likely occur within isolated lenses of cohesionless sands with perched water. We would anticipate surface manifestation to be in the form of localized sand boils, isolated settlements, or localized surficial "pop out" type slope failures, which should not jeopardize the gross stability of the quarry slopes. Regarding the final reclaimed slopes, liquefaction would most likely occur within the bench backfills. The loose sandy backfill would be prone to consolidation upon seismic shaking. Without overburden confinement, even bouldery materials within the fill may consolidate. Because the fills will be placed on essentially level benches underlain by relatively impermeable undisturbed native materials, these benches are likely to contain perched water. Such potential for liquefaction and/or deformation would be limited to areas within the fills; as such, we would anticipate that any resulting slope failures would be localized, limited in size, and near the surface, and should not jeopardize the gross stability of the overall slopes.

SLOPE STABILITY

The native materials at the depths controlling the gross stability of the entire proposed final quarry slopes are anticipated to be comprised of dense, somewhat cemented river channel deposits consisting of sands, gravels, and boulders. Bedding is present within the sandier lithologies but is subhorizontal. These materials have a very low susceptibility to significant slope failure (landsliding). The relatively massive alluvial deposits have a low susceptibility to landsliding due to the lack of geologic structures such as joints, contacts, and bedding, which may present preferred shear surfaces. The presence of the tightly-packed clasts prevent the development of, and displacement along, a localized distinct shear failure surface which acts to distribute the driving shear forces and any shear deformation across a broad zone.

Consideration was given to the fact that the upper materials exposed in the existing pit walls are, and have been, above the groundwater table, and that the lower materials of the additional 35± feet to be mined have historically been below the groundwater table. The persistent nature of the predominantly granitic materials at the site indicated that such material would not be vulnerable to significantly increased weathering and weakening of the clasts below the groundwater table.

SLOPE STABILITY ANALYSIS:

The gross stability of the proposed 120± feet deep quarry slopes was analyzed under both static and seismic conditions for rotational failures using Bishop's Simplified Method and the TSTAB (TAGA, 1986) computer software program. The seismic calculations were performed pseudostatically using a lateral acceleration coefficient k of 0.20 and included a search for the critical seismic coefficient. The critical seismic coefficient is defined as the k required to produce failure (i.e. FS±1). The higher k of 0.20 was utilized instead of the standard 0.15 based on judgement due to the proximity to the San Andreas Fault system.

Based upon the anticipated presence of consolidated undisturbed native clast-supported bouldery sands and gravels at the site, a "drained" condition was considered appropriate for the purposes of evaluating the gross stability of the entire slope.

BACK ANALYSES OF EXISTING SLOPES:

Long-standing existing slopes have a static factor of safety of at least 1.0 against gross failure. Therefore, we performed back analysis of the existing quarry slopes to supplement our direct shear test data, as well as our engineering judgement, in selecting appropriately conservative strength parameters for our analyses.

This type of back analysis is a generally accepted method of estimating the lower-bound full-scale strength of the overall slope and is especially useful as an indicator of the cohesive strength contribution which can be attributed to the matrix cementation combined with the effects of clast-interlocking and the shear resistance across the larger clasts. Although strength parameters would be somewhat variable for the alluvial materials, to simplify our back analysis, the slopes were modeled as being homogeneous with a single set of strength parameters distributed over the entire slope.

As part of our previous analyses, back calculations were performed on 45-feet high pit walls inclined at 0.5(h):1(v). Although our initial observations indicated steeper and taller walls, this height and inclination was supported by the Topographic Map at the three locations indicated on the attached Plat (Enclosure "A-3"). The results of our conservatively performed previous back calculations indicated factors of safety slightly greater than 1.0 for apparent cohesion values of 400, 350, and 275 pounds per square foot (psf) corresponding to friction angles of 36, 38, and 40 degrees, respectively. This range of friction angles was selected based upon our direct shear tests and past experience with similar materials. Because the actual friction angle for the dense bouldery gravels may be considerably higher, we performed additional back calculations with a 45 degree friction angle. The results of these calculations indicated an apparent cohesion of 200 psf.

As part of the geologic mapping included with this investigation, actual measurements were obtained at Section C-C' using a Brunton compass and tape measure. Because the 41-foot high near-vertical wall above the 10± feet high colluvial/bouldery fill wedge provided the opportunity for less conservative back analyses, additional back calculations were performed based upon Section C-C'. Based upon an average slope inclination to the base of the colluvial wedge of 0.2(h):1(v), back calculations for the 50-foot high slope indicated apparent cohesion values of 775, 725, 700, and 575 psf for friction angles of 36, 38, 40, and 45 degrees, respectively.

