TITLE

Existing Hydrology
Neighborhood 2

JOB

Lytle Creek Ranch

RIALTO CA

SCALE	1"= 500'
DESIGNED	CD
DRAWING	PC
CHECKED	SP
DATE	09/30/08
JOB NO.	8425-E

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE

9

P:\8425E\8-CES\mxds\Hydrology\Neighborhoods\Report 20081002\8425E_Fig_09_N02_ExistingOnsiteDrainagePC1_20080930.mxd

TITLE

Master Drainage Plan
Neighborhood 2

JOB

Lytle Creek Ranch

RIALTO CA

SCALE	1"= 500'
DESIGNED	RL
DRAWING	PC
CHECKED	SP
DATE	09/30/08
JOB NO.	8425-E

PACIFIC ADVANCED CIVIL ENGINEERING
17542 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE

10

P:\8425E\6-GIS\mxds\Hydrology\Neighborhoods\Report_20081002\8425E_Fig_10_N02_ProposedDrainageP06_20080930.mxd

P:\18425E\6-GIS\mxds\Hydrology\Neighborhoods\Report_20081002\18425E_Fig_11_N03_ExistingOnsiteDrainagePC3_20080929.mxd

TITLE

Existing Hydrology
Neighborhood 3

JOB

Lytle Creek Ranch

RIALTO CA

SCALE	1"= 500'
DESIGNED	CD
DRAWING	PC
CHECKED	SP
DATE	09/29/08
JOB NO.	8425-E

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE

11

Master Drainage Plan
Neighborhood 3

TITLE

Lytle Creek Ranch

JOB

RIALTO CA

SCALE	1" = 500'
DESIGNED	CD
DRAWING	PC
CHECKED	SP
DATE	09/29/08
JOB NO.	8425-E

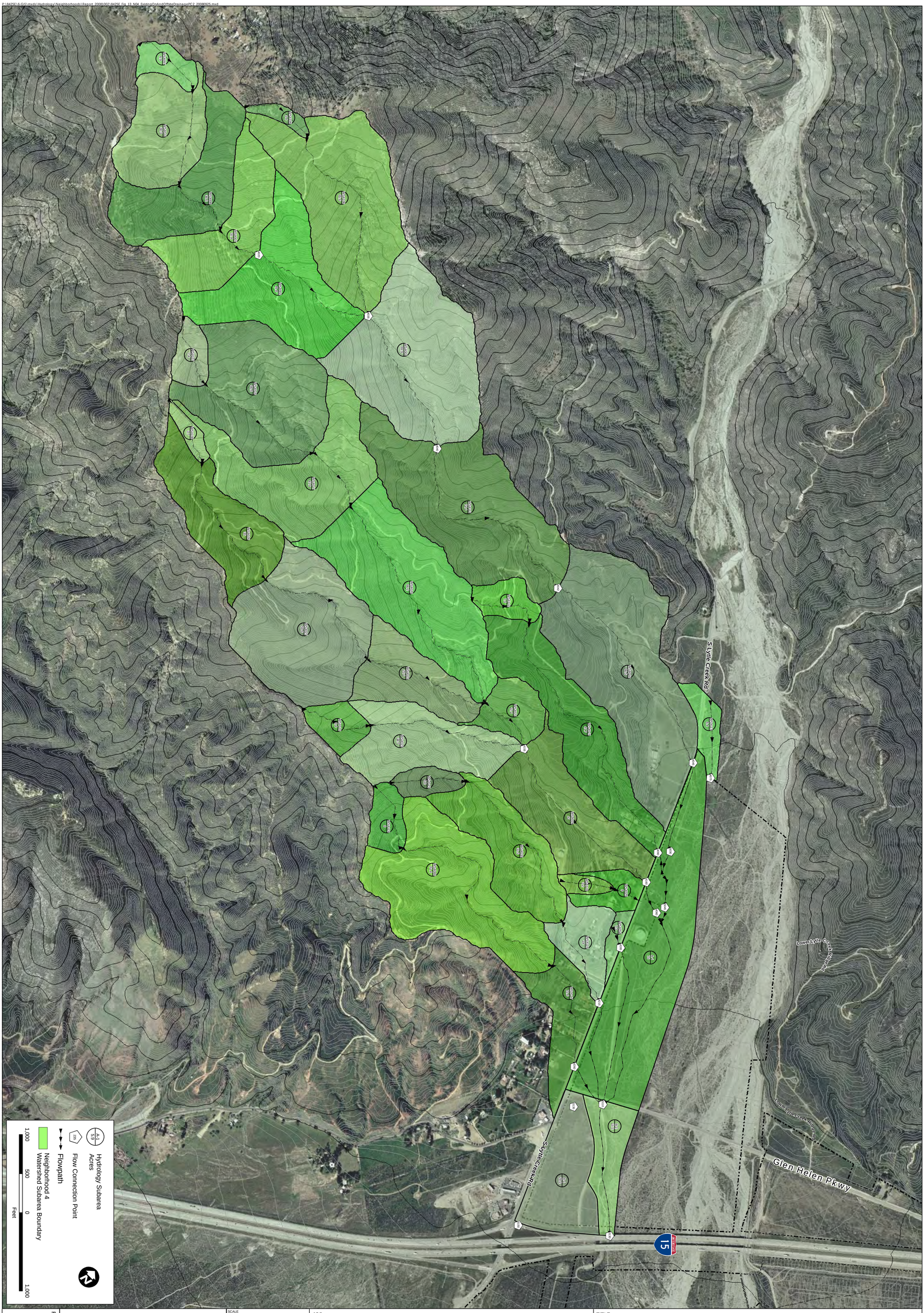
PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA. 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE

12

P:\8425E\6-GIS\mxds\Hydrology\Neighborhoods\Report 20081002\8425E Fig_12_N03_ProposedDrainagePC8_20080929.mxd

P:\8425E\E-Drl\mapdata\hydrology\neighborhoods\1Report_20080930\8425E_Fig_13_NB4_ExistingOnAndOffsiteDrainage4PC2_20080925.mxd



FIGURE

13

PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714)481-7299

SCALE	1"= 500'
DESIGNED	RL
DRAWING	PC
CHECKED	SP
DATE	09/29/08
JOB NO.	8425-E

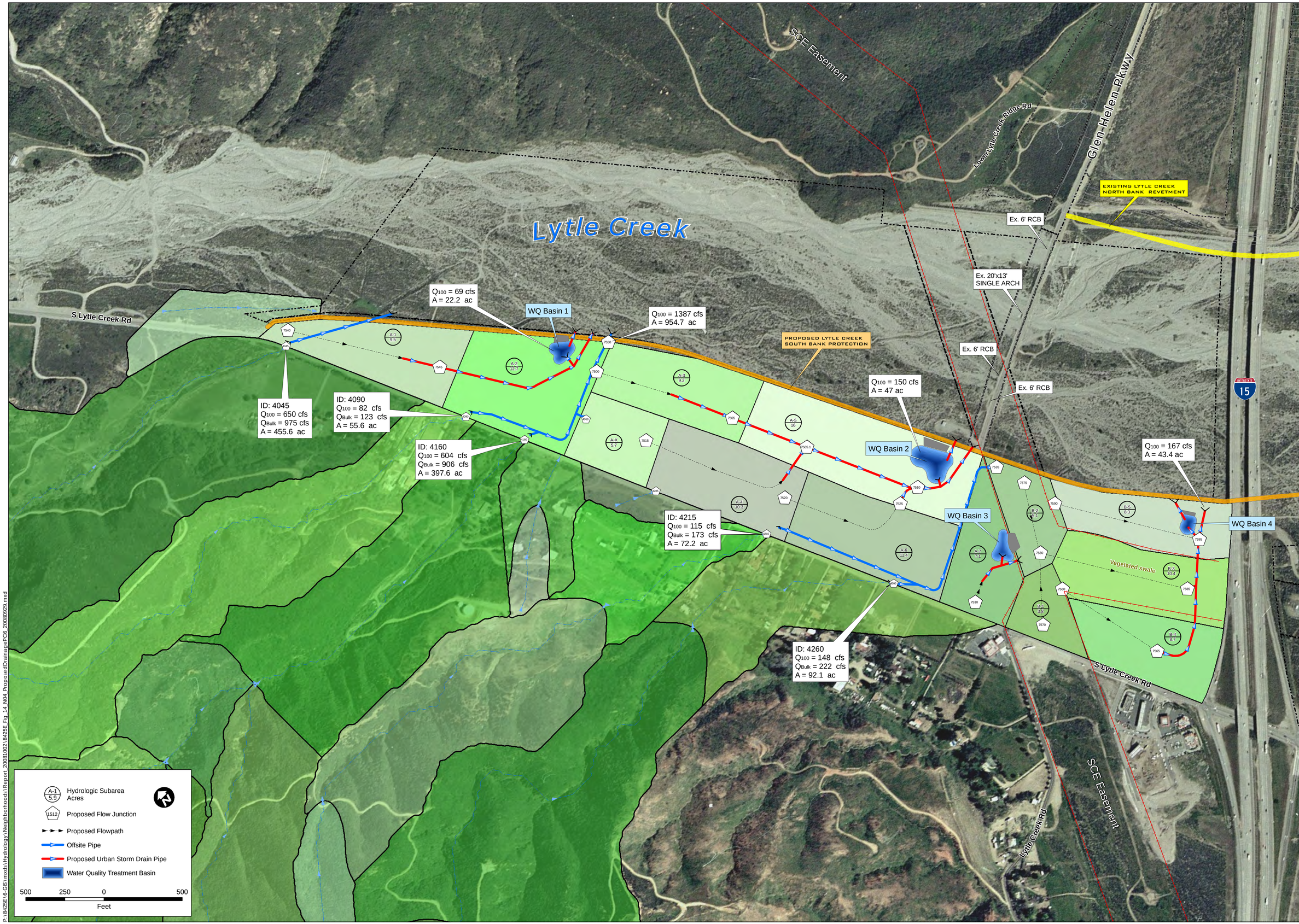
JOB

Lytle Creek Ranch

RIALTO CA

TITLE

Existing Hydrology
Onsite and Offsite
Neighborhood 4



Master Drainage Plan
Neighborhood 4

TITLE

Lytle Creek Ranch

CA

JOB

RIALTO

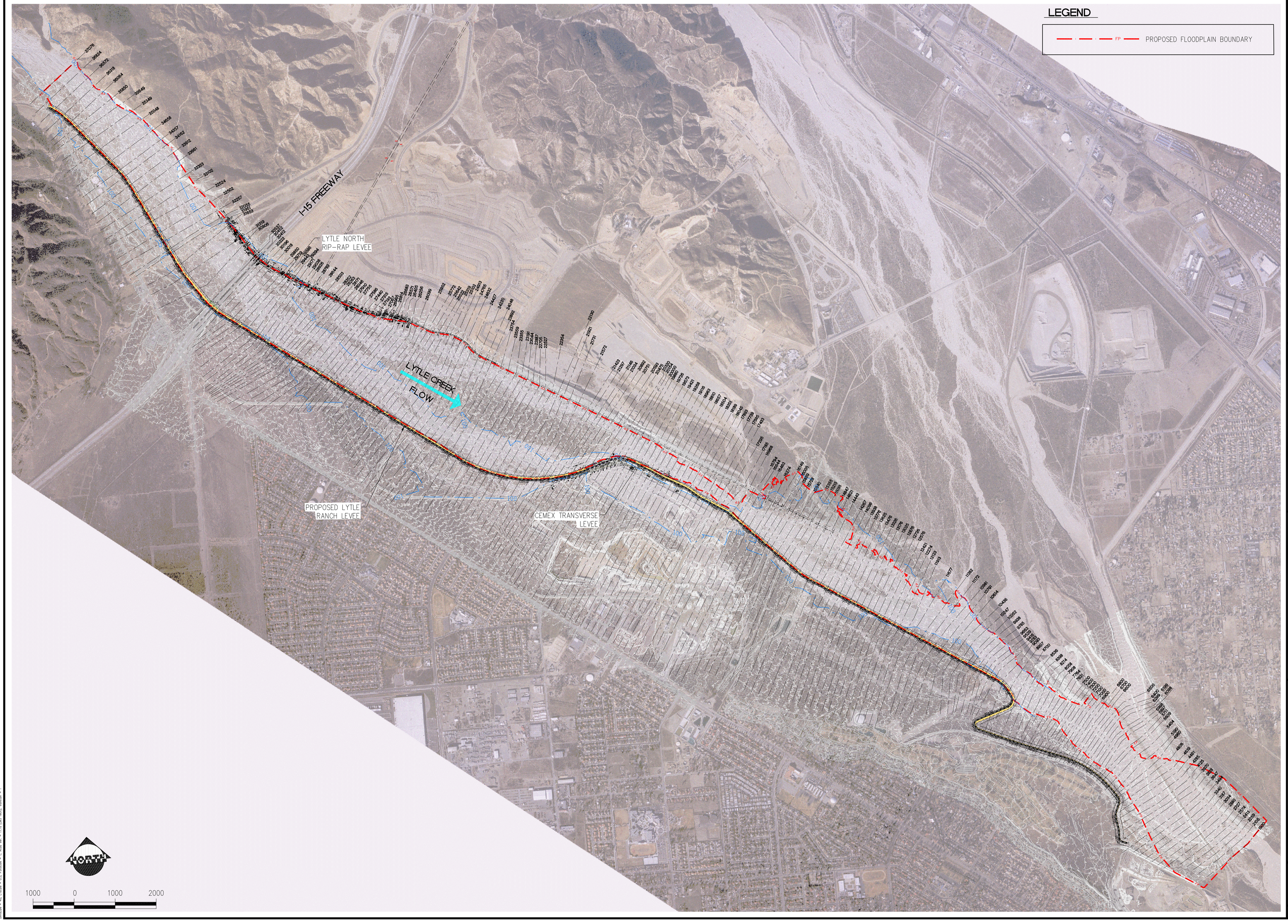
SCALE	1"= 250'
DESIGNED	CD
DRAWING	PC
CHECKED	SP
DATE	09/29/08
JOB NO.	8425-E

PACE
PACIFIC ADVANCED CIVIL ENGINEERING
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
PH (714) 481-7300 FAX (714) 481-7299

FIGURE

14

P:\8425E\6-GIS\mxds\Hydrology\Neighborhood5\Report_20081002\8425E_Fig_14_N04_ProposedDrainagePC6_20080929.mxd



NO	BY	DATE	REVISIONS	DATE	APP.

SCALE AS SHOWN
DESIGNED D.L.D.
DRAWN D.P.
CHECKED B.M.P.
DATE 06/10/2008
JOB NO. 8425-E

TITLE
ULTIMATE FLOODPLAIN BOUNDARY

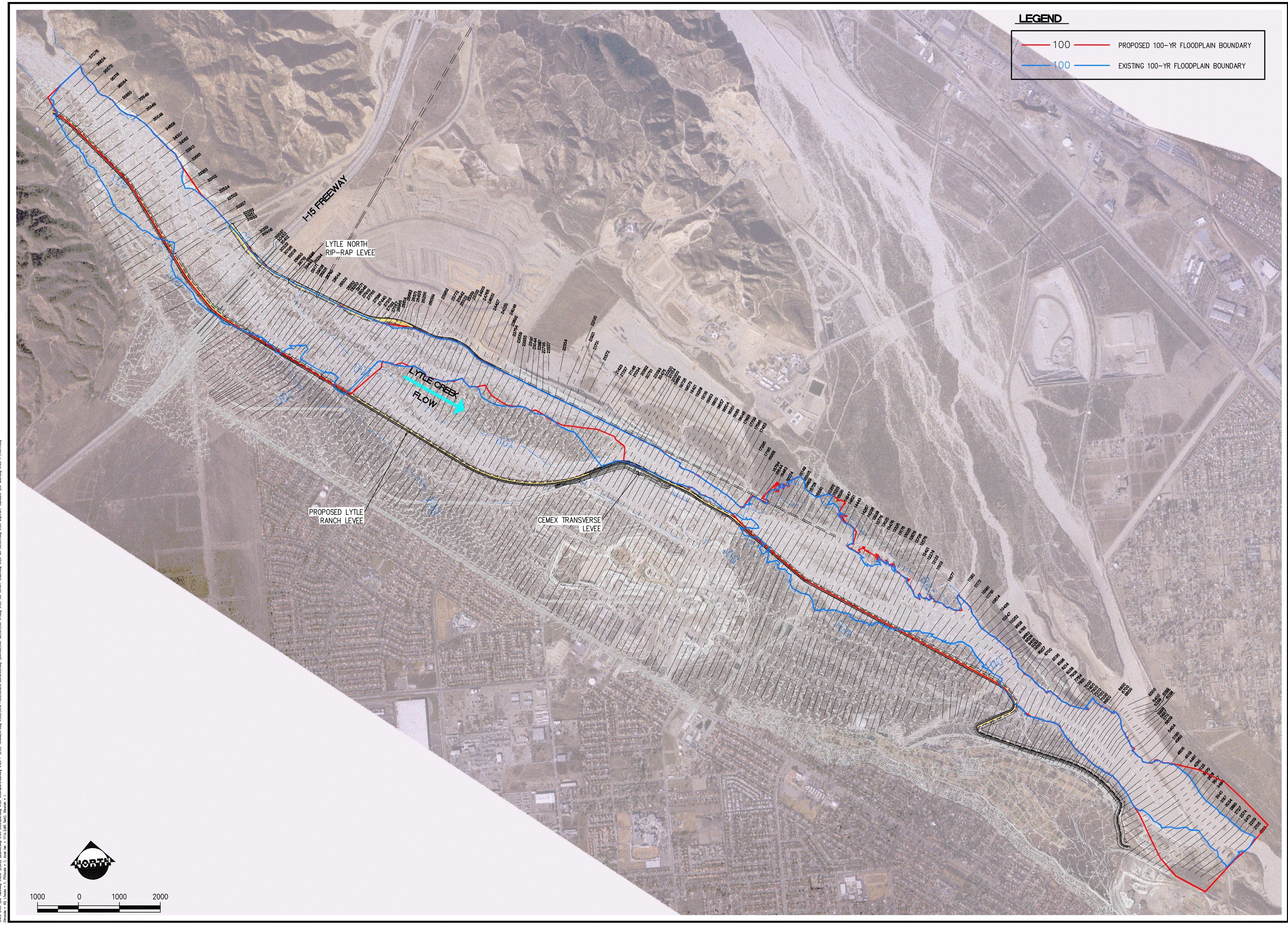
JOB
LYTLE CREEK RANCH
RIALTO CA

PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

EXHIBIT
15

JOB NO. 8425-E

THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E. AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR BE USED FOR CONSTRUCTION UNLESS STAMPED "ISSUED FOR CONSTRUCTION".



NO	BY	DATE	REVISIONS	DATE	APP.

SCALE AS SHOWN
DESIGNED D.L.D.
DRAWN D.P.
CHECKED B.M.P.
DATE 11/12/2008
JOB NO. 8425-E

THESE DRAWINGS ARE THE PROPERTY OF P.A.C.E. AND SHALL NOT BE REPRODUCED IN ANY MANNER NOR BE USED FOR CONSTRUCTION UNLESS STAMPED "ISSUED FOR CONSTRUCTION".

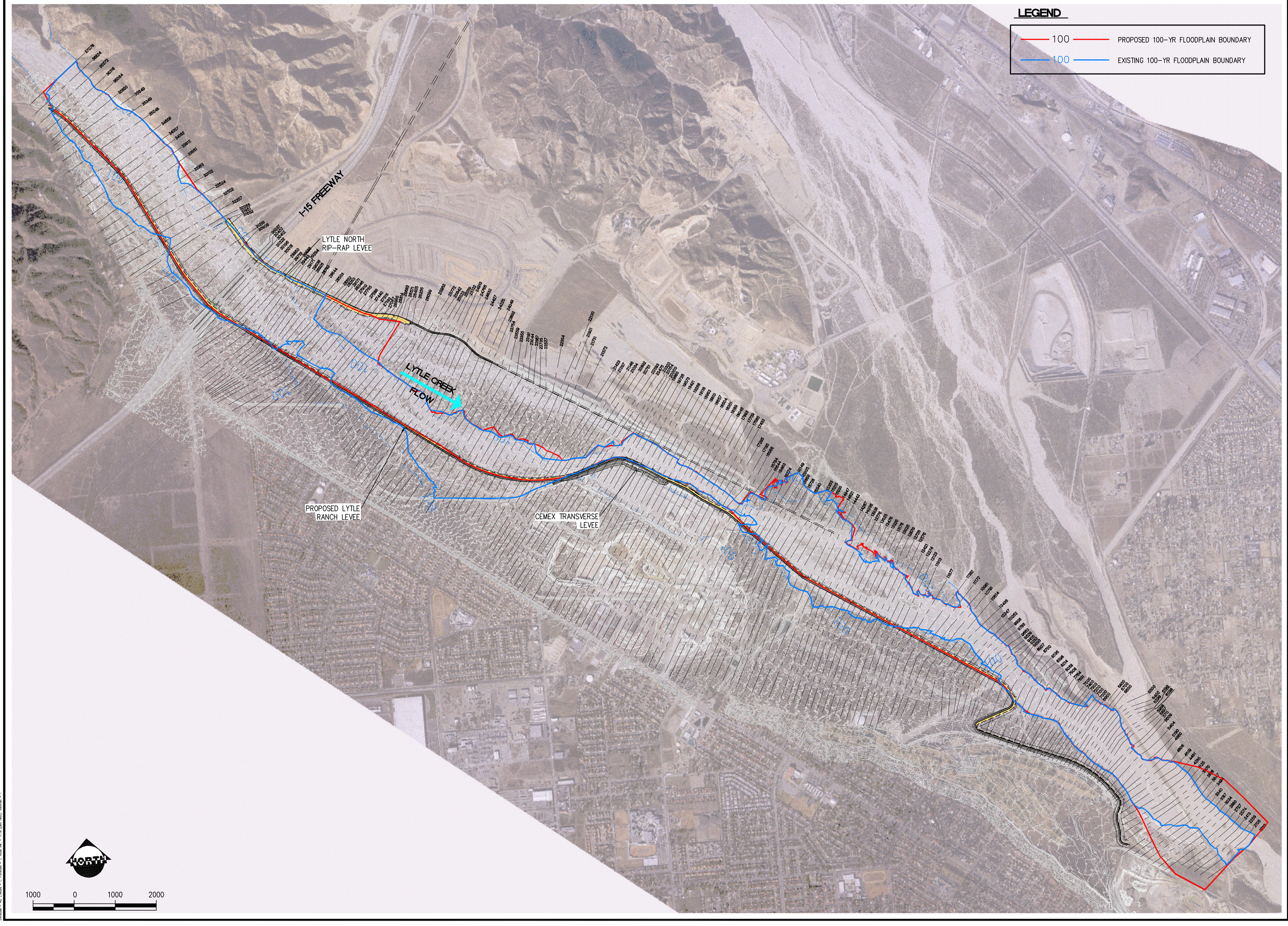
TITLE
LEFT FLOODPLAIN BOUNDARY

JOB
LYTLE CREEK RANCH
RIALTO CA

PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

EXHIBIT
15-L

JOB NO. 8425-E



NO	BY	DATE	REVISIONS	DATE	APP.

SCALE	AS SHOWN
DESIGNED	D.L.D.
DRAWN	D.P.
CHECKED	B.M.P.
DATE	11/12/2008
JOB NO.	8425-E

TITLE: RIGHT FLOODPLAIN BOUNDARY

JOB: LYTLE CREEK RANCH

RIALTO CA

PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

EXHIBIT 15-R

JOB NO. 8425-E

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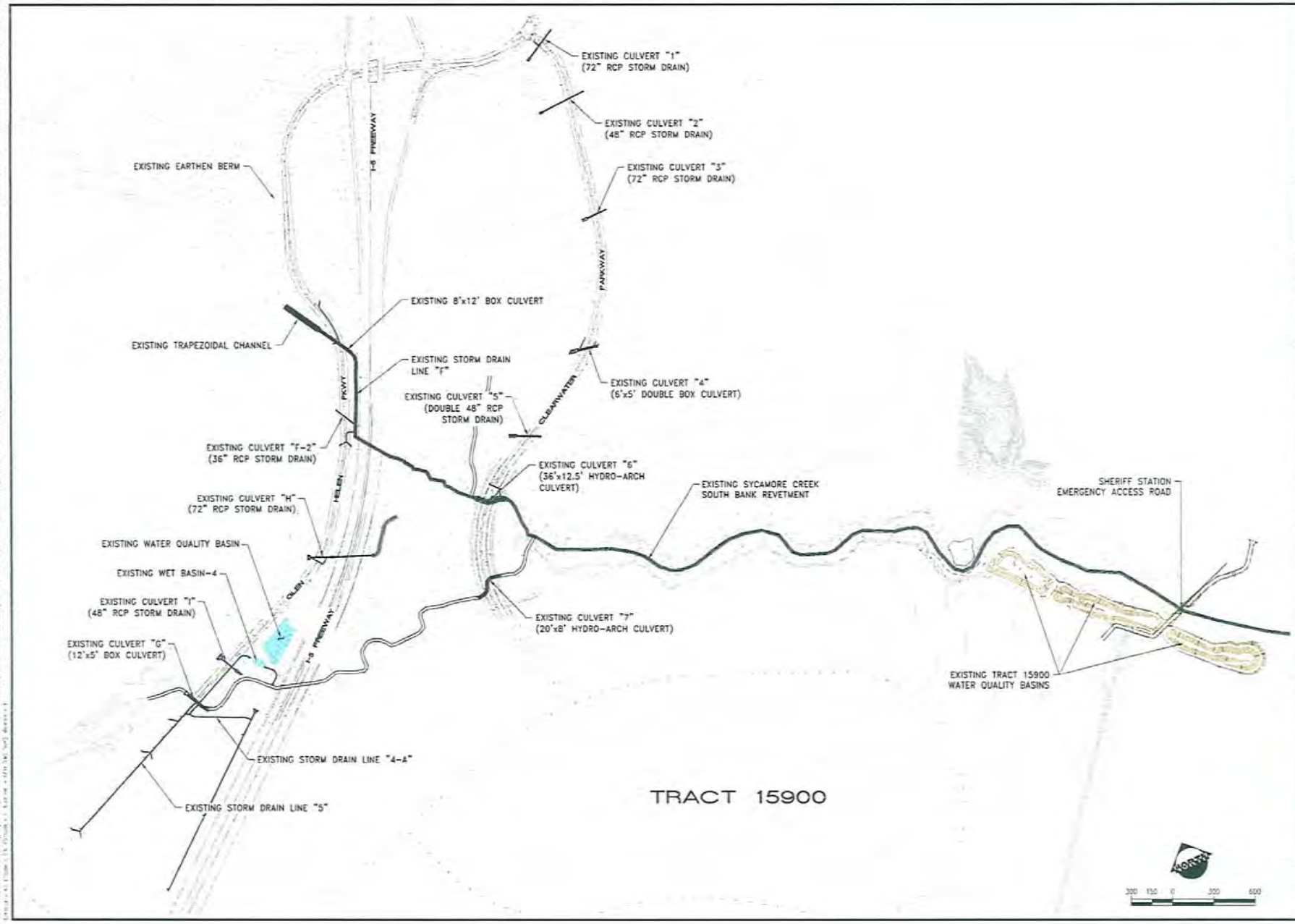


NO	BY	DATE	REVISIONS	DATE	APP

SCALE AS SHOWN
DESIGNED
DRAWN
CHECKED
DATE
JOB NO 8425-E

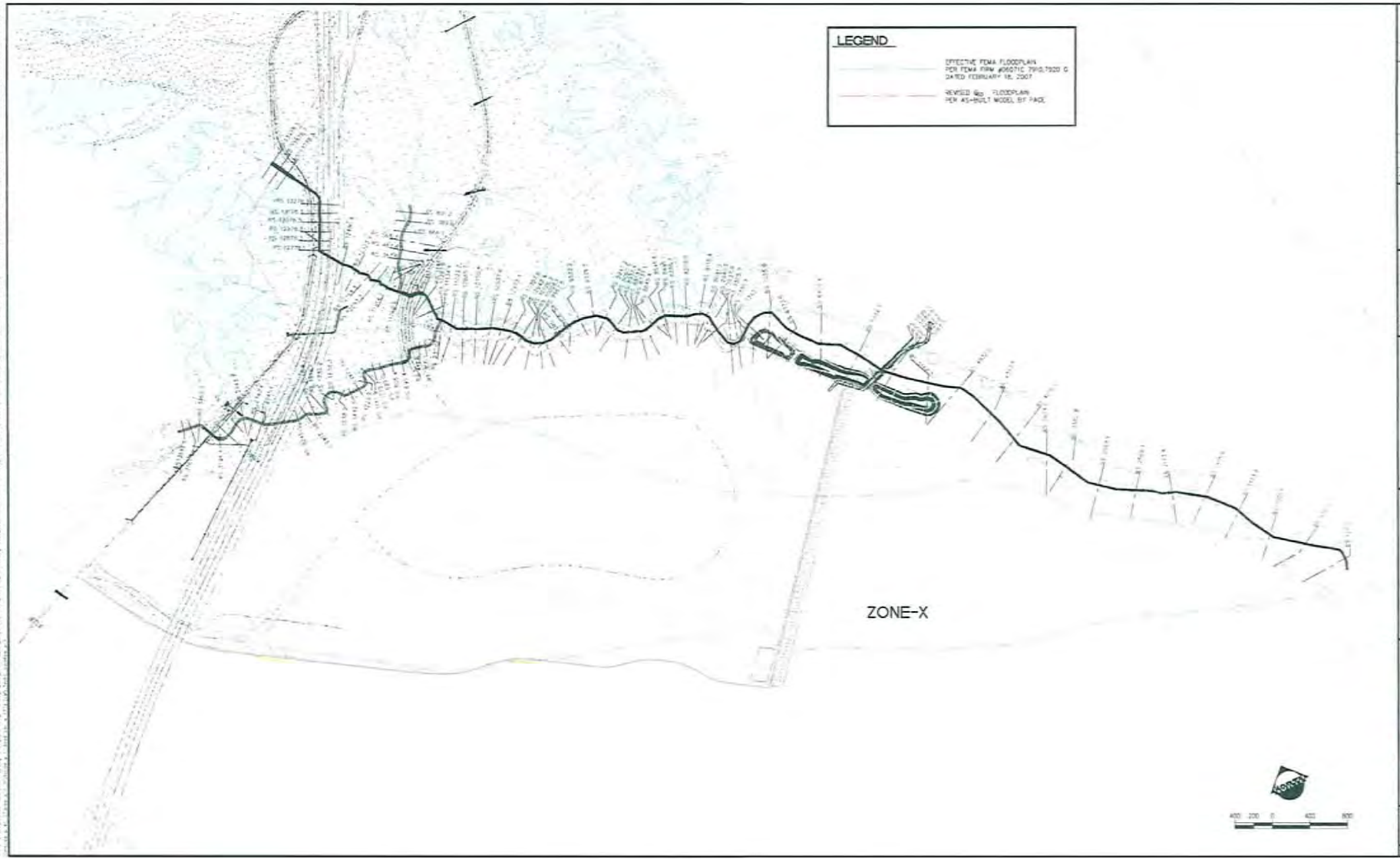
SYCAMORE CREEK
EXISTING
FACILITIES

LYTLE CREEK
RANCH

PACE
Advanced Water Engineering

EXHIBIT
16

JOB NO 8425-E



NO	DATE	BY	REVISIONS	DATE APP
1				
2				
3				
4				
5				

SCALE 1" = 200'-0"
DESIGNED
DRAWN
CHECKED
DATE 07-20-2012
JOB NO. 8420-1

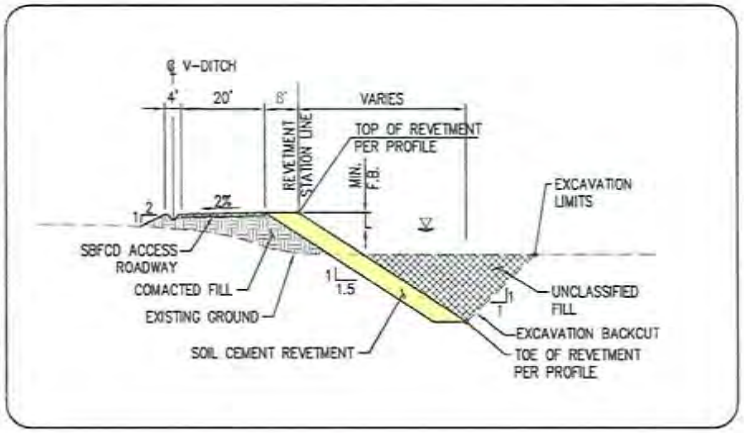
TOPOGRAPHIC WORK MAP

LYTLE CREEK RANCH

PACE

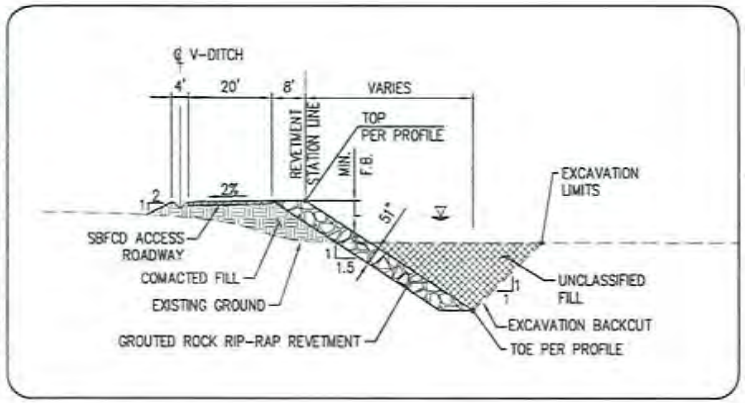
FIGURE 17

JOB NO. 8420-1



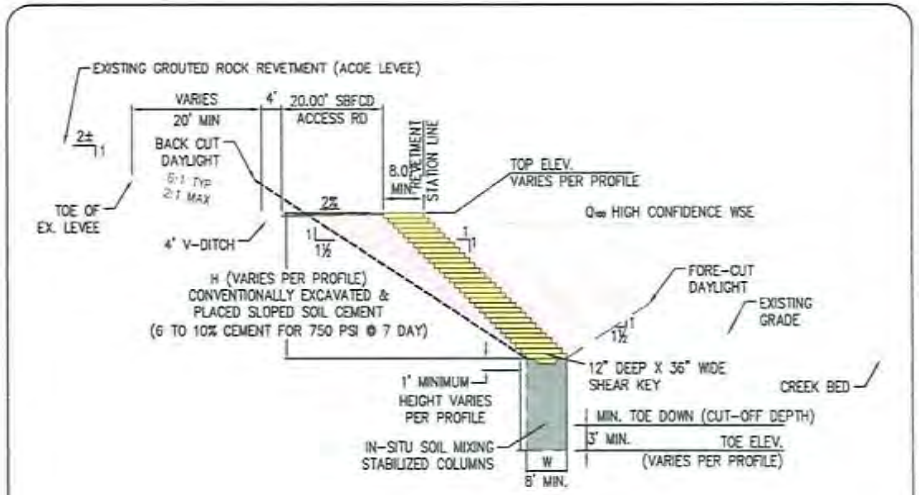
SOIL CEMENT REVETMENT - TYPICAL SECTION

NOT TO SCALE

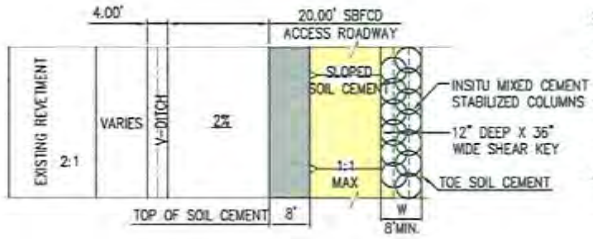


GROUTED ROCK RIP-RAP REVETMENT ALTERNATIVE SECTION

NOT TO SCALE



SECTION



NOTES:

1. DEEP SOIL MIXING ALTERNATIVE FOR WET CONDITIONS
2. "H"- VARIES BASED ON SPECIFIC SITE CONDITIONS TYPICALLY < 15' BUT CONSTRUCTION FEASIBILITY UP TO 60'
3. "W" - WILL VARY BASE UPON HEIGHT (H) SOIL SLOPE STABILITY & OTHER GEOTECHNICAL FACTORS

PLAN

SOIL MIX TOEDOWN DETAIL

NOT TO SCALE

TITLE: TYPICAL LEVEE SECTIONS FOR LYTLE SOUTH BANK PROTECTION

JOB: LYTLE CREEK RANCH

REALTY®

GA

SCALE: AS SHOWN
DESIGNED: S.P.
DRAWN: L.T.
CHECKED: J.S.
DATE: 06/10/2009
JOB NO.: 8425-E

PACE

EXHIBIT 18

Xrefs: 8425-Typical-x-Sections.dwg; 8425-TBLK_11x17n.dwg
Dimscale = 1; LTscale = 0.5; PSltscale = 1; Acad Ver. = 17.1s (LMS Tech); Vars=ain = 1

P:\8425E\Engineering\8425-XX (Lytle West)\exhibits\8425-EXH-18.dwg - Tab: EXH 18_TYP LEVEE SECTIONS By: lfran on Sep. 23, 2008 at 01:25 pm

LYTLE DEVELOPMENT
COUNTY OF SAN BERNARDINO

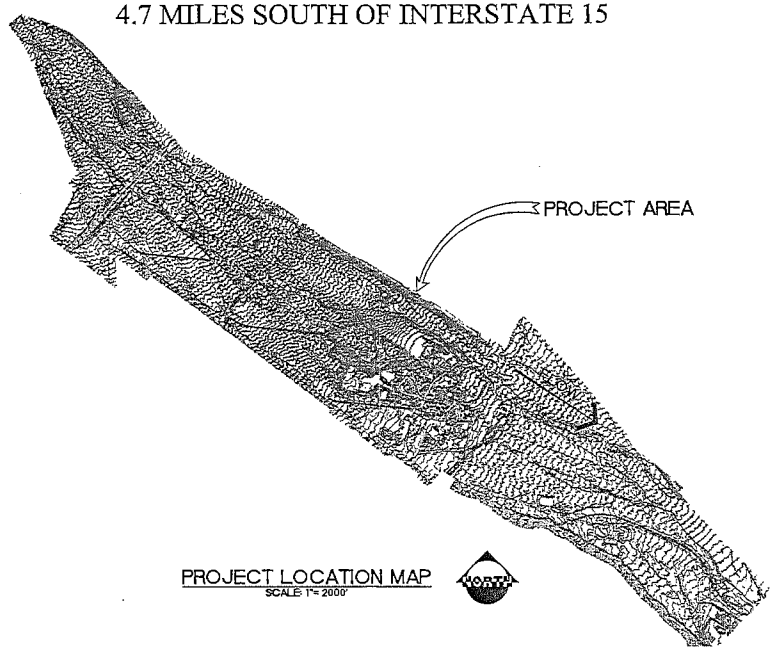
PLANS FOR CONSTRUCTION OF

LYTLE CREEK
LYTLE WEST LEVEE

1.2 MILES NORTH OF INTERSTATE 15
to
4.7 MILES SOUTH OF INTERSTATE 15

GENERAL NOTES:

1. SEE "SPECIAL PROVISIONS" FOR ADDITIONAL CONSTRUCTION INFORMATION & DETAILS.
2. IN GENERAL, ALL MATERIALS & CONSTRUCTION METHODS SHALL CONFORM TO THE 1992 EDITION STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS" UNLESS OTHERWISE SPECIFIED.
3. THESE PLANS DEPICT ALL ACTIVE UTILITIES KNOWN BY THE DISTRICT TO EXIST AT THIS TIME. LOCATIONS ARE APPROXIMATE & SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO ANY EXCAVATION. OPERATORS OF OVERHEAD UTILITIES SHALL BE NOTIFIED PRIOR TO START OF CONSTRUCTION.
4. THE CONTRACTOR SHALL CALL "UNDERGOUND SERVICE ALERT", 1-800-227-2600 AT LEAST 48 HOURS IN ADVANCE OF ANY WORK WITHIN THE PROJECT AREA TO ALLOW UTILITY OPERATORS TO CHECK & MARK LOCATIONS OF EXISTING FACILITIES.
5. THE CONTRACTOR(S) SHALL COORDINATE CONSTRUCTION WITH ALL UTILITIES AND OTHER IMPROVEMENTS INCLUDING, BUT NOT LIMITED TO GAS, TELEPHONE, ELECTRICAL, DOMESTIC WATER, STORM DRAINAGE, FLOOD CONTROL SYSTEMS, ETC.
6. CONTRACTOR SHALL PROTECT ALL UTILITIES, POLES, SIGNS, AND EXISTING IMPROVEMENTS IN PLACE UNLESS OTHERWISE DIRECTED BY THE ENGINEER OR AS NOTED ON THE PLANS.
7. NO CONCRETE SHALL BE PLACED UNTIL THE FORMS AND REINFORCING STEEL HAS BEEN PLACED, INSPECTED AND APPROVED BY THE FLOOD CONTROL DISTRICT AND DSOD ENGINEER.
8. THE WALLS AND FACES OF ALL EXCAVATIONS, GREATER THAN FIVE (5) FEET IN DEPTH SHALL BE EFFECTIVELY GUARDED BY A SHORING SYSTEM, SLOPING OF THE GROUND OR OTHER EQUIVALENT MEANS. TRENCHES LESS THAN FIVE (5) FEET IN DEPTH SHALL ALSO BE GUARDED WHEN EXAMINATION INDICATES HAZARDOUS GROUND MOVEMENT MAY BE EXPECTED.
9. NO STRUCTURE BACKFILL SHALL TAKE PLACE WITHOUT PRIOR APPROVAL OF THE FLOOD CONTROL DISTRICT AND DSOD ENGINEER.
10. ALL MATERIALS TESTING SHALL BE PROVIDED BY OTHERS IN ACCORDANCE WITH THE NUMBER, LOCATION, AND FREQUENCY REQUIRED BY THE FLOOD CONTROL DISTRICT, AND THE SPECIFICATIONS.
11. ALL EXCAVATION SHALL MEET THE REQUIREMENTS OF OSHA 29, CFR PART 1926, SUB-PART P, EXCAVATIONS.
12. ALL EXCAVATIONS OVER TWENTY (20) FEET IN DEPTH SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER, (OSHA SUB-PART P, APPENDIX TABLE B-1).
13. RECORD DRAWINGS SHALL BE PROVIDED TO THE FLOOD CONTROL DISTRICT AND THE STATE OF CALIFORNIA DIVISION OF SAFETY OF DAMS (D.S.O.D.) BY THE CONTRACTOR.



PROJECT LOCATION MAP
SCALE 1"= 2000'

NORTH

CONSULTANTS

CIVIL ENGINEER:
PACIFIC ADVANCED CIVIL ENGINEERING, INC. (PACE)
17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
(714) 481-7300
CONTACT: DEBORAH DE CHAMBEAU, P.E.

ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

THE CONTRACTOR AGREES THAT HE/SHE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSON AND PROPERTY; THAT REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT LIMITED TO NORMAL WORK HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER AND THE ENGINEERS HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

NOTES

THE QUANTITIES SHOWN ARE FOR PERMIT AND/OR BONDING PURPOSES ONLY. THE GRADING CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION PRIOR TO THE START AND ACCOUNT FOR DISTURBING ANY EXCESS MATERIAL OR SUPPLYING ANY DEFICIENCIES TO BRING SITE TO DESIGN GRADE.

REFERENCES

BENCHMARK
036-88 (RIALTO)

LOCATION:

CITY OF RIALTO BRASS DISC SET IN PCC BASE FOR STREET LIGHT No. 2162617E 17-ft SOUTH OF CENTERLINE OF RIVERSIDE OUTER HIGHWAY, 68-ft WEST OF CENTERLINE CACTUS AVENUE

ELEVATION: 1490.698 (04/01/89)

CONSTRUCTION BENCHMARK
042-88 (RIALTO)

LOCATION:

CITY OF RIALTO BRASS DISC SET IN TOP OF SOUTHERLY CURB OF RIVERSIDE AVENUE, 22-ft SOUTH OF CENTERLINE OF RIVERSIDE AVENUE, 0.25 MILES EAST OF CENTERLINE OR SIERRA AVENUE, 0.1 MILES NORTH OF CENTERLINE OF TERRA VISTA DRIVE

ELEVATION: 1924.262 (04/01/89)

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

PREPARED BY:
PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

REGISTERED PROFESSIONAL ENGINEER
No. 57524
Exp. 06-30-10
CIVIL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
CHIEF, ENGINEERING DIVISION — DATE
RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER — DATE
APPROVED BY:
FLOOD CONTROL ENGINEER — DATE

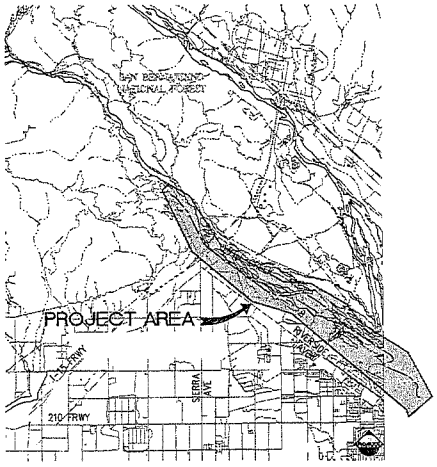
PROJ. ENGR.	RES. BY:	REV'D BY:	DRAWN BY:

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

LYTLE DEVELOPMENT
LYTLE WEST LEVEE

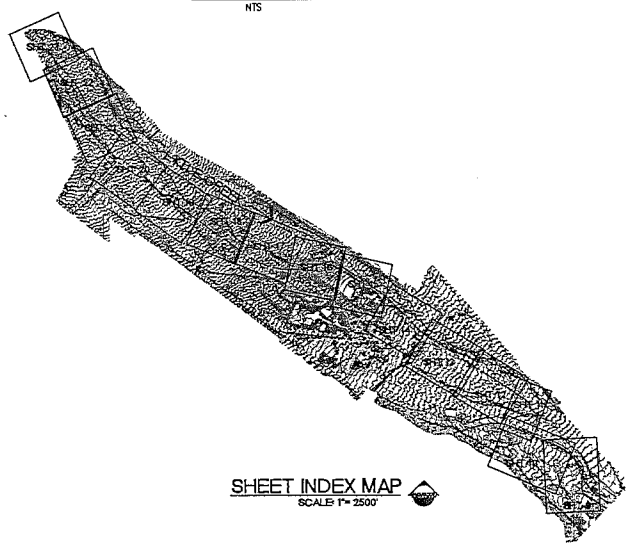
TITLE SHEET

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 1 OF 24



VICINITY MAP

NTS



SHEET INDEX MAP

SCALE 1"= 2500'

INDEX TO PROJECT DRAWINGS

SHEET DESCRIPTION

1. TITLE SHEET
2. GENERAL CONSTRUCTION NOTES AND QUANTITIES
3. SOIL CEMENT NOTES AND SPECIFICATIONS
4. SOIL CEMENT NOTES AND SPECIFICATIONS
5. SOIL CEMENT NOTES AND SPECIFICATIONS
6. SOIL MIXING NOTES AND SPECIFICATIONS
7. SOIL MIXING NOTES AND SPECIFICATIONS
8. HORIZONTAL CONTROL PLAN
9. PLAN AND PROFILE STA 23+00 (BEGIN) TO STA 49+00
10. PLAN AND PROFILE STA 49+00 TO STA 73+00
11. PLAN AND PROFILE STA 73+00 TO STA 96+50
12. PLAN AND PROFILE STA 96+50 TO STA 120+50
13. PLAN AND PROFILE STA 120+50 TO STA 145+00
14. PLAN AND PROFILE STA 145+00 TO STA 169+50
15. PLAN AND PROFILE STA 169+50 TO STA 194+00
16. PLAN AND PROFILE STA 194+00 TO STA 218+50
17. PLAN AND PROFILE STA 218+50 TO STA 243+00
18. PLAN AND PROFILE STA 243+00 TO STA 268+40
19. PLAN AND PROFILE STA 268+40 TO STA 292+00
20. PLAN AND PROFILE STA 292+00 TO STA 316+50
21. PLAN AND PROFILE STA 316+50 TO STA 340+00
22. PLAN AND PROFILE STA 340+00 TO STA 360+00
23. PLAN AND PROFILE STA 360+00 TO STA 375+94 (END)
24. DETAILS

LEGEND:

2013.25 FS	NEW SPOT ELEVATION		PAVEMENT
(2013.25 FS)	EXISTING SPOT ELEVATION		EXIST. SOIL
BELOW GRND. / ABOVE GRND.	SLOPE DIRECTION		EXCAVATION
(12)	CONSTRUCTION NOTE CALLOUT		EXCAVATION & BACKFILL
	S.B.K.R. PREDATION FENCE		COMPACT FILL
	TUBULAR METAL FENCE		SOIL CEMENT
	DAYLIGHT LINE		FOUNDATION PREP
	WATER SURFACE LINE		
	WATER SURFACE MARKER		
	RIP-RAP		

LIST OF ABBREVIATIONS

A.P.W.A.	AMERICA PUBLIC WORKS ASSOCIATION
AB	AGGREGATE BASE
AC	ASPHALTIC CONCRETE
ARV	AIR RELEASE VALVE
BC	BEGIN CURVE
BM	BENCH MARK
BVC	BEGIN VERTICAL CURVE
CATV	COMMUNITY ACCESS TELEVISION
CFS	CUBIC FEET PER SECOND
CONC.	CONCRETE
CP	CONTROL POINT
CY	CUBIC YARDS
DEPT.	DEPARTMENT
DI	DUCTILE IRON
DW	DOMESTIC WATER
EA	EACH
EC	END CURVE
EG	EDGE OF GUTTER (ELEVATION)
EMH	ELECTRICAL MANHOLE
EVC	END VERTICAL CURVE
EX / EXIST.	EXISTING
FB	FREEBOARD
FG	FINISH GROUND (ELEVATION)
FH	FIRE HYDRANT
FL	FLOW LINE (ELEVATION)
FPS	FEET PER SECOND
FS	FINISH SURFACE (ELEVATION)
FT	FEET
FW	FIRE WATER
GALV	GALVANIZED
GB	GRADE BREAK (ELEVATION)
GV	GAS VALVE
HH	HAND HOLE
HP	HIGH POINT
INV	INVERT (ELEVATION)
IRR	IRRIGATION
IV	IRRIGATION VALVE
LC	LOW CHORD
LF	LINEAR FEET
LP	LOW POINT
LT	LEFT
MAX	MAXIMUM
MH	MAN

LIST OF ABBREVIATIONS

MIN	MINIMUM
NE	NORTHEAST
NG	NATURAL GROUND (ELEVATION)
NW	NORTHWEST
OC	ON CENTER
PB	PULL BOX
PCC	PORTLAND CONCRETE CEMENT
PIV	POST INDICATOR VALVE
PKWY	PARKWAY
PL	PROPERTY LINE
PP	POWER POLE
PT	POINT
PVC	POLY VINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
R	RADIUS
(R)	RADIAL
R/W	RIGHT OF WAY
RCP	REINFORCED CONCRETE PIPE
RT	RIGHT
RW	RECLAIMED WATER
S.B.C.F.C.D.	SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
S.B.K.R.	SAN BERNARDINO KANGAROO RAT
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SE	SOUTHEAST
SHT.	SHEET
SMH	SEWER MANHOLE
SQ	SQUARE
SS	SANITARY SEWER
STA	STATION
STD.	STANDARD
STL	STEEL
SW	SIDEWALK
SW	SOUTHWEST
TC	TOP OF CURB (ELEVATION)
TEMP.	TEMPORARY
THK	THICK
TMH	TELEPHONE MANHOLE
TYP	TYPICAL
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
WS	WATER SURFACE
WV	WATER VALVE
YDS	YARDS

CONTRUCTION NOTES AND QUANTITIES		UNIT	QTY
1	PLACE EARTH FILL PER PLAN AND PROFILE AS SHOWN AND PER DETAIL ON SHEET 24	CY	
2	CONSTRUCT SOIL CEMENT / SOIL MIXING REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4, 5, 6 AND 7 AND DETAILS ON SHEET 24.	CY	
3	CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.	CY	
4	CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.	LF	
5	ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).	TON	
6	INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24	EA	

EARTHWORK (UNADJUSTED)	
CUT =	CY
FILL =	CY
NET FILL =	CY

Underground Service Alert
Call: TOLL FREE
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SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
CHIEF, ENGINEERING DIVISION — DATE
RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER — DATE
APPROVED BY:
FLOOD CONTROL ENGINEER — DATE

PRJ. ENGR.	DES. BY:	REV'D BY:	DRAWN BY:

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

LYTLE DEVELOPMENT

LYTLE WEST LEVEE

GENERAL CONSTRUCTION NOTES & QUANTITIES

DATE

SCALE AS SHOWN

FILE NO.

SHEET NO. 2 OF 24

SOIL CEMENT BANK PROTECTION SPECIFICATIONS

1.0 DESCRIPTION

THE WORK SHALL CONSIST OF THE CONSTRUCTION OF SOIL CEMENT BANK PROTECTION, AS REQUIRED BY THE PLANS, INCLUDING TRENCH EXCAVATION STRUCTURE EXCAVATION AND BACKFILL, AND DEWATERING. GEOTECHNICAL INVESTIGATION ANTICIPATES THE NECESSITY FOR DEWATERING IN SOME AREAS. CONTRACTOR SHOULD REVIEW GEOTECHNICAL INFORMATION AND MAKE ALLOWANCE FOR DEWATERING AS NECESSARY.

2.0 MATERIALS

2.1 PORTLAND CEMENT:

PORTLAND CEMENT SHALL BE TYPE II OR AS SPECIFIED BY THE SOILS ENGINEER AND SHALL COMPLY WITH THE LATEST SPECIFICATIONS FOR PORTLAND CEMENT (ASTM C150, CSA A-5, OR AASHTO M85).

2.2 WATER:

WATER SHALL BE CLEAR AND FREE FROM INJURIOUS AMOUNTS OF OIL, ACID, ALKALI, ORGANIC MATTER, OR OTHER DELETERIOUS SUBSTANCES. WATER SHALL CONTAIN NOT MORE THAN 1,000 PARTS PER MILLION OF CHLORIDES AS CL OR OF SULFATES AS SO3. WATER SHALL BE SAMPLED AND TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF AASHTO T26, OR BE FROM A POTABLE SOURCE.

2.3 AGGREGATE:

THE SOIL USED IN THE SOIL CEMENT MIX SHALL NOT CONTAIN ANY MATERIAL RETAINED ON A THREE INCH SIEVE, NOR ANY ORGANIC OR DELETERIOUS MATERIAL. SOIL FOR SOIL CEMENT MAY BE OBTAINED FROM THE REQUIRED EXCAVATIONS, OR FROM OTHER BORROW AREAS APPROVED BY THE GEOTECHNICAL ENGINEER AND STOCKPILED ON THE JOB SITE AS SPECIFIED IN THE GEOTECHNICAL REPORT, AS SHOWN ON THE GRADING PLAN AS PREPARED BY THE CIVIL ENGINEER. ATTENTION IS DIRECTED TO THE FACT THAT NOT ALL MATERIAL EXCAVATED FROM THE BANK PROTECTION ALIGNMENT WILL BE ACCEPTABLE FOR USE AS THE SOIL COMPONENT OF THE SOIL CEMENT MIXTURE. AT THE CONTRACTORS' DISCRETION, EXCAVATED/BORROW AREA SOILS SHALL BE SCREENED BEFORE OR AFTER STOCKPILING, BUT PRIOR TO MIXING. AT THE DISCRETION OF THE GEOTECHNICAL ENGINEER, THE ATTERBERG LIMITS TEST MAY BE PERFORMED TO DETERMINE THE PLASTICITY INDEX (PI). THE SOIL AGGREGATE SHALL HAVE A (PI) NO GREATER THAN EIGHT. IF SAMPLING INDICATES THAT AGGREGATE HAS A PERCENTAGE PASSING OF 20 OR GREATER ON THE NO. 200 SIEVE AND HAS A (PI) OF 5 OR GREATER, CONTRACTOR SHALL USE A ONE INCH SCREEN TO SCREEN OUT ANY CLAY BALLS GREATER THAN ONE INCH IN DIAMETER. ALTERNATELY, IF SAMPLING INDICATES THAT AGGREGATE HAS A PERCENTAGE PASSING OF 20 OR LESS ON THE NO. 200 SIEVE AND HAS A (PI) LESS THAN 5, CONTRACTOR SHALL USE THE THREE INCH SCREEN. IMPORT OF MATERIALS FROM ELSEWHERE ON-SITE SHOULD BE ANTICIPATED FOR THE SOIL CEMENT MIXTURE. THE ACTUAL SOIL TO BE USED SHALL BE ANALYZED BY LABORATORY TESTS IN ORDER TO DETERMINE THE JOB MIX AS SET FORTH HEREIN. THE DISTRIBUTION AND GRADATION OF MATERIALS IN THE SOIL CEMENT LINING SHALL NOT RESULT IN LENSES, POCKETS, STREAKS, OR LAYERS OF MATERIAL DIFFERING SUBSTANTIALLY IN TEXTURE OR GRADATION FROM SURROUNDING MATERIAL. THE CONTRACTOR SHALL PERFORM ANY SCREENING OR BLENDING AS NEEDED TO PRODUCE SOIL AGGREGATE MATERIALS MEETING THE GRADATION REQUIREMENT SPECIFIED HEREIN. STOCKPILES SHALL BE COMPLETED WITH THE MATERIAL NECESSARY TO MEET SOIL CEMENT REQUIREMENTS PRIOR TO TESTING.

THE GRADATION REQUIREMENTS OR SIEVE SIZE PERCENT PASSING (DRY WGHT) OF SOIL AGGREGATE TO BE USED FOR SOIL CEMENT MIXTURE ARE THE FOLLOWING:

1" OR 3" (SEE SECTION 2.3 AGGREGATE)	98% – 100%
3/4"	80% – 100%
#4	60% – 90%
#40	30% – 50%
#200	5% – 20%

THE GRADATION REQUIREMENTS ABOVE MAY BE OUTSIDE OF THE SPECIFIED RANGE, HOWEVER THE PROJECT COMPRESSIVE STRENGTH REQUIREMENT AT 7-DAY MUST BE MET (SEE SECTION 10.0 SOIL CEMENT COMPRESSIVE STRENGTH).

2.4 PROPORTIONING:

THE CONTRACTOR SHALL CONTROL PROPORTIONS OF SOIL AGGREGATE, CEMENT CONTENT, AND MOISTURE CONTENT IN ACCORDANCE WITH THE JOB MIX AS PROVIDED BY THE GEOTECHNICAL ENGINEER. THE CONTRACTOR SHALL ALLOW A MINIMUM OF EIGHT WORKING DAYS FOR THE CEMENT CONTENT RESULTS. DURING THE COURSE OF THE WORK, THE ENGINEER SHALL ADJUST THE JOB MIX PROPORTIONS WHENEVER NECESSARY IN ORDER TO ACHIEVE THE MINIMUM DESIGN STRENGTH SHOWN HEREIN. IN ADDITION, THE CONTRACTOR MAY BE REQUIRED TO BLEND DIFFERENT SOIL AGGREGATE MATERIAL TO MAINTAIN IDEAL SOIL GRADATIONS AS SPECIFIED ABOVE AND TO AVOID CEMENT OVERRUN. BLENDING SHALL REQUIRE CONSTRUCTION OF SEPARATE STOCKPILES FOR MATERIALS TO BE BLENDED. BLENDED AGGREGATE SHALL BE ACCOMPLISHED BY THE UTILIZATION OF SEPARATE STORAGE FEED BINS AT THE MIXING PLANT OR OTHER APPROVED METHOD.

TESTING DURING THE LIFE OF THE PROJECT MAY REQUIRE CHANGES IN THE CEMENT REQUIREMENTS WHICH SHALL BE MADE PROMPTLY BY THE CONTRACTOR AT THE DIRECTION OF THE ENGINEER.

3.0 EQUIPMENT

THE SOIL CEMENT BANK PROTECTION MAY BE CONSTRUCTED WITH ANY COMBINATION OF MACHINES AND/OR EQUIPMENT, EXCEPT AS NOTED HEREIN, THAT WILL PRODUCE A COMPLETED SOIL CEMENT LINING MEETING THE REQUIREMENTS FOR SOIL PULVERIZATION, CEMENT AND WATER APPLICATION, MIXING, TRANSPORTING, PLACING, COMPACTING, FINISHING AND CURING AS PROVIDED IN THESE SPECIFICATIONS.

3.1 COMPACTION EQUIPMENT:

THE COMPACTION EQUIPMENT SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

3.1.1 PRIMARY ROLLERS

SELF-PROPELLED VIBRATORY ROLLERS SHALL BE USED FOR PRIMARY ROLLING AND SHALL BE DOUBLE-DRUM. THEY SHALL TRANSMIT A DYNAMIC IMPACT TO THE SURFACE THROUGH A SMOOTH STEEL DRUM BY MEANS OF REVOLVING WEIGHTS, ECCENTRIC SHAFTS, OR OTHER EQUIVALENT METHODS. THE COMPACTOR SHALL HAVE A MINIMUM GROSS MASS OF 10.0 TONS AND SHALL PRODUCE A MINIMUM DYNAMIC FORCE OF 4,200 LBS/FT OF DRUM WIDTH. THE OPERATING FREQUENCY SHALL BE VARIABLE IN THE APPROXIMATE RANGE OF 1,700 TO 3,000 CYCLES PER MINUTE. THE AMPLITUDE SHALL BE ADJUSTABLE BETWEEN .0157 IN. AND .0393 IN. THE ROLLER SHALL BE OPERATED AT SPEEDS NOT EXCEEDING 2.29 FT/S. WITHIN THE RANGE OF THE OPERATING CAPABILITY OF THE EQUIPMENT, THE CONTRACTING OFFICER MAY DIRECT OR APPROVE VARIATIONS TO THE FREQUENCY, AMPLITUDE AND SPEED OF OPERATION WHICH RESULT IN THE SPECIFIED DENSITY AT THE FASTEST PRODUCTION RATE.

3.1.2 SMALL VIBRATORY ROLLERS

SMALL VIBRATORY ROLLERS SHALL BE USED TO COMPACT THE SOIL CEMENT WHERE THE LARGER VIBRATORY ROLLERS SPECIFIED ABOVE CANNOT MANUEVER. THE ROLLERS SHALL COMPACT THE SOIL CEMENT TO THE REQUIRED DESNITY AND SHALL BE SO DEMONSTRATED DURING CONSTRUCTION OF THE TEST SECTION. SMALL VIBRATORY ROLLERS CANNOT COMPACT THE SOIL CEMENT TO THE SAME DENSITY AND THICKNESS AS THE PRIMARY ROLLERS; THEREFORE, WHEN SMALL ROLLERS ARE USED, TOTAL LIFT THICKNESS OF THE SOIL CEMENT LAYER OR LIFT SHALL BE REDUCED TO NOT OVER 5.90 IN. UNCOMPACTED THICKNESS TO PERMIT ADEQUATE COMPACTION. ROLLERS SHALL HAVE INDEPENDENT SPEED AND VIBRATION CONTROLS AND SHALL BE CAPABLE OF WIDE RANGE OF SPEED ADJUSTMENTS.

3.1.3 TAMPERS (RAMMERS)

HAND TAMPER EQUIPMENT SHALL BE USED WHERE VIBRATORY ROLLERS SPECIFIED ABOVE CANNOT BE MANEUVERED. LIFT THICKNESS WILL BE REDUCED TO FACILITATE ADEQUATE COMPACTION.

4.0 CONSTRUCTION REQUIREMENTS

4.1 REQUIRED CONTRACTOR SUBMITTALS:

PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT TO THE CITY IN WRITING, FOR APPROVAL, THE FOLLOWING ITEMS:

4.1.1 THE APPROXIMATE LENGTH OF SOIL CEMENT TO BE PLACED PRIOR TO STARTING COMPACTION OPERATIONS. SEQUENCING OF CONSTRUCTION ACTIVITIES (I.E. EXCAVATION, SOIL CEMENT PLACEMENT, COMPACTION, BACKFILL, ETC.)

4.1.2 THE NUMBER AND TYPE OF EQUIPMENT TO BE USED FOR PLACEMENT.

4.1.3 THE NUMBER AND TYPE OF EQUIPMENT TO BE USED FOR SPREADING.

4.1.4 THE NUMBER AND TYPE OF EQUIPMENT TO BE USED FOR COMPACTION.

4.1.5 THE NUMBER AND TYPE OF EQUIPMENT TO BE USED FOR WATERING.

4.1.6 THE NUMBER OF LABORERS NEEDED TO CONTROL PLACEMENT OF SOIL CEMENT AND REMOVAL OF CONTAMINATED SOIL CEMENT.

4.1.7 THE METHOD USED TO KEEP SURFACES CONTINUALLY MOIST UNTIL SUBSEQUENT LAYERS OF SOIL CEMENT ARE PLACED.

4.1.8 THE METHOD USED TO CURE PERMANENTLY EXPOSED SURFACES.

4.1.9 THE PROPOSED SOURCE OF SOIL, IF OTHER THAN REQUIRED EXCAVATIONS.

CONTRACTOR SHALL PROVIDE ADEQUATE WATER PRESSURE TO THE MIXING PLANT IN ORDER TO MAINTAIN A CONSTANT FLOW AND VOLUME THROUGHOUT THE COURSE OF SOIL CEMENT MIXING. THE MAXIMUM WATER PRESSURE DIFFERENTIAL ALLOWABLE SHALL BE ±10%, IN ORDER TO MAINTAIN ADEQUATE MOISTURE IN THE SOIL CEMENT MIX (SEE SECTION 4.5 REQUIRED MOISTURE).

4.2 SOIL CEMENT TEST SECTION:

THE CONTRACTOR SHALL CONSTRUCT A SOIL CEMENT TEST SECTION TO VERIFY THAT THE PLANT, EQUIPMENT, MATERIALS AND MIX DESIGNS PROPOSED FOR THE WORK, MEET THE INTENT OF THESE SPECIFICATIONS. THE SOIL CEMENT TEST SECTION SHALL BE CONSTRUCTED AT LEAST SEVEN CALENDAR DAYS PRIOR TO SOIL CEMENT PLACEMENT. THE TEST SECTION SHALL BE CONSTRUCTED AT A LOCATION WITH EQUIVALENT SITE CONDITIONS AND MUST BE APPROVED BY THE COUNTY INSPECTOR, PROJECT DESIGN ENGINEER AND/OR GEOTECHNICAL ENGINEER. THE TEST SECTION SHALL BE SIXTY FEET LONG AND FOUR FEET HIGH CONSISTING OF COMPACTED SOIL CEMENT LIFTS THAT ARE SIX TO NINE INCHES THICK AND EIGHT FEET WIDE. THE FOUNDATION UPON WHICH THE FIRST LIFT OF SOIL CEMENT IS TO BE CONSTRUCTED SHALL BE CLEARED, LEVELED AND THE SURFACE COMPACTED AS SPECIFIED HEREIN (SEE SECTION 4.3 OF THESE SPECIFICATIONS). EACH SOIL CEMENT LIFT SHALL BE CONSTRUCTED AND CURED AS SPECIFIED HEREIN (SEE SECTION 4.9 OF THESE SPECIFICATIONS). THE PROJECT DESIGN ENGINEER AND GEOTECHNICAL ENGINEER, WITH THE ASSISTANCE AND COOPERATION OF THE CONTRACTOR SHALL PERFORM ALL TESTS AND INSPECTIONS REQUIRED FOR THE PERMANENT WORK ON THE TEST SECTION. THE PROJECT DESIGN AND/OR GEOTECHNICAL ENGINEER WILL OBSERVE THE OPERATION AND MAY PERFORM ADDITIONAL TESTS UPON THE MATERIALS AND COMPLETED SOIL CEMENT. THE CONTRACTOR SHALL FURNISH SUCH MATERIALS AND PROVIDE SUCH ASSISTANCE AS NECESSARY FOR SAMPLING AND TESTING BY THE GEOTECHNICAL ENGINEER. AFTER THE TEST SECTION IS COMPLETED, THE CONTRACTOR SHALL MAKE SUCH ADJUSTMENTS IN EQUIPMENT, METHODS AND MIX DESIGNS AS ARE NECESSARY TO PRODUCE SOIL CEMENT IN ACCORDANCE WITH THE REQUIREMENTS OF THESE SPECIFICATIONS. AFTER COMPLETION OF THE TESTING ON THE TEST SECTION AND AFTER APPROVAL BY THE PROJECT DESIGN ENGINEER, THE CONTRACTOR SHOULD BURY THE TEST SECTION WITH A MINIMUM OF TWO FEET OF SOIL. UNLESS THE SOIL CEMENT TEST SECTION MATERIAL HAS BEEN PREVIOUSLY APPROVED TO REMAIN IN PLACE, IT IS THE CONTRACTOR'S RESPONSIBILITY TO REMOVE AND DISPOSE OF THE TEST SECTION.

4.3 SUBGRADE PREPARATION:

BEFORE SOIL CEMENT PROCESSING BEGINS, THE AREA ON WHICH SOIL CEMENT WILL BE PLACED SHALL BE GRADED AND SHAPED TO LINES AND GRADES AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SUBGRADE SHALL BE COMPACTED TO A MINIMUM OF NINETY PERCENT AS DETERMINED BY ASTM D1557-00.

IMMEDIATELY PRIOR TO PLACEMENT OF THE SOIL CEMENT MIXTURE, THE SUBGRADE SHALL BE MOISTENED IF NECESSARY. SOFT OR YIELDING SUBGRADE SHALL BE CORRECTED AND MADE STABLE BEFORE CONSTRUCTION PROCEEDS.

FIELD SURVEY AND CERTIFICATION SHALL BE PERFORMED BY THE CIVIL ENGINEER PRIOR TO PLACEMENT OF SOIL CEMENT. THE VERTICAL TOLERANCE FOR THE TOE SHALL BE 0.1 FT PER ELEVATIONS SHOWN ON THESE PLANS.

4.4 MIXING:

4.4.1 CAPACITY

THE MIXING PLANT, PLACING, COMPACTION, AND CLEANUP SYSTEMS SHALL HAVE A CAPACITY OF AT LEAST 100 CUBIC YARDS PER HOUR.

4.4.2 MIXING PLANT

THE MIXING PLANT SHALL BE A WEIGH-BATCH TYPE OR CONTINUOUS TYPE.

4.4.2.1 LOCATION

THE MIXING PLANT SHALL BE LOCATED AT THE SITE OF THE WORK, SUBJECT TO THE APPROVAL OF THE ENGINEER.

4.4.2.2 BINS AND SILOS

SEPARATE BINS, COMPARTMENTS, OR SILOS SHALL BE PROVIDED FOR EACH OF THE CEMENTITIOUS MATERIALS. THE COMPARTMENTS SHALL BE OF AMPLE SIZE AND SO CONSTRUCTED THAT THE VARIOUS MATERIALS WILL BE MAINTAINED SEPARATELY UNDER ALL WORKING CONDITIONS. ALL COMPARTMENTS CONTAINING BULK CEMENT SHALL BE SEPARATED FROM EACH OTHER BY A FREE-DRAINING AIR SPACE. THE CEMENT BINS SHALL BE EQUIPPED WITH FILTERS WHICH ALLOW AIR PASSAGE BUT PRECLUDES THE VENTING OF CEMENT INTO THE ATMOSPHERE. ALL FILLING PORTS SHALL BE CLEARLY MARKED WITH A PERMANENT SIGN STATING THE CONTENTS.

4.4.2.3 BATCH PLANT MIXING

THE BATCH PLANTS SHOULD MEET THE FOLLOWING REQUIREMENTS.

A. BATCHERS - AGGREGATE SHALL BE WEIGHED IN SEPARATE WEIGH BATCHERS WITH INDIVIDUAL SCALES OR MAY BE BATCHED CUMULATIVELY. BULK CEMENT AND OTHER CEMENTITIOUS MATERIALS SHALL BE WEIGHED ON A SEPARATE SCALE IN A SEPARATE WEIGH BATCHER. WATER SHALL BE MEASURED BY WEIGHT OR BY VOLUME. IT SHALL NOT BE WEIGHED OR MEASURED CUMULATIVELY WITH ANOTHER INGREDIENT.

B. WATER BATCHER - A SUITABLE WATER-MEASURING AND BATCHING DEVICE SHALL BE PROVIDED THAT WILL BE CAPABLE OF MEASURING AND BATCHING THE MIXING WATER WITHIN THE SPECIFIED TOLERANCES FOR EACH BATCH. THE MECHANISM FOR DELIVERING WATER TO THE MIXERS SHALL BE FREE FROM LEAKAGE WHEN THE VALVES ARE CLOSED. THE FILLING AND DISCHARGE VALVES FOR THE WATER BATCHER SHALL BE SO INTERLOCKED THAT THE DISCHARGE VALVE CANNOT BE OPENED BEFORE THE FILLING VALVE IS FULLY CLOSED. WHEN A WATER METER IS USED, A SUITABLE STRAINER SHALL BE PROVIDED AHEAD OF THE METERING DEVICE.

C. MOISTURE CONTROL - THE PLANT SHALL BE CAPABLE OF READY ADJUSTMENT TO COMPENSATE FOR THE VARYING MOISTURE CONTENT OF THE AGGREGATES AND TO CHANGE THE MASSES OF THE MATERIALS BEING BATCHED.

D. SCALES & CALIBRATION - ADEQUATE FACILITIES SHALL BE PROVIDED FOR THE ACCURATE MEASUREMENT AND CONTROL OF EACH OF THE MATERIALS ENTERING THE SOIL CEMENT. EACH WEIGHING UNIT SHALL INCLUDE A VISIBLE INDICATOR THAT SHALL INDICATE THE SCALE LOAD AT ALL STAGES OF THE WEIGHING OPERATION AND SHALL SHOW THE SCALE IN BALANCE AT ZERO LOAD. THE WEIGHING EQUIPMENT SHALL BE ARRANGED SO THAT THE PLANT OPERATOR CAN CONVENIENTLY OBSERVE THE INDICATORS. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND GEOTECHNICAL INSPECTOR 48 HOURS PRIOR TO THE SCALE CERTIFICATION. THE CONTRACTOR SHALL COMPLETE A SCALE CALIBRATION BY A THIRD PARTY CERTIFIED LABORATORY PRIOR TO PRODUCTION OF ANY SOIL CEMENT MATERIAL. THE ENGINEER OR THE GEOTECHINCAL INSPECTOR SHALL OBSERVE THE CALIBRATION OF THE SCALES. ADDITIONAL CALIBRATIONS, THROUGHOUT THE PROJECT MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.

E. OPERATION & ACCURACY - THE WEIGHING OPERATION OF EACH MATERIAL SHALL BEGIN AUTOMATICALLY WHEN ACTUATED BY ONE OR MORE STARTER SWITCHES AND SHALL END WHEN THE DESIGNATED AMOUNT OF EACH MATERIAL HAS BEEN REACHED. THESE REQUIREMENTS CAN BE MET BY PROVIDING A SEMIAUTOMATIC OR AUTOMATIC BATCHING SYSTEM AS DEFINED BY THE NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA) CPMB 100. THE WEIGH BATCHERS SHALL BE CONSTRUCTED AND ARRANGED THAT THE SEQUENCE AND TIMING OF BATCHER DISCHARGE GATES CAN BE CONTROLLED TO PRODUCE A RIBBONING AND MIXING OF THE AGGREGATES, WATER, AND CEMENTITIOUS MATERIALS AS THE MATERIALS PASS THROUGH THE CHARGING HOPPER INTO THE MIXER. THE PLANT SHALL INCLUDE PROVISIONS TO FACILITATE THE INSPECTION OF ALL OPERATIONS AT ALL TIMES. DELIVERY OF MATERIALS FROM THE BATCHING EQUIPMENT SHALL BE WITHIN THE FOLLOWING LIMITS OF ACCURACY:

MATERIAL	% OF REQ. MASS
CEMENTITIOUS MATERIALS	0 TO +2
WATER	1
AGGREGATE	2

WHEN WATER IS MEASURED BY VOLUME, IT SHALL MEET THE SAME TOLERANCE PERCENT AS STATED IN THE CHART.

INTERLOCKS – BATCHERS AND MIXERS SHALL BE INTERLOCKED SO THAT:

1. THE CHARGING DEVICE OF EACH BATCHER CANNOT BE ACTUATED UNTIL ALL SCALES HAVE RETURNED TO ZERO BALANCE WITHIN PLUS OR MINUS 0.2 PERCENT OF THE SCALE CAPACITY AND EACH VOLUMETRIC DEVICE HAS RESET TO START OR HAS SIGNALED EMPTY.
2. THE CHARGING DEVICE OF EACH BATCHER CANNOT BE ACTUATED IF THE DISCHARGE IS OPEN.
3. THE DISCHARGE DEVICE OF EACH BATCHER CANNOT BE ACTUATED IF THE CHARGING DEVICE IS OPEN.
4. THE DISCHARGE DEVICE OF EACH BATCHER CANNOT BE ACTUATED UNTIL THE INDICATED MATERIAL IS WITHIN THE ALLOWABLE TOLERANCES.
5. THE MIXERS CANNOT BE DISCHARGED UNTIL THE REQUIRED MIXING TIME HAS ELAPSED.

RECORDER – AN ACCURATE RECORDER OR RECORDERS SHALL BE PROVIDED AND SHALL CONFORM TO THE FOLLOWING DETAILED REQUIREMNTS:

1. THE RECORDER SHALL PRODUCE A GRAPHICAL OR DIGITAL RECORD ON A SINGLE VISIBLE CHART OR TAPE OF THE WEIGHT OR VOLUME OF EACH MATERIAL IN THE BATCHERS AT THE CONCLUSION OF THE BATCHING CYCLE. THE RECORD SHALL BE PRODUCED PRIOR TO DELIVERY OF THE MATIERALS TO THE MIXER. AFTER THE BATCHERS HAVE BEEN DISCHARGED, THE RECORDER SHALL SHOW THE RETURN TO EMPTY CONDITION.
2. A GRAPHICAL RECORDING OR DIGITAL PRINTOUT UNIT SHALL BE COMPLETELY HOUSED IN A SINGLE CABINET THAT SHALL BE CAPABLE OF BEING LOCKED.
3. THE CHART OR TAPE SHALL BE SO MARKED THAT EACH BATCH MAY BE PERMANENTLY IDENTIFIED AND SO THAT VARIATIONS IN BATCH WEIGHTS OF EACH TYPE OF BATCH CAN BE READILY OBSERVED. THE CHART OR TAPE SHALL BE EASILY INTERPRETED IN INCREMENTS NOT EXCEEDING 0.5 PERCENT OF EACH BATCH WEIGHT.
4. THE CHART OR TAPE SHALL SHOW TIME OF DAY AT INTERVALS OF NOT MORE THAN 15 MINUTES.
5. THE RECORDER CHART OR TAPE SHALL BECOME THE PROPERTY OF THE CLIENT/PROJECT OWNER.
6. THE RECORDER SHALL BE PLACED IN A POSITION CONVENIENT FOR OBSERVATION BY THE MIXING PLANT OPERATOR AND THE GEOTECHINCAL INSPECTOR.
7. THE RECORDED WEIGHTS OR VOLUMES WHEN COMPARED TO THE WEIGHTS OR VOLUMES ACTUALLY BATCHED SHALL BE ACCURATE WITHIN PLUS OR MINUS 2 PERCENT.

4.4.2.4 CONTINUOUS MIXING PLANT

A. CONTINUOUS MIXING PLANT SHALL BE CAPABLE OF PRODUCING SOIL CEMENT OF THE SAME QUALITY AND UNIFORMITY AS WOULD BE PRODUCED IN A CONVENTIONAL BATCH PLANT AND SHALL BE CAPABLE OF PRODUCING A UNIFORM CONTINUOUS PRODUCT (AT BOTH MAXIMUM AND MINIMUM PRODUCTION RATES) THAT IS MIXED SO THAT COMPLETE INTERMINGLING OF ALL INGREDIENTS OCCURS WITHOUT BALLING, SEGREGATION, AND WET OR DRY PORTIONS.

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PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
LYTLE DEVELOPMENT
LYTLE WEST LEVEE
SOIL CEMENT NOTES AND SPECIFICATIONS

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B. OPERATION AND ACCURACY - AN ELECTRONIC CONTROL SYSTEM SHALL BE PROVIDED. THE CONTROL SYSTEM SHALL HAVE THE CAPABILITY OF CHANGING MIXTURES INSTANTANEOUSLY, MEASURING THE MOISTURE IN THE COMBINED AGGREGATE ENTERING THE MIXER, PRODUCING ANY OF THE MIXTURES AT A VARIABLE RATE AND TRACKING A MIXTURE CHANGE TO A HOPPER OR A CONVEYOR SYSTEM. THE CONTROL PANEL SHALL DISPLAY FOR EACH INGREDIENT THE DESIGNED FORMULA VALUES AND THE INSTANTANEOUS PRECENTAGE VALUES AND SHALL RECORD THE INSTANTANEOUS VALUES AT A PRESET TIME INTERVAL OR ON DEMAND WITH A MULTIPLE COPY PRINTER/RECORDER. THE RECORDER SHALL NOTE FORMULA CHANGES AND SHALL PRINT TOTAL QUANTITIES OF EACH INGREDIENT AND TOTAL AMOUNTS PRODUCED ON COMMAND. THERE SHALL BE WEIGHING DEVICES (BELT SCALE OR OTHER) FOR CONTINUOUS WEIGHING OF INDIVIDUAL INGREDIENTS AND TOTAL INGREDIENTS. THE PLANT CONTROL SHALL NOT REQUIRE MANUAL DEVICES TO ADJUST THE MATIERAL FLOW. THE PLANT SHALL BE CAPABLE OF TOTAL MANUAL CONTROL OPERATION FOR A SINGLE PRODUCT AT A LIMITED PRODUCTION FOR SHORT-TIME DURATIONS IN THE EVENT OF LOSS OF ELECTRONIC CONTROL. THE ELECTRONIC CONTROL SYSTEM SHALL INCORPORATE MODULAR REPLACEABLE COMPONENTS TO REDUCE DOWN TIME IN THE EVENT OF CONTROL SYSTEM MALFUNCTION. AN INVENTORY SHALL BE MAINTAINED OF SUCH REPLACEABLE COMPONENTS. THE ACCURACY OF THE PLANT DISPENSING SYSTEMS SHALL BE WITHIN THE FOLLOWING LIMITS:

CEMENT . . . . . 0 TO +2 PERCENT
WATER . . . . 1 PERCENT
AGGREGATE . . . . 2 PERCENT

THE CONTINUOUS FEEDERS FOR EACH OF THE INGREDIENTS SHALL BE CALIBRATED AS PER THE MANUFACTURER'S SPECIFICATIONS. DEVICES AND TOOLS SHALL BE MAINTAINED AT THE PLANT LOCATION TO CHECK THE FEEDER'S CALIBRATION AT THE GEOTECHINCAL INSPECTOR'S REQUEST. A TECHNICIAN SHALL BE PROVIDED THAT IS SKILLED IN CALIBRATION OF THE FEED DEVICES AND THE MAINTENANCE AND REPAIR OF THE PLANT CONTROL SYSTEM. THE TECHNICIAN SHALL BE AVAILABLE WITHIN 30 MINUTES NOTICE DURING ALL SCHEDULED PLANT OPERATIONS. THE TECHNCIAN COULD BE ONE OR MORE OF THE CONTRACTOR'S PERSONNEL.

C. SCALE CALIBRATION - THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND GEOTECHNICAL INSPECTOR 48 HOURS PRIOR TO THE SCALE CERTIFICATION. THE CONTRACTOR SHALL COMPLETE A SCALE CALIBRATION BY A THIRD PARTY CERTIFIED LABORATORY PRIOR TO PRODUCTION OF ANY SOIL CEMENT MATERIAL. THE ENGINEER OR THE GEOTECHINCAL INSPECTOR SHALL OBSERVE THE CALIBRATION OF THE SCALES. ADDITIONAL CALIBRATIONS, THROUGHOUT THE PROJECT MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.

D. CEMENT AND AGGREGATE FEED - CEMENT AND AGGREGATE SHALL BE UNIFORMLY, CONTINUOUSLY, AND SIMULTANEOUSLY FED (AT THE PROPER RATIOS AND QUANTITY FOR THE MIXTURE REQUIRED) INTO THE MIXER BY BELT, AUGER, VANE FEEDER, OR OTHER ACCEPTABLE METHOD. THE FEED BINS OR SILOS FOR EACH INGREDIENT SHALL BE KEPT SUFFICIENTLY FULL AND SHALL BE OF SUFFICIENT SIZE TO ENSURE A UNIFORM FLOW AT A CONSTANT RATE FOR A SPECIFIC MIXTURE. THE FEED BINS SHALL HAVE A LOW-LEVEL INDICATOR THAT BOTH WARNS THE OPERATOR AND CAN SHUT THE PLANT DOWN IF INSUFFICIENT MATERIAL IS AVAILABLE FOR A UNIFORM AND CONTINUOUS FLOW.

E. WATER DISPENSER - THE LIQUID-DISPENSING DEVICE SHALL BE CAPABLE OF METERING AND DISPENSING WITHIN THE SPECIFIED REQUIREMENTS. THE LIQUID DISPENSERS VALVES SHALL BE FREE FROM LEAKAGE IN THE CLOSED POSITION. THE DISPENSERS SHALL HAVE ATTACHMENTS AND/OR BE INSTALLED IN SUCH A MANNER THAT WILL PERMIT CONVENIENT CHECKING OF THEIR ACCURACY. PLUMBING SHALL BE LEAK-FREE AND PROPERLY VALVED TO PREVENT BACKFLOW AND SIPHONING. THE DISPENSER SHALL BE INTERLOCKED WITH THE ELECTRONIC PLANT CONTROL AND SHALL WARN THE OPERATOR AND SHUT DOWN THE PLANT IF INSUFFICIENT LIQUID IS AVAILABLE.

F. CONTINUOUS MIXER - THE CONTINUOS MIXER SHALL HAVE PROPER INTRODUCTION OF INGREDIENTS AS SPECIFIED BY THE MANUFACTURER AND SHALL NOT BE CHARGED IN EXCESS OF THE MANUFACTURER'S RECOMMENDED CAPACITY. MIXER SHALL BE CAPABLE OF COMBINING THE MATERIALS INTO A UNIFORM HOMOGENOUS MIXTURE AND OF DISCHARGING THIS MIXTURE WITHOUT SEGREGATION. THE MIXER SHALL OPERATE AT THE BLADE SPEED DESIGNATED BY THE MANUFACTURER AND SHALL BE CAPABLE OF CHANGING RENTENTION TIME OF THE INGREDIENTS IN THE MIXER. THIS SHOULD BE ACCOMPLISHED BY MANUALLY RESETTING THE MIXER BLADE ANGLES. MIXING TIME (INGREDIENT RETENTION TIME IN THE MIXER) SHALL BE PREDICATED UPON THE UNIFORMITY, HOMOGENEITY, AND CONSISTENCY OF THE RESULTANT MIXTURE. THE MIXER SHALL BE MAINTAINED IN SATISFACTORY OPERATING CONDITION AND MIXER BLADES SHALL BE KEPT FREE OF HARDENED SOIL CEMENT. SHOULD MIXER AT ANY TIME PRODUCE UNSATISFACTORY RESULTS, ITS USE SHALL BE PROMPTLY DISCONTINUED UNTIL IT IS REPAIRED. SUITABLE FACILITIES SHALL BE PROVIDED FOR OBTAINING REPRESENTATIVE SAMPLES OF SOIL CEMENT FOR TESTING. ALL NECESSARY PLATFORMS, SHELTERS, TOOLS, LABOR, AND EQUIPMENT SHALL BE PROVIDED FOR OBTAINING SAMPLES.

G. SEGREGATION – A MEANS SHALL BE USED TO REDUCE AND MINIMIZE SEGREGATION AND WASTE WHICH WOULD OTHERWISE RESULT FROM THE CONTINUOUS STREAM OF SOIL CEMENT BEING FED INTO THE BATCH HAUL DEVICES (DUMP TRUCKS, ETC.). THE EQUIPMENT SHALL RETAIN THE SOIL CEMENT BETWEEN TRACKS OR OTHER MEANS OF TRANSPORT TO PREVENT THE NEED FOR STOPPING THE MIXER. THESE DEVICES COULD INCLUDE, BUT NOT LIMITED TO, A DISCHARGE HOPPER HAVING A CAPACITY OF AT LEAST 20 METRIC TON. THE HOPPER SHALL BE EQUIPPED WITH DUMP GATES TO ASSURE RAPID AND COMPLETE DISCHARGE WITHOUT SEGREGATION.

H. PROTECTION - THE WEIGHING, INDICATING, RECORDING AND CONTROL EQUIPMENT SHALL BE PROTECTED AGAINST EXPOSURE TO DUST, MOISTURE, AND VIBRATION SO THAT THERE IS NO INTERFERENCE WITH PROPER OPERATION OF THE EQUIPMENT.