The majority of our calculations were performed with a total unit weight of 135 pounds per cubic foot (pcf). To evaluate the sensitivity of the calculated factor of safety to changes in the unit weight, we also performed 45 degree friction angle back calculations with a unit weight of 145 pcf. The results of these calculations performed with the same cohesion indicated a slightly lower factor of safety (1.05 for γ=145 pcf vs. 1.08 for γ=135 pcf).

STRENGTH PARAMETERS:

Because the strength parameters control the results of the calculations, and because the strength modeling of the subject slopes was not straight forward, we have included this section to discuss the basis of the strength parameters selected for our analysis.

First of all, for simplicity and consistency with our back analyses, the slopes were treated as being homogenous with one set of strength parameters. Because the outer materials of actual slopes will be comprised of both undisturbed native materials and uncontrolled fills, discretion was utilized to estimate an average strength of the outer soils. Consideration was given to the fills being variable, both in proportion to the native materials and in distribution across the slopes. Further, because of uncertainties with actual materials and their placement, the fill strengths were conservatively assumed. Neglecting the frictional strength contribution from any gravel, cobbles, or boulders, the results of our direct shear testing performed on disturbed dry sand obtained from the site to model potential fills indicated a 36 degree friction angle.

The apparent cohesion values indicated by the direct shear results are based upon overburden pressures at depth. Understanding the curved linear nature of the strength envelope with the apparent cohesion decreasing within the low normal stress range of depths less than 5± feet, minimal cohesion was assumed for the surficial fills. An apparent cohesion of 350 psf and a friction angle of 38 degrees was utilized to represent the average overall strengths of the undisturbed native materials and the fills at the depths affecting the slip circles of our gross stability calculations. The full-scale friction angle of undisturbed native gravelly materials at the site would be in excess of 40 degrees, and the corresponding cohesion would be in excess of 700 psf, as supported by our back analysis of Section C-C' inclined at 1.2(h):1(v).

Although the gross stability slip circles are anticipated to mainly pass through undisturbed native soils, it was considered appropriately conservative to assume that certain slopes may be comprised of 50 percent cohesionless fill and 50 percent undisturbed native materials. An apparent cohesion of 350 psf and a 38 degree friction angle has been utilized to represent such soils.

ANALYSES OF PROPOSED FINAL SLOPES:

Our initial calculations previously performed for the final 120-feet deep slopes inclined at 1.5(h):1(v) utilized a total unit weight of 135 pcf, an apparent cohesion of 350 psf, and a friction angle of 38 degrees. These strength parameters were selected to represent the strength of the near-surface materials anticipated to be mainly comprised of relatively undisturbed native materials with alternating triangular-shaped wedges of loosely placed bouldery backfill material on the mining benches. The results of these calculations indicated acceptable 1.59 static and 1.11 seismic factors of safety against gross failure with a critical seismic coefficient of 0.25.

Our previous analyses also included static calculations performed with the more friction-dominated back calculated parameters (C=275 psf, ϕ=40°) as a check and for comparison purposes. These calculations, which are also included with this report, indicated a slightly improved and acceptable 1.63 static factor of safety against gross failure.

To evaluate deeper slip circles through undisturbed native materials, we performed calculations using an apparent cohesion of 700 psf and the 38 degree friction angle supported by our back analysis of Section C-C'. The results of these calculations indicated 1.85 static and 1.38 seismic factors of safety with a critical seismic coefficient of 0.357.

GROUNDWATER ANALYSES:

To evaluate the effects of potential rising groundwater, we ran a series of static calculations with a horizontal phreatic surface set equal to the external pond depth. The results of these calculations performed for a range of assumed pond depths with ϕ=38° and C=350 psf are as follows:

Pond and Groundwater Depth (Ft)	Static F.S.
10	1.57
20	1.55
30	1.53
40	1.52

Although highly unlikely, it is possible that a major seismic event could occur near the site during periods of relatively high groundwater. Therefore, as a check against failure only, we performed seismic calculations in combination with various assumed groundwater and pond depth scenarios. Because it is reasonable to assume that the groundwater level is likely to rise to, and be sustained at, elevations corresponding to a 20-foot pond depth in the final 120-feet deep pit, this assumed groundwater depth was utilized in our further calculations. The results of our combined seismic and groundwater calculations, performed as a check against failure only, are summarized as follows:

Resisting External Pond Depth (Ft)	ϕ	C (psf)	k	FS	k_{cr}
20	38°	350	0.20	1.06	0.23
10	38°	350	0.20	1.00	0.20
10	40°	350	0.20	1.05	0.23
10	38°	400	0.20	1.03	0.21
0	38°	350	0.20	0.99	0.20
0	38°	350	0.15	1.08	0.19

Seiches are long-period oscillatory standing waves excited by a force acting on the water surface. Seiches are typically activated by earthquakes and/or landslides. Based on the anticipated groundwater depths and management, it appears that the potential for a large earthquake coinciding with significant standing water in the proposed quarry is remote. However, the above calculations with pond depths at 10 feet were performed without one-half of the resisting pond depth to account for sloshing during an earthquake, and the calculations with no pond were performed as if all 20 feet of the resisting pond water were temporarily removed from the slope face.

Because the above results indicated pending failure for the conservative strengths combined with the highly unlikely assumed scenarios, the above table also includes the results of separate calculations performed with slight realistic changes in ϕ, C, and k for sensitivity evaluations.

ANALYSES OF TEMPORARY MINING EXCAVATIONS:

For the purposes of evaluating the stability of the planned temporary mining excavations, we analyzed 120-feet deep slopes with a 36-foot high near-vertical bench at the base with the upper 84 feet at the final 1.5(h):1(v) inclination. Because the mining cuts will expose undisturbed native materials, and considering the temporary nature of these excavations, we analyzed these slopes with an apparent cohesion of 700 psf and a 38 degree friction angle based upon our back analysis. The results of these calculations indicated an adequate 1.68 static factor of safety with only 5 feet of groundwater and a 5-foot pond depth. Our seismic calculations indicated an adequate 1.16 seismic factor of safety.

However, when we increased the groundwater depth to 20 feet, our static calculations indicated a 0.60 factor of safety with the critical failure occurring within the lower half of the slope. A similar failure (F.S.=0.67) was calculated with the phreatic surface reduced to 10 feet and 20 feet of ponded water, which demonstrated that ponded water has minimal resisting effects on the near-vertical excavation. Therefore, we performed calculations with the addition of a 18-foot high 1(h):1(v) wedge at the base to represent the anticipated pile of bouldery backfill. The results of these calculations performed with 20 feet of groundwater and the reduced 350 psf cohesion indicated an adequate 1.57 static factor of safety against gross failure.

Our slope stability calculations, together with the plotted output indicating the critical circle, are presented in the order of discussion in Appendix "C".

CONCLUSIONS

Based upon our geologic field observations, the results of laboratory testing and slope stability calculations, it is the opinion of this firm that the proposed mining and reclamation are feasible from a geotechnical standpoint, and that the planned slopes demonstrate adequate safety factors against gross failure.

For cuts exposing undisturbed native material, the potential for erosion and shallow failure of slope faces associated with standing water is considered negligible due to the gravelly lithologies, as well as the clast density and degree of consolidation of the anticipated clast-supported materials.

The portions of the final slopes comprised of uncontrolled bench backfills would be more susceptible to erosion and potential surficial failures. Backfill procedures being practiced at the project include the piling of oversized boulders along the base of the near-vertical mine excavations. The nested boulders would provide a clast-supported structure resistant to erosion and landsliding and would serve to buttress the near-vertical cuts. The anticipated finer matrix fill material would eventually wash into and infill the void spaces between the boulders, which would further improve their stability over time.

Full rapid drawdown conditions are not applicable to the quarry because the quarry will not be outletted and any impounded water would gradually dissipate.

A detailed seepage analysis was beyond the scope of this investigation.

LIMITATIONS

C.H.J., Incorporated has striven to perform our services within the limits prescribed by our client, and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, expressed or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.

This report reflects the testing conducted on the site as the site existed during the investigation, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application, or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject investigation, and the findings of this report may be invalidated fully or partially by changes outside of the control of C.H.J., Incorporated. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions be encountered in the field, by the client or any firm performing services for the client or the client's assign, that appear different than those described herein, this firm should be contacted immediately in order that we might evaluate their effect.

If this report or portions thereof are provided to contractors or included in specifications, it should be understood by all parties that they are provided for information only and should be used as such.

The report and its contents resulting from this investigation are not intended or represented to be suitable for reuse on extensions or modifications of the project, or for use on any other project.

CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this office.