4.4.2 MIXERS

MIXERS SHALL BE STATIONARY MIXERS OR PUGMILL MIXERS. MIXERS MAY BE BATCH OR CONTINUOUS MIXING. EACH MIXER SHALL COMBINE THE MATERIALS INTO A UNIFORM MIXTURE AND DISCHARGE THIS MIXTURE WITHOUT SEGRATION. MIXERS SHALL NOT BE CHARGED IN EXCESS OF THE CAPACITY RECOMMENDED BY THE MANUFACTURER. EXCESSIVE OVERMIXING REQUIRING ADDITIONS OF WATER WILL NOT BE PERMITTED. THE MIXERS SHALL BE MAINTAINED IN SATISFACTORY OPERATING CONDITION. MIXER BLADES OR PADDLES SHALL BE REPLACED WHEN WORN DOWN MORE THAN 10 PERCENT OF THEIR DEPTH WHEN COMPARED WITH THE MANUFACTURER'S DIMENSION FOR NEW BLADES. SHOULD ANY MIXER AT ANY TIME PRODUCE UNSATISFACTORY RESULTS, ITS USE SHALL BE PROMPTLY DISCONTINUED UNTIL IT IS REPAIRED OR REPLACED.

4.3.1 PUGMILL MIXERS

A BATCH OR CONTINUOUS MIXING TWIN-SHAFT PUGMILL MIXER SHALL BE CAPABLE OF PRODUCING SOIL CEMENT OF THE SAME QUALITY AND UNIFORMITY AS WOULD BE PRODUCED IN A CONVENTIONAL PLANT THAT MEETS ALL THE REQUIREMENTS OF THESE SPECIFICATIONS. ALL PUGMILL MIXERS SHALL MEET THE REQUIREMENTS OF PARAGRAPH 4.4.2.4 CONTINUOUS MIXING PLANT.

4.4 ACCESS TO MIXING FACILITY:

FREE AND SAFE ACCESS TO THE PLANT MUST BE PROVIDED TO THE ENGINEER AND GEOTECHNICAL INSPECTOR AT ALL TIMES FOR INSPECTION OF THE PLANT'S OPERATION AND FOR SAMPLING THE SOIL CEMENT MIXTURE AND ITS COMPONENTS.

4.5 REQUIRED MOISTURE:

AT THE TIME OF COMPACTION, THE MOISTURE CONTENT SHALL NOT BE MORE THAN ONE (1) PERCENTAGE POINT BELOW OPTIMUM AND SHALL NOT BE MORE THAN ONE PERCENTAGE POINT ABOVE OPTIMUM WHEN THE MEAN AIR TEMPERATURE DURING CONSTRUCTION HOURS DOES NOT EXCEED 90 DEGREES F. WHEN THE MEAN AIR TEMPERATURE DOES EXCEED 90 DEGREES F, OR THERE IS A BREEZE OR WIND WHICH PROMOTES THE RAPID DRYING OUT OF THE SOIL CEMENT MIXTURE, THE MOISTURE CONTENT OF SAID MIX MAY BE INCREASED AS NEEDED AT THE DIRECTION OF THE GEOTECHNICAL ENGINEER, BUT SHALL BE LESS THAN THAT QUANTITY THAT WILL CAUSE THE SOIL CEMENT TO BECOME UNSTABLE DURING COMPACTION AND FINISHING OPERATIONS. THE OPTIMUM MOISTURE CONTENT OF SOIL CEMENT MIXTURE SHALL BE DETERMINED BY ASTM D1557.

4.6 HANDLING:

THE SOIL CEMENT MIXTURE SHALL BE TRANSPORTED FROM THE MIXING PLANT TO THE EMBANKMENT IN CLEAN EQUIPMENT PROVIDED WITH SUITABLE PROTECTIVE DEVICES IN UNFAVORABLE WEATHER. IN NO CASE SHALL THE TOTAL ELAPSED TIME BETWEEN THE START OF MOIST MIXING AND START OF COMPACTION EXCEED (60) MINUTES. HAUL TIME SHALL NOT EXCEED (30) MINUTES, AT ANY TIME DURING COMPACTION OPERATIONS. COMPACTION OF EACH LAYER SHALL BE DONE IN SUCH A MANNER AS TO PRODUCE A DENSE SURFACE, FREE OF COMPACTION PLANES, IN NOT LONGER THAN TWO (2) HOURS FROM THE START OF MOIST MIXING. TIME MAY BE REDUCED BY THE ENGINEER WHEN THE AIR TEMPERATURE EXCEEDS 90°F OR WHEN THERE IS A BREEZE OR WIND WHICH PROMOTES RAPID DRYING OF THE SOIL CEMENT MIXTURE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO COMPLETED SOIL CEMENT BY THE EQUIPMENT AND TO AVOID THE DEPOSITION OF RAW EARTH OR FOREIGN MATERIALS BETWEEN LAYERS OF SOIL CEMENT. EARTH RAMPS CROSSING COMPLETED SOIL CEMENT MUST HAVE AT LEAST TWO (2) FOOT COMPACTED THICKNESS. WHERE RAMPS ARE CONSTRUCTED OVER SOIL CEMENT THAT IS NOT GRADE, ALL FOREIGN MATERIALS AND THE UPPERMOST ONE (1) INCH OF THE PREVIOUSLY PLACED SOIL CEMENT MIXTURE MUST BE REMOVED PRIOR TO CONTINUATION OF THE SOIL CEMENT CONSTRUCTION.

4.7 PLACING AND COMPACTION:

THE MIXTURE SHALL BE PLACED ON THE MOISTENED SUBGRADE EMBANKMENT, OR PREVIOUSLY COMPLETED SOIL CEMENT WITH SPREADING EQUIPMENT THAT WILL PRODUCE LAYERS OF SUCH WIDTHS AND THICKNESS AS ARE NECESSARY FOR COMPACTION TO THE REQUIRED DIMENSIONS OF THE COMPLETED SOIL CEMENT LAYERS. THE COMPACTED LAYERS OF SOIL CEMENT SHALL NOT EXCEED NINE (9) INCHES IN THICKNESS, NOR BE LESS THAN SIX (6) INCHES IN THICKNESS.

EACH SUCCESSIVE LAYER SHALL BE PLACED AS SOON AS PRACTICABLE AFTER THE PRECEDING LAYER IS COMPLETED AND APPROVED BY THE ENGINEER.

ALL SOIL CEMENT SURFACES THAT WILL BE IN CONTACT WITH SUCCEEDING LAYERS OF SOIL CEMENT SHALL BE KEPT CONTINUOUSLY MOIST BY FOG SPRAYING UNTIL PLACEMENT OF THE SUBSEQUENT LAYER.

MIXING SHALL NOT PROCEED WHEN THE SOIL AGGREGATE OR THE AREA ON WHICH THE SOIL CEMENT IS TO BE PLACED IS FROZEN. SOIL CEMENT SHALL NOT BE MIXED OR PLACED WHEN THE AIR TEMPERATURE IS BELOW (45° F, 7° C), UNLESS THE AIR TEMPERATURE IS AT LEAST (40° F, 5° C) AND RISING.

AT THE START OF COMPACTION, THE MIXTURE SHALL BE IN A UNIFORM, LOOSE CONDITION, THROUGHOUT ITS FULL DEPTH. ITS MOISTURE CONTENT SHALL BE AS SPECIFIED BY GEOTECHNICAL ENGINEER AT START-UP.
SOIL CEMENT SHALL BE UNIFORMLY COMPACTED TO A MINIMUM 95% OF THE MAXIMUM DENSITY AS DETERMINED BY ASTM D1557. THE IN-PLACE DENSITY SHALL BE DETERMINED BY ASTM D1556 AND/OR ASTM D2922 AND ASTM 3017. A MINIMUM OF 1 IN 10 COMPACTION TESTS SHALL BE BY ASTM D1556. WHEEL ROLLING WITH ONLY HAULING EQUIPMENT SHALL NOT BE AN ACCEPTABLE METHOD OF COMPACTION.

WHENEVER THE CONTRACTOR'S OPERATION IS INTERRUPTED FOR MORE THAN TWO (2) HOURS, OR PRIOR TO COMMENCEMENT OF THE DAY'S CONSTRUCTION, ONE OF THE FOLLOWING PROCEDURES MAY BE CHOSEN TO PROVIDE BINDING OF LAYERS:

4.7.1 SPRINKLE THE TOP OF A COMPLETED LAYER WITH DRY CEMENT, ABOUT 1 TO 1 ½ LB. PER SQ. YRD. THE CEMENT SHOULD BE APPLIED TO A CLEAN SURFACE, THEN MOISTENED TO FORM A SLURRY NO MORE THAN FIFTEEN (15) MINUTES (OR LESS, AT FIELD/SOILS ENGINEER'S DISCRETION AND DEPENDING UPON SUCH FACTORS AS AMBIENT TEMPERATURE AND HUMIDITY) PRIOR TO PLACEMENT OF THE NEXT LAYER.

4.7.2 APPLY A NEAT CEMENT SLURRY AT AN APPROXIMATE 1:1 RATIO OVER A CLEAN SURFACE NO MORE THAN FIFTEEN (15) MINUTES (OR LESS, AT FIELD/SOILS ENGINEER'S DISCRETION AND DEPENDING UPON SUCH FACTORS AS AMBIENT TEMPERATURE AND HUMIDITY) PRIOR TO PLACEMENT OF THE NEXT LAYER.

PRIOR TO COMMENCEMENT OF THE DAY'S CONSTRUCTION, THE SURFACE OF THE SOIL CEMENT MUST BE CLEANED TO REMOVE ALL DEBRIS AND WASTE SOIL CEMENT, AND A SMOOTH SURFACE AS DESCRIBED HEREIN PROVIDED TO ENSURE PROPER BONDING WITH SUCCEEDING SOIL CEMENT LAYERS.

THE FINAL TWO (VERTICAL) FEET OF SOIL CEMENT SHALL BE PLACED WITHOUT INTERRUPTION TO PREVENT LAMINATION.

4.8 FINISHING:

AFTER COMPACTION, THE SOIL CEMENT SHALL BE FURTHER SHAPED, IF NECESSARY, TO THE REQUIRED LINES, GRADES AND CROSS SECTIONS AND ROLLED TO A REASONABLE SMOOTH SURFACE.

THE FOLLOWING REQUIREMENTS SHALL APPLY REGARDING THE FINISHING OF SOIL CEMENT SURFACE:

DURING THE COMPACTION OPERATIONS FOR THE UPPERMOST LAYER OF SOIL CEMENT, SHAPING WILL BE REQUIRED TO OBTAIN THE REQUIRED SURFACE AND CROSS SECTION. DURING SHAPING OPERATIONS IT MAY BE NECESSARY TO LIGHTLY SCARIFY AND BROOM-DRAG THE SURFACE IN ORDER TO REMOVE RIDGES OR DEPRESSIONS IN EXCESS OF THE PERMITTED TOLERANCE SPECIFIED HEREIN. THE RESULTING SURFACE SHALL THEN BE ROLLED WITH A SMOOTH STEEL-WHEEL ROLLER, WEIGHING NOT LESS THAN TEN TONS, OR PNEUMATIC TIRE ROLLERS, OR BOTH. THE FINAL ROLLING SHALL BE DONE BY A SMOOTH STEEL-WHEEL ROLLER. WEIGHING NOT LESS THAN TEN TONS, OR PNEUMATIC TIRE ROLLERS, OR BOTH. THE FINAL ROLLING SHALL BE DONE BY A SMOOTH STEEL-WHEEL ROLLER. SEVERAL APPLICATIONS OF WATER MAY BE REQUIRED TO KEEP THE SURFACE AT THE PROPER MOISTURE CONTENT, AS DIRECTED BY THE ENGINEER, DURING THE FINISHING OPERATION.

WATER SHALL BE APPLIED BY THE PRESSURE SPRAY BAR METHOD. COMPACTION AND FINISHING SHALL BE DONE IN A MANNER AS TO PRODUCE, IN NOT LONGER THAN TWO HOURS AFTER COMPLETION OF MIXING. A SMOOTH, DENSE SURFACE FREE OF COMPACTION PLANES, CRACKS, RIDGES, OR LOOSE MATERIALS. IMMEDIATELY AFTER ROLLING, THE SURFACE OF THE SOIL CEMENT SHALL BE TESTED FOR TRUENESS, TRANSVERSELY AND LONGITUDINALLY. THE UPPERMOST LAYER INCLUDING ACCESS ROADS AND ALL PERTINANT SOIL CEMENT STRUCTURES SHALL BE CONSTRUCTED WITHIN A VERTICAL TOLERANCE OF 0.1FT PER ELEVATIONS SHOWN ON THESE PLANS. SURFACE FINISHING SHALL BE COMPLETED IN DAYLIGHT HOURS.

EDGES ON SOIL CEMENT FACE ADJACENT TO SOIL BACKFILL SHALL NOT BE SMOOTHED, BUT SHALL BE LEFT AT RIGHT ANGLES IN A STEPPED FASHION, WITH THE PROJECTING PORTIONS OF EACH STEP TO BE COMPACTED. BACKFILLING SHALL OCCUR IMMEDIATELY AFTER COMPACTION OF EACH STEPPED EDGE, SUCH THAT PLACEMENT OF EACH LAYER AND BACKFILLING OF SOIL TO THAT LEVEL OCCUR AT THE SAME TIME.

ANY PORTION OF THIS COURSE WHICH HAS DENSITY LESS THAN THE SPECIFIED SHALL BE CORRECTED OR REMOVED AND REPLACED TO ITS FULL DEPTH TO MEET THESE SPECIFICATION, AT THE CONTRACTOR'S EXPENSE.

4.9 CURING:

TEMPORARILY EXPOSED SURFACES SHALL BE KEPT MOIST AS SET FORTH HEREIN. CARE MUST BE EXERCISED TO ENSURE THAT NO CURING MATERIAL OTHER THAN WATER IS APPLIED TO THE SURFACES THAT WILL BE IN CONTACT WITH SUCCEEDING LAYERS.

PERMANENTLY EXPOSED SURFACES SHALL BE KEPT IN A MOIST CONDITION FOR SEVEN (7) DAYS, OR THEY MAY BE COVERED WITH SOME SUITABLE CURING MATERIAL, SUBJECT TO THE ENGINEER'S APPROVAL. ANY DAMAGE TO THE PROTECTIVE COVERING WITHIN SEVEN (7) DAYS SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER.

REGARDLESS OF THE MATERIAL USED, THE PERMANENTLY EXPOSED SURFACES SHALL BE KEPT MOIST UNTIL THE PROTECTIVE COVER IS APPLIED. SUCH PROTECTIVE COVER IS TO BE APPLIED AS SOON AS PRACTICABLE, WITH A MAXIMUM TIME LIMIT OF TWENTY-FOUR (24) HOURS BETWEEN THE FINISHING OF THE SURFACE AND THE APPLICATION OF THE PROTECTIVE COVER OR MEMBRANE. WHEN NECESSARY, THE SOIL CEMENT SHALL BE PROTECTED FROM FREEZING FOR SEVEN (7) DAYS AFTER ITS CONSTRUCTION BY COVERING OF LOOSE EARTH, STRAW, OR OTHER SUITABLE MATERIAL.
FINISHING SHALL BE COMPLETED IN DAYLIGHT HOURS.

4.10 CONSTRUCTION JOINTS:

AT THE END OF EACH DAY'S WORK, OR WHENEVER CONSTRUCTION OPERATIONS ARE INTERRUPTED FOR MORE THAN TWO (2) HOURS, A TRANSVERSE CONSTRUCTION JOINT SHALL BE FORMED BY CUTTING BACK INTO THE COMPACTED SOIL CEMENT TO FORM A FULL-DEPTH VERTICAL FACE IN THE LAST LIFT PLACED.

4.11 MAINTENANCE:

THE CONTRACTOR SHALL BE REQUIRED, WITHIN THE LIMITS OF THE CONTRACT TO MAINTAIN THE SOIL CEMENT IN GOOD CONDITION UNTIL ALL WORK IS COMPLETED AND ACCEPTED. MAINTENANCE SHALL INCLUDE IMMEDIATE REPAIRS OF ANY DEFECTS THAT MAY OCCUR. THIS WORK SHALL BE DONE BY THE CONTRACTOR AT HIS OWN EXPENSE AND REPEATED AS OFTEN AS NECESSARY. FAULTY WORK SHALL BE REPLACED FOR A FULL DEPTH OF THE LAYER.

5.0 INSPECTION AND TESTING

THE GEOTECHNICAL ENGINEER AND THE PROJECT DESIGN ENGINEER, WITH THE ASSISTANCE AND COOPERATION OF THE CONTRACTOR, WILL MAKE SUCH INSPECTIONS AND TESTS AS DEEMED NECESSARY TO ENSURE THE CONFORMANCE OF THE WORK TO THE CONTRACT DOCUMENTS. THESE INSPECTIONS MAY INCLUDE, BUT WILL NOT BE LIMITED TO: (1) FIELD SURVEY CERTIFICATION OF TOP AND TOE OF SOIL CEMENT BANK PROTECTION AS TO ENSURE CONTRACTOR MEETS THE VERTICAL TOLERANCE SPECIFIED IN THESE PLANS, (2) THE TAKING OF THE TEST SAMPLES OF THE SOIL CEMENT AND ITS INDIVIDUAL COMPONENTS AT ALL STAGES OF PROCESSING AND AFTER COMPLETION, AND (3) THE CLOSE OBSERVATION OF THE OPERATION OF ALL EQUIPMENT USED ON THE WORK. ONLY THOSE MATERIALS, MACHINES, AND METHODS MEETING THE REQUIREMENTS OF THE CONTRACT DOCUMENTS SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER.

ALL TESTING OF SOIL CEMENT OR ITS INDIVIDUAL COMPONENTS, UNLESS OTHERWISE PROVIDED SPECIFICALLY IN THE CONTRACT DOCUMENTS, SHALL BE IN ACCORDANCE WITH THE LATEST APPLICABLE CALIFORNIA, ASTM, OR AASHTO SPECIFICATIONS IN EFFECT AS OF THE DATE OF ADVERTISEMENT FOR BIDS ON THE PROJECT.

TESTING FOR PROPER COMPACTION SHALL BE DONE ON AT LEAST EVERY OTHER LAYER OF COMPACTED SOIL CEMENT AT ANY LOCATION CHOSEN BY THE INSPECTOR. IF THE LAYER BEING TESTED DOES NOT PASS THE MINIMUM 95% OF THE MAXIMUM DENSITY REQUIREMENT AS DETERMINED BY ASTM D1557, IT MUST BE REWORKED UNTIL IT PASSES OR BE REMOVED AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL NOT CONTINUE PLACING LAYERS OF SOIL CEMENT ON ANY LAYER WHICH HAS FAILED THE COMPACTION TESTS UNTIL SUCH TIME AS THAT LIFT HAS BEEN REWORKED, RETESTED, AND PASSED AS TO MEETING DENSITY REQUIREMENTS.

THE INITIAL ACCEPTANCE OF MATERIAL SHALL IN NO WAY PRECLUDE FURTHER EXAMINATION AND TESTING AT ANY TIME. DURING THE COURSE OF CONSTRUCTION OR SUBSEQUENT WARRANTY PERIOD, THE GEOTECHNICAL ENGINEER SUSPECTS THAT THE MATERIAL IS NO LONGER PROPERLY REPRESENTED BY THE ACCEPTANCE SAMPLE. THE ACCEPTANCE AT ANY TIME OF ANY MATERIAL INCORPORATED INTO THE WORK SHALL NOT BAR ITS FUTURE REJECTION IF IT IS SUBSEQUENTLY FOUND TO BE DEFECTIVE IN QUALITY OR UNIFORMITY.

6.0 MIX DESIGN FOR THIS PROJECT

FOR BIDDING PURPOSES ONLY, THE ESTIMATED MIX DESIGN FOR THIS PROJECT SHALL BE 10% BY DRY WEIGHT.

THE PERCENT OF CEMENT TO BE USED IN THE MIX SHALL BE CALCULATED TO BE THE WEIGHT OF CEMENT DIVIDED BY THE TOTAL WEIGHT OF THE DRY COMPACTED SOIL CEMENT. THE ACTUAL MIX DESIGN USED ON THIS PROJECT SHALL BE DETERMINED BY LABORATORY TESTS ON MATERIAL STOCKPILED AFTER CONSTRUCTION OF THE STOCKPILE HAS BEEN COMPLETED IN ACCORDANCE WITH THE REQUIREMENTS HEREIN, PER APPROVAL OF THE PROJECT DESIGN ENGINEER.

7.0 STOCKPILING OF AGGREGATE

SOIL AGGREGATE STOCKPILE SHALL BE CONSTRUCTED ON LEVEL, FIRM GROUND FREE OF BRUSH, TREES, STUMPS, ROOTS, RUBBISH, DEBRIS, AND OTHER OBJECTIONABLE OR DELETERIOUS MATERIAL AND SHALL BE LOCATED SO AS TO PROVIDE A DISTANCE OF NOT LESS THAN FIFTY (50) FEET FROM THE OUTSIDE BOTTOM EDGE OF THE CONICAL STOCKPILE BUILD UP UNDER THE PROCESSING PLANT CONVEYER OR ANY OTHER EXISTING STOCKPILE. THE STOCKPILE SHALL BE CONSTRUCTED IN LAYERS, EACH LAYER NOT EXCEEDING TWO (2) FEET IN THICKNESS.

RAMPS FORMED FOR STOCKPILE CONSTRUCTION SHALL BE OF THE SAME MATERIAL AS THAT BEING STOCKPILED, AND WILL BE CONSIDERED A PART OF THE STOCKPILE. BEFORE STEEPENING A RAMP, ANY CONTAMINATED SURFACE MATERIAL SHALL BE REMOVED. THE TOTAL HEIGHT OF THE STOCKPILE SHALL NOT EXCEED FIFTEEN (15) FEET OR THE REACH OF THE EQUIPMENT EMPLOYED TO REMOVE MATERIAL FOR SAMPLING AND UTILIZATION, WHICHEVER IS LESS.

STOCKPILED MATERIAL SHOULD BE THOROUGHLY MIXED THROUGHOUT ITS DEPTH, WIDTH, AND LENGTH BEFORE UTILIZATION. THE MATERIAL SHALL BE HOMOGENOUS AND UNIFORM IN COLOR, GRADATION, AND MOISTURE THROUGHOUT.

DURING CONSTRUCTION OF STOCKPILES TO BE UTILIZED IN THE PRODUCTION OF SOIL CEMENT, THE CONTRACTOR WILL BE SOLELY RESPONSIBLE FOR MONITORING THE QUALITY AND UNIFORMITY OF THE MATERIAL BEING PLACED THEREIN. TO ASSURE CONFORMANCE WITH THE GRADATION REQUIREMENTS SPECIFIED FOR IDEAL SOIL MATERIAL THE TESTING LABORATORY SHALL SAMPLE AND TEST AT FREQUENT ENOUGH INTERVALS TO DEMONSTRATE SUCH COMPLIANCE TO THE GEOTECHNICAL ENGINEER. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE SOILS REPORTS PREPARED FOR THIS PROJECT AND WHICH ARE AVAILABLE FOR REVIEW AT THE OWNER'S OFFICE.

STOCKPILE SAMPLING WILL BE DONE BY THE GEOTECHNICAL ENGINEER AFTER THE REQUIRED AMOUNT OF SOIL AGGREGATE FOR THE ENTIRE SOIL CEMENT JOB HAS BEEN EXCAVATED AND STOCKPILED. AFTER THE STOCKPILE HAS BEEN SAMPLED AND APPROVED, NO MATERIAL WILL BE ADDED TO IT WITHOUT APPROVAL OF THE GEOTECHNICAL ENGINEER.

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FLOOD CONTROL ENGINEER — DATE
PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
LYTLE DEVELOPMENT
LYTLE WEST LEVEE
SOIL CEMENT NOTES AND SPECIFICATIONS

DATE
SCALE: AS SHOWN
FILE NO.
SHEET NO. 4 OF 24

UPON COMPLETION OF THE STOCKPILE, THE CONTRACTOR SHALL NOTIFY THE GEOTECHNICAL ENGINEER IN ORDER TO ALLOW FOR VERIFICATION OF THE SOIL CEMENT MIX DESIGN DETERMINED DURING DESIGN FROM RANDOM SITE SAMPLING. THE CONTRACTOR SHALL PROVIDE THE MANPOWER AND EQUIPMENT NECESSARY TO SAMPLE THE STOCKPILE IN ACCORDANCE WITH THE FOLLOWING PROCEDURE:

UNDER THE DIRECTION OF THE GEOTECHNICAL ENGINEER, THE CONTRACTOR SHALL USE A FRONT-END LOADER TO EXCAVATE A FACE FOR THE FULL HEIGHT OF THE STOCKPILE, EXTENDING INTO THE STOCKPILE A DISTANCE SPECIFIED BY THE GEOTECHNICAL ENGINEER, AT FOUR (4) DIFFERENT LOCATIONS (N, S, E &W) AROUND THE PERIMETER OF THE STOCKPILE. THE FRONT-END LOADER SHALL THEN BE USED TO CHANNEL THE TOTAL EXCAVATED FACE AT EACH LOCATION FROM THE BOTTOM TO THE TOP IN ONE OPERATION, AND THE MATERIAL OBTAINED SHALL BE DUMPED ON THE GROUND IN PILES. THE GEOTECHNICAL ENGINEER WILL THEN SAMPLE EACH OF THE FOUR (4) PILES BY CHANNELING IT WITH A HAND SHOVEL AT FOUR (4) LOCATIONS EQUALLY SPACED AROUND THE PERIMETER.

APPROVAL OF A STOCKPILE SHALL NOT RELIEVE, IN ANY DEGREE, THE FULLEST RESPONSIBILITY OF THE CONTRACTOR TO FURNISH IN ITS FINAL POSITION, A MATERIAL CONFORMING TO ALL THE SPECIFICATION REQUIREMENTS.

8.0 UTILIZATION OF STOCKPILES

STOCKPILES OF MATERIAL MAY BE USED FOR ANY ITEM FOR WHICH IT IS ACCEPTABLE.

MATERIAL REMOVAL FROM ACCEPTED STOCKPILES FOR PROJECT UTILIZATION SHALL BE BY SIDE EXCAVATION FOR THE FULL HEIGHT OF THE STOCKPILE UNLESS OTHERWISE APPROVED IN WRITING, BY THE GEOTECHNICAL ENGINEER.

UNLESS OTHERWISE STIPULATED, THE CONTRACTOR SHALL PROVIDE AND PAY FOR ALL SUPPLIES, MATERIALS, LABOR, WATER, TOOLS, EQUIPMENT, LIGHT, POWER, TRANSPORTATION, AND OTHER FACILITIES NECESSARY FOR EXECUTION AND COMPLETION OF THE PROJECT. UNLESS OTHERWISE SPECIFIED, ALL MATERIALS AND SUPPLIES SHALL BE NEW AND OF THE BEST QUALITY. THE CONTRACTOR, IF REQUIRED, SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF SUPPLIES AND MATERIALS.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND/OR MATERIALS SUPPLIER TO MAINTAIN IN-HOUSE QUALITY CONTROL OF PROCESSED MATERIALS.

THE CONTRACTOR SHALL SUBMIT A REQUEST FOR MATERIALS TESTING FORTY-EIGHT (48) HOURS IN ADVANCE. ALL RE-TESTING OF MATERIALS OR MATERIAL SOURCES SHALL BE DONE AT THE CONTRACTOR'S EXPENSE. THE UNIT CHARGES FOR THESE RE-TESTS ARE AVAILABLE FROM THE GEOTECHNICAL ENGINEER.

STOCKPILE(S) SHALL BE COMPLETED AND APPROVED AT LEAST TEN (10) DAYS PRIOR TO START OF SOIL CEMENT PRODUCTION. MIX DESIGN SHALL THEN BE PERFORMED BY THE GEOTECHNICAL ENGINEER, TO DETERMINE JOB MIX PROPORTIONS.

9.0 TEST PROCEDURE FOR DETERMINATION OF CEMENT REQUIRED FOR SOIL CEMENT MIXTURES AND CYLINDER SPECIMENS PREPARED DURING CONSTRUCTION

THE COMPRESSIVE STRENGTH OF MOLDED SPECIMENS AT VARYING CEMENT CONTENTS SHALL BE DETERMINED BY ASTM D1633 AND SHALL BE USED TO DETERMINE THE PERCENTAGE OF PORTLAND CEMENT REQUIRED IN DEVELOPING SOIL CEMENT MIXTURES. (ASTM D1633 SHALL BE MODIFIED TO USE ASTM D1557 TO PREPARE THE MOLDED SPECIMENS.)

10.0 SOIL CEMENT COMPRESSIVE STRENGTH

THE RUNNING AVERAGE OF 7-DAY COMPRESSIVE STRENGTHS FOR FIELD SPECIMENS OVER ANY THREE CONSECUTIVE DAYS OF CONSTRUCTION SHALL BE 750 PSI. THE MINIMUM 7-DAY COMPRESSIVE STRENGTH FOR ANY SINGLE FIELD SPECIMEN SHALL NOT BE LESS THAN 450 PSI. IF THE RUNNING AVERAGE OF THE 7-DAY COMPRESSIVE STRENGTHS OVER ANY THREE CONSECUTIVE DAYS OF CONSTRUCTION IS BELOW 750 PSI, THE REPRESENTATIVE SPECIMEN FROM THE STAND-BY CYLINDERS CORRESPONDING TO THE LOWEST 7-DAY COMPRESSIVE STRENGTH FROM THE THREE DAY PERIOD SHALL BE TESTED FOR DURABILITY, IN ACCORDANCE WITH ASTM D559 (SEE SECTION 11.0 OF THESE SPECIFICATIONS). THE REPRESENTATIVE SPECIMENS SHALL BE TESTED TO DETERMINE IF SPECIMENS FROM THE THREE DAY PERIOD MEET THE MINIMUM DURABILITY REQUIREMENTS. FOR SPECIMENS THAT DO NOT MEET THE ABOVE PARAMETERS, THE ENGINEER SHALL ANALYZE THE EFFECT ON THE SERVICE LIFE OF THE LINING. SHOULD IT BE DETERMINED THAT THE SERVICE LIFE OF THE LINING IS INADEQUATE, THE AFFECTED AREA OF THE LINING SHALL BE REMOVED AND REPLACED WITH ACCEPTABLE SOIL CEMENT AT THE EXPENSE OF THE CONTRACTOR. TESTING OF IN-PLACE SOIL CEMENT BY BORING OR OTHER METHODS SHALL BE PERFORMED AT THE EXPENSE OF THE CONTRACTOR AND AS DIRECTED BY THE ENGINEER FOR TEST SAMPLES THAT FALL OUTSIDE OF THE ESTABLISHED PARAMETERS.

11.0 SCHEDULE OF GEOTECHNICAL TESTING

GEOTECHNICAL ENGINEER SHALL OVERSEE CONSTRUCTION OF THE STOCKPILE, INCLUDING ANY ENGINEERING NECESSARY TO BRING THE FINES CONTENT TO ACCEPTABLE LEVELS. CONTRACTOR SHALL ENSURE THAT THE STOCKPILE CONTAINS NO MATERIAL RETAINED ON A 3-INCH SIEVE, NOR ANY ORGANIC OR DELETERIOUS MATERIAL, BEFORE GEOTECHNICAL APPROVAL FOR USE IN CONSTRUCTION OF THE SOIL CEMENT BANK PROTECTION (SEE SECTION 2.3 OF THESE SPECIFICATIONS).

GEOTECHNICAL ENGINEER SHALL DETERMINE THE FOLLOWING INFORMATION FOR THE STOCKPILE AT THE BEGINNING OF EVERY DAY THAT CONSTRUCTION OF THE SOIL CEMENT BANK PROTECTION IS TO OCCUR, PRIOR TO COMMENCEMENT OF CONSTRUCTION FOR THAT DAY:

1. PERFORM SIEVE ANALYSIS OF STOCKPILED MATERIAL (PASSED THROUGH MIXING APARATUS) PRIOR TO ADDITION OF CEMENT, IN ACCORDANCE WITH THE METHODS LAID OUT IN ASTM D421 AND ASTM D422 (SEE SECTION 2.5 OF THESE SPECIFICATIONS).
2. PERFORM MOISTURE CONTENT DETERMINATION FOR STOCKPILED MATERIAL PRIOR TO ADDITION OF CEMENT, IN ACCORDANCE TO ONE OF THE FOLLOWING METHODS: AASHTO T 217, ASTM D3017, AASHTO T 239, OR ASTM D4643 (SEE SECTION 4.5 OF THESE SPECIFICATIONS).
3. PERFORM MODIFIED PROCTOR TEST (ASTM D1557) TO DETERMINE REQUIRED MAX. DRY DENSITY OF SOIL CEMENT.

11.1 DAILY TESTING

GEOTECHNICAL ENGINEER SHALL PERFORM THE FOLLOWING AT REASONABLE INTERVALS OR AT LEAST EVERY 500C.Y. OF SOIL CEMENT PLACED, SUCH THAT A MINIMUM OF FOUR SAMPLES ARE OBTAINED TWICE A DAY PER EVERY DAY OF SOIL CEMENT CONSTRUCTION:

1. TAKE IN-PLACE SAMPLES AFTER SOIL CEMENT MIXTURE IS PLACED, BUT PRIOR TO BLADING AND COMPACTION.
2. RECORD STATION AND ELEVATION FROM WHICH SAMPLES WERE TAKEN.
3. PERFORM MOISTURE CONTENT DETERMINATION ON SAMPLES, IN ACCORDANCE WITH THE TEST METHOD SELECTED TO DETERMINE MOISTURE CONTENT FOR STOCKPILED MATERIAL.
4. DETERMINE MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE OF SOIL CEMENT MIXTURE IN ACCORDANCE WITH ASTM D1557.
5. PREPARE FIVE (5) CYLINDERS FOR COMPRESSIVE STRENGTH AND DURABILITY TESTING (1,3, (2) 7 & STAND-BY SPECIMEN) AS AN INDICATOR THAT CONTRACTOR IS ACHIEVING MIN. COMPRESSIVE STRENGTH. THESE CYLINDERS SHALL BE PREPARED IN ACCORDANCE TO ASTM D558 AND MODIFIED TO THE HIGHER ENERGY OF COMPACTION IN ACCORDANCE WITH ASTM D1557.
6. CAP AND SEAL SAMPLES AND SEND TO LAB FOR COMPRESSIVE STRENGTH TESTING AT (1,3, 7 & STAND-BY SPECIMEN), IN ACCORDANCE WITH ASTM D1633. SAMPLES SHOULD BE KEPT MOIST IN AN AIRTIGHT CONTAINER PRIOR TO TRANSPORT TO LAB, TO ENSURE PROPER CURING.
7. A STAND-BY SPECIMEN SHOULD BE TESTED FOR DETERMINATION OF DURABILITY FOR EVERY 10,000 C.Y. OF SOIL CEMENT PLACED OR AT LEAST TWO PER PROJECT, IN ACCORDANCE WITH ASTM D559.
8. STAND-BY SPECIMEN SHOULD BE TESTED FOR 28-DAY COMPRESSIVE STRENGTH FOR EVERY 5000C.Y. OF SOIL CEMENT PLACED, IN ACCORDANCE WITH ASTM D1633.

11.2 TESTING ON EVERY OTHER LAYER

GEOTECHNICAL ENGINEER SHALL PERFORM THE FOLLOWING ON EVERY OTHER LAYER OF SOIL CEMENT PLACED:

1. VERIFY FIELD COMPACTION TO 95% OF MAXIMUM DENSITY AND MOISTURE CONTENT UTILIZING EITHER ASTM D2922-81 OR ASTM D1556-90 (SEE SECTION 4.7 OF THESE SPECIFICATIONS).

11.3 CEMENT CONTENT UTILIZED FOR SOIL CEMENT

PROJECT DESIGN ENGINEER SHALL PERFORM THE FOLLOWING TO VERIFY THE CEMENT CONTENT UTILIZED FOR SOIL CEMENT CONSTRUCTION:

1. PERFORM NUMERICAL CALCULATIONS USING SCALE VALUES FROM THE PUGMILL TO DETERMINE CEMENT CONTENT. COMPARE TO TARGET CEMENT AND COORDINATE WITH SOIL CEMENT PUGMILL OPERATOR TO ADJUST AS NECESSARY.
2. IF THERE IS INCONSISTENCY IN THE CEMENT CONTENT BEING USED FOR SOIL CEMENT CONSTRUCTION, AT THE DIRECTION OF THE GEOTECHNICAL ENGINEER, THE FOLLOWING TEST SHALL BE PERFORMED:
   a) HEAT OF NEUTRALIZATION TEST MAY BE USED TO DETERMINE CEMENT CONTENT OF FRESHLY MIXED SOIL CEMENT USED IN PREPARING SAMPLES, IN PERCENT BY DRY WEIGHT, IN ACCORDANCE WITH ASTM D5982-96. THIS TEST, WHICH CAN BE CONDUCTED IN THE FIELD, PROVIDES A MEANS FOR RELIABLY DETERMINING THE CEMENT CONTENT OF SOIL CEMENT IN APPROXIMATELY 15 TO 20 MINUTES. COMPARE TO TARGET CEMENT AND COORDINATE WITH SOIL CEMENT PUGMILL OPERATOR TO ADJUST AS NECESSARY.

RIPRAP

1. RIPRAP STONE SHALL BE INDIVIDUALLY PLACED BY EQUIPMENT SUITABLE FOR LIFTING, MANIPULATING, AND PLACING STONES OF THE SPECIFIED SIZE AND SHAPE. NO STONE SHOULD HAVE A LONGEST DIMENSION MORE THAN TWO TIMES ITS SHORTEST DIMENSION AS DETERMINED ALONG PERPENDICULAR AXES PASSING THROUGH THE APPROXIMATE CENTER OF GRAVITY. PLACING EFFORTS SHALL ENSURE THAT EACH STONE IS FIRMLY SET AND SUPPORTED BY UNDERLYING MATERIALS AND ADJACENT STONES. THE STONE PLACEMENT METHOD IS SIMILAR TO CALTRANS' PLACEMENT METHOD A REFERRING STANDARD SPECIFICATIONS FOR CONSTRUCTION OF LOCAL STREETS AND ROADS, STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, PUBLICATION DISTRIBUTION UNIT 1990 ROYAL OAKS DRIVE SACRAMENTO, CALIFORNIA 95815. JULY, 2002. "CALTRANS STANDARD" THEREAFTER.
2. CALTRANS STANDARD "PLACEMENT METHOD A" SPECIFICATION:

METHOD A PLACEMENT

A. A FOOTING TRENCH SHALL BE EXCAVATED ALONG THE TOE OF THE SLOPE AS SHOWN ON THE PLANS.
B. THE LARGER ROCKS SHALL BE PLACED IN THE FOOTING TRENCH.
C. ROCKS SHALL BE PLACED WITH THEIR LONGITUDINAL AXIS NORMAL TO THE EMBANKMENT FACE AND ARRANGED SO THAT EACH ROCK ABOVE THE FOUNDATION COURSE HAS A 3-POINT BEARING ON THE UNDERLYING ROCKS. FOUNDATION COURSE IS THE COURSE PLACED ON THE SLOPE IN CONTACT WITH THE GROUND SURFACE. BEARING ON SMALLER ROCKS WHICH MAY BE USED FOR CHINKING VOIDS WILL NOT BE ACCEPTABLE. PLACING ROCKS BY DUMPING WILL NOT BE PERMITTED.
D. LOCAL SURFACE IRREGULARITIES OF THE SLOPE PROTECTION SHALL NOT VARY FROM THE PLANNED SLOPE BY MORE THAN 0.3-M (ONE FOOT) MEASURED AT RIGHT ANGLES TO THE SLOPE.

3. RIPRAP STONE CAN BE SELECTED FROM LOCAL SOURCE AS SUPPLEMENT TO QUARRY STONE PRODUCTION OR, IN CASE SUFFICIENT SOURCE EXISTS, AS EXCLUSIVE SOURCE. THE STONE MUST BE IN GOOD QUALITY WITHOUT EVIDENT WEATHERING, CRACK OR OTHER DEFECTS. RIPRAP STONE GRADATION RANGE MUST BE PER TABLES SHOWN ON PLANS. ROCKS SHALL BE OF SUCH AS TO FORM A STABLE PROTECTION STRUCTURE OF THE REQUIRED SECTION. ROUNDED BOULDERS OR COBBLES SHALL NOT BE USED ON PREPARED GROUND SURFACES HAVING SLOPES STEEPER THAN 2:1. ANGULAR SHAPES MAY BE USED ON ANY PLANNED SLOPE. FLAT OR NEEDLE SHAPES WILL NOT BE ACCEPTED UNLESS THICKNESS OF THE INDIVIDUAL PIECES IS GREATER THAN 1/3 THE LENGTH.
4. STONE USED FOR SURFACE LAYER (ARMOR LAYER STONE) BEING DAMAGED DURING CONSTRUCTION MUST BE REMOVED AND REPLACED WITH STONE WITH GOOD QUALITY. DAMAGED STONE WHICH FITS INTO VOIDS BETWEEN STABILIZED LARGE STONE MAY BE USED AS FILLING STONE IN GROUTING PROCEDURE.

BACKFILL AND SERVICE ROADWAY

1. BACKFILL IN TOE-DOWN CONSTRUCTION SHALL BE COMPLETED TO A RELATIVE COMPACTION OF NOT LESS THAN 90 PERCENT WITH MINIMUM DEPTH OF 1.0 FOOT BELOW GRADING.
2. IN PAVEMENT AND REVETMENT RAMP CONSTRUCTION, RELATIVE COMPACTION OF NO LESS THAN 95 PERCENT SHALL BE OBTAINED FOR A MINIMUM DEPTH OF 0.5 FOOT BELOW THE GRADING SURFACE OR BASEMENT WHICHEVER HAS THE GREATER WIDTH. THE REMAINING LAYERS OF BACKFILL SHALL REACH MINIMUM 90 PERCENT RELATIVE COMPACTION WITH MAXIMUM 12" THICKNESS IN EACH COMPACTION LAYER.
3. CONTRACTOR IS RESPONSIBLE TO FOLLOW STANDARDS APPLICABLE TO LOCAL CONDITIONS IN ROADWAY AND PAVEMENT CONSTRUCTION, MATERIAL TESTING, CONSTRUCTION PROCEDURES AND EXEMPLARY PROVISIONS PER SAN BERNARDINO COUNTY TRANSPORTATION DEPARTMENT STANDARDS AND SPECIFICATIONS (1989).
4. AGGREGATES FOR ROADWAY AND RAMP CONSTRUCTION MUST MEET SBFCD MATERIAL AND SPECIFICATION REQUIREMENT.
5. PROPOSED ASPHALT PAVEMENT SURFACING SHALL CONFORM TO THE PROVISIONS PER SECTION 38 IN THE SBCTDSS.

FILTER FABRIC AND RIPRAP GROUTING

1. PLACEMENTS OF RIPRAP STONE SHALL AVOID BREAKING THE FILTER FABRIC LAYER. IN CASE THE FILTER FABRIC BEING RUPTURED, IMMEDIATE REPAIR OF THE DAMAGED IS REQUIRED. THE MINIMUM JOINT WIDTH OF SEAM IN THE REPAIR SHALL BE FOUR FEET BEYOND THE DAMAGE BREAKAGE. A SIX INCHES THICK LAYER CUSHION WITH CRASH STONE AND/OR GRAVELS MAY BE PLACED BETWEEN RIPRAP AND THE FILTER FABRIC LAYER AS OPTIONAL REVETMENT CONSTRUCTION MEASURE TO REDUCE DIRECT WEIGHT IMPACTION FROM LARGER STONE TO THE FILTER FABRIC LAYER.
2. SELECTION AND PLACEMENT OF THE FILTER FABRIC MAY REFER TO SECTION 88 "ENGINEERING FABRIC" IN THE CALTRANS STANDARD UNDER "ROCK SLOPE PROTECTION FABRIC", WHICH IS REITERATED IN THE FOLLOWING PARAGRAPH. IN GENERAL HIGH STRENGHT CLASS A EROSION CONTROL OR DRAINAGE FABRIC SHALL BE USED AS FILTER FABRIC.
3. THE CALTRANS STANDARD SECTION 88 PREVISION RELATED TO FILTER FABRIC SELECTION.