Respectfully submitted,
C.H.J., INCORPORATED

REGISTERED PROFESSIONAL ENGINEER
TODD R. WYLAND
No. 60618
Exp. 12-31-04
CIVIL
STATE OF CALIFORNIA

Ross McIntosh, Staff Geologist

Todd R. Wyland, R.C.E. 60618
Project Engineer

Jay J. Martin, E.G. 1529
Senior Geologist

Robert J. Johnson, G.E. 443
Senior Vice President

REGISTERED GEOLOGIST
JAY J. MARTIN
No. 1529
CERTIFIED ENGINEERING GEOLOGIST
8/31/02
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. JOHNSON
No. 443
Exp. 3-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

RM/TRW/JJM/RJJ:sra

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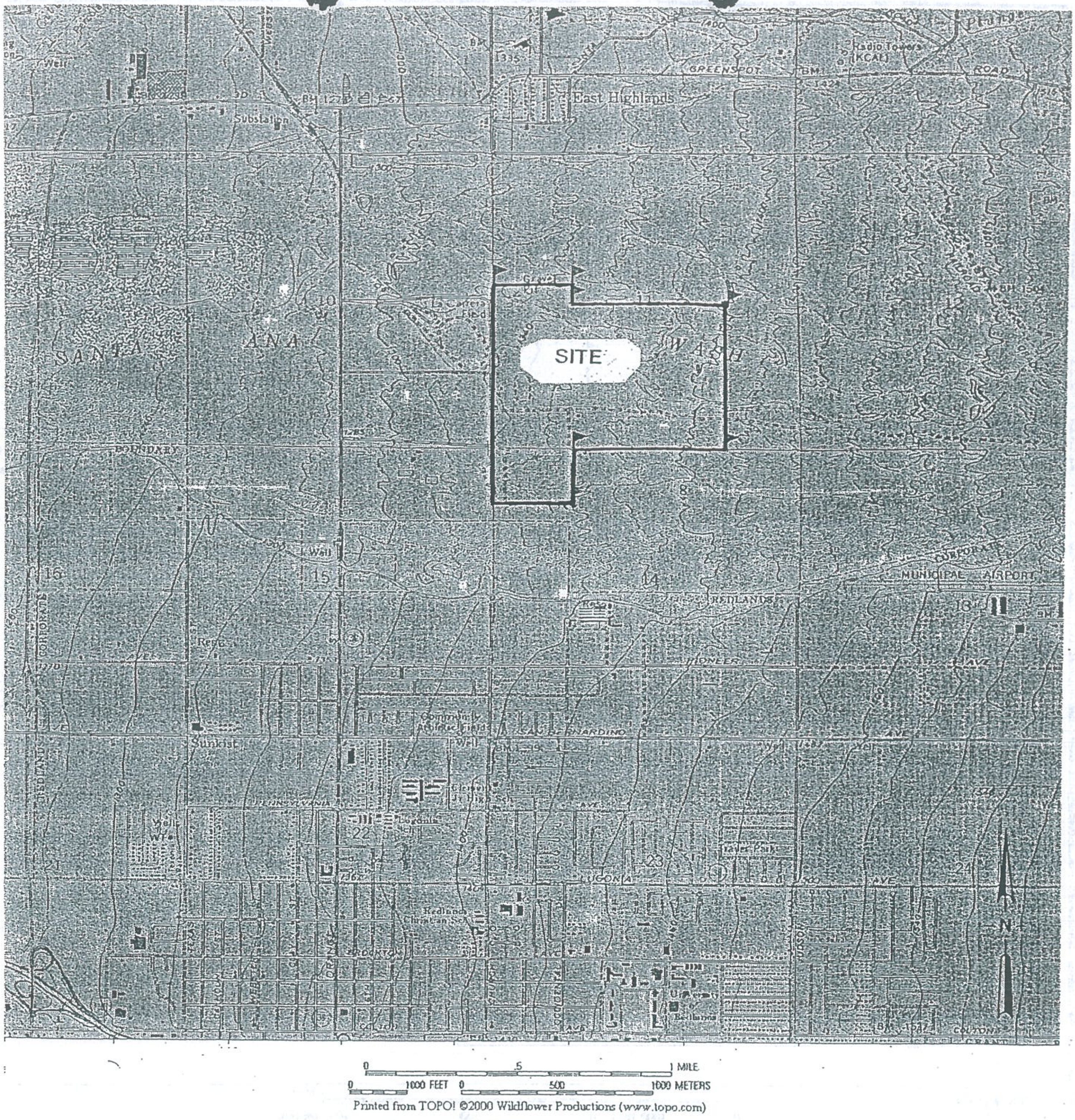
C·H·J·