88-1.04 ROCK SLOPE PROTECTION FABRIC

A. ROCK SLOPE PROTECTION FABRIC SHALL BE MANUFACTURED FROM POLYESTER, NYLON, POLYVINYLIDENE OR POLYVINYLIDENE MATERIAL OR ANY COMBINATION THEREOF.
B. ROCK SLOPE PROTECTION FABRIC SHALL BE TREATED WITH ULRAVIOLET RAY (UV) PROTECTION. THE UV TREATED FABRIC SHALL PROVIDE A MINIMUM OF 70 PERCENT BREAKING STRENGTH RETENTION AFTER 500 HOURS EXPOSURE WHEN TESTED IN CONFORMANCE WITH THE REQUIREMENTS IN ASTM DESIGNATION: D 4355. UNLESS OTHERWISE SPECIFIED, THE CONTRACTOR SHALL SUBMIT SAMPLES OF THE TREATED FABRIC TO THE TRANSPORTATION LABORATORY AT LEAST 45 DAYS PRIOR TO USE.
C. ROCK SLOPE PROTECTION FABRIC SHALL BE, AT THE OPTION OF THE CONTRACTOR, EITHER WOVEN FILAMENT OR NONWOVEN TYPE FABRIC.
D. EDGES OF WOVEN FILAMENT FABRIC SHALL BE EITHER SALVAGED OR SERGED.
E. NONWOVEN TYPE ROCK SLOPE PROTECTION FABRIC SHALL BE TYPE A OR TYPE B AS SPECIFIED IN THE SPECIAL PROVISIONS AND SHALL CONFORM TO THE FOLLOWING:

SPECIFICATION	REQUIREMENT	
	TYPE A	TYPE B
WEIGHT, GRAMS PER SQUARE METER, MIN. ASTM DESIGNATION: D3776	135	200
GRAB TENSILE STRENGHT (25-MM GRIP), KILONEWTONS, MIN. IN EACH DIRECTION ASTM DESIGNATION: D 4632	0.40	0.89
ELONGATION AT BREAK, PERCENT MIN. ASTM DESIGNATION: D4632	50	50
TOUGHNESS, KILONEWTONS, MIN. (PERCENT ELONGATION X GRAB TENSILE STRENGHT)	26	53
PERMITTIVITY, 1/SEC., MIN. ASTM DESIGNATION: D4491	0.5	0.5

4. CERTIFICATION OF COMPLIANCES SIGNED BY MANUFACTURE OF THE FILTER SHALL STATE THAT THE MATERIALS INVOLVED COMPLY IN ALL RESPECTS WITH THE REQUIREMENTS OF THE SPECIFICATION. THE ENGINEERING FABRIC SHALL BE FURNISHED IN PROTECTION COVERS CAPABLE OF PROTECTING THE FABRIC FROM ULTRAVIOLET RAYS, ABRASION AND WATER DAMAGE.
5. FILTER FABRIC SHALL BE MANUFACTURED FROM POLYESTER, NYLON OR POLYPROPYLENE MATERIAL, OR ANY COMBINATION THEREOF. THE FABRIC SHALL BE PERMEABLE, NON-WOVEN, AND SHALL CONFORM TO SPECIFICATIONS SIMILAR TO SECTION 88-1.03 OF THE CALTRANS STANDARD AND MIN.WEIGHT OF 8 OZ/YD.
6. THE GROUT SHALL BE 660-E-3250 CONCRETE MIX.
7. MINIMUM GROUTING DEPTH SHALL BE ENSURED AT THE DESIGN DEPTH. GROUTING INJECTION INITIATES AT GREATER DEPTH PER THIS PLAN OR PENETRABLE VOID DEPTH. IN CONSTRUCTION OF THE 4 FEET THICK RIPRAP LAYER, GROUTING POSSESS SHALL BE STARTED AFTER STONES ARE PLACED IN FULL DEPTH; FOR THE 8 FEET THICK RIPRAP LAYER, THE GROUTING PROCEDURE SHALL BE STARTED AFTER PLACEMENT OF FIRST APPROXIMATE 4 FEET THICK RIPRAP AND THE REPEATED ON THE (SURFACE) LAYER OF STONES.

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SUBMITTED BY: ______ CHIEF, ENGINEERING DIVISION ______ DATE
RECOMMENDED BY: ______ ASSIST. FLOOD CONTROL ENGINEER ______ DATE
APPROVED BY: ______ FLOOD CONTROL ENGINEER ______ DATE
PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

LYTLE DEVELOPMENT

LYTLE WEST LEVEE

SOIL CEMENT NOTES AND SPECIFICATIONS

DATE

SCALE AS SHOWN

FILE NO.

SHEET NO. 5 OF 24

SOIL MIXING SPECIFICATIONS

1.0 GENERAL NOTES

1.1 INTENT

A. THE INTENT OF THE SOIL MIXING PROGRAM SPECIFIED HEREIN IS TO PROVIDE SOIL IMPROVEMENT WITHIN THE LIMITS INDICATED ON THE PROJECT DRAWINGS TO ACHIEVE THE REQUIRED DEGREE OF IMPROVEMENT DETAILED IN THESE SPECIFICATIONS.

1.2 STANDARDS AND REFERENCES

A. THE MOST RECENT VERSION OF THE FOLLOWING TESTING METHODS MAY BE EMPLOYED:

1. FULL-SCALE LOAD TESTING (INDIVIDUAL COLUMN, OR COLUMN GROUPS) D1194 MODIFIED FOR SIZE.
2. ASTM D1586 STANDARD PENETRATION TESTING (SPT)
3. ASTM D5778 CONE PENETROMETER TESTING (CPT)
4. ASTM C39 UNCONFINED COMPRESSIVE STRENGTH TESTING

B. REFERENCE DOCUMENTS AS PROVIDED TO THE SOIL MIXING CONTRACTOR SHALL INCLUDE:

1. THIS SPECIFICATION.
2. PROJECT DRAWINGS:
a. ENGINEER'S REVETMENT PLAN
b. ENGINEER'S EXISTING UNDERGROUND UTILITIES PLAN IN THE WORK AREA.
3. PROJECT GEOTECHNICAL REPORT.
4. CONTRACT DOCUMENTS.

1.3 SUBMITTALS

A. THE FOLLOWING SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE BY THE SOIL MIXING CONTRACTOR WITH THE BID DOCUMENTS:

1. A LIST OF AT LEAST FIVE PREVIOUSLY COMPLETED PROJECTS OF SIMILAR SCOPE AND PURPOSE FOR APPROVAL BY THE OWNER'S REPRESENTATIVE. THE LIST SHALL INCLUDE A DESCRIPTION OF THE PROJECT, RELATIVE SIZE, AND CONTACT PERSON WITH PHONE NUMBER.

B. THE FOLLOWING SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE BY THE SOIL MIXING CONTRACTOR PRIOR TO THE START OF THE WORK:

1. RESUMES OF THE MANAGEMENT, SUPERVISORY, AND KEY PERSONNEL, FOR APPROVAL BY THE OWNER'S REPRESENTATIVE.
2. A SOIL-MIX DESIGN FOR THE PROJECT INDICATING SOURCES AND TYPE OF BINDER MATERIAL, WITH VOLUMETRIC PROPORTIONS. IF THE SOIL MIXING CONTRACTOR INTENDS TO DEVIATE FROM THIS SUBMITTAL, IT SHALL SUBMIT EVIDENCE OF SATISFACTORY USE OF THE PROPOSED MATERIAL FROM COMPLETE LABORATORY TESTING SPECIFIC TO THESE SITE CONDITIONS.
3. A GROUND IMPROVEMENT QC PLAN, AS DETAILED IN SECTION 3.3 OF THESE SPECIFICATIONS.
4. A GENERAL WORK PROCEDURES PLAN OUTLINING MEANS AND METHODS TO ACHIEVE THE SPECIFIED CRITERIA DETAILED IN THIS SPECIFICATION.

C. A SHOP DRAWING FOR REVIEW, INDICATING THE SPACING, LOCATION, AND DEPTH OF THE SOIL MIX COLUMNS TO ACHIEVE THE CRITERIA OUTLINED IN THIS SPECIFICATION. THE SHOP DRAWING SHALL ALSO INCLUDE:

1. SEQUENCE AND TIME SCHEDULE OF ALL SOIL STABILIZATION OPERATIONS
2. PLAN LOCATIONS OF ALL PROPOSED SOIL MIX COLUMNS SHOWN ON A PLAN OF 1 INCH = 5 FEET SCALE TO SHOW THE DETAILS OF THE LAYOUT NECESSARY TO SATISFY THE REQUIRED GEOMETRIES.
3. THE CENTER OF EACH PROPOSED SOIL MIX COLUMN LOCATION NUMBERED AND SHOWN ON THE PLAN AND DIMENSIONED TO THE SOIL MIXING CONTRACTOR'S ESTABLISHED SITE-SPECIFIC COORDINATE SYSTEM AND OTHER SURVEY BASELINES, WHICH THE SOIL MIXING CONTRACTOR INTENDS TO USE FOR LAYOUT AND LOCATION.

D. IF REQUIRED, A LOAD TEST DETAIL AND SETUP THAT REPRESENTS ACTUAL LOADING CONDITIONS. THIS SHOULD INCLUDE A LOAD TEST FOOTING HAVING THE DIMENSIONS AND LOADING OF THEIR PROJECT'S TYPICAL FOOTING.

E. A SCHEDULE OF WORK TASKS AND TIME FOR COMPLETION.

F. A DESCRIPTION OF THE QUALITY ASSURANCE-QUALITY CONTROL (QA/QC) PROGRAM PLAN INCLUDING:

1. A DETAILED OUTLINE OF THE QA/QC PROGRAM TO BE UNDERTAKEN EACH DAY DURING PRODUCTION TO CONFIRM THE SOIL MIX COLUMNS ACHIEVE SPECIFIED PERFORMANCE REQUIREMENTS.
2. DETAILS OF PROCEDURES TO MAKE THE REQUIRED TEST COLUMNS AND THE TEST EQUIPMENT TO BE USED.
3. MEASURES TO BE IMPLEMENTED EACH DAY DURING SOIL MIX COLUMN INSTALLATION TO MONITOR, MODIFY, RECORD, AND CONTROL LIME/CEMENT RATIOS, AND INJECTION PRESSURES AND QUANTITIES, AUGER ROTATIONAL SPEEDS, TOOL DOWN PRESSURES, AUGER/MIXING TOOL PENETRATION AND WITHDRAWAL RATES, AND OTHER RELATED ASPECTS OF THE SOIL MIX COLUMN INSTALLATION PROCESS.
4. EXAMPLE FORMATS OF DAILY PRODUCTION REPORTS MEETING THE REQUIREMENTS STATED HEREIN.

G. THE FOLLOWING SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE BY THE SOIL MIXING CONTRACTOR DURING THE WORK:

1. ACCURATE DAILY RECORDS OF THE WORK, INCLUDING:
a. AREA MIXED (BY STATION, OFFSET) AS SHOWN ON CONSTRUCTION LAYOUT DRAWING(S) FOR EACH CONTAINER OF GROUT SLURRY
b. WORKING GRADE
c. MIXING DEPTH
d. START TIME
e. FINISH TIME
f. MIXING DURATION
g. SLURRY MIX DETAILS (% BY WEIGHT)
h. SLURRY INJECTION RATE
i. TOTAL SLURRY WEIGHT INJECTED
j. TOOL RPM ON PENETRATION
k. TOOL RPM ON WITHDRAWAL
l. DESCRIPTION OF OBSTRUCTIONS OR OTHER INTERRUPTIONS OF LIME-CEMENT INJECTIONS
m. TYPE OF MIXING TOOL
2. ANY CHANGE IN THE PREDETERMINED SOIL MIXING PROGRAM NECESSITATED BY A CHANGE IN THE SUBSURFACE CONDITIONS.

H. THE FOLLOWING SHALL BE SUBMITTED TO THE OWNER'S REPRESENTATIVE BY THE SOIL MIXING CONTRACTOR AFTER THE WORK:

1. A REPORT DOCUMENTING THE OBSERVATIONS AND RESULTS OF THE TESTS. THIS REPORT WILL CERTIFY THAT THE BEARING PRESSURE HAS BEEN ACHIEVED WITHIN SETTLEMENT TOLERANCES.

1.4 QUALITY ASSURANCE

A. THE SOIL MIXING PROGRAM SHALL BE PERFORMED BY A SPECIALIST SOIL MIXING CONTRACTOR WITH AT LEAST FIVE CONTINUOUS YEARS OF DOCUMENTED EXPERIENCE IN SOIL MIXING.

B. THE SOIL MIXING CONTRACTOR SHALL PROVIDE EXPERIENCED MANAGEMENT, SUPERVISORY AND KEY PERSONNEL AS REQUIRED TO IMPLEMENT THE SOIL MIXING PROGRAM, AS FOLLOWS:

1. THE PROJECT MANAGER SHALL HAVE AT LEAST FIVE YEARS OF CONTINUOUS EXPERIENCE IN SOIL MIXING, WITH AT LEAST THE LAST TWO YEARS IN THE FULL-TIME EMPLOYMENT OF THE SOIL MIXING CONTRACTOR.
2. THE SUPERINTENDENT SHALL HAVE AT LEAST TWO YEARS OF EXPERIENCE IN SOIL MIXING.
3. THE SOIL MIXING CONTRACTOR SHALL PROVIDE DETAILED INFORMATION ON THE TRAINING AND EXPERIENCE OF ANY OPERATORS WITH LESS THAN 5 YEARS EXPERIENCE FOR APPROVAL BY THE CONTRACTING OFFICER; BUT IN NO CASE SHALL ANY OPERATOR HAVE LESS THAN 4 YEARS OF EXPERIENCE IN THE INSTALLATION OF SOIL MIX COLUMNS.
4. AS DETAILED IN SECTION 1.06 OF THESE SPECIFICATIONS, THE SOIL MIXING CONTRACTOR SHALL PROVIDE:

a. EVIDENCE OF PREVIOUS SOIL MIXING PROJECT EXPERIENCE.
b. EVIDENCE OF MANAGEMENT, SUPERVISORY AND KEY PERSONNEL EXPERIENCE.

A. THE OWNER'S REPRESENTATIVE WILL ENSURE THAT PROCEDURES AND DOCUMENTATION CONFORM TO THESE SPECIFICATIONS.

2.0 EQUIPMENT AND MATERIALS

2.1 EQUIPMENT

A. THE SOIL MIXING CONTRACTOR SHALL SUPPLY ALL EQUIPMENT REQUIRED TO ACCOMPLISH THE SOIL MIXING PROGRAM AND MEET THE PROJECT OBJECTIVES.

B. THE GROUT SLURRY DELIVERY SYSTEM SHALL CONSIST OF TEMPORARY STORAGE AND A BINDER DELIVERY STATION.

C. AN ADEQUATE COMMUNICATIONS SYSTEM SHALL BE MAINTAINED BETWEEN THE DRILLING OPERATOR AND THE GROUT SLURRY DELIVERY OPERATOR.

D. COMPUTERIZED CONTROLS:

ALL EQUIPMENT SHALL HAVE COMPUTERIZED CONTROLS TO PERMIT ACCURATE AND CONTINUOUS MONITORING, RECORDING AND CONTROL OF: MIXING TOOL DEPTH, BINDER VOLUME FLOW RATES AND FACTORS, BINDER INJECTION PRESSURES AND QUANTITIES, TOOL ROTATIONAL SPEEDS, TOOL DOWN PRESSURE, TOOL ADVANCEMENT AND WITHDRAWAL RATES AND OTHER OPERATIONS REQUIRED TO INSTALL SOILCRETE COLUMNS. SOIL STABILIZATION EQUIPMENT SHALL BE OF SUFFICIENT SIZE, CAPACITY, AND TORQUE TO PERFORM THE REQUIRED SOIL STABILIZATION OPERATIONS TO THE DESIRED DEPTHS. THE EQUIPMENT SHALL BE CAPABLE OF ADVANCING THROUGH PREVIOUSLY INSTALLED AND CURED SOILCRETE. THE EQUIPMENT SHALL UTILIZE SUFFICIENT MIXING AND INJECTING EQUIPMENT TO ADEQUATELY BLEND BINDER WITH THE IN SITU SOILS TO PRODUCE A DISTRIBUTION OF BINDER THROUGHOUT THE MIXED IN SITU SOILS, SUFFICIENT TO PROVIDE THE REQUIRED MINIMUM STRENGTH.

E. MIXING RIG

THE MIXING RIG IS THE SYSTEM USED TO PROVIDE POWER TO THE MIXING TOOL. SIZE VARIES FROM CONVENTIONAL HYDRAULIC DRILL HEADS TO DUAL-MOTOR, CRANE-MOUNTED TURNTABLES. TORQUE REQUIREMENTS RANGE FROM 30,000 FT-LBS TO 300,000 FT-LBS. THE POWER SOURCE FOR DRIVING THE MIXING SHAFT SHALL BE SUFFICIENT TO MAINTAIN REQUIRED RPM AND PENETRATION RATE FROM A STOPPED POSITION AT THE DEPTH SPECIFIED.

F. MIXING TOOL

THE MIXING TOOL CAN BE A COMBINATION OF PARTIAL FLIGHTING, MIX BLADES, INJECTION PORTS AND NOZZLES, AND SHEAR BLADES. SIZE RANGES FROM 1 TO 12 FEET IN DIAMETER.

G. BATCHING EQUIPMENT

THE BATCH PLANT SHALL CONSIST OF PURPOSE-BUILT MIXERS, VOLUMETRIC SCREW FEEDERS, AND FLOW CONTROLLERS. DRY MATERIALS SHALL BE STORED IN SILOS AND FED BY SCREW FEEDERS TO THE MIXERS FOR AGITATION AND CIRCULATION. THE RESULTING GROUT WILL BE TRANSFERRED TO SUPPLY THE SOIL MIXING RIG.

THE PRECISE ARRANGEMENT AND SEQUENCE OF MIXING SHALL BE BASED ON THE RESULTS OF THE DESIGN MIX PROGRAM. COMMERCIAL GRADE CLAYS (I.E., BENTONITE AND OR ATTAPULGITE) MAY BE PREMIXED WITH WATER (HYDRATED) IN A SEPARATE MIXER AND THE SLURRY STORED IN A TANK. THE CLAY-WATER SLURRY SHALL BE TRANSFERRED TO A SECOND MIXER (ONLY IF PREMIXING IS NECESSARY WHERE CEMENT AND/OR OTHER MATERIALS WILL BE ADDED AND MIXED INTO THE GROUT).

DRY INGREDIENT PROPORTIONS SHALL BE BATCH MIXED BY WEIGHT OR CONTINUOUSLY BY MEANS OF A JET VALVE TO A PREDETERMINED FINAL DENSITY. A MINIMUM MIXING TIME OF THREE MINUTES AND A MAXIMUM HOLDING TIME OF THREE HOURS WILL BE ENFORCED FOR THE GROUT.

CALIBRATION OF MIXING COMPONENTS SHALL BE DONE AT THE BEGINNING OF THE PROJECT AND MONTHLY THEREAFTER. THE SCREW FEEDERS SHALL BE CALIBRATED AGAINST TIME TO DELIVER A PREDETERMINED WEIGHT. WATER SHALL BE CONTROLLED BY FLOW METER AND/OR BY VOLUME LEVEL INDICATORS IN THE COLLOIDAL MIXER. THE SPECIFIC GRAVITY OF THE GROUT SHALL BE DETERMINED DURING THE DESIGN MIX PROGRAM FOR DOUBLE CHECKING GROUT PROPORTIONS.

2.2 MATERIALS

THE SOIL MIXING CONTRACTOR SHALL PROVIDE ALL MATERIALS REQUIRED TO ACCOMPLISH THE SOIL MIXING PROGRAM AND MEET PROJECT OBJECTIVES.

A. GROUT SLURRY

1. THE SOIL MIXING CONTRACTOR SHALL PRODUCE EVIDENCE THAT THE MATERIAL TO BE USED MEETS OR EXCEEDS THE DESIGN REQUIREMENTS. THE BINDER/GROUT IS DELIVERED IN A SLURRY FORM (I.E. COMBINED WITH WATER). DEPENDING ON THE IN SITU SOIL, THE VOLUME OF GROUT SLURRY NECESSARY RANGES FROM 20 TO 40 PERCENT BY VOLUME. THE GROUT SLURRY IS TYPICALLY COMPOSED OF A VARIETY OF MATERIALS INCLUDING: PORTLAND CEMENT, FLY ASH, AND GROUND, GRANULATED BLAST FURNACE SLAG.

THE PURPOSE OF THE GROUT SLURRY IS TO ASSIST IN LOOSENING THE SOIL FOR PENETRATION AND MIXING, AND TO LOWER PERMEABILITY, AID IN STRUCTURAL SUPPORT, AND TREAT IN SITU SOILS. THE GROUT SLURRY WILL BE PREMIXED IN BATCH PLANTS WHICH COMBINE MATERIALS IN PREDETERMINED PROPORTIONS OR VIA CONTINUOUS MIXING WITH ITS QUALITY CONTROLLED BY SPECIFIC GRAVITY.

B. WATER

1. FRESH WATER, FREE OF EXCESSIVE AMOUNTS OF DELETERIOUS SUBSTANCES THAT ADVERSELY AFFECT THE PROPERTIES OF GROUT SHALL BE USED TO MANUFACTURE THE GROUT. IT IS THE RESPONSIBILITY OF THE SOIL MIXING CONTRACTOR THAT THE GROUT RESULTING FROM THE WATER SHALL ALWAYS MEET THE STANDARD OF THIS SPECIFICATION.

C. ADDITIVES

1. ADMIXTURES OF SOFTENING AGENTS, DISPERSIONS, RETARDERS, OR PLUGGING OR BRIDGING AGENTS MAY BE ADDED TO THE WATER OR THE GROUT SLURRY TO PERMIT EFFICIENT USE OF MATERIALS AND PROPER WORKABILITY OF THE GROUT SLURRY.

D. CEMENT

1. CEMENT USED IN PREPARING GROUT SLURRY SHALL CONFORM TO ASTM DESIGNATION C-150 "REQUIREMENTS FOR PORTLAND TYPE I-II CEMENT." THE CEMENT SHALL BE ADEQUATELY PROTECTED FROM MOISTURE CONTAMINATION WHILE IN TRANSIT TO AND IN STORAGE AT THE JOB SITE. RECLAIMED CEMENT OR CEMENT CONTAINING LUMPS OR DELETERIOUS MATTER SHALL NOT BE USED.

E. REINFORCING STEEL

1. REINFORCING STEEL SHALL MEET ASTM A 36 AND BE FREE FROM ANY DEFECTS AFFECTING ITS USEFULNESS.

3.0 EXECUTION

3.1 SITE EXAMINATION

A. PRIOR TO SUBMITTING A BID PRICE FOR THE SOIL MIXING, THE SOIL MIXING CONTRACTOR SHALL CONDUCT A SITE INVESTIGATION.

3.2 TEST SECTION

A. PRIOR TO PRODUCTION WORK TEST SECTIONS SHALL BE PERFORMED TO VERIFY THAT THE SPECIFIED RESULTS CAN BE ACHIEVED. THE METHOD OF INSTALLATION OF THE TEST SECTION SHALL COMPLY WITH THIS SPECIFICATION AND SHALL BE PERFORMED USING THE SAME SOIL MIXING EQUIPMENT AND GROUT SLURRY AS THAT TO BE USED FOR THE PRODUCTION WORK.

B. TEST SECTION LOCATIONS WITHIN THE TREATMENT AREA WILL BE AGREED UPON BY THE INSPECTOR, A.K.A. FIELD QUALITY CONTROL REPRESENTATIVE (FQCR), AND SOIL MIXING CONTRACTOR.

C. THE TEST SECTION SHALL CONSIST OF MIXING A 10' BY 10' AREA FROM THE GROUND SURFACE TO THE SPECIFIED TREATMENT DEPTH.

D. IF THE PRE-PRODUCTION TEST SECTION INDICATES THAT THE REQUIRED IMPROVEMENT HAS NOT BEEN ACHIEVED, THE SOIL MIXING CONTRACTOR SHALL REVISE THE WORK PROCEDURE PLAN AND RE-TEST.

3.3 INSTALLATION

A. AS THE SOIL MIXING TOOL IS DRILLED INTO THE GROUND, CEMENT-BASED SLURRY SHALL BE PUMPED THROUGH THE HOLLOW STEM OF THE SHAFT AND INJECTED INTO THE SOIL THROUGH JETS LOCATED ON THE BACKSIDE OF THE ROTATING MIXING BLADES. THE AUGER FLIGHTS AND MIXING BLADES ON THE TOOL WILL MIX THE SOIL WITH THE SLURRY. INJECTION AND MIXING WILL CONTINUE TO DESIGN DEPTH. WHEN DESIGN DEPTH IS REACHED, THE MIXING TOOL IS WITHDRAWN, LEAVING BEHIND STABILIZED SOIL MIX COLUMNS.

1. HORIZONTAL ALIGNMENT: THE SOIL MIX COLUMNS SHALL BE CAREFULLY STAKED OUT PRIOR TO BEGINNING CONSTRUCTION. THE COLUMNS SHALL BE CONSTRUCTED WITHIN 4 INCHES OF THE LOCATIONS SHOWN ON THE DRAWINGS.
2. VERTICAL ALIGNMENT: VERTICAL ALIGNMENT OF THE AUGER STROKE WILL BE CONTROLLED BY THE EQUIPMENT OPERATOR. THE COLUMNS SHALL HAVE A TOLERANCE OF 1:50.
3. MIXING SHAFT SPEED: THE MIXING SHAFT SPEED (RPM) SHALL BE ADJUSTED TO ACCOMMODATE A CONSTANT RATE OF MIXING SHAFT PENETRATION BASED ON THE DEGREE OF DRILLING DIFFICULTY. MIXING SHAFT SPEED CAN BE ADJUSTED ACCORDING TO DRILLING DIFFICULTY, AND TO AID MIXING OF THE SOIL MIX COLUMN WHEN NEEDED. MIXING SHAFT SPEED MAY ALSO BE ADJUSTED TO ASSIST PENETRATION IN HARD DRILLING.
4. PENETRATION RATE: IN ORDER TO ENSURE ADEQUATE MIXING, THE PENETRATION RATE OF THE MIXING SHAFT SHALL BE MAINTAINED IN THE RANGE OF ONE TO EIGHT VERTICAL FEET/MINUTE DURING BOTH PENETRATION AND WITHDRAWAL. THE BOTTOM OF THE COLUMNS SHALL BE DOUBLE MIXED BY RAISING THE MIXING SHAFTS TEN FEET OFF THE BOTTOM AND THEN REINSERTING THEM FOR REMIXING. THE PENETRATION RATE AND MAXIMUM DEPTH OF EACH STROKE SHALL BE RECORDED ON THE DAILY QC FORM.
5. GROUT TAKE: THE GROUT TAKE (OR INJECTION RATE) PER VERTICAL FOOT OF COLUMN WILL BE ADJUSTED TO THE REQUIREMENTS OF THE DESIGN MIX. POSITIVE DISPLACEMENT PUMPS WILL BE USED TO TRANSFER THE GROUT FROM THE MIX PLANT TO THE SOIL MIXING RIG. A FLOW MONITORING DEVICE WILL BE INSTALLED IN THE GROUT LINE TO DETECT ANY LINE BLOCKAGE.

THE POSITIVE DISPLACEMENT GROUT PUMPS WILL BE CALIBRATED ACCORDING TO REAL SITE CONDITIONS TO PRODUCE A TIME VS. FLOW CORRELATION. THE RATE OF APPLICATION MAY BE CONTROLLED AND MONITORED BY ADJUSTING THE PUMP OUTPUT TO THE PENETRATION RATE. A PRESET GROUT TAKE CAN BE ACHIEVED. TYPICALLY, THE APPLICATION RATE CAN BE SUCCESSFULLY CONTROLLED BY EXPERIENCED OPERATORS ONCE THE PATTERN OF OPERATION IS ESTABLISHED.

INEVITABLY SOME VARIATIONS OF THE GROUT TAKE WILL OCCASIONALLY OCCUR DUE TO FIELD CONDITIONS. HOWEVER, THE OVERALL APPLICATION RATE TO EACH STROKE SHALL BE MONITORED, CALCULATED AND CONTROLLED. ADDITIONAL MIXING WILL BE USED WHEN NECESSARY TO EVENLY DISTRIBUTE THE GROUT THROUGH THE ENTIRE COLUMN. THE INJECTION OF GROUT TO EACH STROKE WILL BE MONITORED, CHECKED BY CALCULATION AND RECORDED.

6. COLUMN DEPTH: UNLESS OTHERWISE DIRECTED, THE SOIL MIXED COLUMNS SHALL BE EXTENDED TO THE ELEVATIONS SPECIFIED ON THE PLANS. THE FINAL DEPTH AND PENETRATION OF THE COLUMNS SHALL BE REASSURED FROM SHAFT PENETRATION AND CHECKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER IMMEDIATELY FOLLOWING PENETRATION.
7. OBSTRUCTIONS/MIXING SHAFT REFUSAL: IF OBSTRUCTIONS THAT REDUCE THE RATE OF PENETRATION TO ONE FOOT PER MINUTE FOR FIVE MINUTES ARE ENCOUNTERED, THE STROKE SHALL BE COMPLETED IN ACCORDANCE WITH THE SPECIFICATIONS AND REMEDIAL MEASURES WILL BE TAKEN.

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SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

LYTLE DEVELOPMENT

LYTLE WEST LEVEE

SOIL CEMENT NOTES AND SPECIFICATIONS

DATE

SCALE AS SHOWN

FILE NO.

SHEET NO. 6 OF 24

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3.4 FIELD QUALITY CONTROL

A. ALL SOIL MIXING OPERATIONS SHALL BE PERFORMED UNDER THE SUPERVISION OF THE INSPECTOR (FQCR).

B. MONITORING AND LOGGING OF SOIL MIXING OPERATIONS FOR BOTH TEST AREAS AND PRODUCTION WORK SHALL BE DONE BY THE FQCR.

C. LAYOUT OF THE SOIL MIX COLUMN LOCATIONS SHALL BE BY THE SOIL MIXING CONTRACTOR AND CHECKED BY THE INSPECTOR (FQCR).

D. AS DETAILED ABOVE, DAILY RECORDS SHALL BE MAINTAINED BY THE SOIL MIXING CONTRACTOR AND SUBMITTED TO THE OWNER'S REPRESENTATIVE.

3.5 TESTING AND INSPECTION

A. THE EFFECTIVENESS OF THE SOIL MIX COLUMNS WILL BE VERIFIED AS FOLLOWS:

1. ALL TESTING TO DETERMINE SPECIFICATION COMPLIANCE WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.

2. PRE-PRODUCTION LABORATORY TESTING SHALL BE CONDUCTED TO VERIFY THE PERFORMANCE OF THE TREATMENT UNDER THE MIX METHODOLOGY, ENERGY AND GROUT SLURRY SYSTEM PROPOSED BY THE SOIL MIXING CONTRACTOR.

3. VERTICALITY SHALL BE CHECKED AS DEEMED NECESSARY BY THE INSPECTOR (FQCR).

a. WET SAMPLES SHALL BE RETRIEVED AND CAST INTO MOLDS FOR STRENGTH TESTING IMMEDIATELY UPON COMPLETION OF MIXING. THIS SHALL BE DONE FOR EVERY 250 CY OF MIXING PERFORMED, AND SHALL CONSIST OF NO FEWER THAN 10 TEST ELEMENTS/SAMPLES. THESE SAMPLES SHALL BE TAKEN BY A SPECIAL SAMPLING TOOL AT MID-DEPTH OF THE COLUMN IMMEDIATELY FOLLOWING INSTALLATION. THE SOIL MIX SHALL BE PLACED IN SUITABLE MOLDS, RODDED TO REMOVE TRAPPED AIR POCKETS AND THEN SEALED. PARTICLES >10% OF THE MOLD OPENING SHALL BE SCREENED OFF. THE SAMPLES WILL BE STORED IN A DAMP ENVIRONMENT FOR CURING UNTIL INITIAL SET HAS BEEN ACHIEVED. AFTER INITIAL SET, A DEAD WEIGHT LOAD MAY BE IMPOSED ON THE SAMPLE TO MODEL THE STRESS FROM EARTH PRESSURES.

THE SAMPLES WILL BE TRANSPORTED TO AN INDEPENDENT GEOTECHNICAL LABORATORY FOR TESTING ONCE THEY HAVE SUFFICIENT STRENGTH GAIN SO THAT THE TRANSPORTING WILL NOT ADVERSELY AFFECT THE PROPERTIES.

UNCONFINED COMPRESSION TESTING SHALL BE PERFORMED IN PAIRS OF SAMPLES AT AGES OF 3, 7, 14, 28, AND 56 DAYS.

b. STRENGTH TESTING BY WET SAMPLING/CAST MOLDS TO AVERAGE 500 PSI AFTER 56-DAY CURE PERIOD. UP TO 5% OF INDIVIDUAL TEST RESULTS MAY BE LESS THAN THIS VALUE.

MONITORING AND LOGGING OF SOIL MIXING OPERATIONS IN THE TEST AREAS AND FOR PRODUCTION WORK SHALL BE DONE BY THE SOIL MIXING CONTRACTOR.

IF SURCHARGE REQUIREMENTS ARE CALLED FOR IN THE DESIGN, THE GENERAL CONTRACTOR SHALL FURNISH ALL MATERIALS AND SUPPORT TO PLACE THE SURCHARGE AS SOON AS POSSIBLE AFTER EACH WORK SHIFT.

3.6RESTRICTIONS

A. SOIL MIX COLUMN CONSTRUCTION IS TYPICALLY PERFORMED UNDER THE SITE PERMIT. THE OWNER OR GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY STATE AND LOCAL PERMITS (IF REQUIRED) AND CONFORMING TO ALL STATE AND LOCAL REGULATIONS.

B. THE OWNER WILL BE RESPONSIBLE FOR THE PRECISE DELINEATION OF ALL ABOVE AND BELOW GROUND UTILITIES AND OBSTRUCTIONS.

C. THE GENERAL CONTRACTOR SHALL PROVIDE ALL NECESSARY CONTAINMENT TO RESTRICT THE MATERIALS TO THE WORK AREA.

D. THE FOLLOWING SHALL ALSO BE LISTED WITHIN THIS SECTION WHEN APPLICABLE:

1. ENVIRONMENTAL RESTRICTIONS.
2. WORK BOUNDARIES.
3. HOURS FOR CONSTRUCTION.

4.0 PAYMENT

4.1 METHOD OF PAYMENT

A. MOBILIZATION AND DEMOBILIZATION SHALL BE SEPARATE LUMP SUM ITEMS.

B. DESIGN AND CONSTRUCTION OF THE SOIL MIX COLUMNS SHALL BE A SEPARATE LUMP SUM.

C. LOAD TESTING MAY BE PRICED AS A LUMP SUM OR UNIT PRICE BASED ON THE SOIL MIX COLUMN SPECIFIED

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SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

LYTLE DEVELOPMENT

LYTLE WEST LEVEE

SOIL CEMENT PATTERN
AND SPECIFICATIONS

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 7 OF 24

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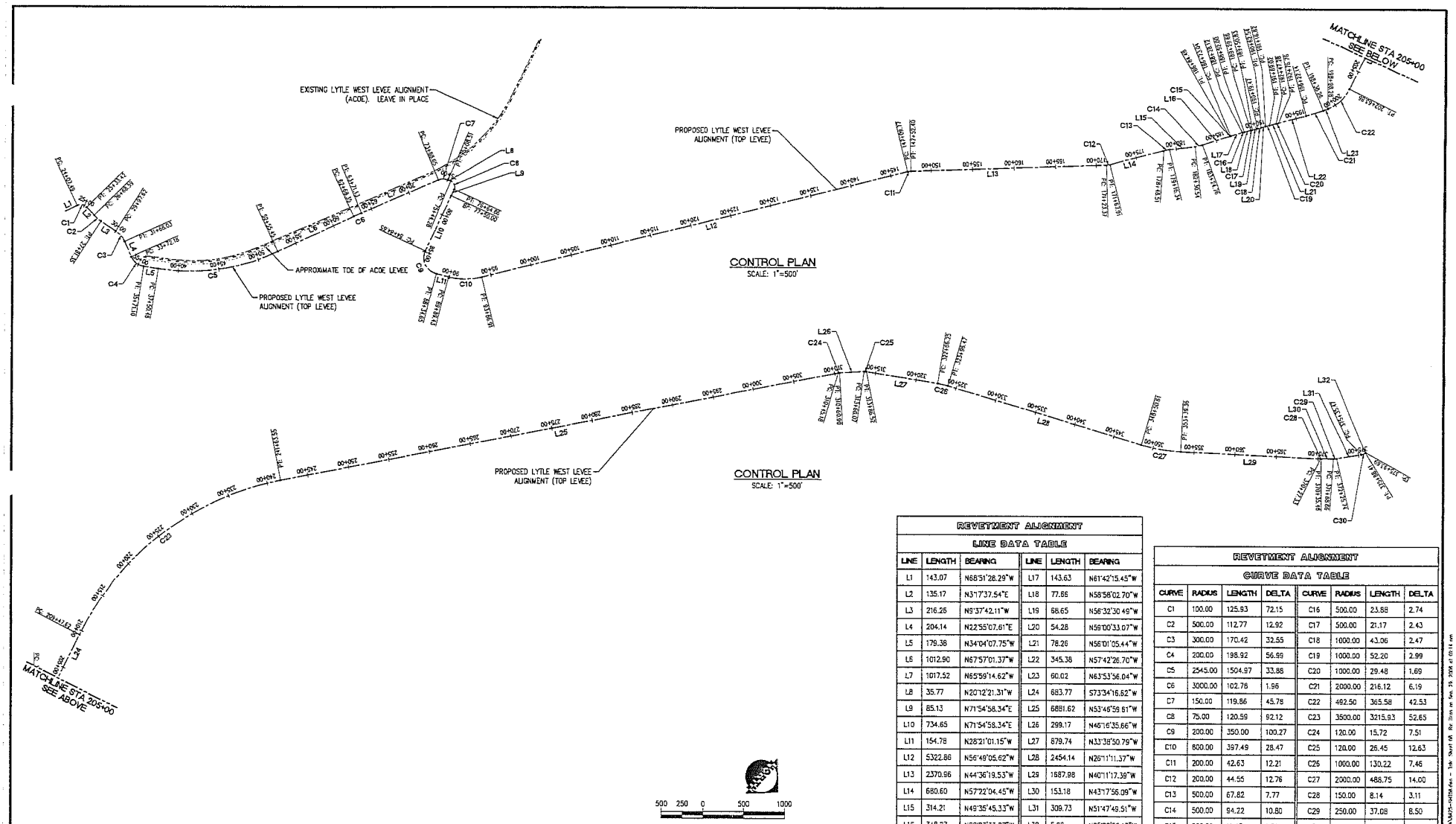

REVETMENT ALIGNMENT					
LINE DATA TABLE					
LINE	LENGTH	BEARING	LINE	LENGTH	BEARING
L1	143.07	N68°51'28.29"W	L17	143.63	N61°42'15.45"W
L2	135.17	N31°37'37.54"E	L18	77.66	N58°58'02.70"W
L3	216.26	N5°37'42.11"W	L19	68.65	N56°32'30.49"W
L4	204.14	N22°55'07.61"E	L20	54.28	N59°00'33.07"W
L5	179.38	N34°04'07.75"W	L21	78.26	N56°01'05.44"W
L6	1012.90	N67°57'01.37"W	L22	345.38	N57°42'26.70"W
L7	1017.52	N65°59'14.62"W	L23	60.02	N63°53'56.04"W
L8	35.77	N20°12'21.31"W	L24	683.77	S73°34'16.62"W
L9	85.13	N71°54'58.34"E	L25	6881.62	N53°46'59.61"W
L10	734.65	N71°54'58.34"E	L26	299.17	N45°16'35.66"W
L11	154.78	N28°21'01.15"W	L27	879.74	N33°38'50.79"W
L12	5322.86	N56°49'05.62"W	L28	2454.14	N26°11'11.37"W
L13	2370.96	N44°36'19.53"W	L29	1687.98	N40°11'17.39"W
L14	680.60	N57°22'04.45"W	L30	153.18	N43°17'56.09"W
L15	314.21	N49°35'45.33"W	L31	309.73	N51°47'49.51"W
L16	348.27	N60°23'33.27"W	L32	5.28	N85°29'58.13"W

REVETMENT ALIGNMENT							
CURVE DATA TABLE							
CURVE	RADIUS	LENGTH	DELTA	CURVE	RADIUS	LENGTH	DELTA
C1	100.00	125.93	72.15	C16	500.00	23.88	2.74
C2	500.00	112.77	12.92	C17	500.00	21.17	2.43
C3	300.00	170.42	32.55	C18	1000.00	43.06	2.47
C4	200.00	198.92	56.99	C19	1000.00	52.20	2.99
C5	2545.00	1504.97	33.88	C20	1000.00	29.48	1.69
C6	3000.00	102.76	1.96	C21	2000.00	216.12	6.19
C7	150.00	119.86	45.78	C22	492.50	365.58	42.53
C8	75.00	120.59	92.12	C23	3500.00	3215.93	52.65
C9	200.00	350.00	100.27	C24	120.00	15.72	7.51
C10	800.00	397.49	28.47	C25	120.00	26.45	12.63
C11	200.00	42.63	12.21	C26	1000.00	130.22	7.46
C12	200.00	44.55	12.76	C27	2000.00	486.75	14.00
C13	500.00	67.82	7.77	C28	150.00	8.14	3.11
C14	500.00	94.22	10.80	C29	250.00	37.08	8.50
C15	500.00	11.45	1.31	C30	90.00	52.94	33.70

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LYTLE WEST LEVEE

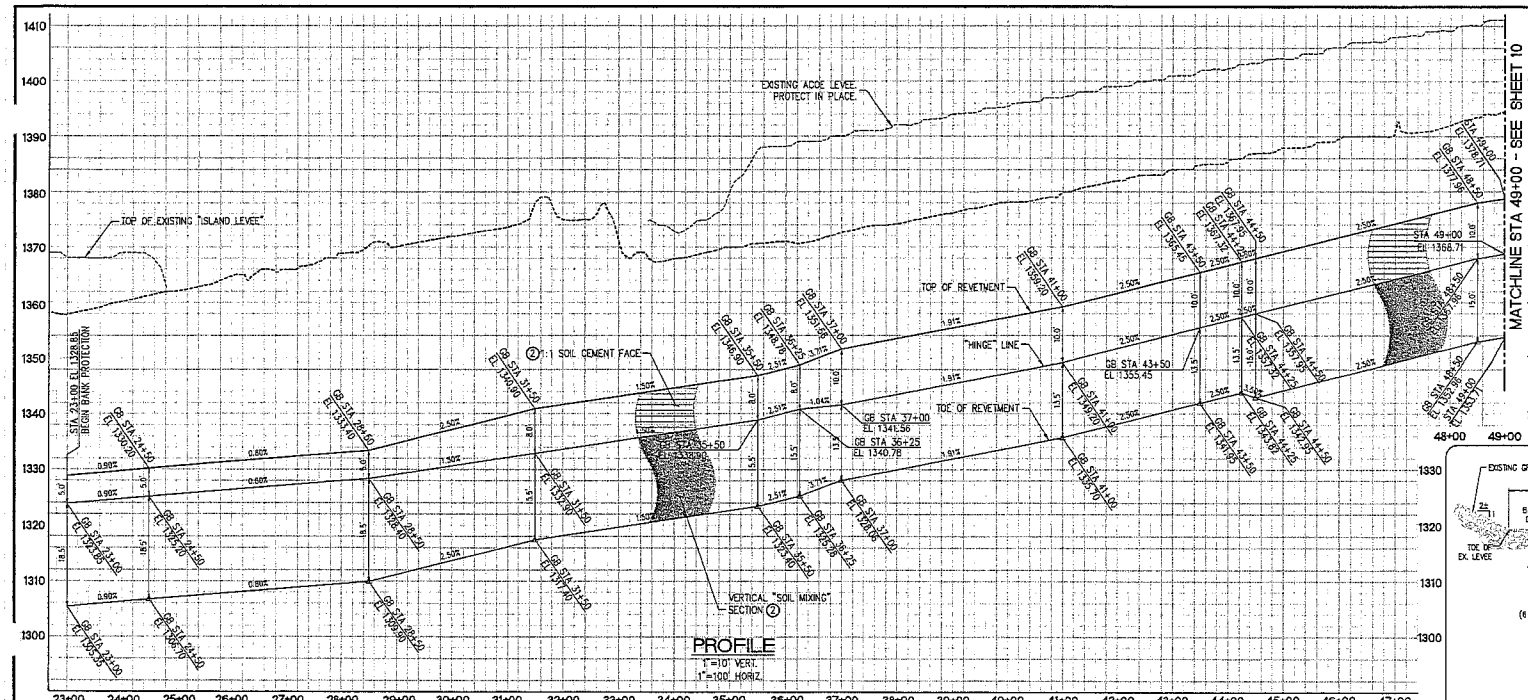
HORIZONTAL CONTROL PLAN

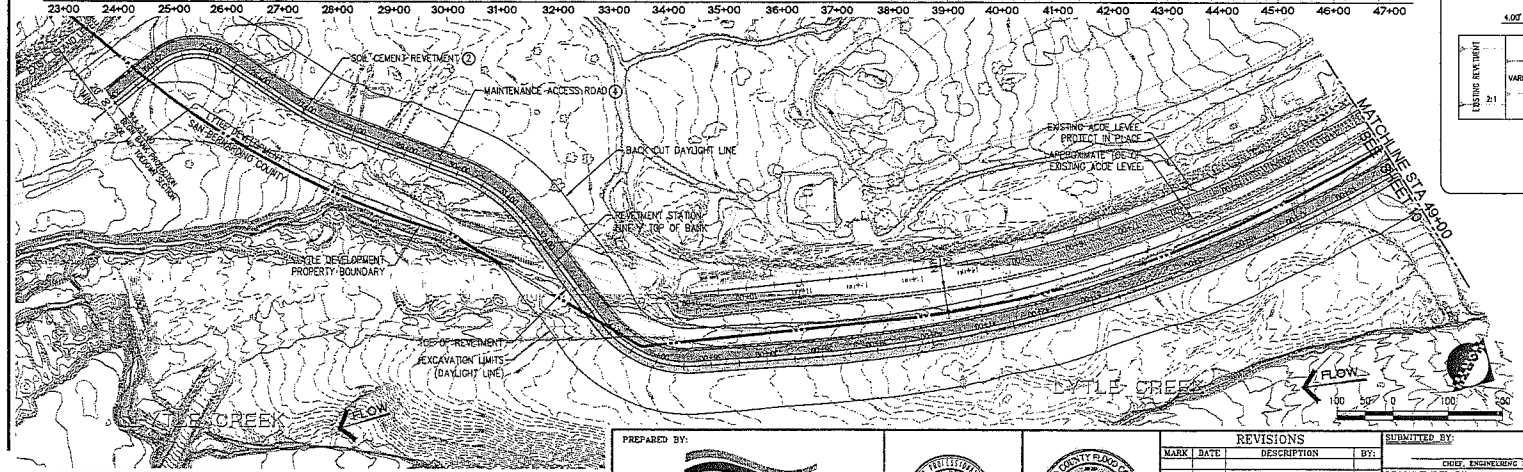
DATE

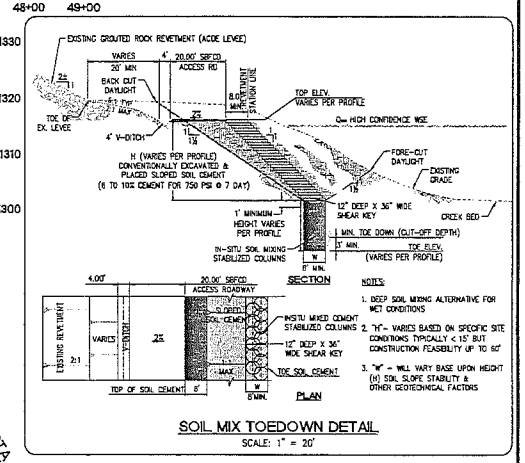
SCALE AS SHOWN

FILE NO.

SHEET NO. 8 OF 24







SOIL MIX TOEDOWN DETAIL

SCALE: 1" = 20'

CONSTRUCTION NOTES

② CONSTRUCT SOIL CEMENT / SOIL MIXING REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4, 5, 6 AND 7 AND DETAILS ON SHEET 24.

④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

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LYTLE DEVELOPMENT

LYTLE WEST LEVEE

PLAN AND PROFILE

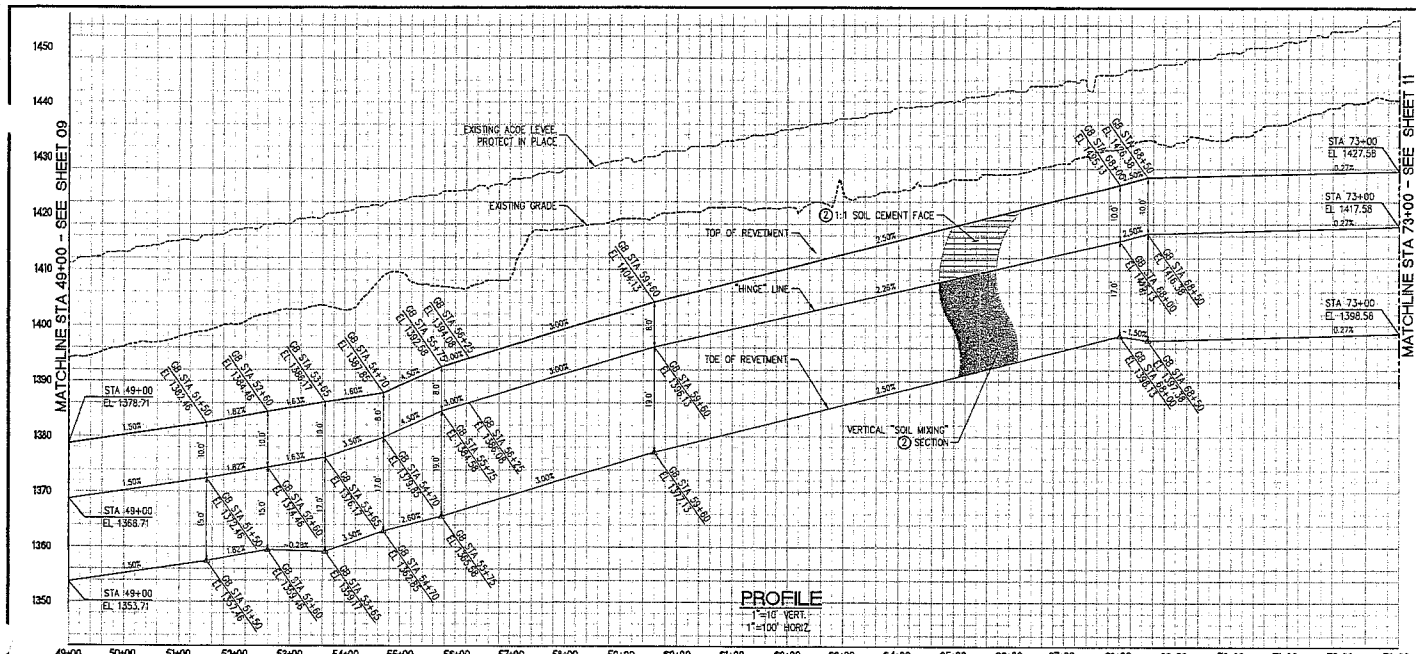
STA 23+00 (START) TO STA 49+00

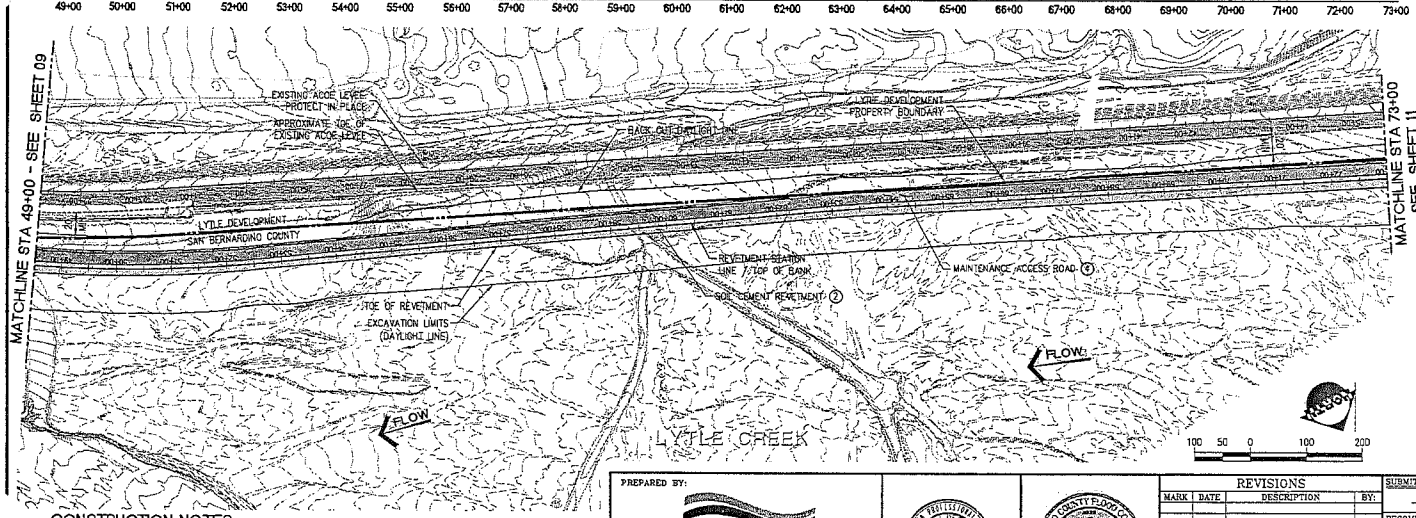
DATE

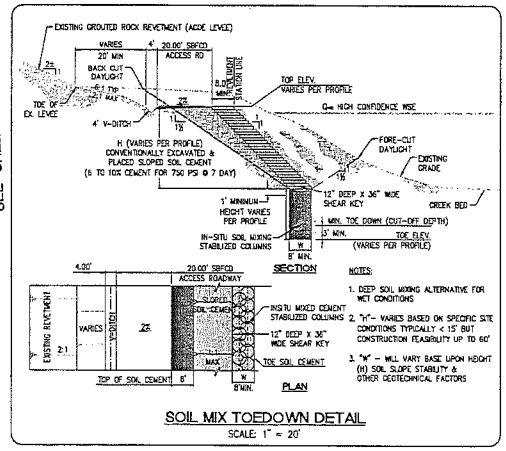
SCALE AS SHOWN

FILE NO.

SHEET NO. 9 OF 24







SOIL MIX TOEDOWN DETAIL

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(2) CONSTRUCT SOIL CEMENT / SOIL MIXING REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4, 5, 6 AND 7 AND DETAILS ON SHEET 24.

(4) CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

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LYTLE WEST LEVEE

PLAN AND PROFILE
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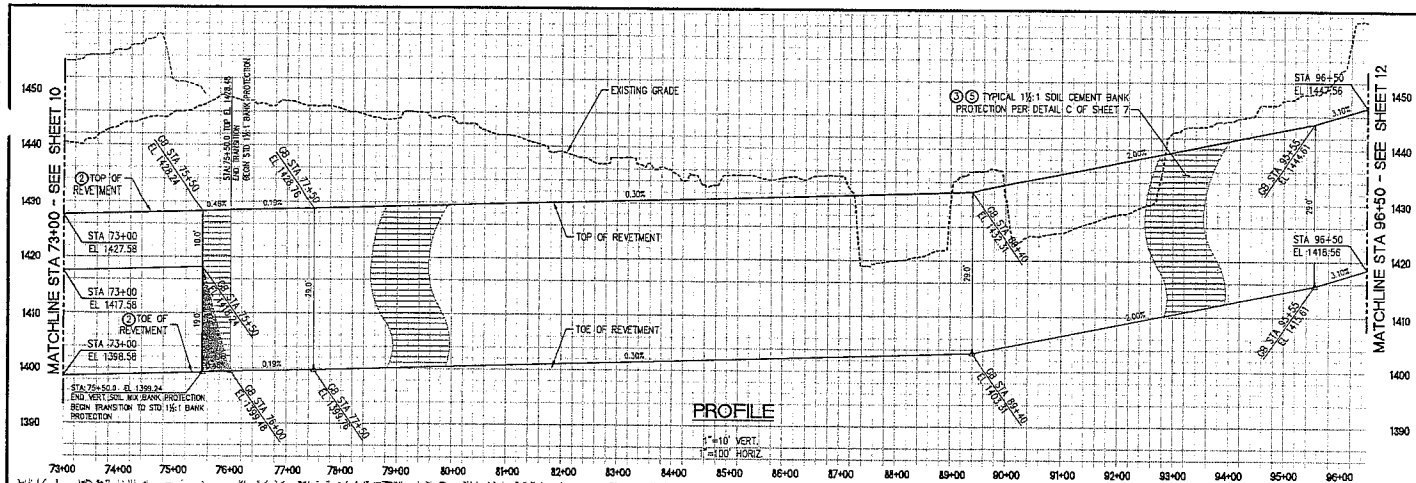
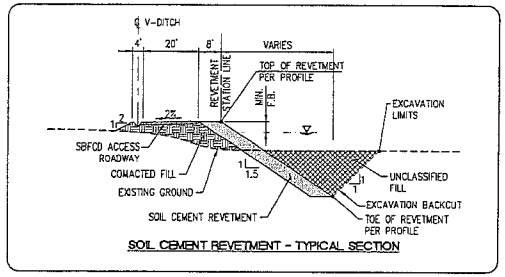
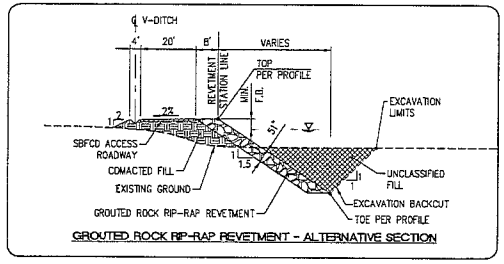
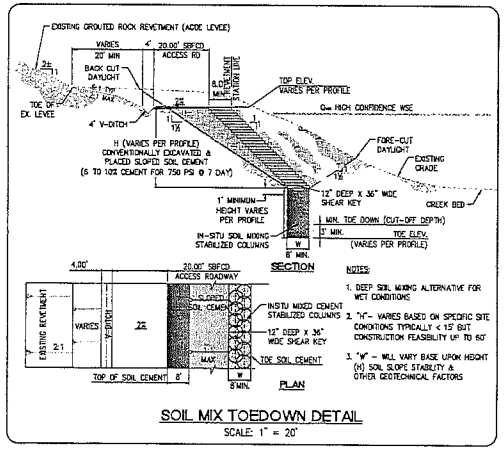




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION

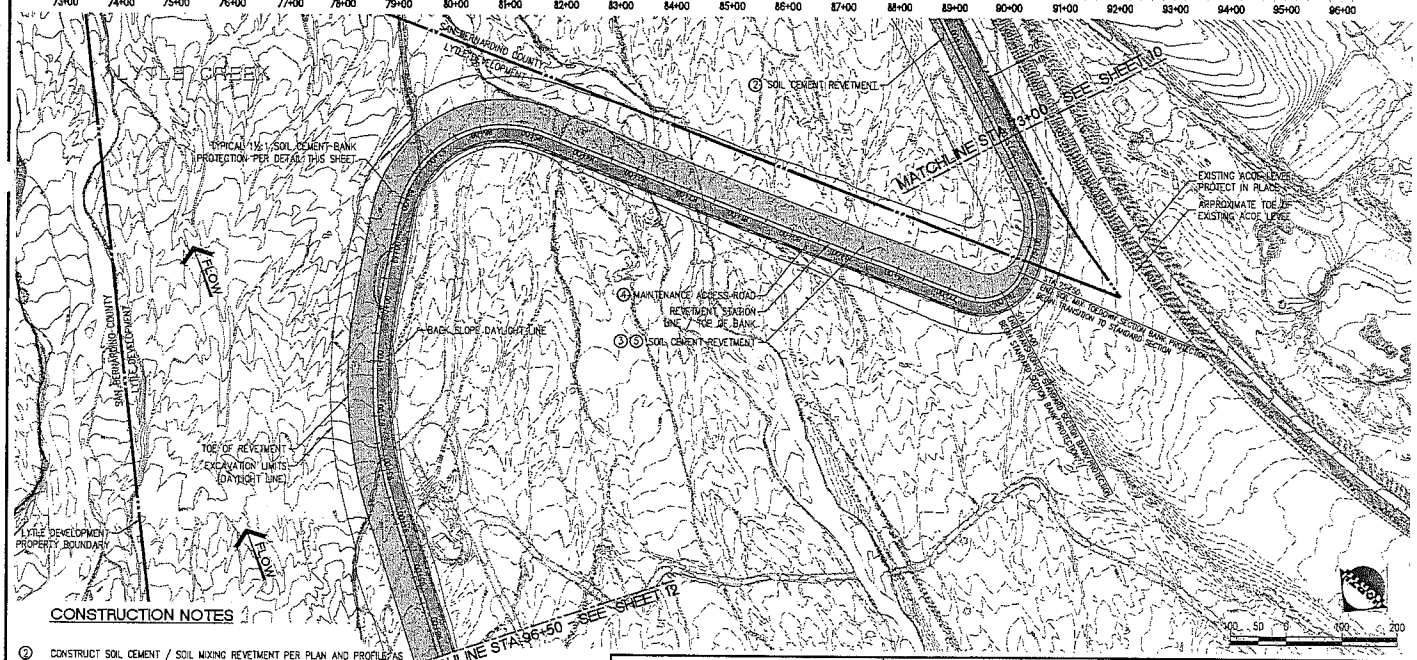


NOTES:

1. DEEP SOIL MIXING ALTERNATIVE FOR WET CONDITIONS
2. "H" - VARIES BASED ON SPECIFIC SITE CONDITIONS TYPICALLY < 15' BUT CONSTRUCTION FEASIBILITY UP TO 60'
3. "W" - WILL VARY BASE UPON HEIGHT (H) SOIL SLOPE STABILITY & OTHER GEOTECHNICAL FACTORS

SOIL MIX TOEDOWN DETAIL

SCALE: 1" = 20'



CONSTRUCTION NOTES

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③ CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.

④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER — DATE
APPROVED BY: FLOOD CONTROL ENGINEER — DATE
PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

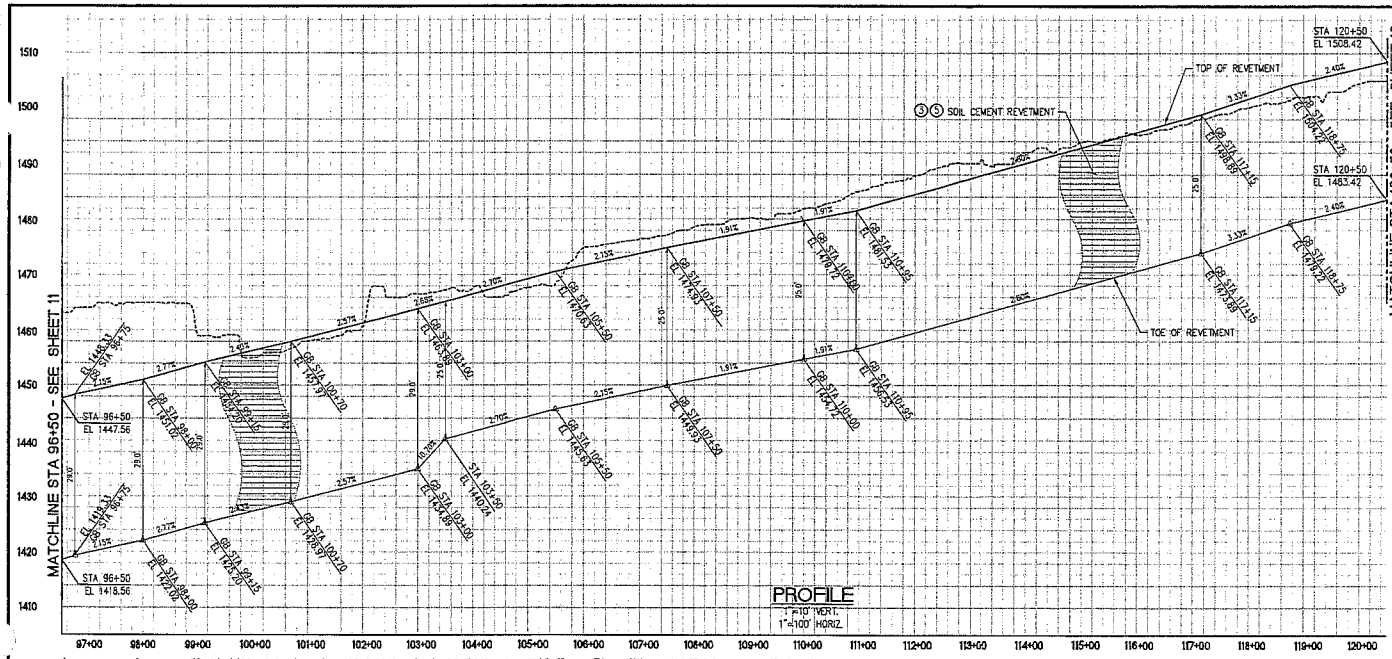
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

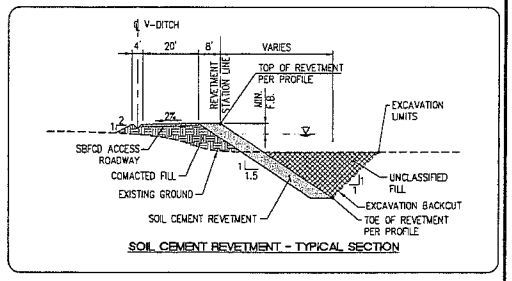
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

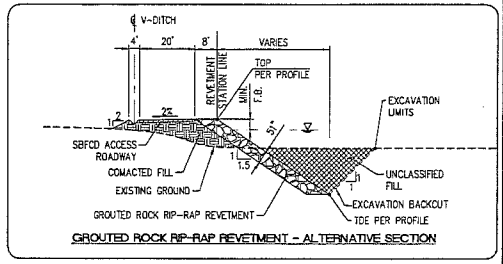
PLAN AND PROFILE
STA 73+00 TO STA 96+50

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 11 OF 24

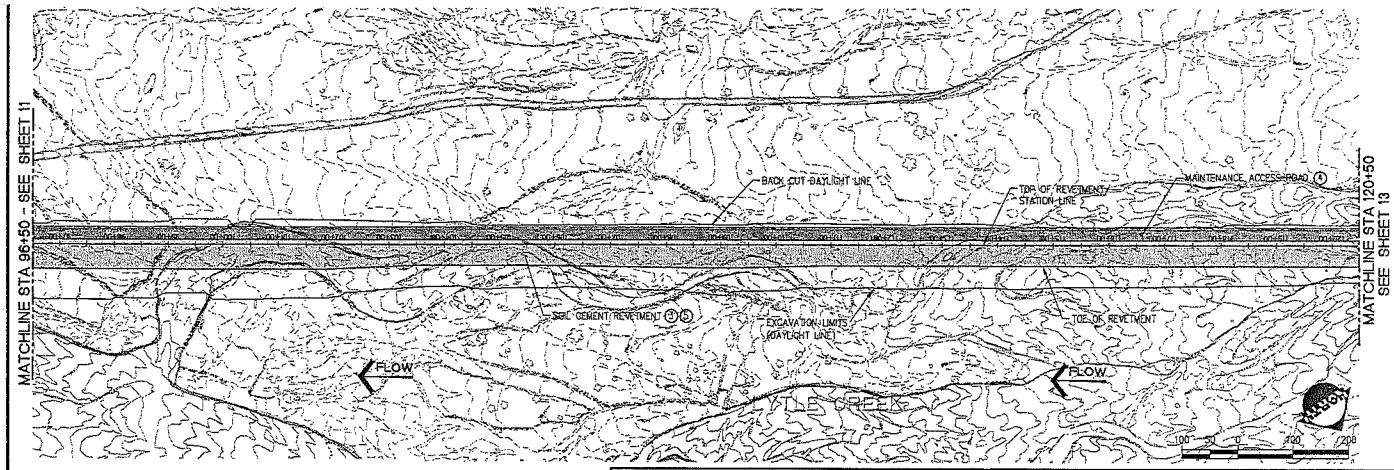




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

③ CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.

④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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No. 57924
Exp. 06-30-10
CIVIL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY:
FLOOD CONTROL ENGINEER DATE
PRES. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

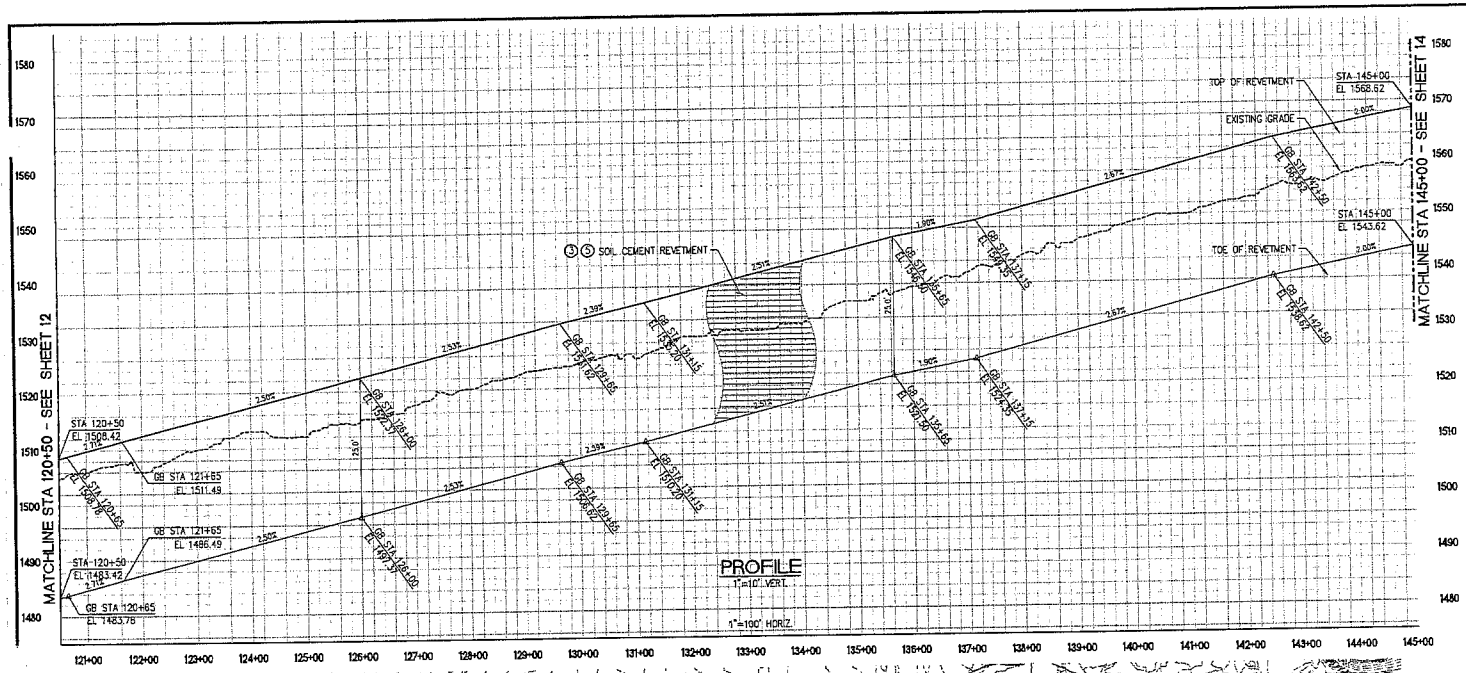
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

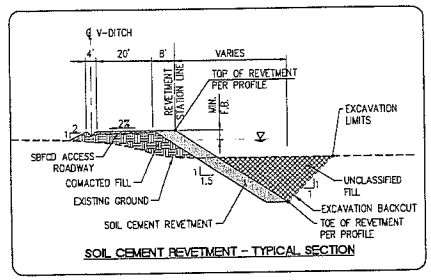
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

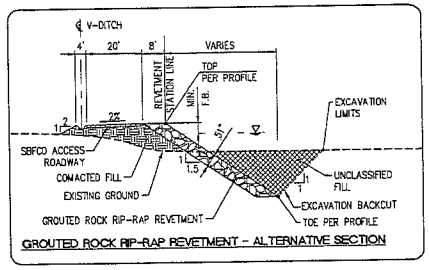
PLAN AND PROFILE
STA 96+50 TO
STA 120+50

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 12 OF 24

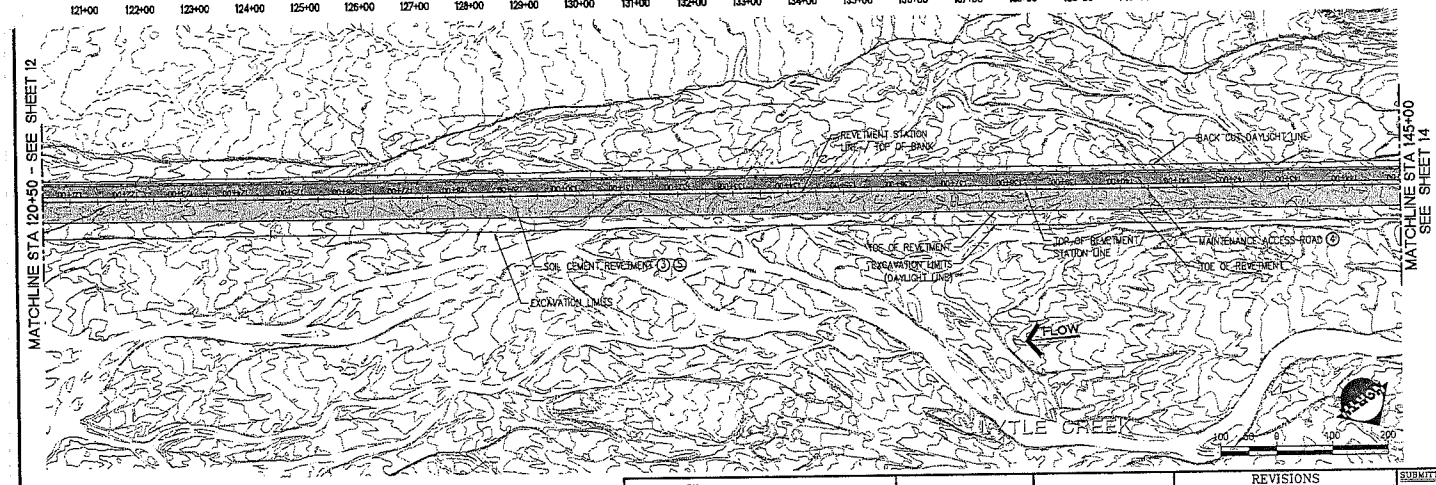




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

③ CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.

④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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REGISTERED PROFESSIONAL ENGINEER
No. 57924
Exp. 06-30-10
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STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY:
FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | DES. BY: | REV'D BY. | DRAWN BY:

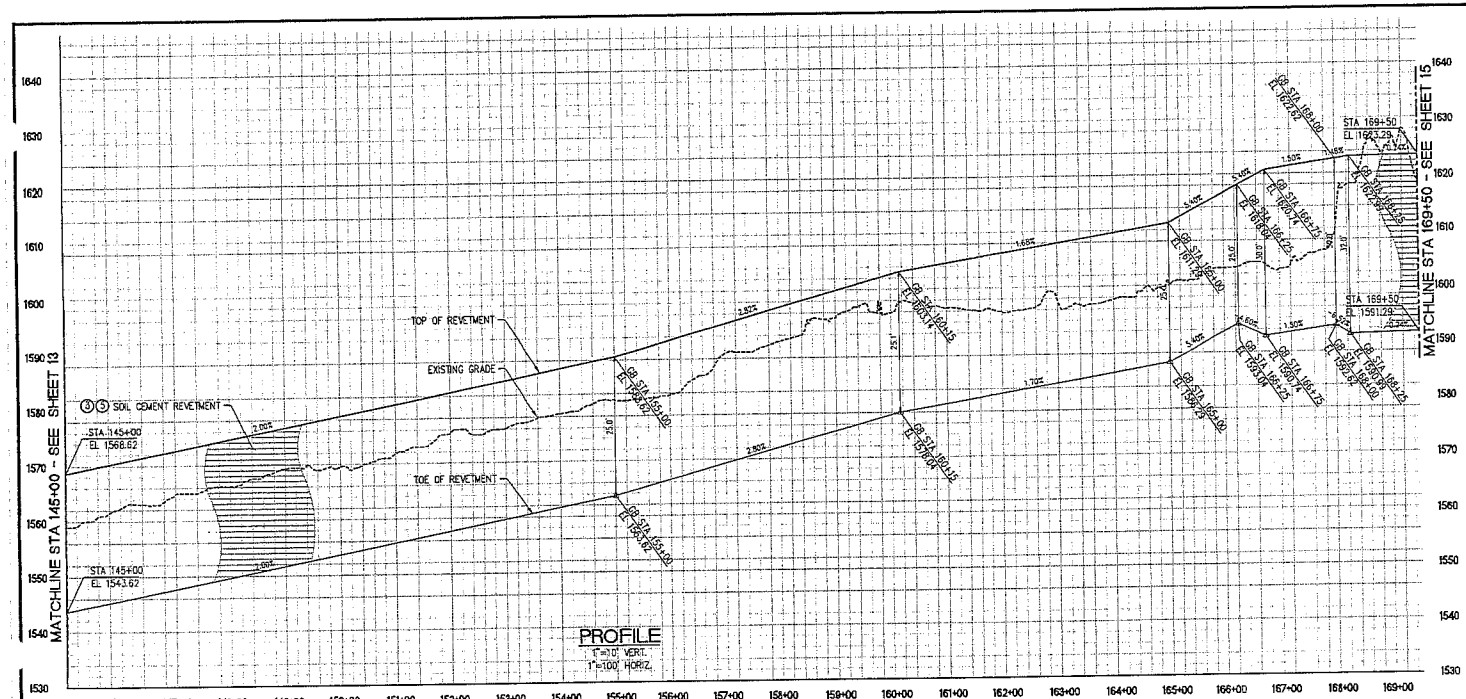
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

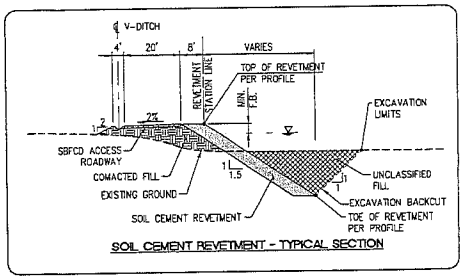
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

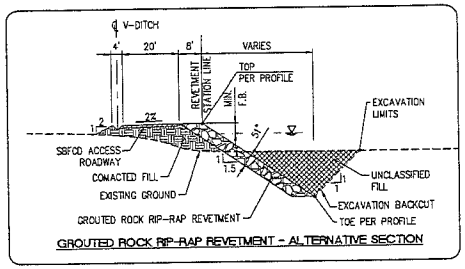
PLAN AND PROFILE
STA 120+50 TO
STA 148+00

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 13 OF 24

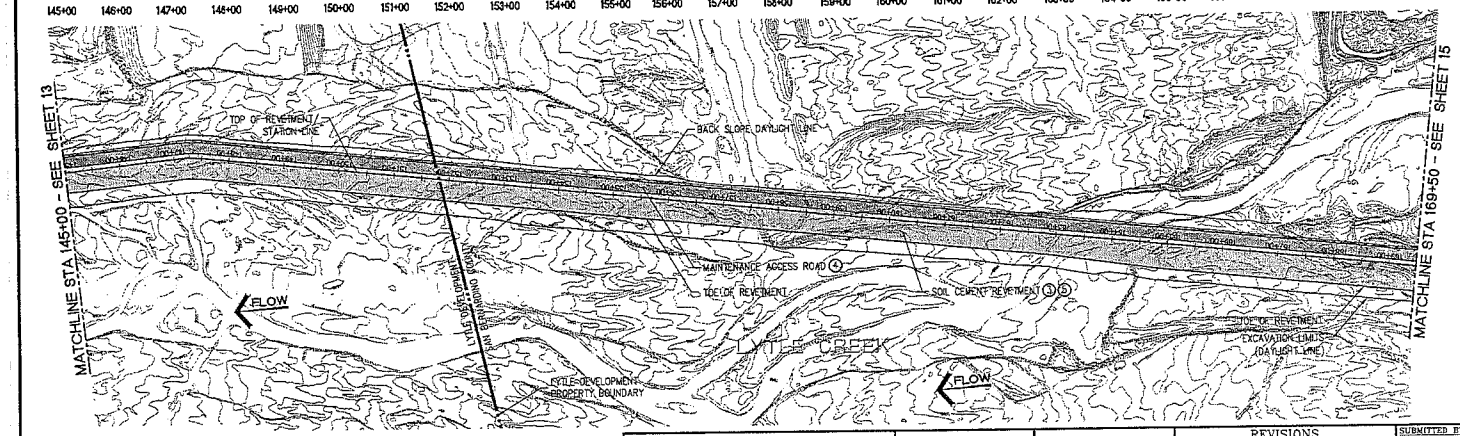




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

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⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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REGISTERED PROFESSIONAL ENGINEER
RICHARD L. DE LOACHE
No. 57924
Exp. 06-30-10
CIVIL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

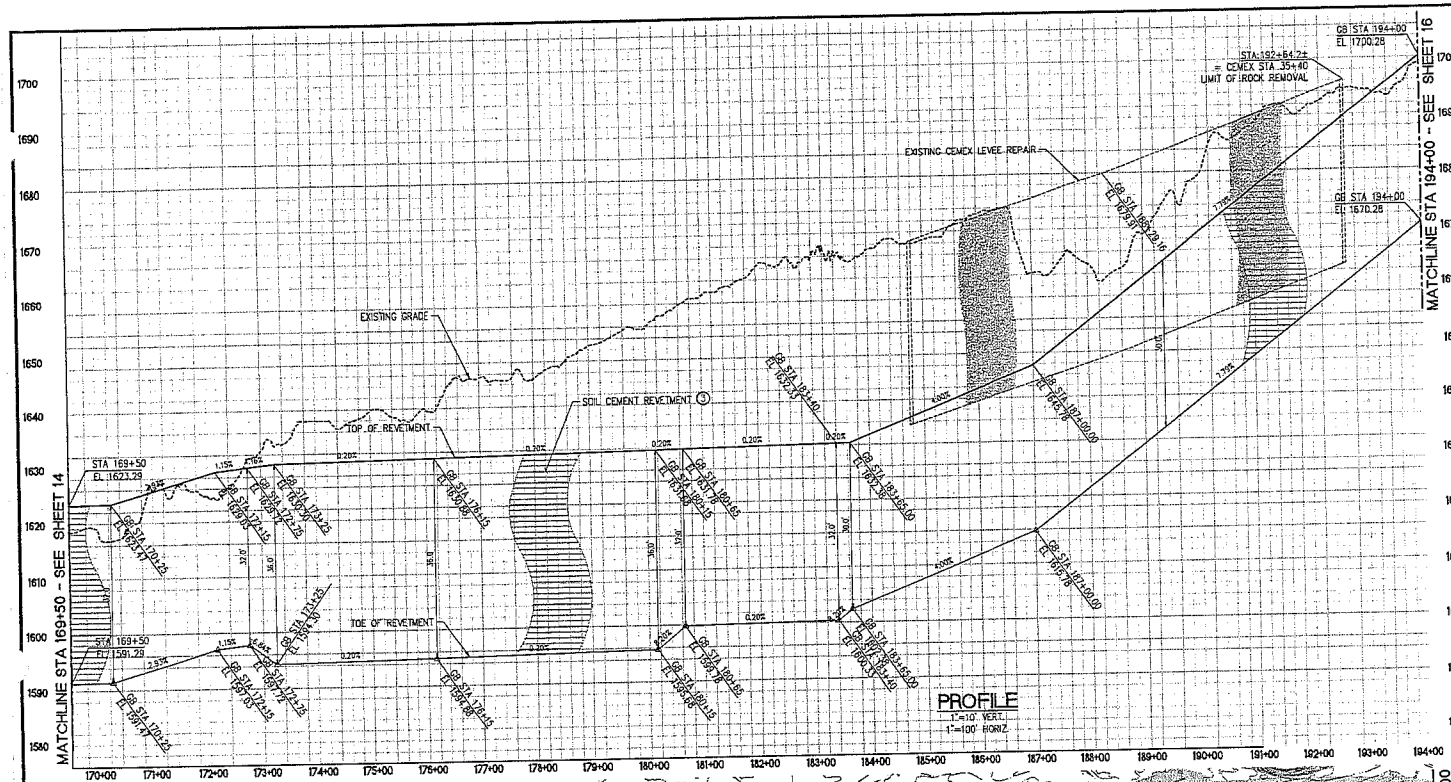
REVISIONS

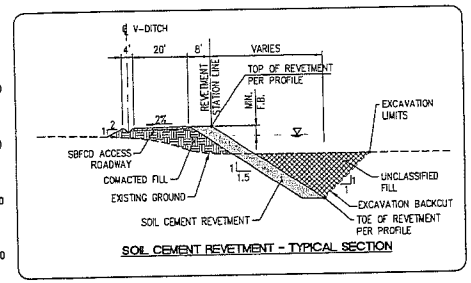
MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY: CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY: FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | EST. BY: | MT'D BY: | DRAWN BY:

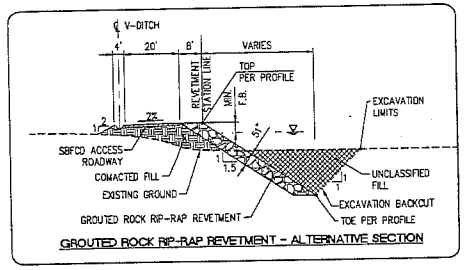
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
LYTLE DEVELOPMENT
LYTLE WEST LEVEE
PLAN AND PROFILE
STA 145+00 TO
STA 169+50

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 14 OF 24

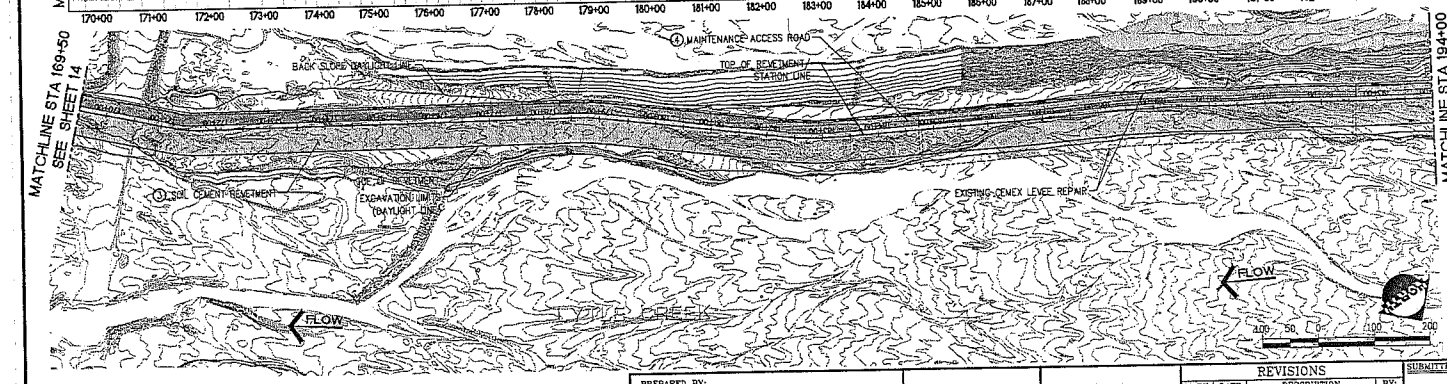




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

3. CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.
4. CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.
5. ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).
6. INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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REGISTERED PROFESSIONAL ENGINEER
No. 57934
Exp. 06-30-10
CIVIL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY: CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY: FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | DES. BY: | DRV'D BY: | DRAWN BY:

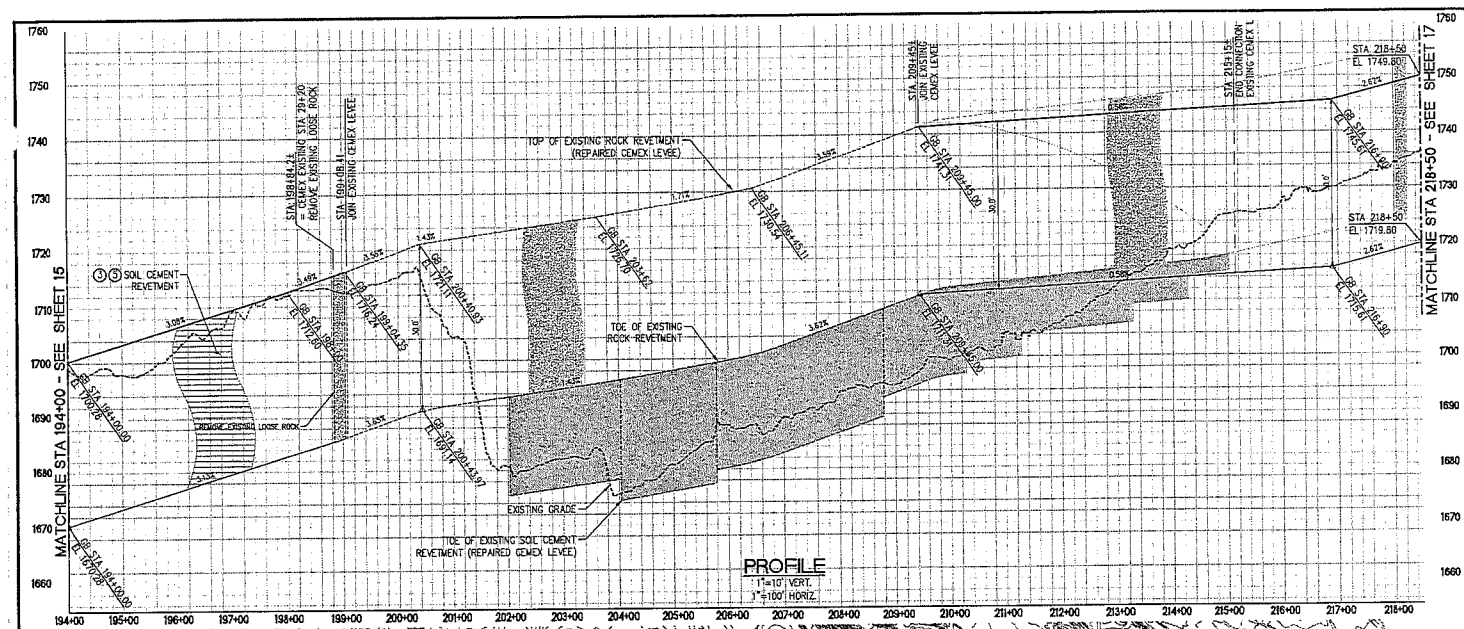
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

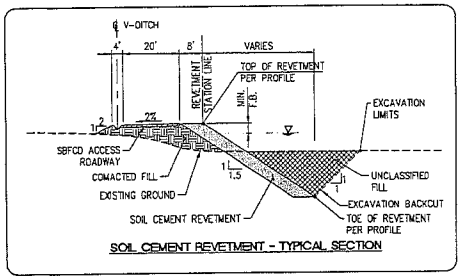
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

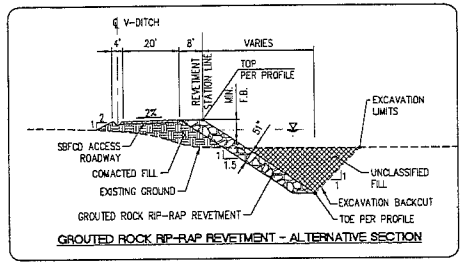
PLAN AND PROFILE
STA 169+50 TO
STA 194+00

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 15 OF 24

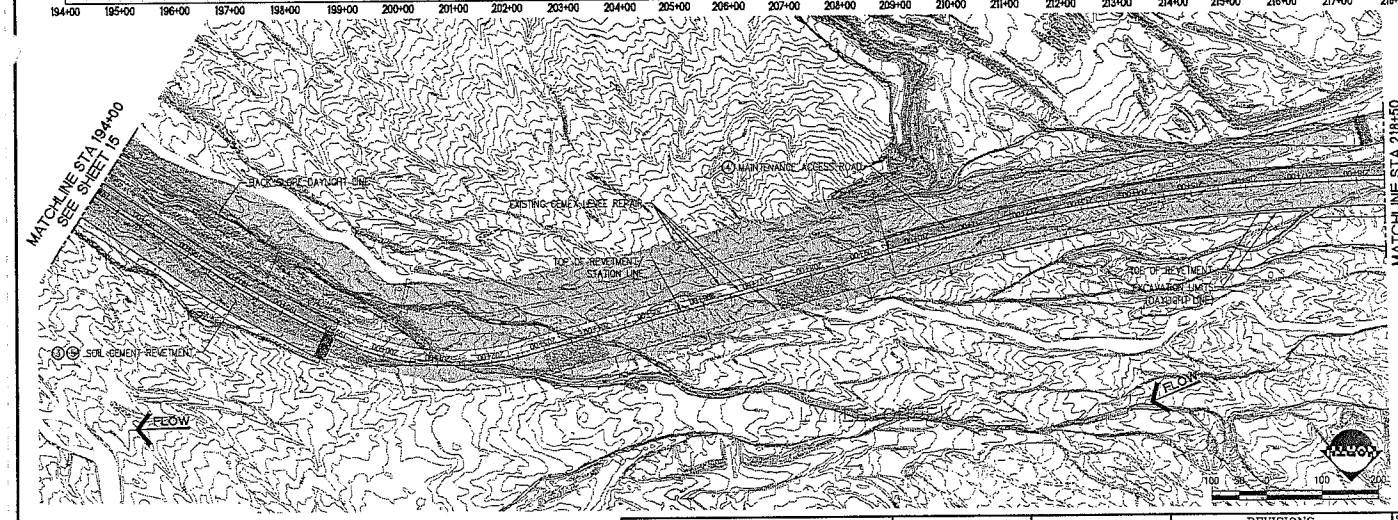




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

③ CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.