APPENDIX "A"

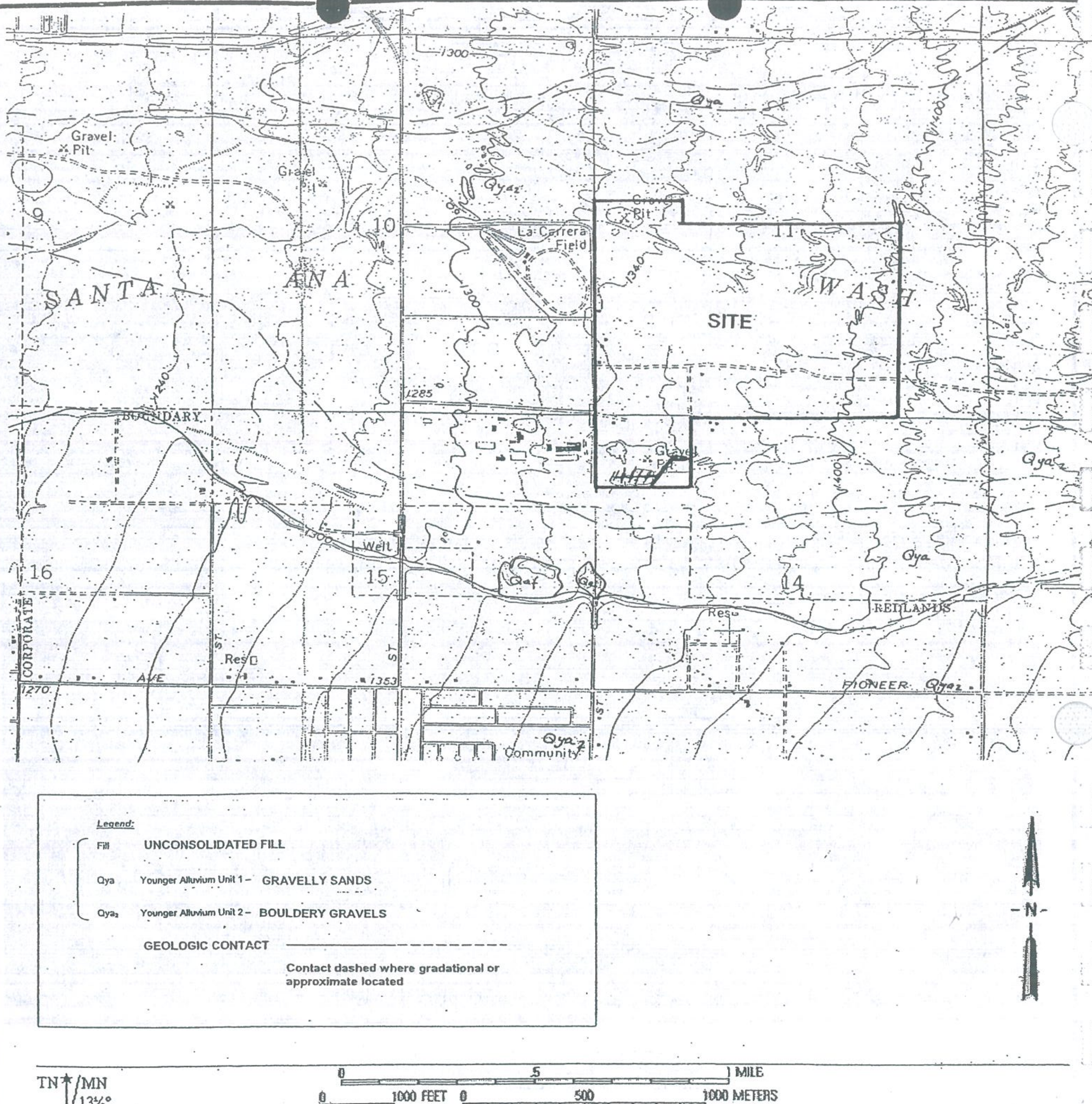
GEOLOGIC MAPS AND CROSS-SECTIONS



SITE INDEX MAP

FOR: ROBERTSON'S READY MIX	REVISION 2 MINE PLAN OLD WEBSTER QUARRY REDLANDS, CALIFORNIA	ENCLOSURE "A-1"
DATE: JANUARY 2002		JOB NUMBER 011029-3