④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT CALIFORNIA

REVISIONS			
MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY: CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY: FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

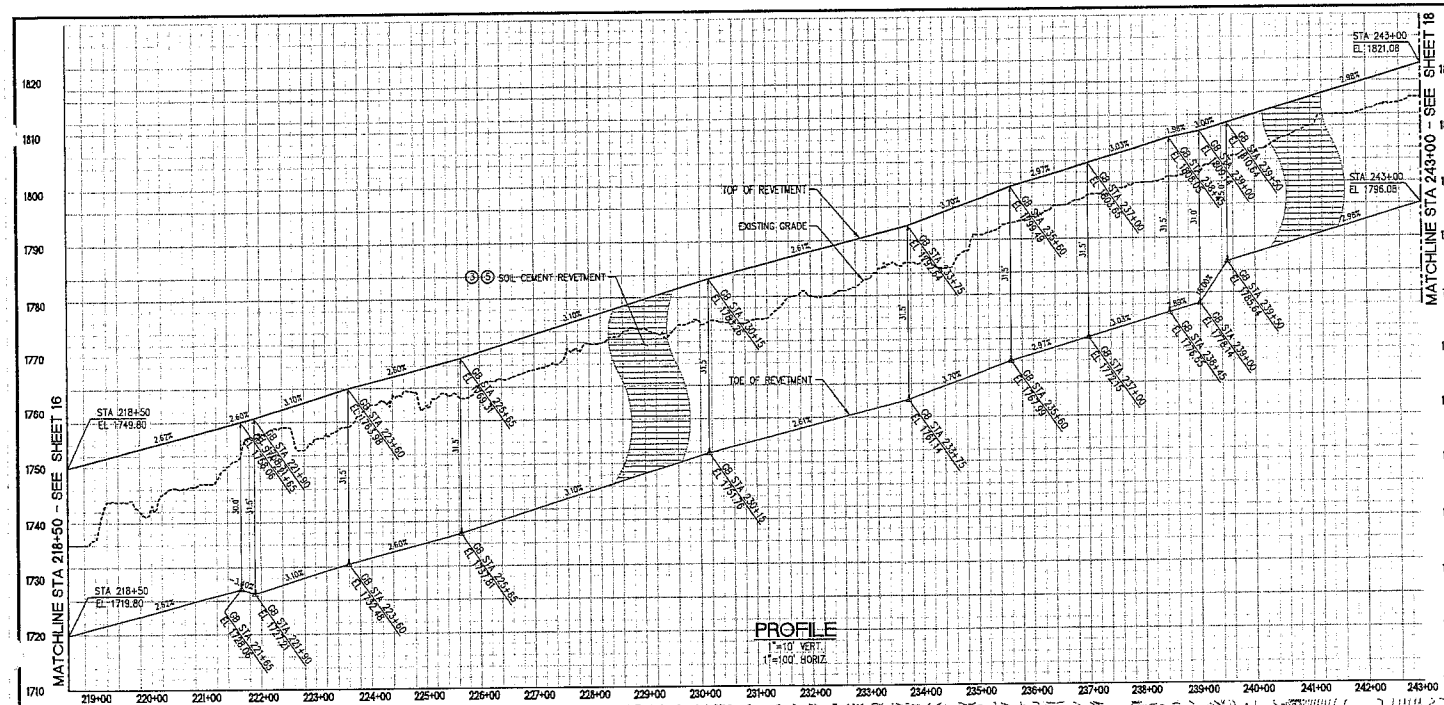
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

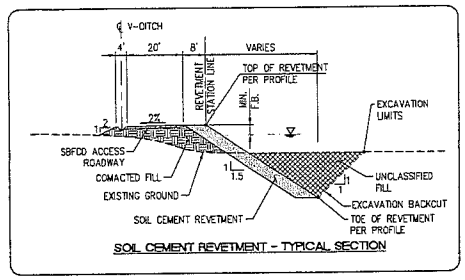
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

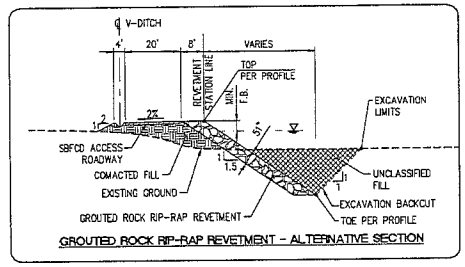
PLAN AND PROFILE
STA 194+00 TO
STA 218+50

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 16 OF 24

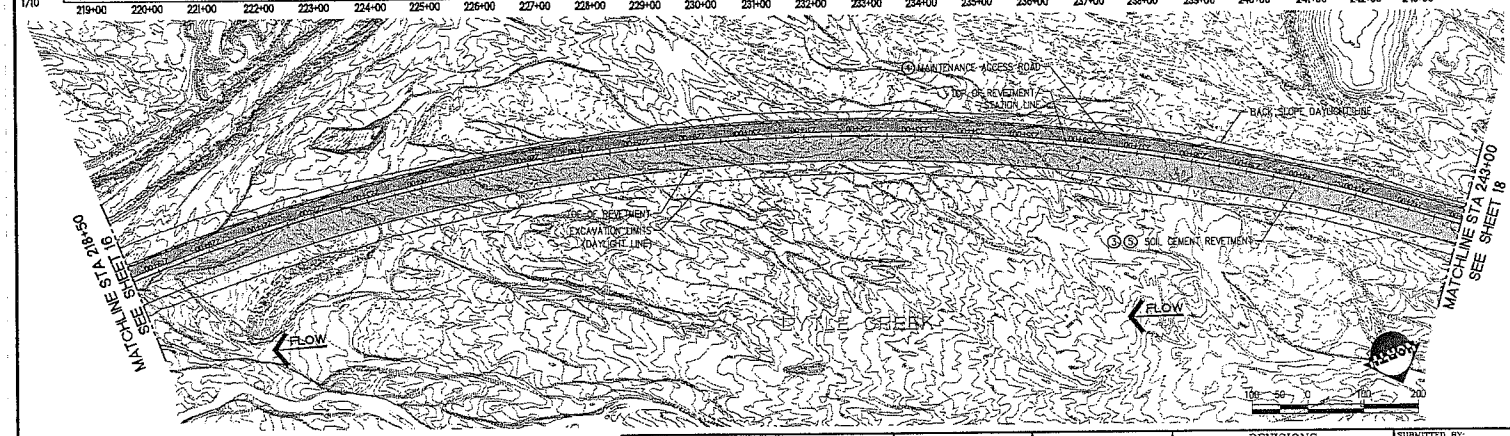




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

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⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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REGISTERED PROFESSIONAL ENGINEER
No. 57924
Exp. 06-30-10
CIVIL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS			
MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY:
FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | DES. BY: | DES'D BY: | DRAWN BY:

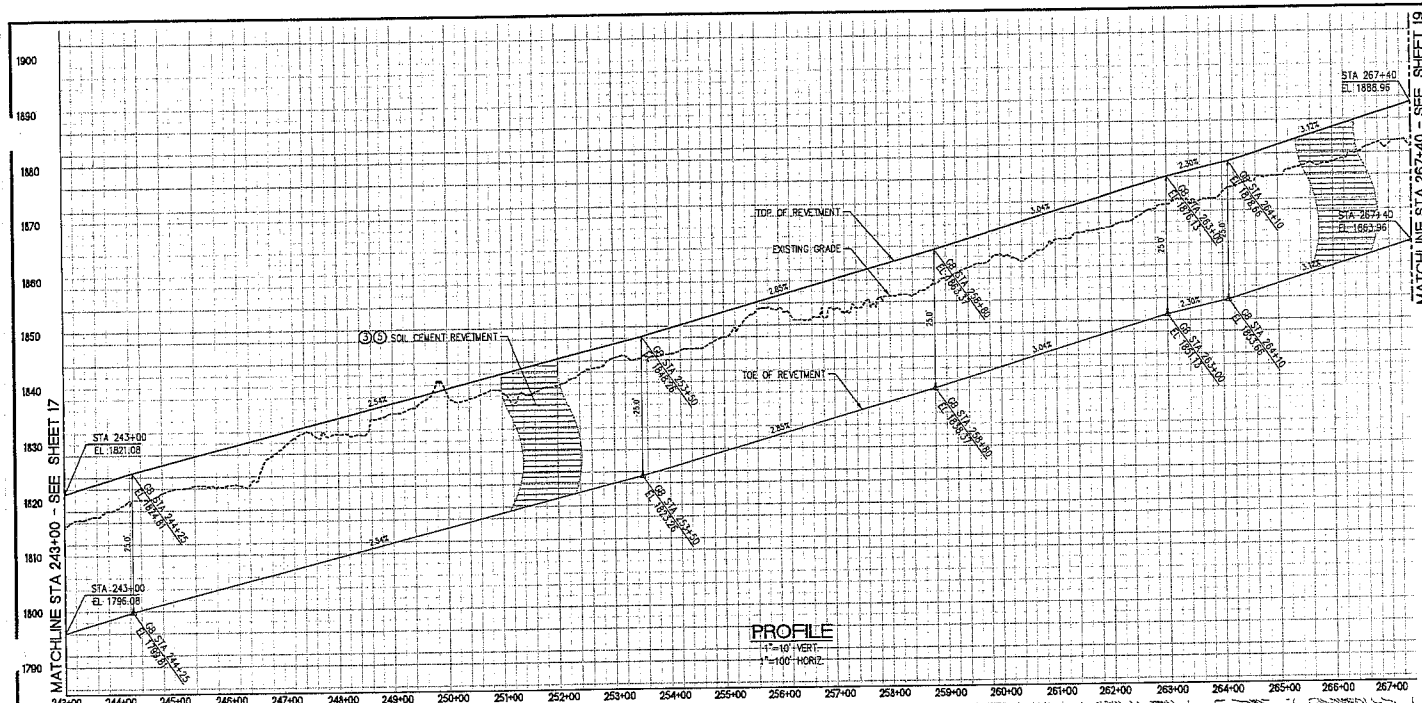
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

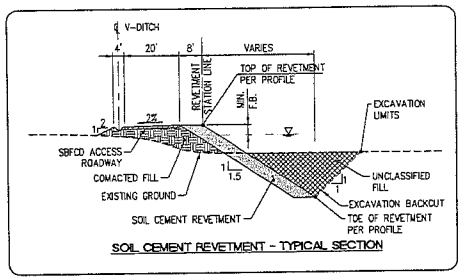
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

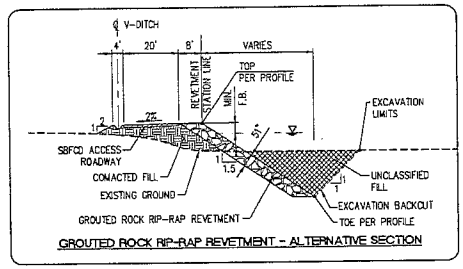
PLAN AND PROFILE
STA 218+50 TO
STA 243+00

DATE	
SCALE	AS SHOWN
FILE NO.	
SHEET NO.	17 OF 24

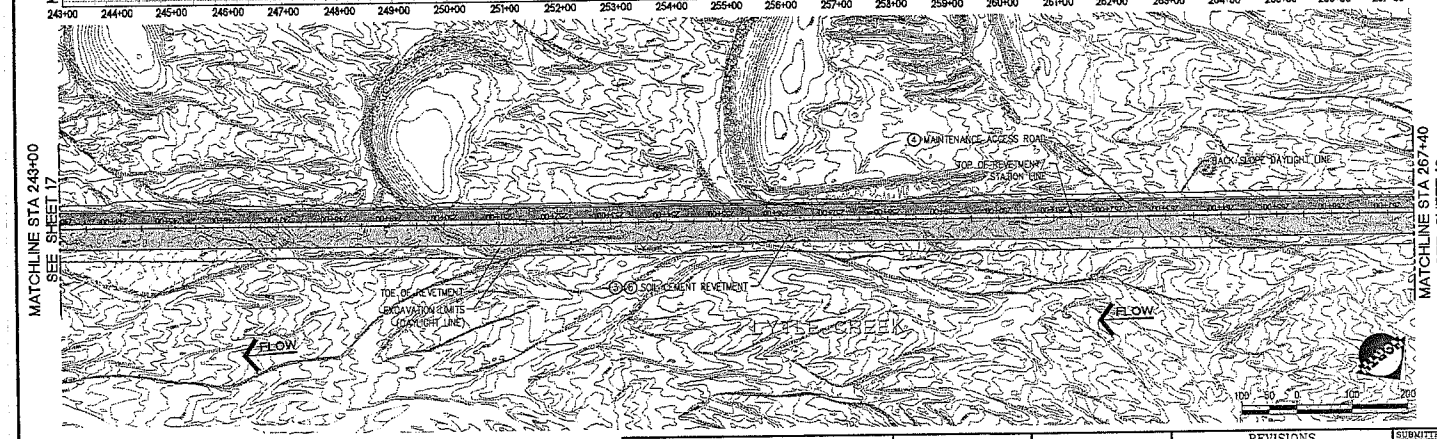




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

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⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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REGISTERED PROFESSIONAL ENGINEER
GEORGE C. LEE
No. 57924
Exp. 06-30-10
CIVIL
STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
CHIEF, ENGINEERING DIVISION — DATE
RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER — DATE
APPROVED BY:
FLOOD CONTROL ENGINEER — DATE

FIELD ENGR.	DES. BY:	REV'D BY:	DRAWN BY:

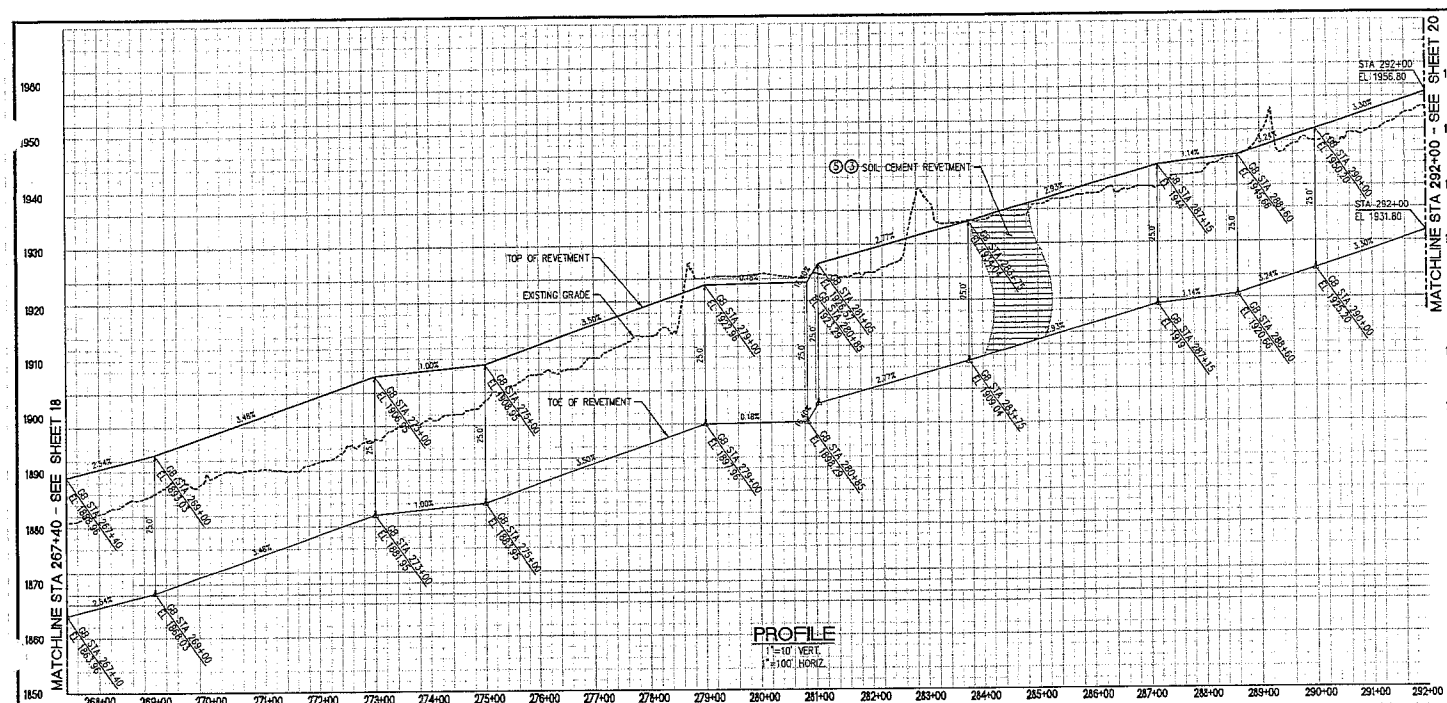
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

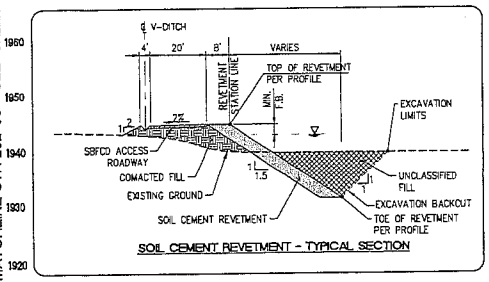
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

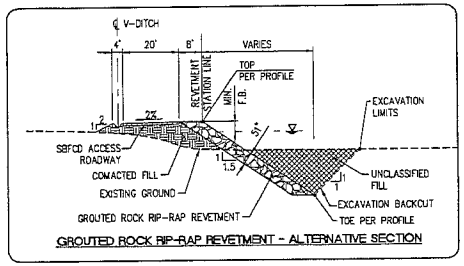
PLAN AND PROFILE
STA 243+00 TO
STA 267+40

DATE	
SCALE	AS SHOWN
FILE NO.	
SHEET NO.	18 OF 24

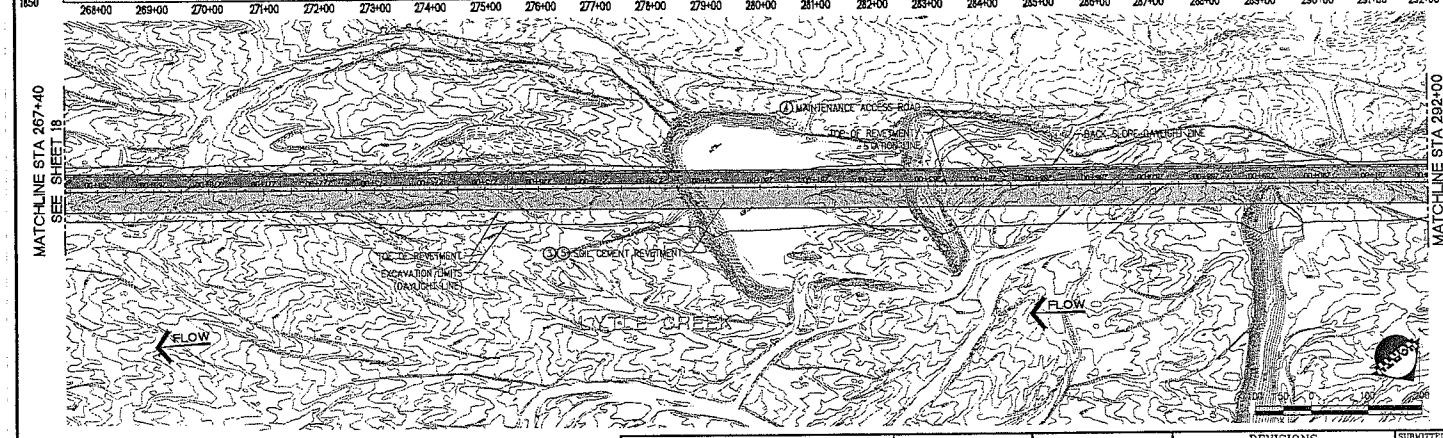




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

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No. 57924
Exp. 06-30-10
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STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
CALIFORNIA

REVISIONS			
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APPROVED BY:
FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

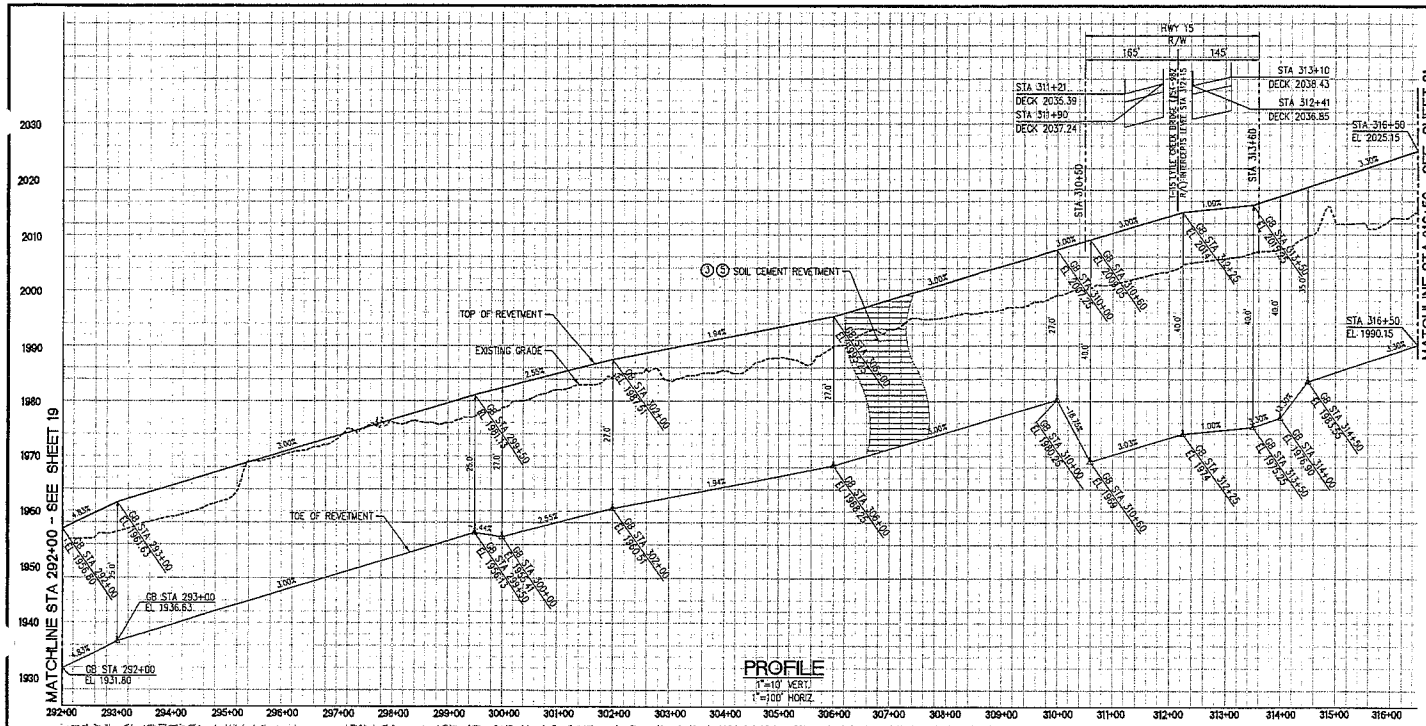
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

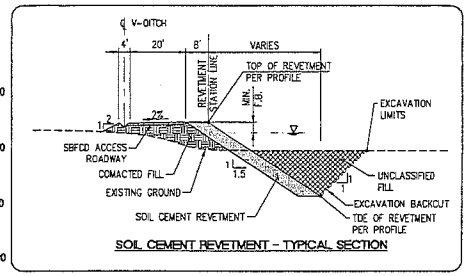
LYTLE DEVELOPMENT

LYTLE WEST LEVEE

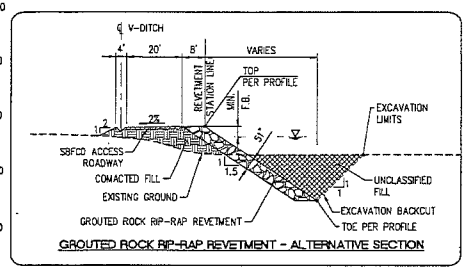
PLAN AND PROFILE
STA 267+40 TO
STA 292+00

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 19 OF 24

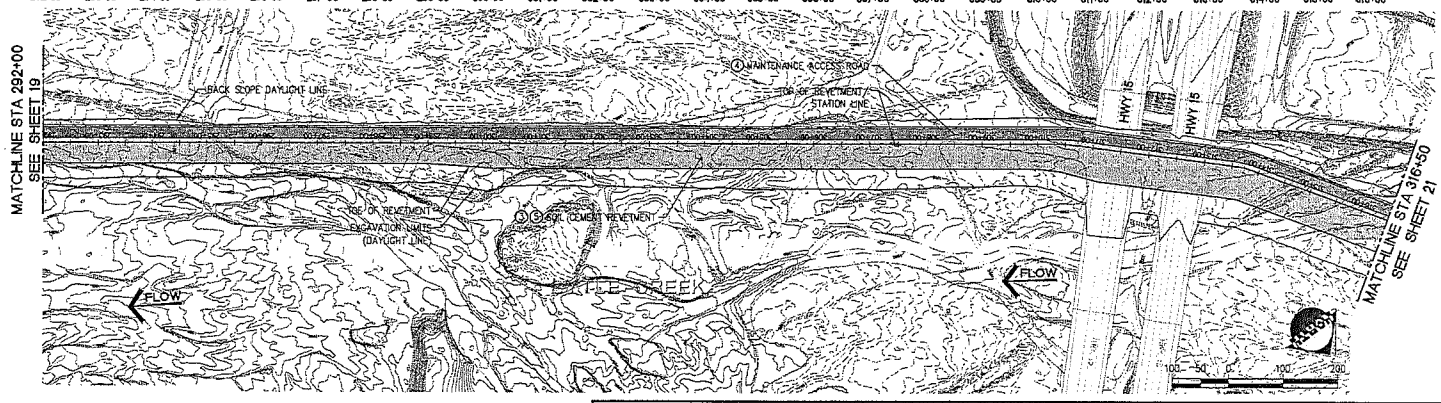




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



CONSTRUCTION NOTES

③ CONSTRUCT SOIL CEMENT REVETMENT PER PLAN AND PROFILE AS SHOWN, PER SPECIFICATION NOTES ON SHEETS 3, 4 AND 5 AND DETAILS ON SHEET 24.

④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON SHEET 24.

⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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BENJAMIN J. DELOACH
No. 57824
Exp. 06-31-10
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STATE OF CALIFORNIA

SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
SAN BERNARDINO, CALIFORNIA

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MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY:
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RECOMMENDED BY:
ASSIST. FLOOD CONTROL ENGINEER — DATE
APPROVED BY:
FLOOD CONTROL ENGINEER — DATE

PROJ. ENGR.	DES. BY:	SEY'D BY:	DRAWN BY:

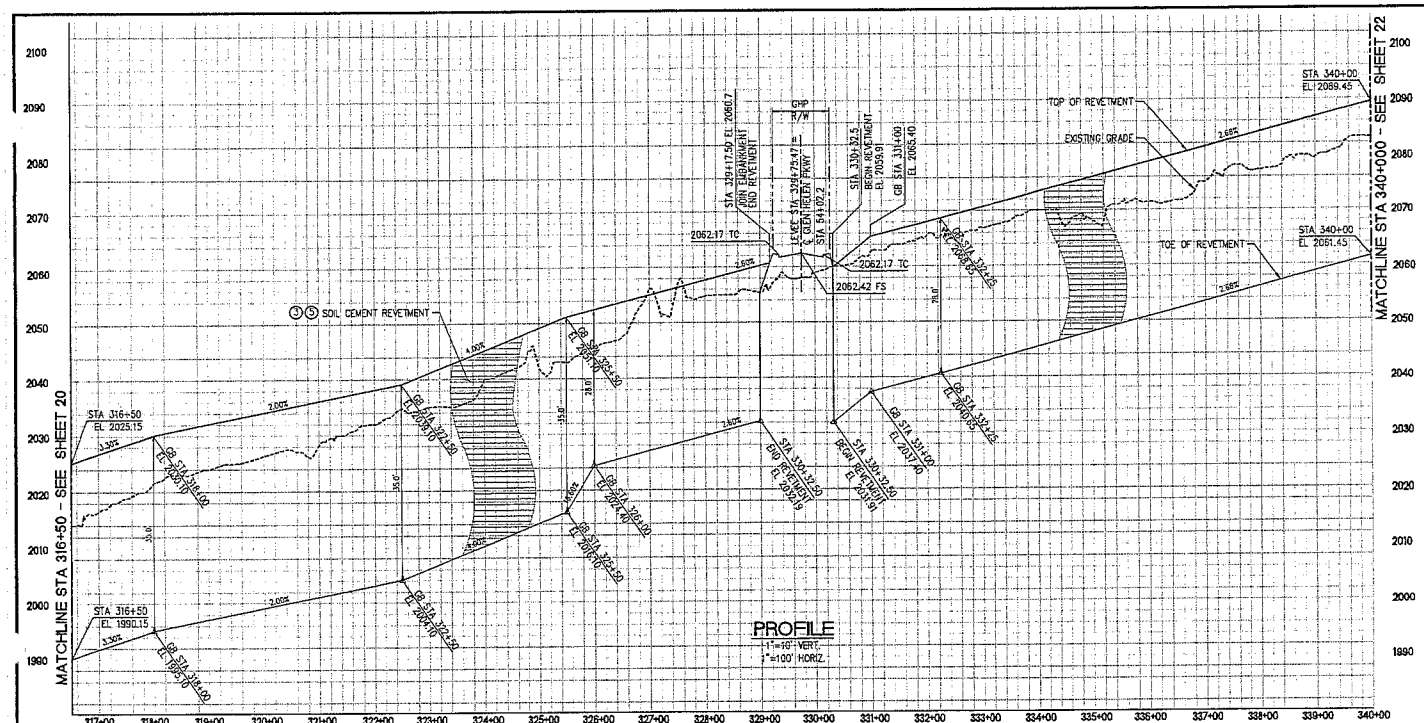
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

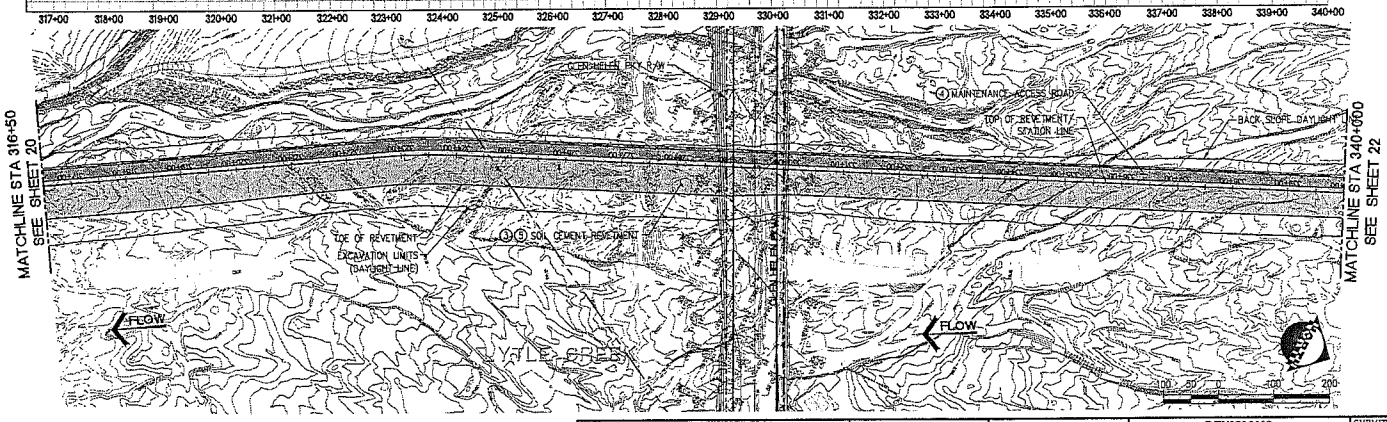
LYTLE DEVELOPMENT

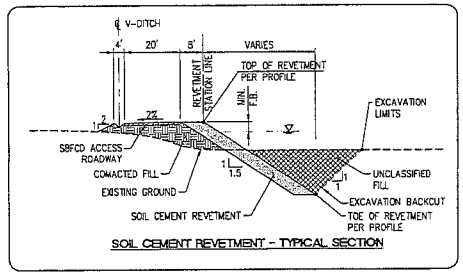
LYTLE WEST LEVEE

PLAN AND PROFILE
STA 292+00 TO
STA 316+50

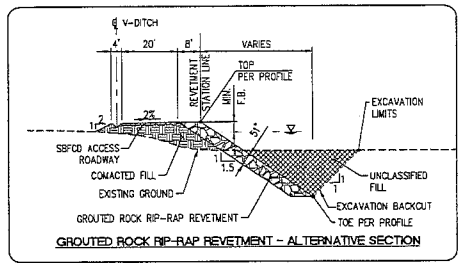
DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 20 OF 24







SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION

CONSTRUCTION NOTES

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SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT CALIFORNIA

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MARK	DATE	DESCRIPTION	BY:

SUBMITTED BY: CHIEF, ENGINEERING DIVISION DATE
RECOMMENDED BY: ASSIST. FLOOD CONTROL ENGINEER DATE
APPROVED BY: FLOOD CONTROL ENGINEER DATE
PROJ. ENGR. | DES. BY: | REV'D BY: | DRAWN BY:

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

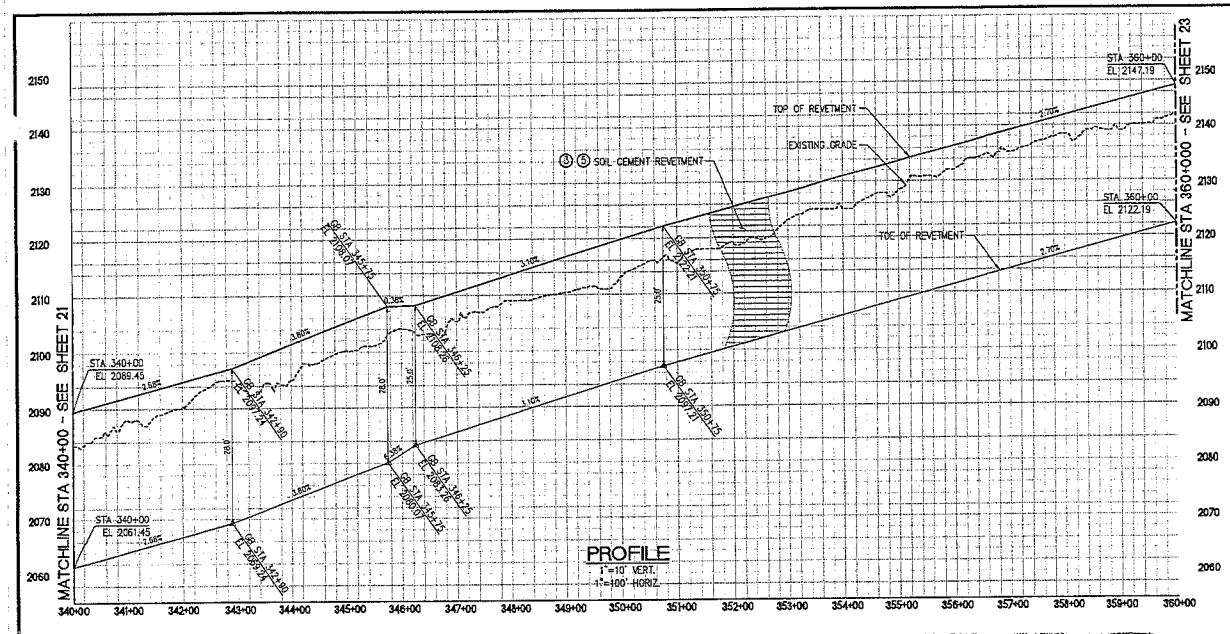
LYTLE DEVELOPMENT

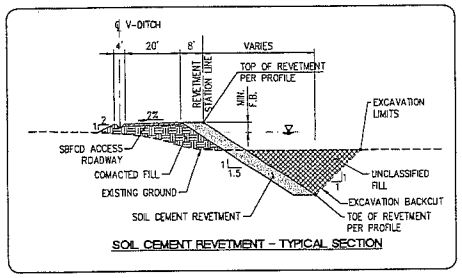
LYTLE WEST LEVEE

PLAN AND PROFILE
STA 316+50 TO
STA 340+00

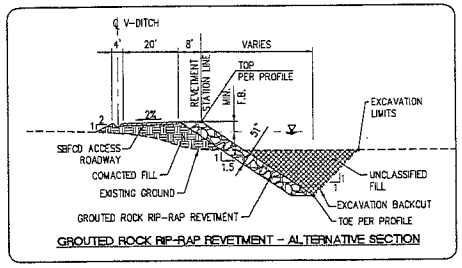
DATE	
SCALE	AS SHOWN
FILE NO.	
SHEET NO.	21 OF 24

P:\MCSV\Volume4\A5175-EE Flds and Plans\A5175-0177.dwg - Tab: Sheet 21 By: Rich on Oct 29, 2008 at 17:06:00

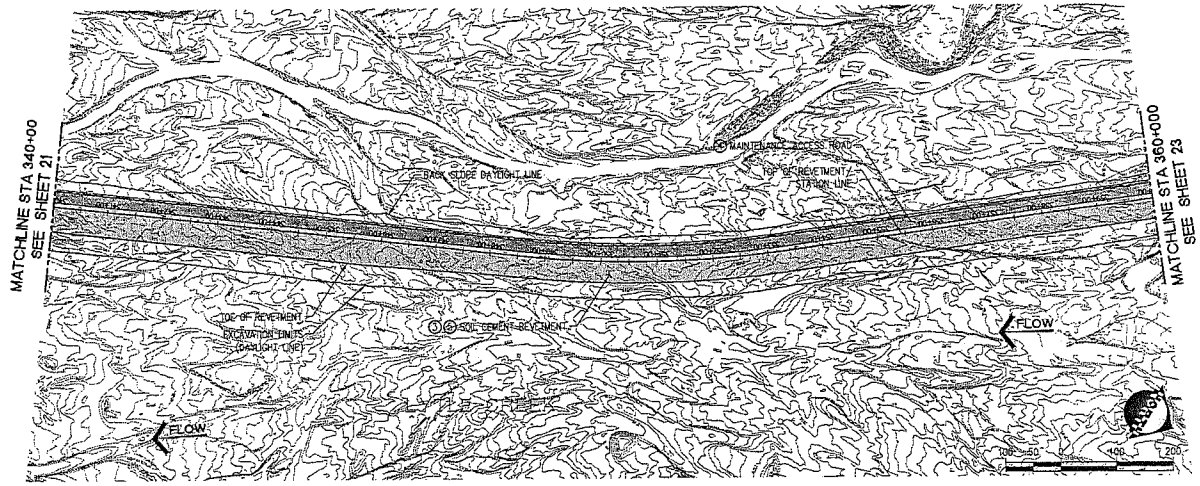




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



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⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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APPROVED BY:
FLOOD CONTROL ENGINEER — DATE

PROJ. ENGR.	DES. BY:	REV'D BY:	DRAWN BY:

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

LYTLE DEVELOPMENT

LYTLE WEST LEVEE

PLAN AND PROFILE
STA 340+00 TO
STA 360+00

DATE	
SCALE	AS SHOWN
FILE NO.	
SHEET NO.	22 OF 24

SHEET 24.

⑤ ALTERNATE CONSTRUCTION OF GROUTED ROCK RIP-RAP REVETMENT (INSTEAD OF CONST. NOTE 3 PER DETAIL ON SHEET 24).

⑥ INSTALL PIPE SCOUR GAUGE PER DETAIL ON SHEET 24

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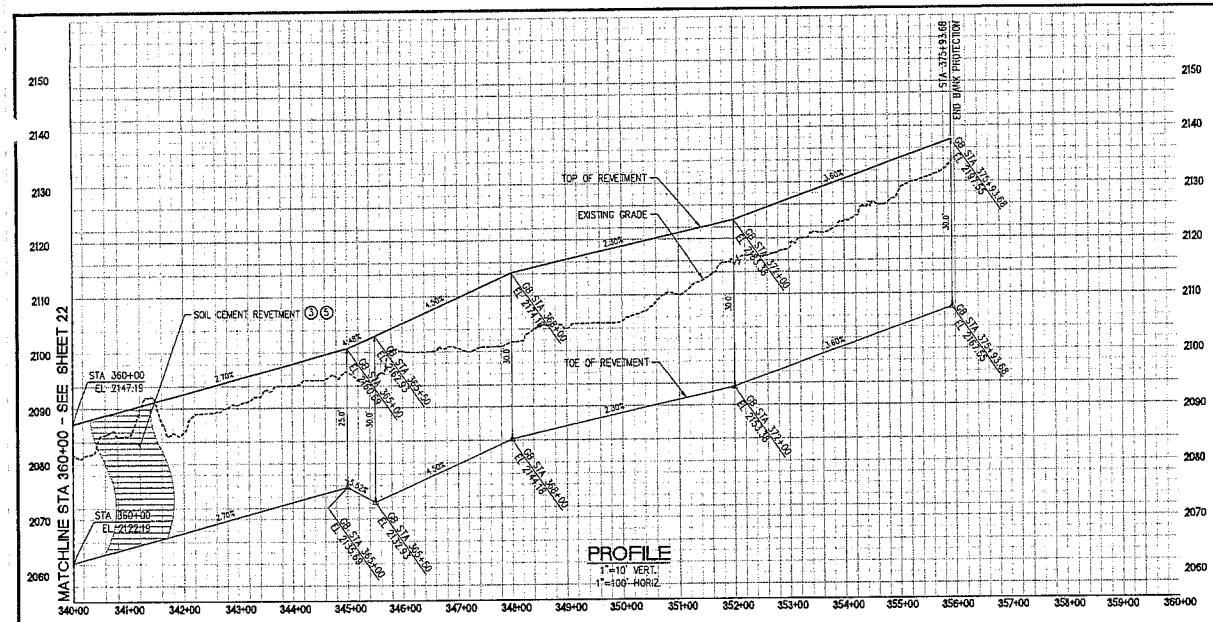
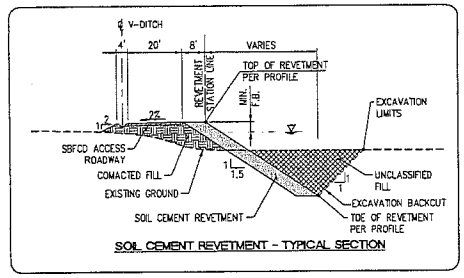
LYTLE WEST LEVEE

PLAN AND PROFILE
STA 300+00 TO
STA 375+93.68 (END)

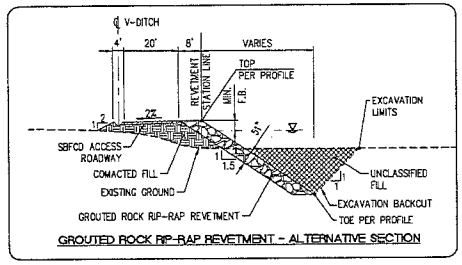
FILE NO.

SHEET NO. 23 OF 24

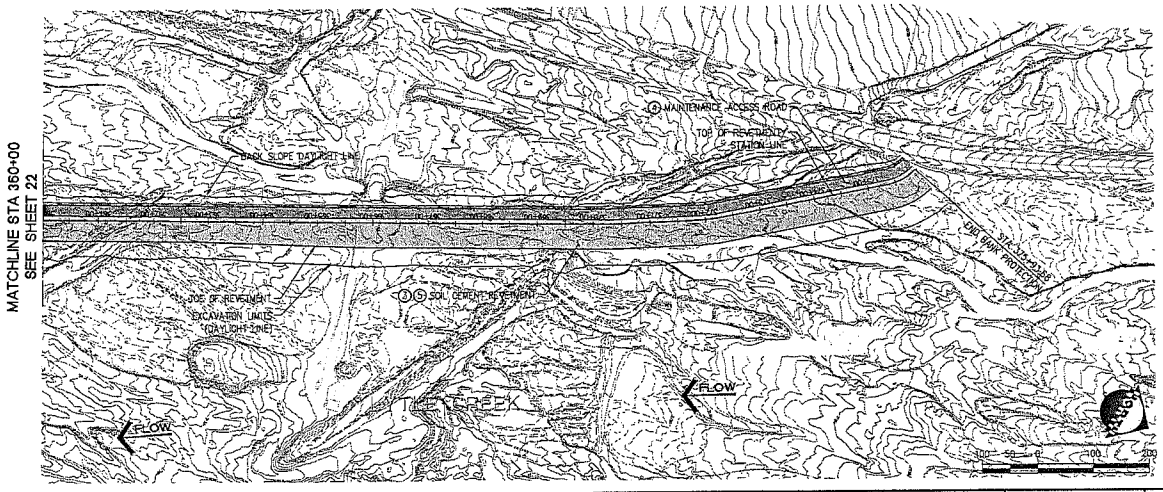




SOIL CEMENT REVETMENT - TYPICAL SECTION



GROUTED ROCK RIP-RAP REVETMENT - ALTERNATIVE SECTION



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④ CONSTRUCT 20' WIDE MAINTENANCE ROAD PER PLAN, PROFILE AND DETAIL ON

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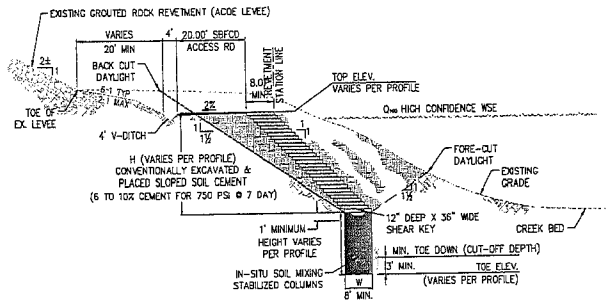
SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

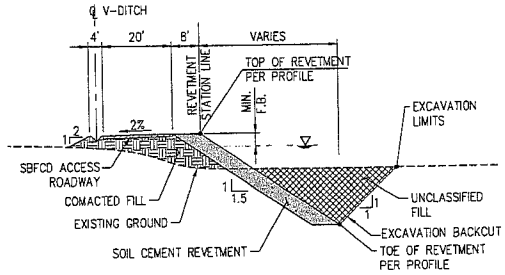
LYTLE DEVELOPMENT

DATE

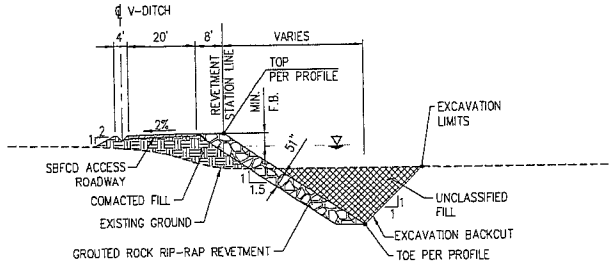
SCALE AS SHOWN



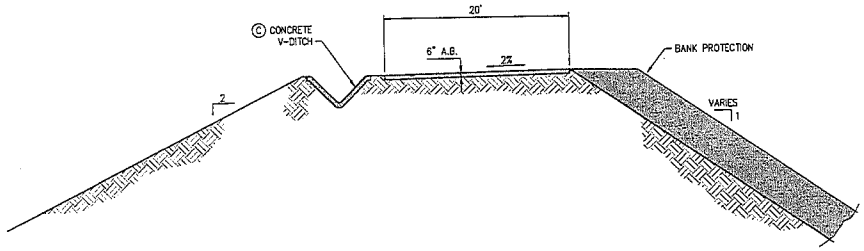
STA 23+00 TO STA 75+50 - SOIL MIXING TYPICAL SECTION | N.T.S. | 2



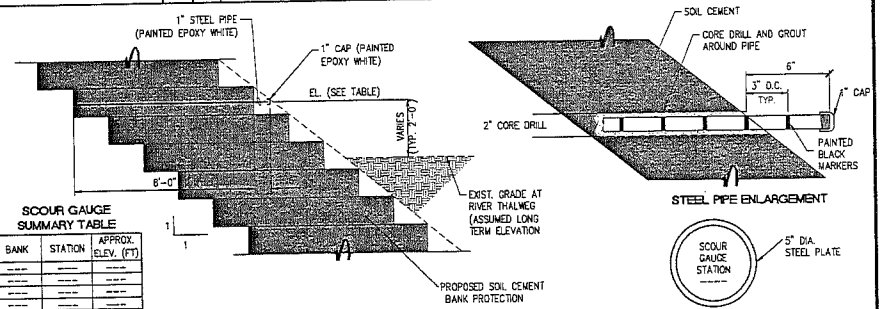
STA 75+50 TO STA 375+94 - SOIL CEMENT TYP. SECTION | N.T.S. | 3



STA 75+50 TO STA 375+94 - ALTERNATE TYP. SECTION | N.T.S. | 5



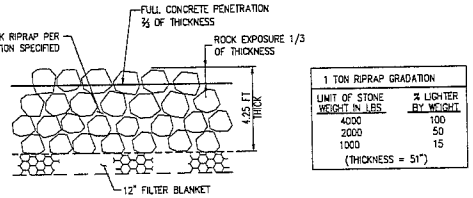
AB MAINTENANCE ROAD DETAIL | N.T.S. | 4



SCOUR GAUGE SUMMARY TABLE

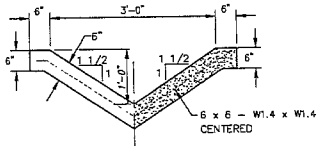
BANK	STATION	APPROX. ELEV. (FT)
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---
---	---	---

PIPE SCOUR GAUGE IN SOIL CEMENT BANK PROTECTION | SCALE: 1" = 2' | 6

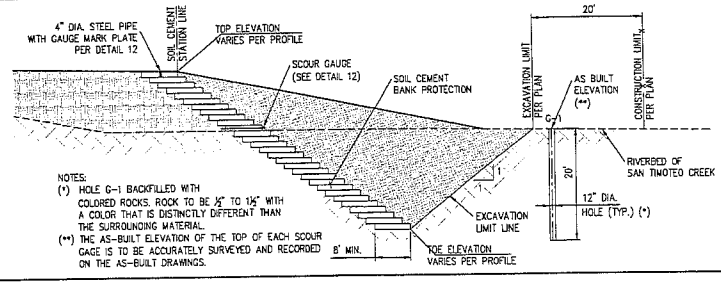


1 TON RIPRAP GRADATION	
LIMIT OF STONE WEIGHT IN LBS.	% LIGHTER BY WEIGHT
4000	100
2000	50
1000	15
(THICKNESS = 51")	

GROUTED ROCK RIP-RAP DETAIL | N.T.S. | A



CONCRETE V-DITCH DETAIL | 1/4"=1' | C



NOTES:
(*) HOLE G-1 BACKFILLED WITH COLORED ROCKS. ROCK TO BE ½" TO 1½" WITH A COLOR THAT IS DISTINCTLY DIFFERENT THAN THE SURROUNDING MATERIAL.
(**) THE AS-BUILT ELEVATION OF THE TOP OF EACH SCOUR GAGE IS TO BE ACCURATELY SURVEYED AND RECORDED ON THE AS-BUILT DRAWINGS.

TYPICAL SECTION AT SCOUR GAGES | NTS | B

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SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT
LYTLE DEVELOPMENT
LYTLE WEST LEVEE
DETAILS

DATE
SCALE AS SHOWN
FILE NO.
SHEET NO. 24 OF 24

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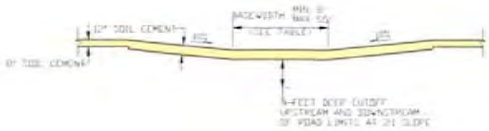
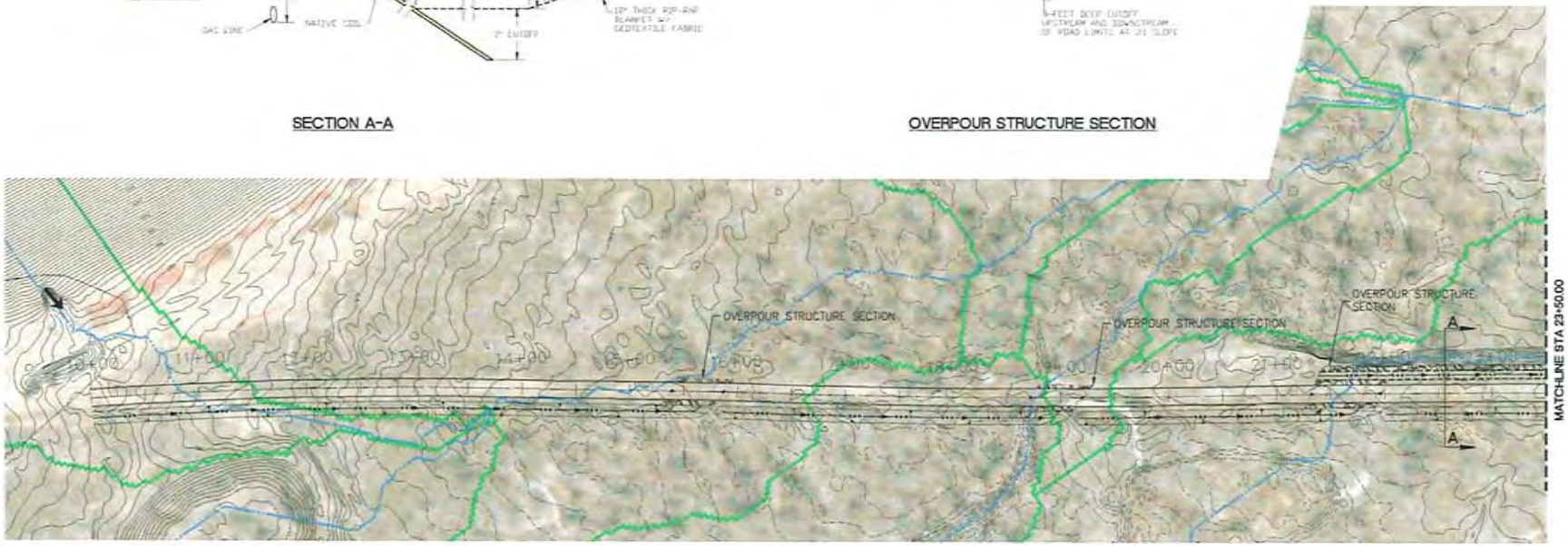
SECTION A-A



OVERPOUR STRUCTURE SECTION



GAS LINE PROTECTION AND DRAINAGE FACILITIES

SYCAMORE CREEK
GAS LINE PROTECTION
AND DRAINAGE
FACILITIES

LYTLE CREEK
RANCH

PACE

SHEET
20

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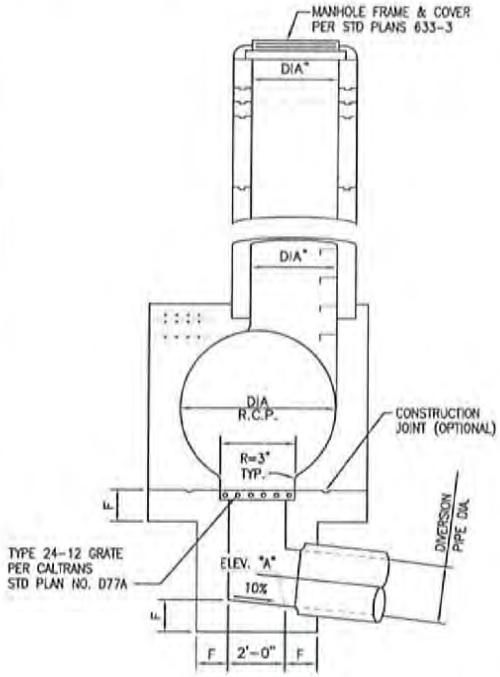

SECTION A-A
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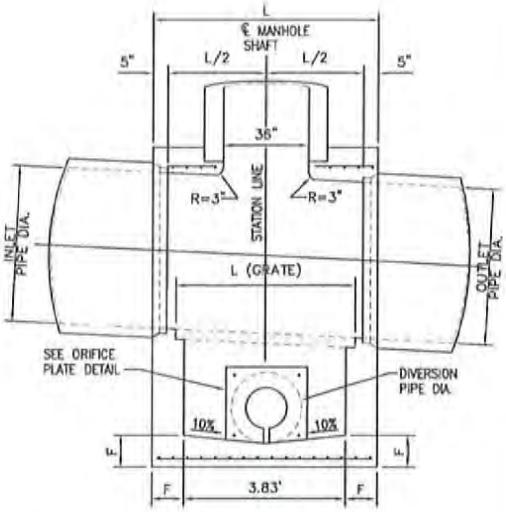
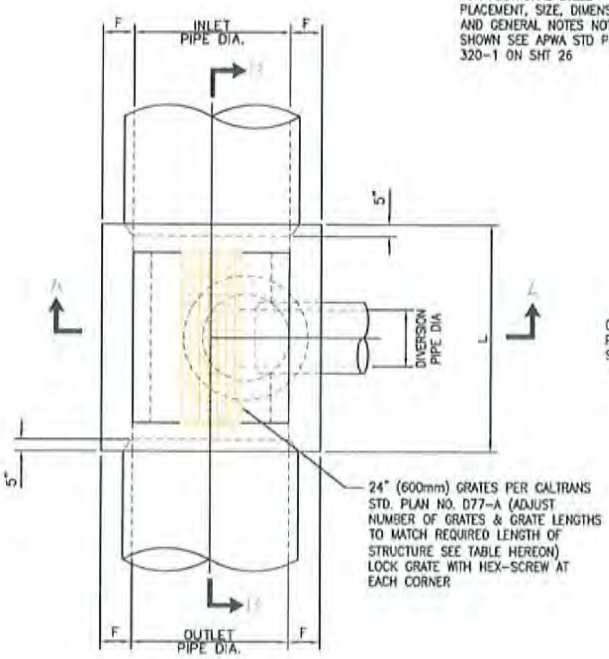
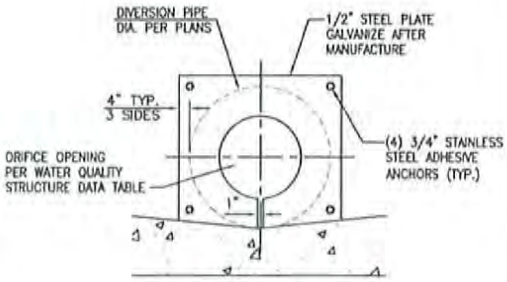


SECTION B-B
NO SCALE

NOTE:
FOR ADDITIONAL STEEL PLACEMENT, SIZE, DIMENSION AND GENERAL NOTES NOT SHOWN SEE APWA STD PLAN 320-1 ON SHT 26



PLAN
NO SCALE

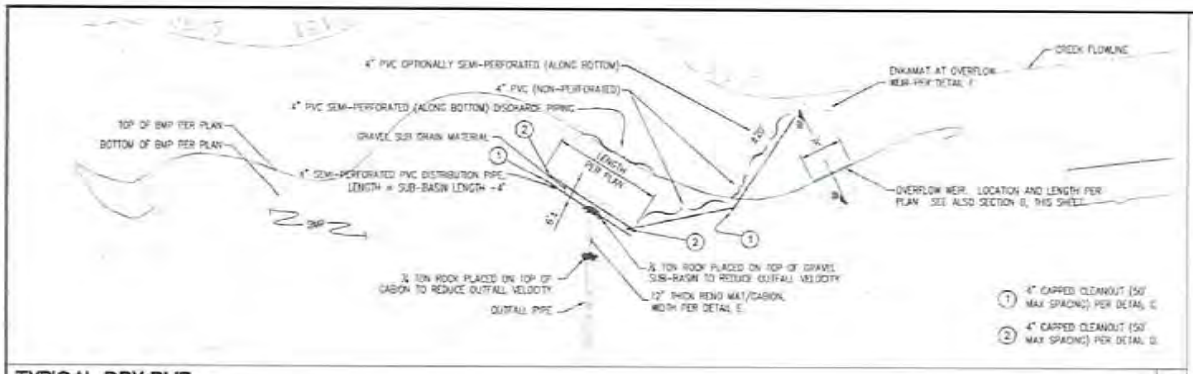


ORIFICE PLATE DETAIL
NO SCALE

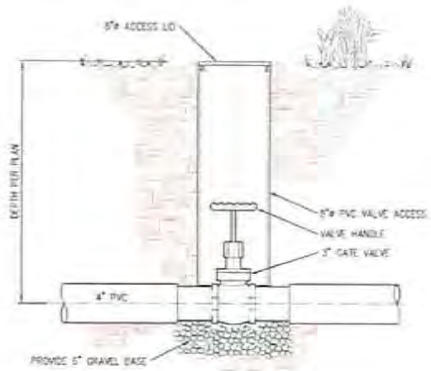
DIVERSION STRUCTURE DETAIL

N.T.S.

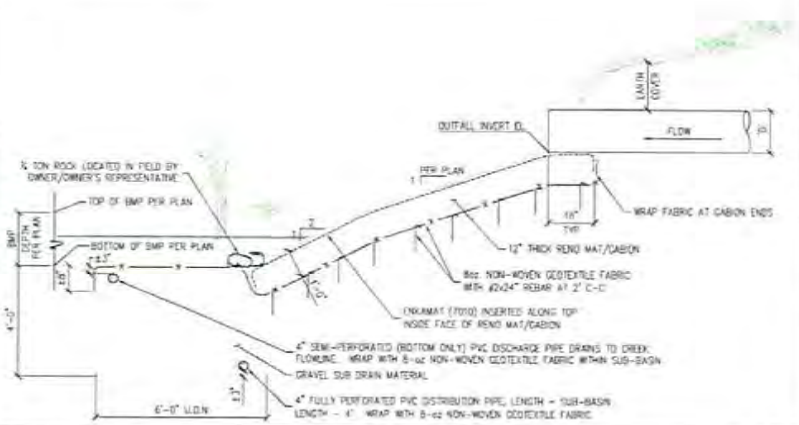
FIGURE				TITLE
21	PACE Advanced Water Engineering	SCALE AS SHOWN DESIGNED S.P. DRAWN L.E. CHECKED J.S. DATE 06/10/2008 JOB NO. 8425-E	JOB LYTLE CREEK RANCH RIALTO CA	TYPICAL DIVERSION STRUCTURE FOR BMP BASINS



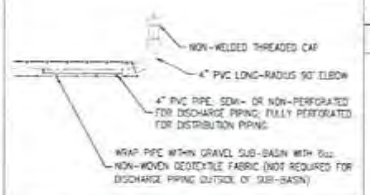
TYPICAL DRY BMP 1"=20' A



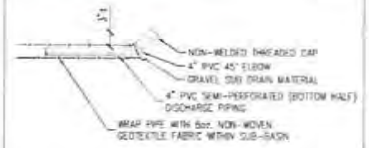
DISCHARGE CLEANOUT VALVE N.T.S. G



TYPICAL DRY BMP SECTION ½"=1' B



TYPICAL CLEANOUT ½"=1' C



NEAR GRADE CLEANOUT ½"=1' D

– N.T.S. H

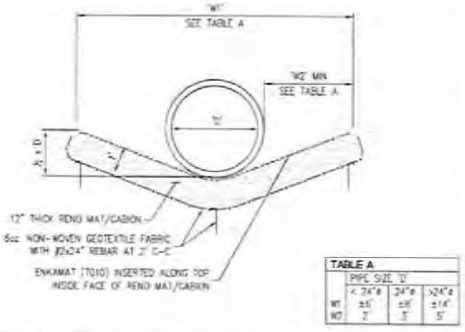
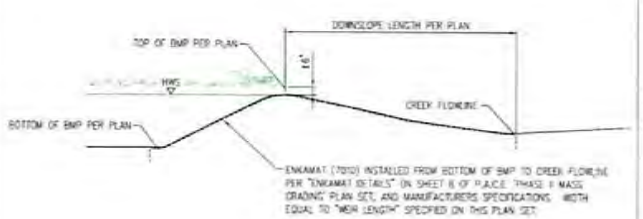


TABLE A	PIPE SIZE "D"		
	< 24"ø	24"ø	>24"ø
W1	±6'	±8'	±14'
W2	2'	3'	5'

ELEVATION THROUGH RENO MAT ½"=1' E



TYPICAL OVERFLOW WEIR ½"=1' F

– N.T.S. H

NO.	BY	DATE	REVISIONS	DATE APP.
1				
2				
3				
4				
5				

SCALE AS SHOWN
DESIGNED
DRAWN
CHECKED
DATE
JOB NO.

DRY WATER QUALITY BASIN TYPICAL DETAIL

LYTLE CREEK RANCH

SIGNATURE

PACE

EXHIBIT 22

JOB NO. 8425-E

CONSTRUCTION PLANS FOR IMPROVEMENTS OF OFFSITE DRAINAGE FACILITIES FOR GLEN HELEN PARKWAY

FEBRUARY 2006

NOTICE TO CONTRACTOR

ALL UNDERGROUND UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR OTHERS, AND THOSE SHOWN ON THE RECORDS EXAMINED, ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE OWNER, BY ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERETO, AGREES TO ASSUME LIABILITY AND TO HOLD UNDERSIGNED HARMLESS FOR ANY DAMAGES RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED TO THE UNDERSIGNED, NOT INDICATED ON THE PUBLIC RECORDS EXAMINED, LOCATED AT VARIANCE WITH THOSE REPORTED OR SHOWN ON RECORDS EXAMINED. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHER UTILITIES OR STRUCTURES FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK.

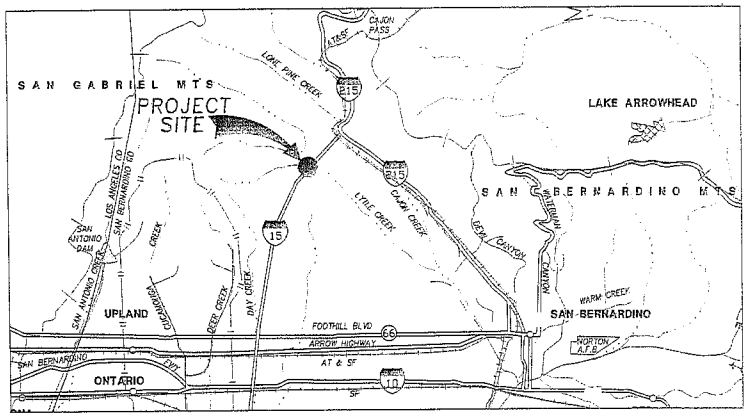
THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THIS PLAN ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS.

ALL CONTRACTORS AND SUBCONTRACTORS PERFORMING WORK SHOWN ON OR RELATED TO THESE PLANS SHALL CONDUCT THEIR OPERATIONS SO THAT ALL EMPLOYEES ARE PROVIDED A SAFE PLACE TO WORK AND THE PUBLIC IS PROTECTED. ALL CONTRACTORS AND SUBCONTRACTORS SHALL COMPLY WITH THE "OCCUPATIONAL SAFETY AND HEALTH REGULATIONS" OF THE U.S. DEPARTMENT OF LABOR, AND WITH THE STATE OF CALIFORNIA DEPARTMENT OF INDUSTRIAL RELATIONS' "CONSTRUCTION SAFETY ORDERS."

THE ENGINEER SHALL NOT BE RESPONSIBLE IN ANY WAY FOR THE CONTRACTORS' AND SUBCONTRACTORS' COMPLIANCE WITH THE "OCCUPATIONAL SAFETY AND HEALTH REGULATIONS" OF THE U.S. DEPARTMENT OF LABOR OR WITH THE STATE OF CALIFORNIA DEPARTMENT OF INDUSTRIAL RELATIONS' "CONSTRUCTION SAFETY ORDERS."

CONTRACTOR FURTHER AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY, THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER, THE COUNTY, AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

THE ESTIMATED QUANTITIES HEREON ARE ONLY FOR THE PURPOSE OF OBTAINING THE NECESSARY PERMITS.
THE ACCURACY OF THE ESTIMATED QUANTITIES CANNOT BE GUARANTEED. THE CONTRACTOR SHALL PERFORM HIS OWN QUANTITY ESTIMATES BEFORE SUBMITTING A BID FOR ANY PORTION OF THE IMPROVEMENTS COVERED BY THESE PLANS.



VICINITY MAP

DESCRIPTION	SHEET NO.
TITLE SHEET	1
INDEX SHEET, NOTES AND QUANTITIES	2
INDEX SHEET & SLOPE PROTECTION NOTES	3
PLAN AND PROFILE – CULVERTS "1" AND "2"	4
PLAN AND PROFILE – CULVERTS "3" AND "4"	5
MISCELLANEOUS DETAILS	6
SLOPE PROTECTION	7
INDEX SHEET 2	8
PLAN AND PROFILE LINE 4 STA 10+00.00 TO STA 18+00.00 LAT "4-B"	9
PLAN AND PROFILE LINE 4 STA 18+00.00 TO STA 24+41.52 LAT "4-C" & LAT "4-D"	10
PLAN AND PROFLE LINE 5 STA 10+00.00 TO STA 16+00.00 LAT "5-B", LAT "5-C", & LAT "5-D"	11
PLAN AND PROFILE LINE 5 STA 16+00.00 TO STA 22+78.28 LAT "5-E" & LAT "5-F"	12
PLAN AND PROFILE LINE 4-A STA 9+57.58 TO STA 16+00.00 LAT "5-A" & LAT "F-4"	13
PLAN AND PROFILE LINE 4-A STA 16+00.00 TO STA 20+37.74 LAT "R-1", LAT "R-2", & LAT "R-3"	14
PLAN AND PROFILE – CULVERT "G"	15
PLAN AND PROFILE – CULVERT "I"	16
PLAN – WATER QUALITY GRADING PLAN	17
BASIN 4 WATER QUALITY VEGETATION PLAN	18
PLAN AND PROFILE – STA 10+00 TO STA 10+54.16 BASIN 4 OUTLET PIPE	19
DRAINAGE DETAILS	20
BASIN 4 DETAILS	21
PROFILE AND DETAILS – BASIN 4	22
PLAN AND PROFILE CULVERT "H" STA 10+00 TO STA 11+55.00 LAT "H-1" & LAT "H-2"	23
INDEX SHEET 3	24
PLAN AND PROFILE – CULVERT "F-2" STA 10+00 TO STA 15+40.77 12' X 8' CONC. CHANNEL & DETAILS	25
PLAN AND PROFILE LINE F – STA 15+40.77 TO STA 21+97.71 LAT "F-3"	26
PLAN AND PROFILE – STA 21+97.71 TO STA 32+54.68	27
PLAN AND PROFILE – STA 32+54.68 TO STA 41+38.28	28
RETAINING WALL SECTIONS AND DETAILS LAT "F-5"	29

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

CONSTRUCTION BENCHMARK
042-88 (Rialto)
LOCATION:
CITY OF RIALTO BRASS DISC SET IN TOP OF SOUTHERLY CURB OF RIVERSIDE AVENUE, 22-11 SOUTH OF CENTERLINE OF RIVERSIDE AVENUE, 0.25 MILES EAST OF CENTERLINE OF SIERRA AVENUE, 0.1 MILES NORTH OF CENTERLINE OF TERRY MESA DRIVE
ELEVATION: 1924.262 (04/01/89)

BENCHMARK 036-88 (Rialto)
LOCATION:
CITY OF RIALTO TO BRASS DISC SET IN PGE BASE FOR STREET LIGHT NO. 2162897E 17-11, SOUTH OF CENTERLINE OF RIVERSIDE CUTTER HIGHWAY, 66-11 WEST OF CENTERLINE CACTUS AVENUE
ELEVATION: 1490.698 (04/01/89)

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PLANNING • DESIGN • CONSTRUCTION
14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 • FAX 949.472.8373 • www.RBF.com
THOMAS J. RYAN
DATE 2-16-06
REG. NO. C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER
THOMAS J. RYAN
No. C61701
Exp. 6-30-07
CIVIL
STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS
DESIGNED BY: TJR DRAWN BY: BC CHECKED BY: TJR
APPROVED BY:
SUBMITTED BY:
RECOMMENDED APPROVAL BY:
LAND DEVELOPMENT ENGINEER DATE 2-1-06
ASST DIRECTOR OF PUBLIC WORKS DATE
DIRECTOR OF PUBLIC WORKS DATE

DRAINAGE IMPROVEMENT PLANS
LYTLE CREEK DEVELOPMENT
TRACT NO. 16900
TITLE SHEET

SHEET 1 OF 29
FILE NO.

H:\PLATA\10\0515\CADD\STORMWATER\OFF-SITE\OLV\GH-SHEET01.DWG TJR 2/16/06 10:13 am

GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THIS PLAN AND THE SAN BERNARDINO COUNTY STANDARDS AND SPECIFICATIONS, THE APWA STANDARD PLANS, AND THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION", GREEN BOOK, LATEST EDITION.

2. A PERMIT FROM THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS WILL BE REQUIRED PRIOR TO ANY ENCROACHMENT, CONSTRUCTION OR EXCAVATION WITHIN THE COUNTY RIGHTS-OF-WAY OR EASEMENTS

3. ALL PIPELINES OR SUBSTRUCTURES OF ANY KIND, TELEPHONE OR POWER POLES, WATER METERS, VALVES, HYDRANTS, ETC., SHOWN OR NOT SHOWN ON THESE PLANS WITHIN THE LIMITS OF THIS DEVELOPMENT OR IN ADJACENT AREAS WHERE IMPROVEMENT WORK IS TO BE DONE SHALL BE REMOVED OR RELOCATED AT DEVELOPERS EXPENSE AND AT NO COST TO THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS. IT SHALL BE THE OWNER'S RESPONSIBILITY TO NOTIFY ALL AGENCIES CONCERNED.

4. IMMEDIATELY FOLLOWING REMOVAL OF EXISTING PAVEMENT, DIKES, CURBS AND/OR CURB AND GUTTER THE CONTRACTOR SHALL DILIGENTLY PURSUE THIS PORTION OF WORK UNTIL COMPLETION.

5. EXISTING COUNTY ROADS WHICH WILL REQUIRE RECONSTRUCTION SHALL REMAIN OPEN FOR TRAFFIC AT ALL TIMES WITH ADEQUATE DETOURS DURING ACTUAL CONSTRUCTION.

6. IF ASPHALT CONCRETE IS TO BE PLACED DIRECTLY ON SUB-GRADE OF ROAD OR DRAINAGE FACILITIES, A SOIL STERILANT REGISTERED BY THE E.P.A. FOR USE UNDER AC AND PCC SHALL BE UNIFORMLY APPLIED AT THE MANUFACTURER'S RECOMMENDED RATE FOR THE FULL PAVEMENT WIDTH PRIOR TO PAVING.

7. AT THE COMPLETION OF ROUGH GRADING, A MATERIALS REPORT AND THE PROPOSED STRUCTURAL SECTIONS SHALL BE SUBMITTED BY THE ENGINEER TO THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS, FIELD ENGINEERING DIVISION, DEPARTMENT OF PUBLIC WORKS PERMITS SECTION, FOR REVIEW AND EVALUATION BY THE PAVEMENT MANAGEMENT SECTION. THE SUBMITTAL SHALL INCLUDE A PLAN SHOWING THE LOCATION OF SAMPLING, A TABULATION SIEVE ANALYSIS AND SAND EQUIVALENT TEST RESULTS, A STATEMENT OF RECOMMENDED STRUCTURAL SECTION AND TEST DATA SHEETS FOR ALL R-VALUE TESTS PERFORMED, INCLUDING EXPANSION PRESSURE READINGS. APPROVAL WILL BE GIVEN WHEN ALL STRUCTURAL SECTION REQUIREMENTS HAVE BEEN MET.

8. COMPACTION TESTS OF EMBANKMENT CONSTRUCTION, TRENCH BACKFILL COMPACTING ORIGINAL GROUND, ALL SUB-GRADES SHALL BE PERFORMED AT NO COST TO SAN BERNARDINO COUNTY. A WRITTEN REPORT WITH THESE COMPACTION TESTS SHALL BE SUBMITTED TO THE SAN BERNARDINO COUNTY. A WRITTEN REPORT WITH THESE COMPACTION TESTS SHALL BE SUBMITTED TO THE SAN BERNARDINO COUNTY PUBLIC WORKS DEPARTMENT, FIELD ENGINEERING DIVISION, PUBLIC WORKS PERMIT SECTION, FOR APPROVAL PRIOR TO PLACEMENT OF BASE MATERIALS AND/OR SURFACING.

9. SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS APPROVAL DOES OT INCLUDE WATER OF SEWER SYSTEM OR ESTIMATE OF QUANTITIES.

10. THE PRIVATE ENGINEER IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE WORK HEREON. IN THE EVENT OF DISCREPANCIES ARISING DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISE THE PLAN FOR APPROVAL BY THE COUNTY OF SAN BERNARDINO.

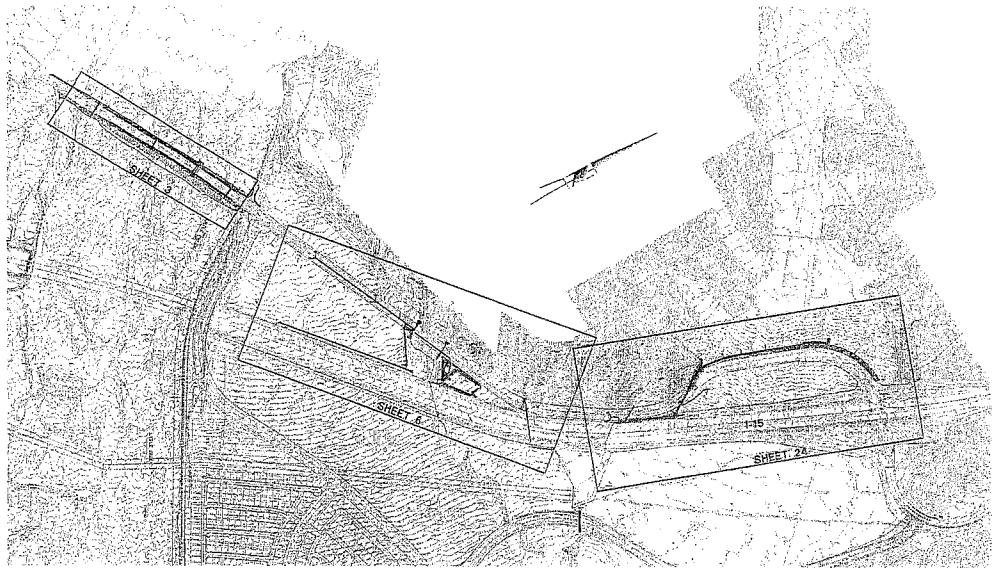
11. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ENGINEER PRIOR TO ANY STREET REMOVAL OPERATIONS BY THE CONTRACTOR SO THAT THE ENGINEER MAY TIE OUT EXISTING MONUMENTS.

12. A PERMIT SHALL BE OBTAINED FROM THE SAN BERNARDINO COUNTY DEPARTMENT OF PUBLIC WORKS PRIOR TO ANY CONSTRUCTION ON THIS PROJECT.

13. THE CONTRACTOR SHALL CALL IN A LOCATION REQUEST TO UNDERGROUND SERVICE ALERT (USA), PHONE NUMBER 1-800-227-2600, TWO (2) WORKING DAYS BEFORE DIGGING MINIMUM.

14. SURVEY MONUMENTS SHALL BE PRESERVED AND REFERENCED BEFORE CONSTRUCTION AND REPLACED AFTER CONSTRUCTION PERSUANT TO SECTION 8771 OF THE BUSINESS AND PROFESSIONS CODE.

15. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL PROJDECT REQUIRED CONSTRUCTION SURVEY CONTROL AND STAGING.



SHEET INDEX
SCALE: 1"=600'

CONSTRUCTION NOTES & QUANTITIES

NO.	DESCRIPTION	UNIT	QUANTITY
	STORM DRAIN IMPROVEMENT NOTES		
10	CONSTRUCT RC CUTOFF WALL PER PLAN AND DETAILS ON SHEET 7.	CY	1,490
11	INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)	LF	3,140
12	INSTALL 30" RCP STORM DRAIN (D-LOAD PER PROFILE)	LF	600
13	INSTALL 36" RCP STORM DRAIN (D-LOAD PER PROFILE)	LF	1,297
15	INSTALL 48" RCP STORM DRAIN (D-LOAD PER PROFILE)	LF	280
16	INSTALL 72" RCP STORM DRAIN (D-LOAD PER PROFILE)	LF	140
17	CONSTRUCT GROUTED RIPRAP PER PLAN, PROFILE, AND DETAIL ON SHEET 15.	CY	285
18	CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAIL ON SHEET 15.	CY	1,190
19	CONSTRUCT TYPE "A" CATCH BASIN PER SBCTD STD DWG 206 ("V" AND "L" PER PLAN).	EA	10
20	CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 320-1.	EA	4
21	CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 321-1.	EA	7
22	CONSTRUCT BOX CULVERT WARPED WINGWALLS PER CALTRANS STD. PLAN D86A	CY	60
23	CONSTRUCT DIVERSION MANHOLE PER DETAIL "23" ON SHEET 20.	EA	3
24	CONSTRUCT HEADWALL WWA TYPE PER SBCTD STD 205.	EA	5
25	CONSTRUCT BRICK AND MORTAR PLUG PER DETAIL ON SHEET 21.	EA	7
26	CONSTRUCT GROUTED RIPRAP TRAPEZOIDAL CHANNEL PER PLAN AND DETAIL 17 ON SHEET 15.	CY	1,260
27	CONSTRUCT PIPE CULVERT HEADWALL, ENDWALL, AND WARPED WINGWALL PER CALTRANS STD PLAN D86B	EA	4
28	CONSTRUCT 12'X5' BOX CULVERT PER CALTRANS STD PLAN D80.	CY	130
31	CONSTRUCT CONCRETED ROCK RIPRAP BANK PROTECTION PER DETAILS ON SHEET 3 AND 6.	CY	25,222
32	CONSTRUCT JUNCTION STRUCTURE PIPE TO PIPE PER APWA STD PLAN 332-1	EA	1
33	CONSTRUCT INTAKE STRUCTURE, GATE, STEM, AND OPERATOR PEDESTAL PER DETAILS ON SHEET 19.	EA	1
34	CONSTRUCT 6'X12' BOX CULVERT PER CALTRANS STD PLAN D80.	CY	350
35	CONSTRUCT BASIN OUTLET STRUCTURE PER PLAN, PROFILE, AND DETAILS ON SHEET 19.	EA	1
36	CONSTRUCT RC SPILLWAY PER PLAN AND DETAIL ON SHEET 20.	CY	70
38	CONSTRUCT RC RETAINING WALL TYPE 1 PER CALTRANS STD. PLAN B3-1 & DETAILS ON SHT 28.	CY	306
39	CONSTRUCT LOOSE RIPRAP CHECK DAM PER PLAN, SECTION A-A, AND DETAIL 18 ON SHEET 28.	CY	360
40	CONSTRUCT DBL 20'w x13'h HYDRO ARCH CULVERT (OR APPROVED EQUAL) PER PLAN, PROFILE, AND DETAILS ON SHEET 6.	EA	1
41	CONSTRUCT HEADWALL PER PLAN AND DETAIL ON SHEET 6	EA	5
42	INSTALL LAYFIELD PVC 30 GEOMEMBRANE LINER OR APPROVED EQUAL	SF	12,000
43	INSTALL MACCAFERRI GABION STRUCTURES (OR APPROVED EQUAL) PER PLAN AND DETAIL ON SHEET 22.	CY	20
44	EXCAVATE BASIN PER PLAN AND PROFILE	CY	21,000
45	INSTALL GRAVEL BEDDING PER PLAN AND DETAIL ON SHEET 22.	CY	10
46	CONSTRUCT EARTHEN BERM PER PLAN AND PROFILE ON SHEET 27.	CY	12,940
47	APPLY HYDROSEED PER PLAN AND DETAILS ON SHEET 18.	SF	3,820
48	CONSTRUCT JOINT PER DETAILS ON SHEET 29.	EA	1
49	CONSTRUCT JUNCTION STRUCTURE PIPE TO RCB PER APWA STD. PLAN 333-1	EA	4
50	CONSTRUCT 6" THICK AGGREGATE BASE	SF	28,100
51	CONSTRUCT RC REMOVABLE TOP BOX CULVERT PER DETAILS ON SHEET 6.	CY	735
52	INSTALL CABLE RAILING PER CALTRANS STD. PLAN B11-51 & DETAILS ON SHEET 5	LF	290
53	INSTALL METAL BEAM GUARD RAILING PER CALTRANS STD. PLAN A77A & DETAILS ON SHEET 6.	LF	14

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THOMAS J. RYAN — DATE 2-16-06
RCE NO. C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — C61701 — 9-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE
		REVISIONS		

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR | DRAWN BY: EC | CHECKED BY: TJR | APPROVED BY:
SUBMITTED BY: | RECOMMENDED/APPROVED BY: | ASST DIRECTOR OF PUBLIC WORKS — DATE
LAND DEVELOPMENT ENGINEER — DATE | DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
INDEX SHEET
NOTES AND QUANTITIES
LYTLE CREEK DEVELOPMENT

SHEET 2 OF 29
PLAN NO.