C.H.J., INCORPORATED



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GEOLOGIC INDEX MAP

FOR:
ROBERTSON'S READY MIX

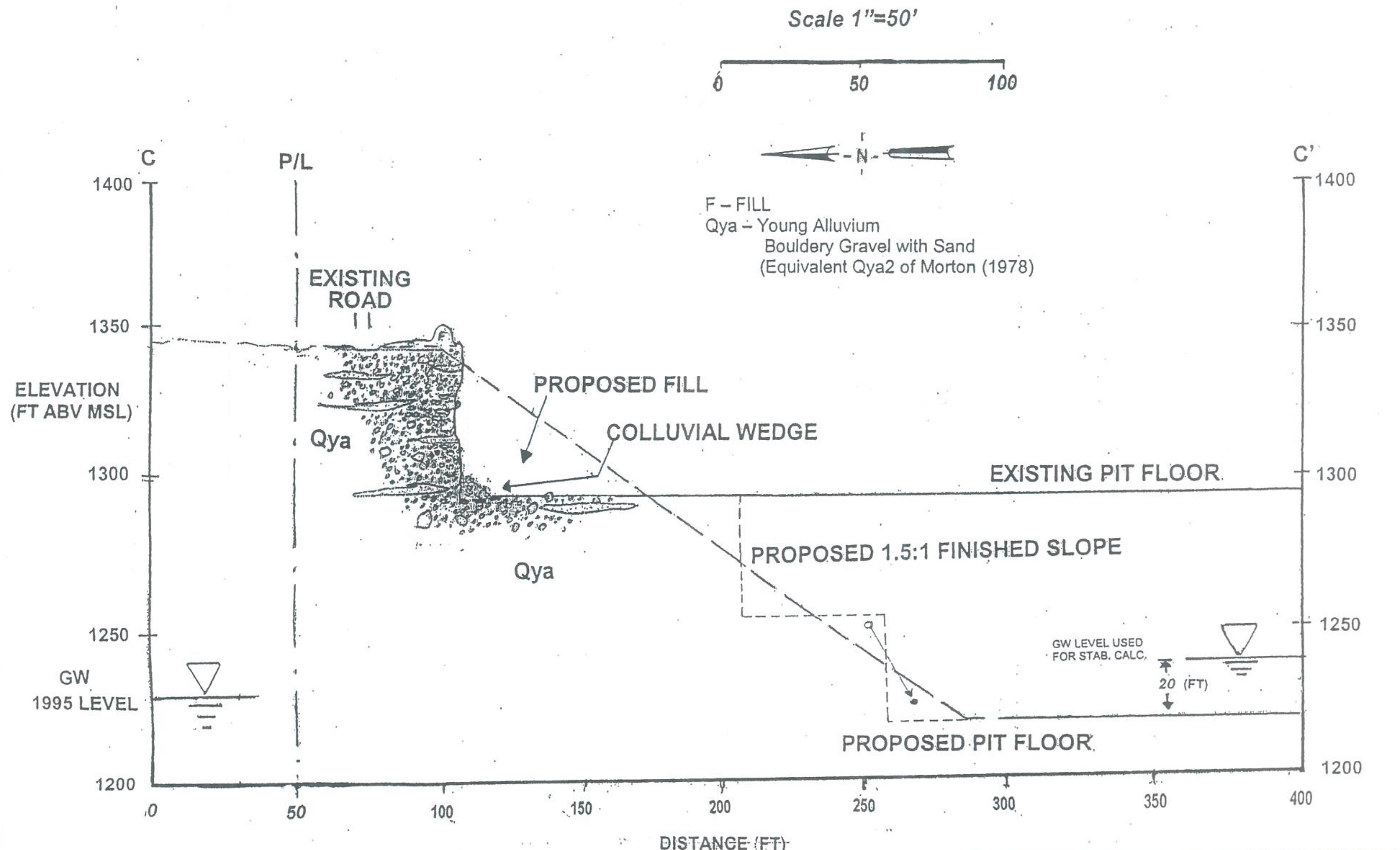
DATE: JANUARY 2002

REVISION 2 MINE PLAN
OLD WEBSTER QUARRY
REDLANDS, CALIFORNIA

ENCLOSURE
"A-4"

JOB NUMBER
011029-3

C.H.J., INCORPORATED



GEOLOGIC CROSS SECTION

FOR: ROBERTSON'S READY MIX	REVISION 2 MINE PLAN OLD WEBSTER QUARRY REDLANDS, CALIFORNIA	ENCLOSURE "A-5"
DATE: JANUARY 2002		JOB NUMBER 011029-3

C.H.J., INCORPORATED