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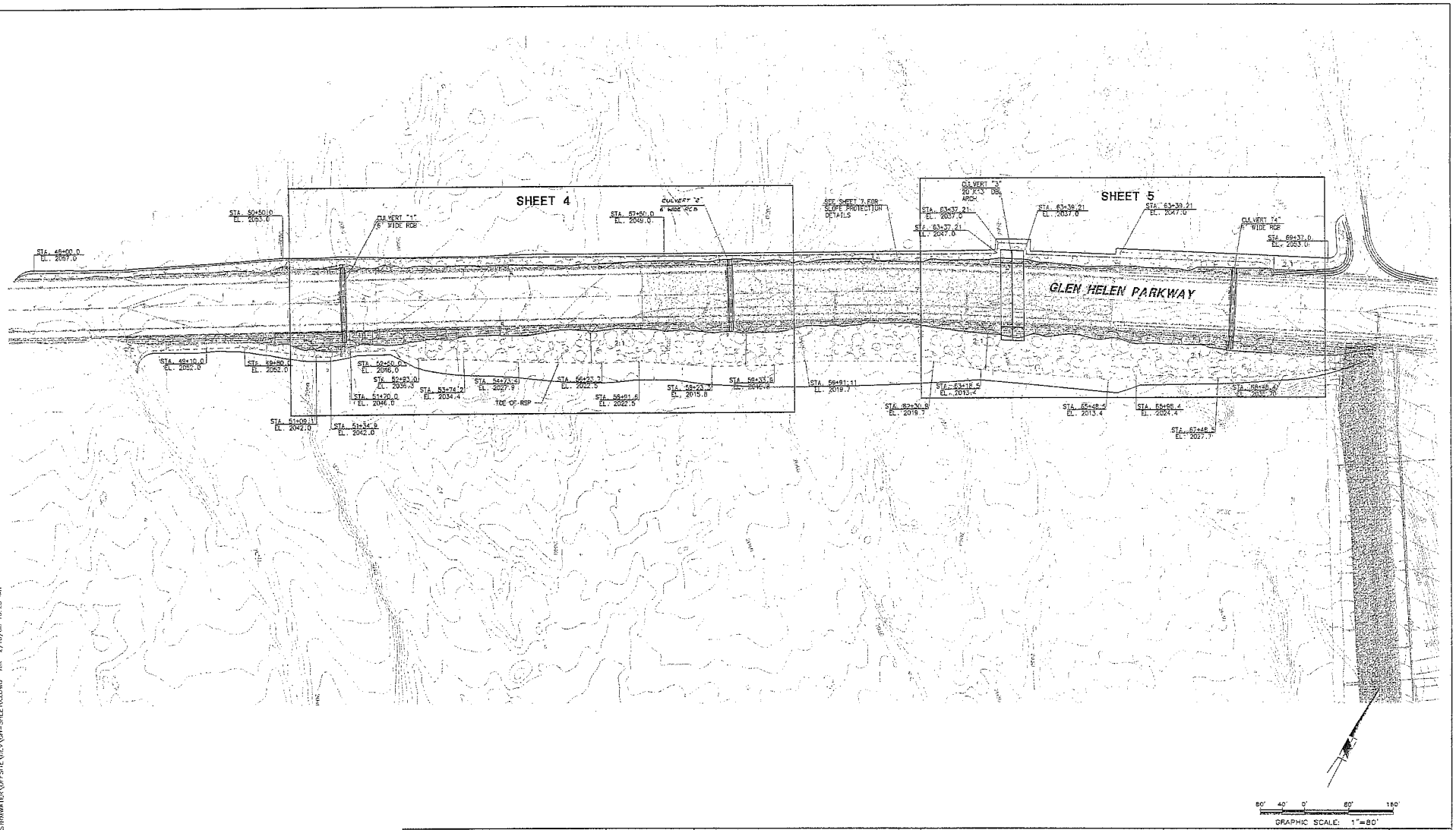

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DATE	BY	DESCRIPTION	APP'D	DATE

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COUNTY OF SAN BERNARDIND
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: EC — CHECKED BY: TJR

APPROVED BY:

SUBMITTED BY: — DATE
RECOMMENDED/APPROVED BY: — DATE 2-1-06
LAND DEVELOPMENT ENGINEER — DATE

ADM. DIRECTOR OF PUBLIC WORKS — DATE
DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY

SHEET INDEX & SLOPE PROTECTION NOTES

LYTLE CREEK DEVELOPMENT

SHEET 3 OF 29

FILE NO.

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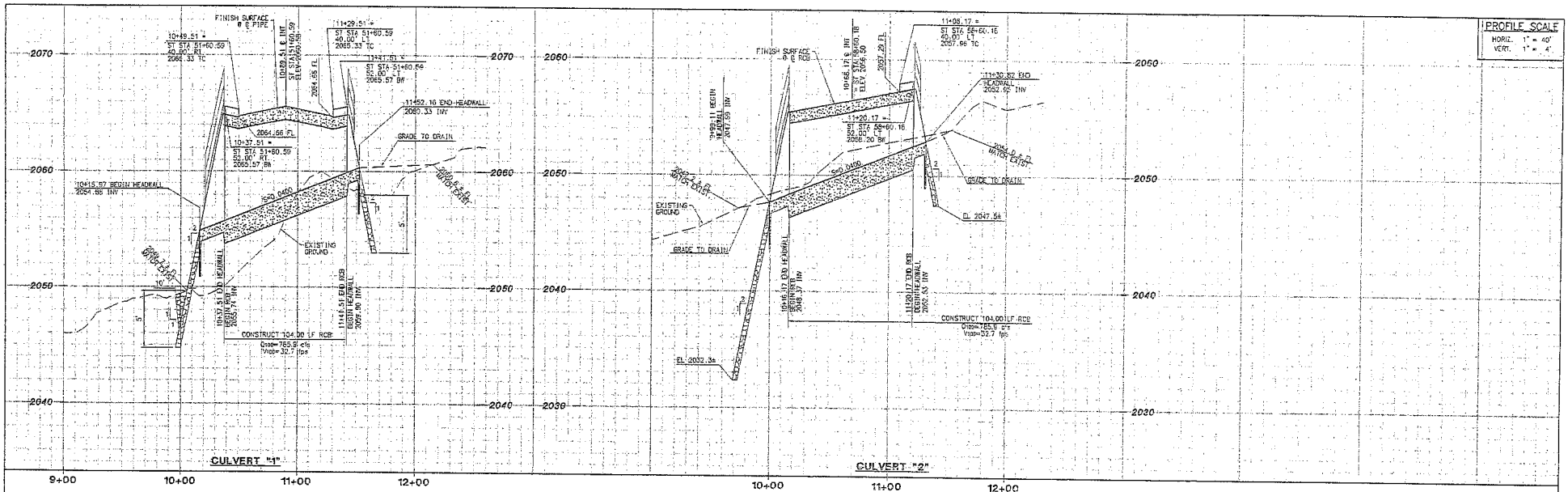
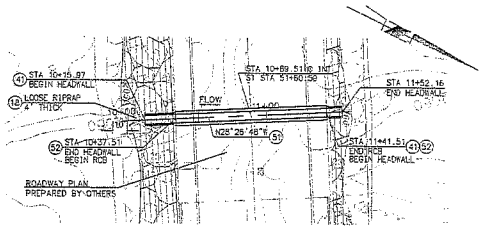
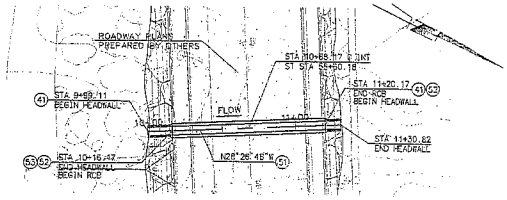
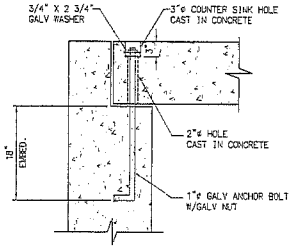




CULVERT "1"



CULVERT "2"



A/4 END SLAB TIE DOWN BOLD DETAIL

NTS

CONSTRUCTION NOTES

17 — CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAIL ON SHEET 15.

41 — CONSTRUCT HEADWALL PER PLAN AND DETAIL ON SHEET 6.

51 — CONSTRUCT RC REMOVABLE TOP BOX CULVERT PER DETAILS ON SHEET 6.

52 — INSTALL CABLE RAILING PER CALTRANS STD. PLAN B11-51 & DETAILS ON SHEET 5.

53 — INSTALL METAL BEAM RAILING PER CALTRANS STD. PLAN A77A & DETAILS ON SHEET 6.

20' 10' 0' 20' 40'

GRAPHIC SCALE: 1"=20'

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THOMAS J. RYAN
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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR | DRAWN BY: EC | CHECKED BY: TJR

APPROVED BY:

SUBMITTED BY: CRC
RECOMMENDED APPROVAL: 3-1-01
LAND DEVELOPMENT ENGINEER — DATE

ASST DIRECTOR OF PUBLIC WORKS — DATE

DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS

GLEN HELEN PARKWAY

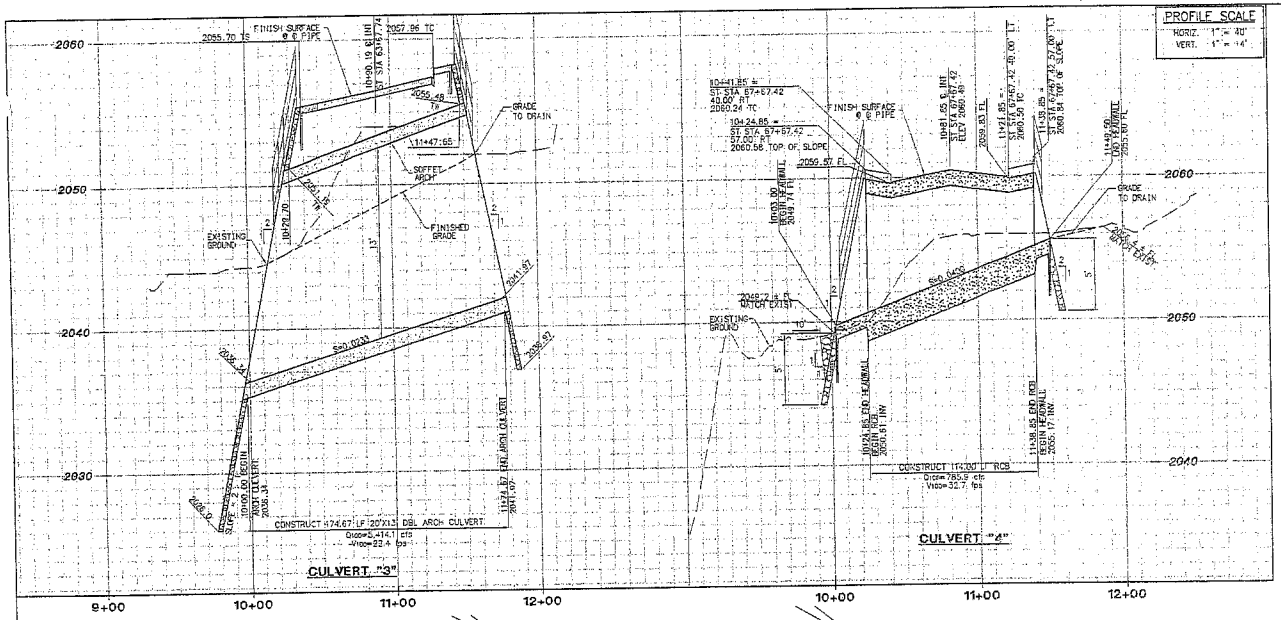
PLAN AND PROFILE
CULVERTS "1" AND "2"

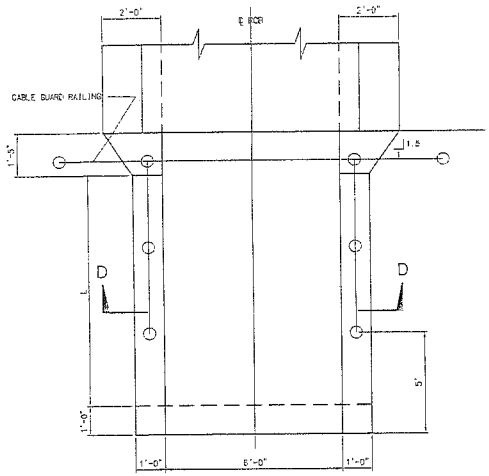
SHEET 4 OF 29

FCD NO.

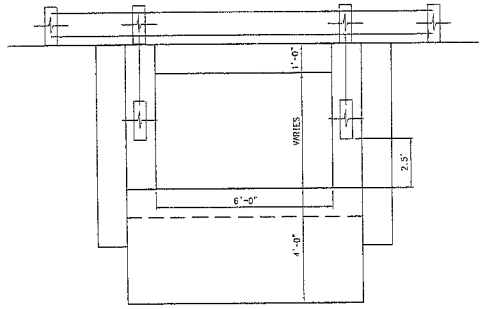
LYTLE CREEK REFLECTIVELY

P:\PDATA\1010.3515\CADD\STORMWATER\OFFSITE\DLV\G4-SHEET04.DWG TJR 2/16/06 10:30 am



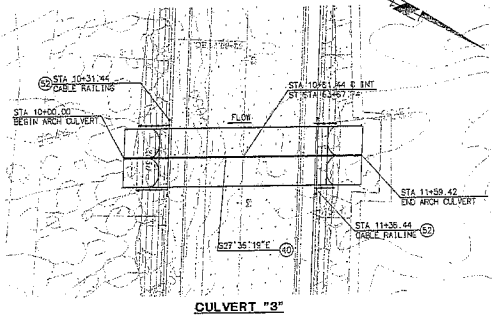


PLAN VIEW
NTS

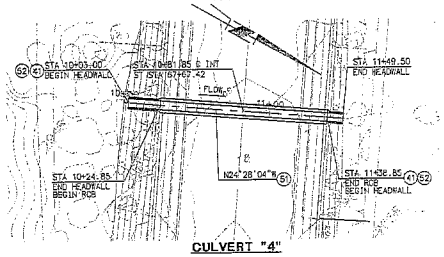


ELEVATION VIEW
NTS

41 HEADWALL



CULVERT "3"



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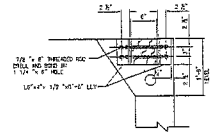
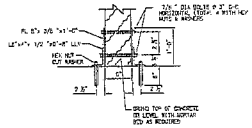
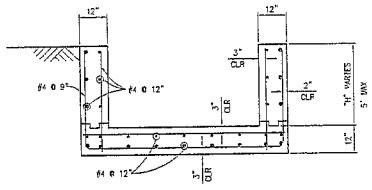


PLAN VIEW
NTS

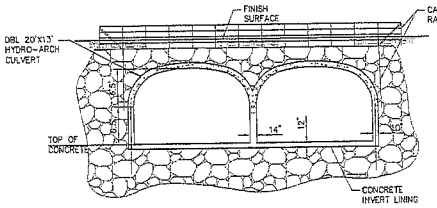


ELEVATION VIEW
NTS

C/5 GUARD RAIL POST ANCHORE DETAILS
CULVERT 2 ONLY



SECTION D-D
N.T.S.



CULVERT "3"
TYPICAL SECTION
N.T.S.

GRAPHIC SCALE: 1"=40'

CONSTRUCTION NOTES

40 — CONSTRUCT DBL 20'w x13'h HYDRO ARCH CULVERT (OR APPROVED EQUAL) PER PLAN, PROFILE, AND DETAILS ON SHEET 6.

41 — CONSTRUCT HEADWALL PER PLAN AND DETAILS ON SHEET 6 & HERON.

51 — CONSTRUCT RC REMOVABLE TOP BOX CULVERT PER DETAILS ON SHEET 6.

52 — INSTALL CABLE RAILING PER CALTRANS STD. PLAN B11-51 & DETAILS ON SHEET 5.

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THOMAS J. RYAN — DATE 2-16-06
RCE NO. C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — No. C61701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR | DRAWN BY: EC | CHECKED BY: TJR

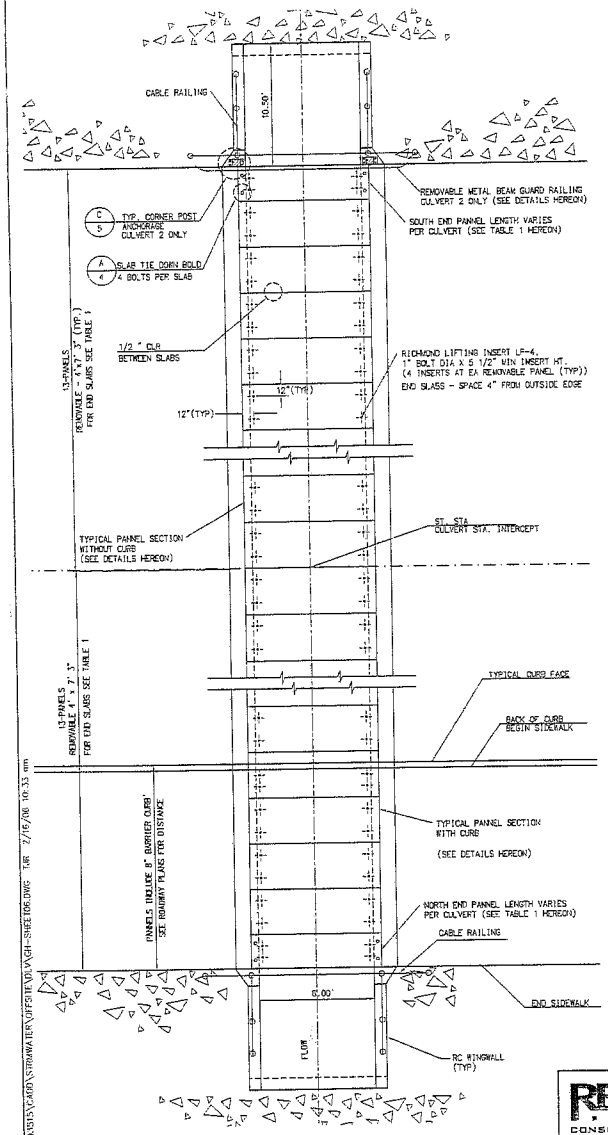
APPROVED BY: ASST DIRECTOR OF PUBLIC WORKS — DATE

SUBMITTED BY: C.O.S.
RECOMMENDED FOR APPROVAL: 2-1-06
LAND DEVELOPMENT ENGINEER — DATE

DIRECTOR OF PUBLIC WORKS — DATE

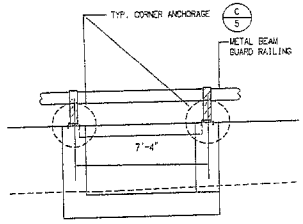
CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
CULVERTS "3", AND "4"
LYTLE CREEK DEVELOPMENT

SHEET 5 OF 29



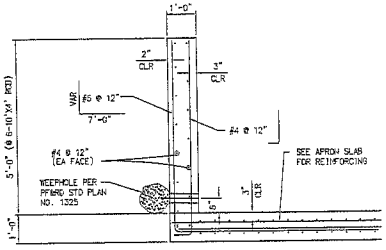
REMOVABLE TOP CULVERT PLAN

SCALE: 1"=5'



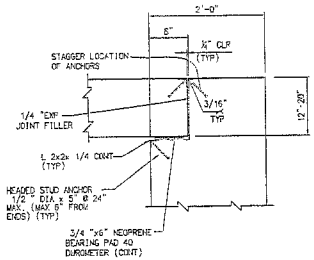
RCB ELEVATION REMOVABLE GUARD RAILING

NTS



SECTION A-A

SCALE: 1"=2'-0"

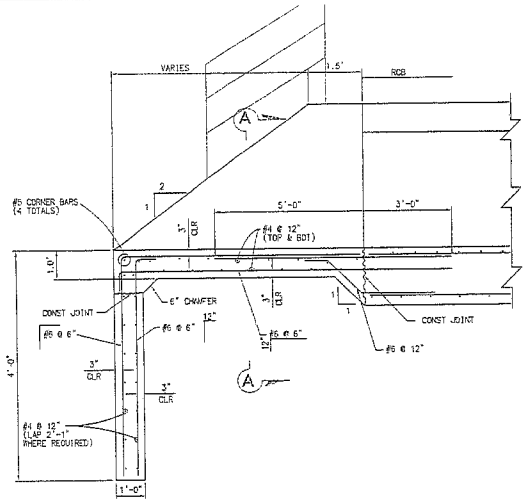


D/6 CORNER DETAIL

SCALE: N.T.S.

REMOVABLE TOP CULVERT DATA		
CULVERT NO.	NORTH END PANEL WIDTH	SOUTH END PANEL WIDTH
1	3' 5 3/4"	3' 5 3/4"
2	3' 5 3/4"	1' 5 3/4"
4	2' 5 3/4"	2' 5 3/4"

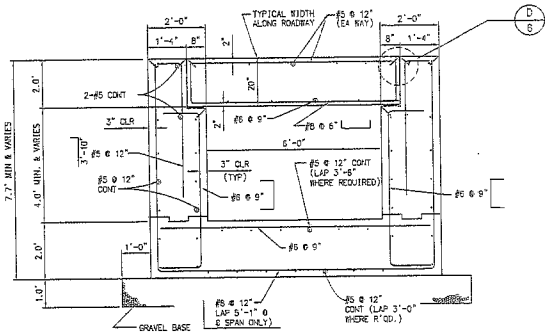
TABLE 1



DETAIL "C" REINFORCMENT DETAIL

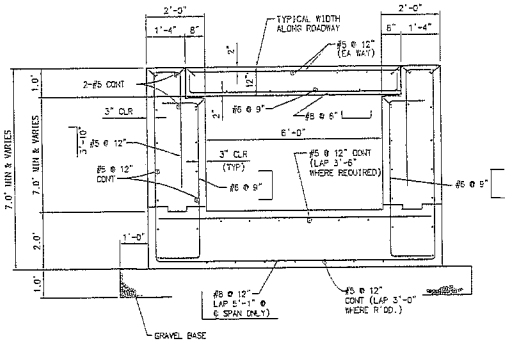
SCALE: NTS

41 WINGWALL



REINFOREMENT DETAIL 20" TOP SECTION

NTS



REINFOREMENT DETAIL 12" TOP SECTION

NTS

51 REINFORCING DETAIL 6' X 4' MIN RCB

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REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — No. C61701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: CC — CHECKED BY: TJR — APPROVED BY:

SUBMITTED BY: — DATE — RECOMMENDED/APPROVED BY: — DATE 2-1-06 — LAND DEVELOPMENT ENGINEER — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
MISCELLANEOUS DETAILS
LYTLE CREEK DEVELOPMENT

SHEET 6 OF 29
FILE NO.

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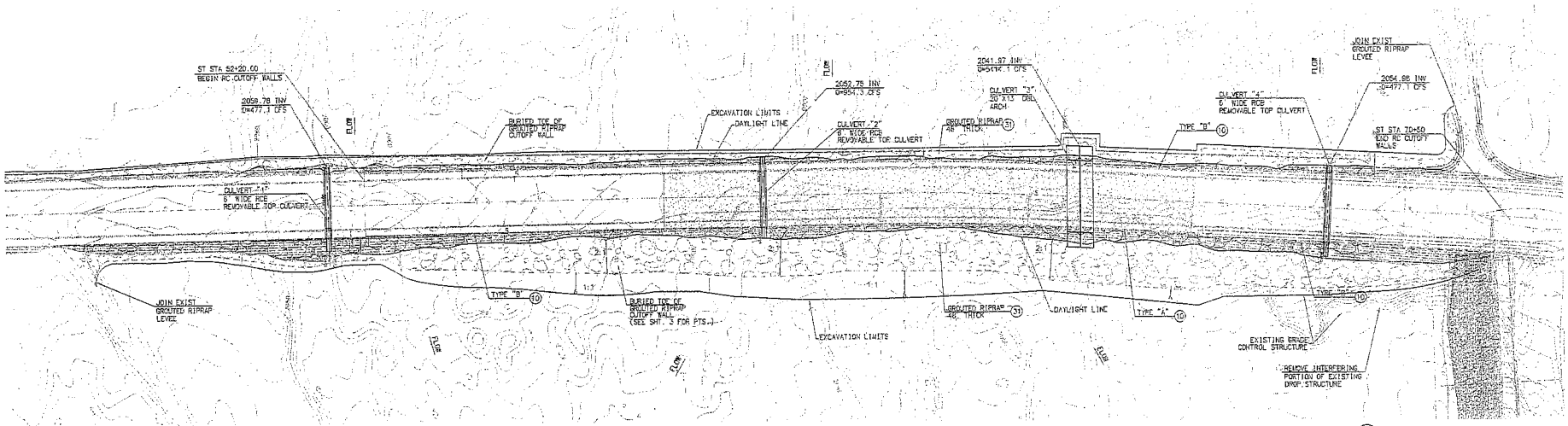
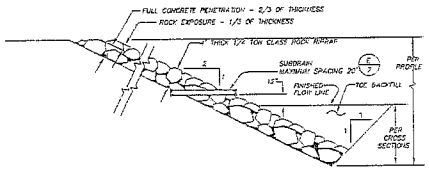
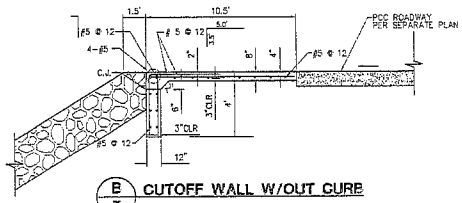




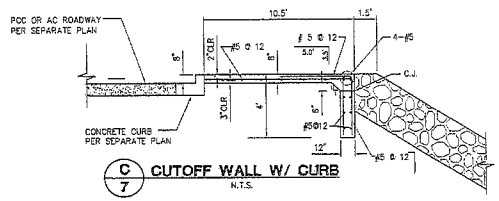
31 CONCRETED ROCK RIPRAP BANK PROTECTION DETAIL

N.T.S.



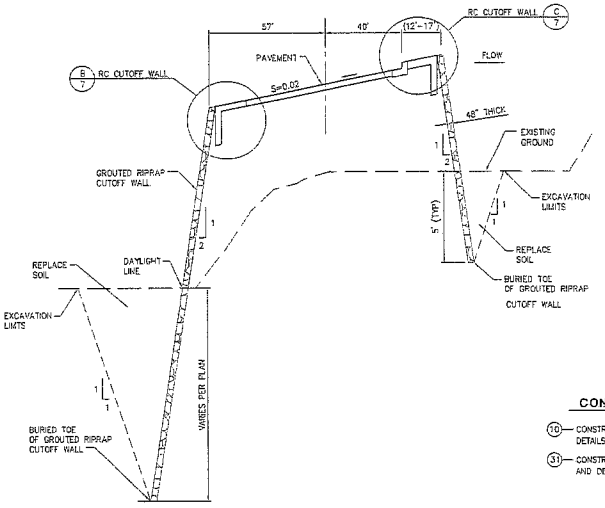
B/7 CUTOFF WALL W/OUT CURB

N.T.S.



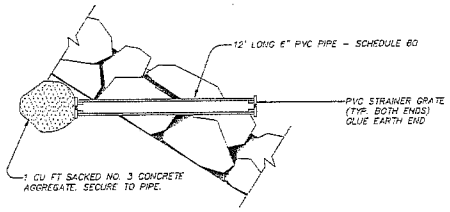
C/7 CUTOFF WALL W/ CURB

N.T.S.



TYPICAL CROSS SECTION

N.T.S.



SUBDRAIN DETAIL E/7

NOT TO SCALE

10 CUTOFF WALL

CONSTRUCTION NOTES

(10) — CONSTRUCT RC CUTOFF WALL PER PLAN AND DETAILS HEREON AND SHEET 3.

(31) — CONSTRUCT CONCRETED RIPRAP PER PLAN, PROFILE, AND DETAILS ON SHEET 5.

80' 40' 0' 80' 160'

GRAPHIC SCALE: 1"=80'

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: SJT — DRAWN BY: EC — CHECKED BY: TJR

SUBMITTED BY: — RECOMMENDED FOR APPROVAL BY: — LAND DEVELOPMENT ENGINEER — DATE 2-1-01

APPROVED BY: — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS

GLEN HELEN PARKWAY

SLOPE PROTECTION

LYTLE CREEK DEVELOPMENT

SHEET 7 OF 29

FILE NO.

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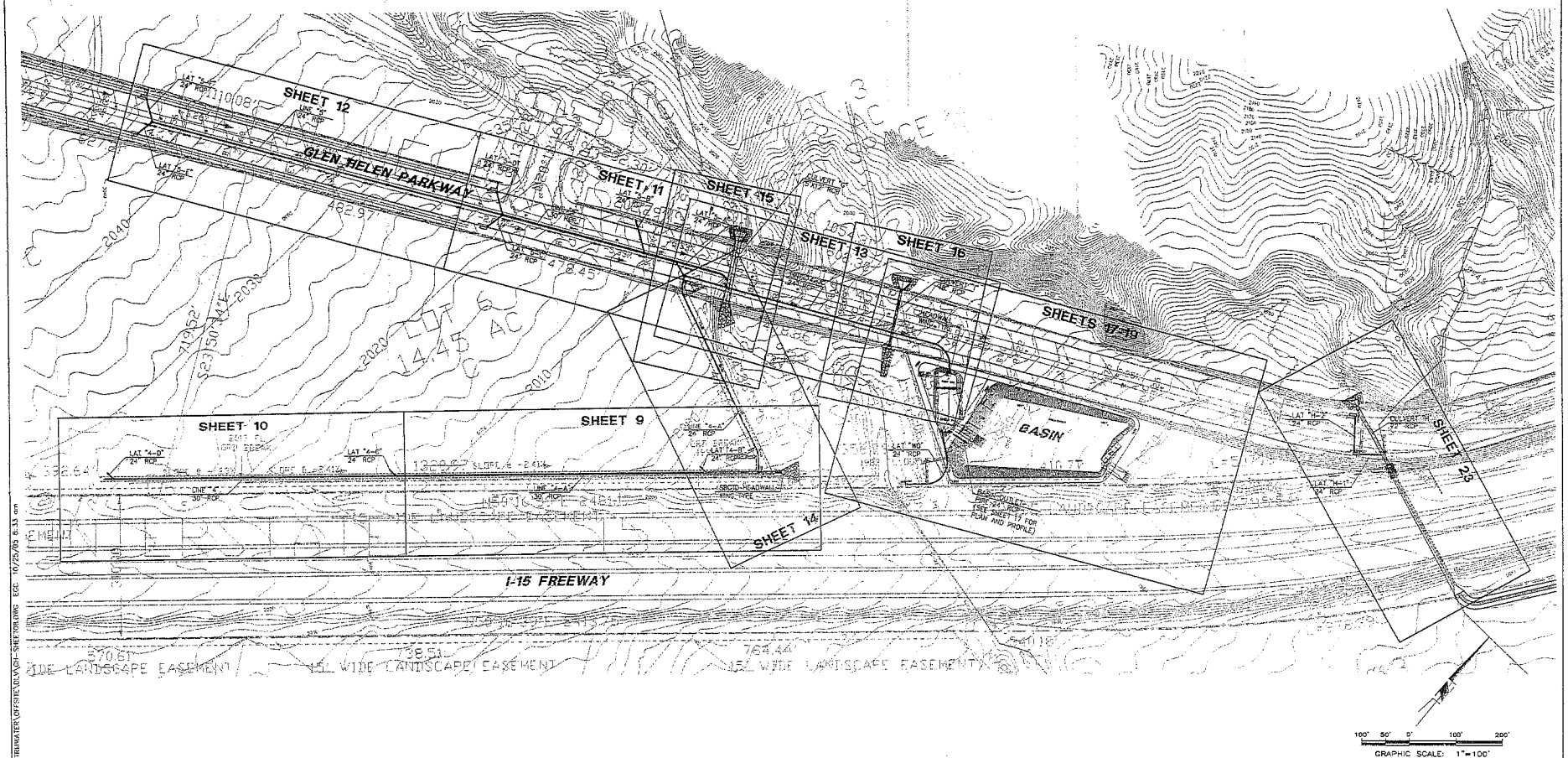

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RCE NO. C61701 EXP. 06-30-07

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: EC — CHECKED BY: TJR — APPROVED BY:

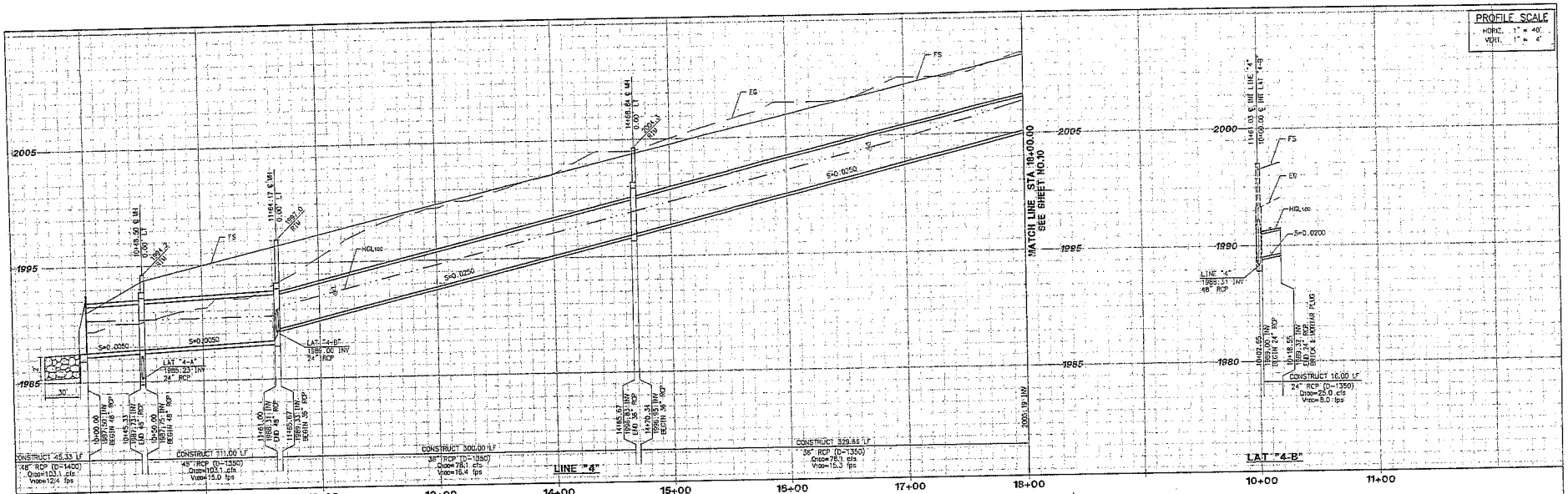
SUBMITTED BY: ASST DIRECTOR OF PUBLIC WORKS — DATE
RECOMMENDED/APPROVED BY: LAND DEVELOPMENT ENGINEER — DATE 12-1-05 — DIRECTOR OF PUBLIC WORKS — DATE

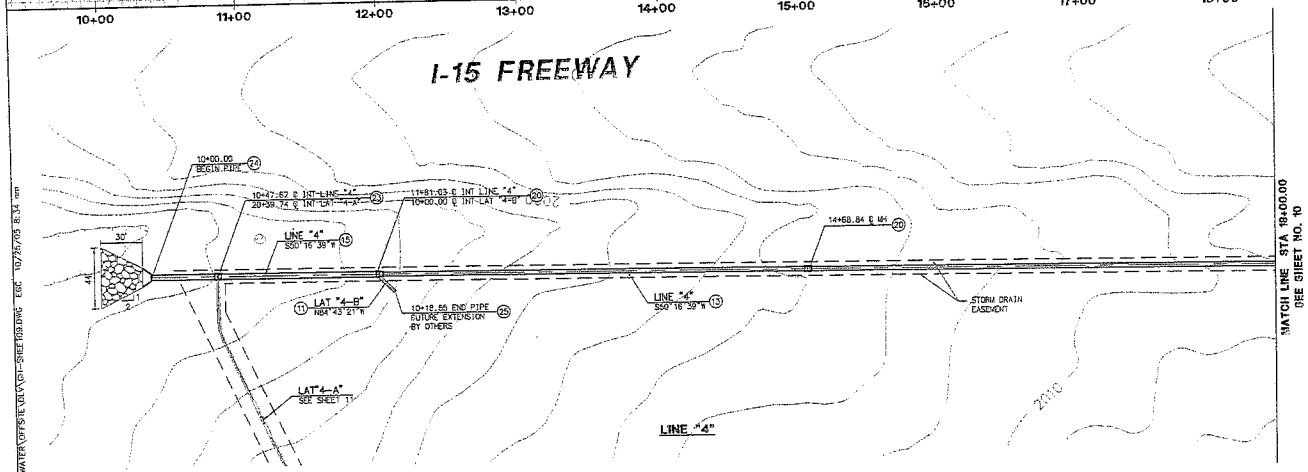
CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
INDEX SHEET 2

SHEET 8 OF 29

DEV: LYTLE CREEK DEVELOPMENT

H:\PDATA\10103515\CADD\STORMWATER\OPSHC\DLVP\H-SHEET08.DWG EGC 10/25/05 8:33 am





CONSTRUCTION NOTES

11 — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

13 — INSTALL 36" RCP STORM DRAIN (D-LOAD PER PROFILE)

15 — INSTALL 48" RCP STORM DRAIN (D-LOAD PER PROFILE)

20 — CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 320-1.

23 — CONSTRUCT DIVERSION MANHOLE PER DETAIL 23 ON SHEET 20.

24 — CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 209.

25 — CONSTRUCT BRICK AND MORTAR PLUG PER DETAIL ON SHEET 21.

40' 20' 0' 40' 80'

GRAPHIC SCALE: 1"=40'

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

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SUBMITTED BY: RCE | RECOMMENDED FOR APPROVAL: | LAND DEVELOPMENT ENGINEER | DATE 10-25-05 | ASST DIRECTOR OF PUBLIC WORKS | DATE | DIRECTOR OF PUBLIC WORKS | DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
LINE "4"
STA10+00.00 TO STA 18+00.00

FOR: LYTLE CREEK DEVELOPMENT

SHEET 9 OF 29

FILE NO.

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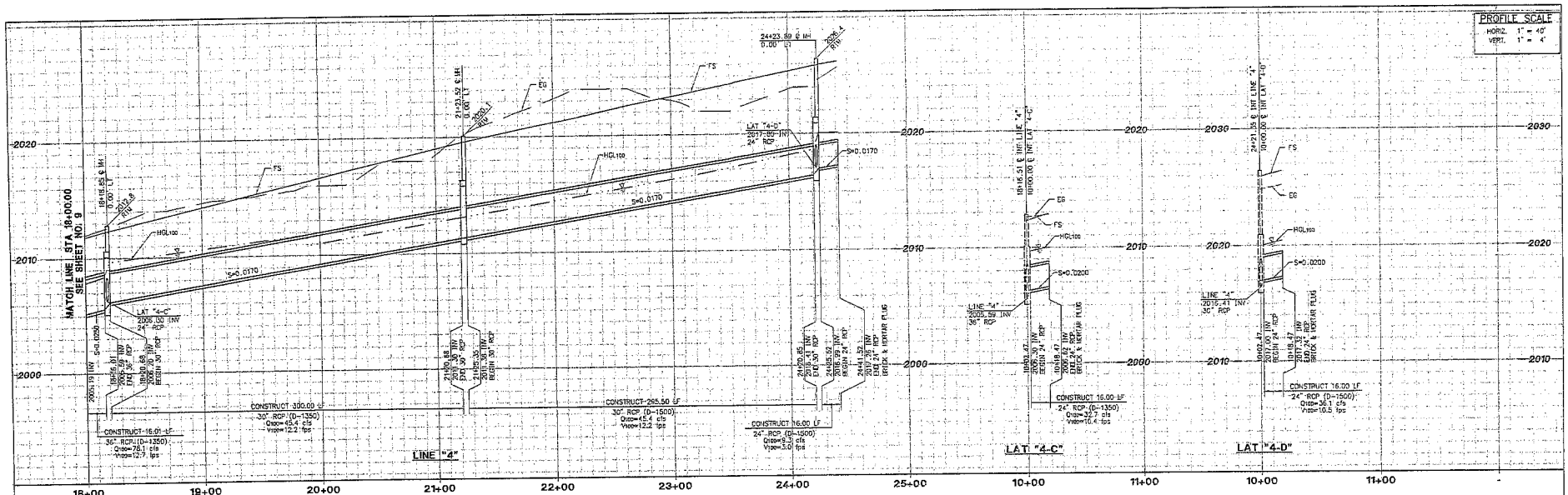
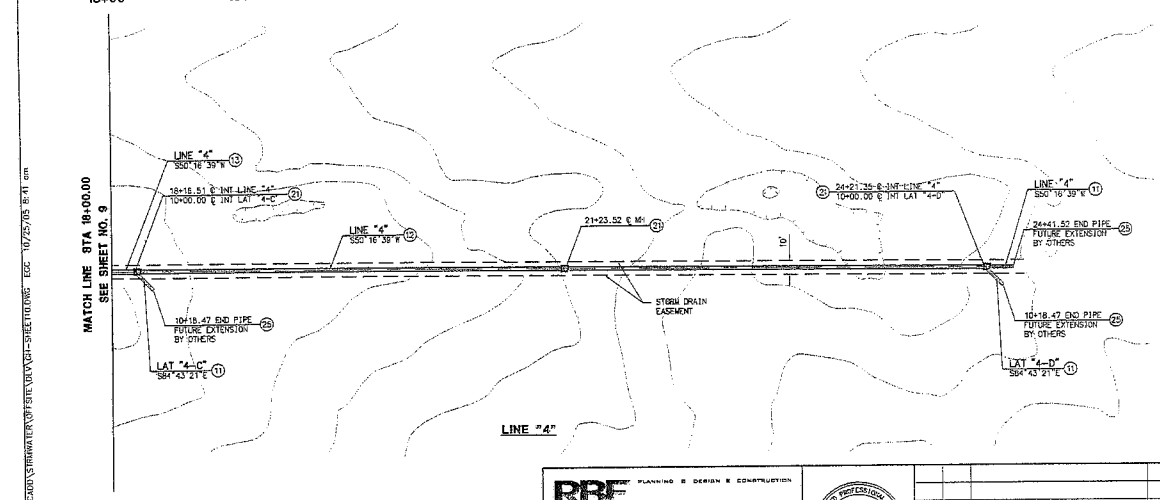




CONSTRUCTION NOTES

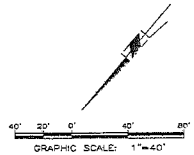
(11) — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

(12) — INSTALL 30" RCP STORM DRAIN (D-LOAD PER PROFILE)

(13) — INSTALL 36" RCP STORM DRAIN (D-LOAD PER PROFILE)

(21) — CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 321-1.

(25) — CONSTRUCT BRICK AND MORTAR PLUG PER DETAIL ON SHEET 21.



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REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — No. C51701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
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RECOMMENDED/APPROVED BY: — LAND DEVELOPMENT ENGINEER — DATE 12-1-05 — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS

GLEN HELEN PARKWAY
PLAN AND PROFILE
LINE "4"
STA 18+00.00 TO STA 24+41.52
LAT "4-C" & LAT "4-D"

FOR: LYTLE CREEK DEVELOPMENT

SHEET 10 OF 29

FILE NO.

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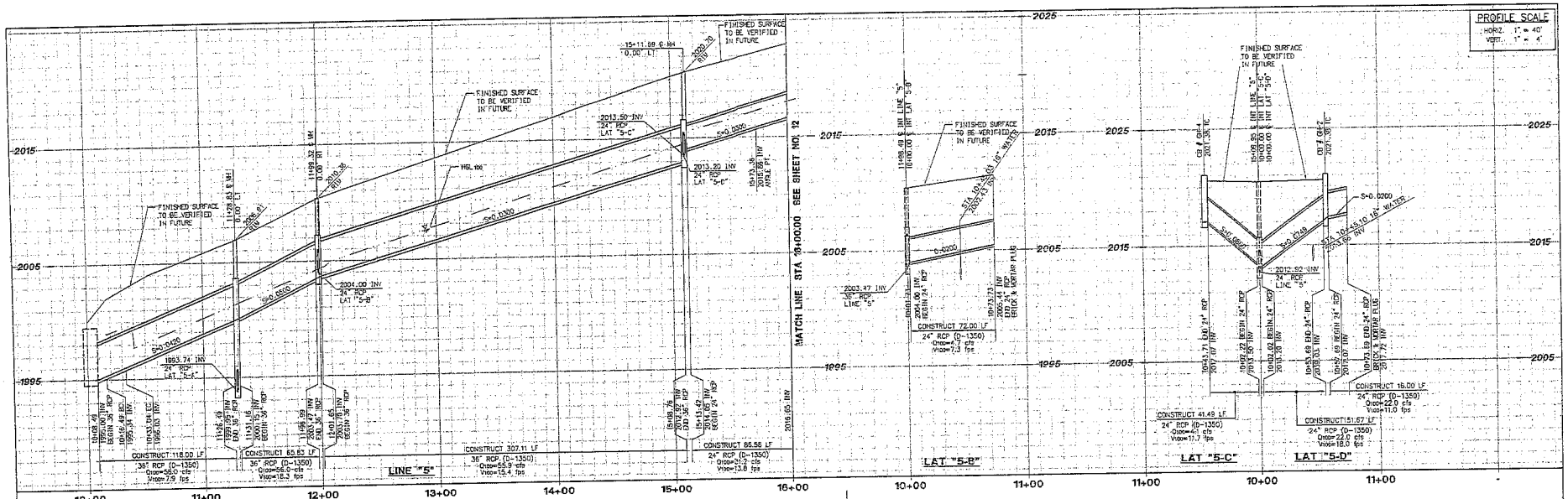

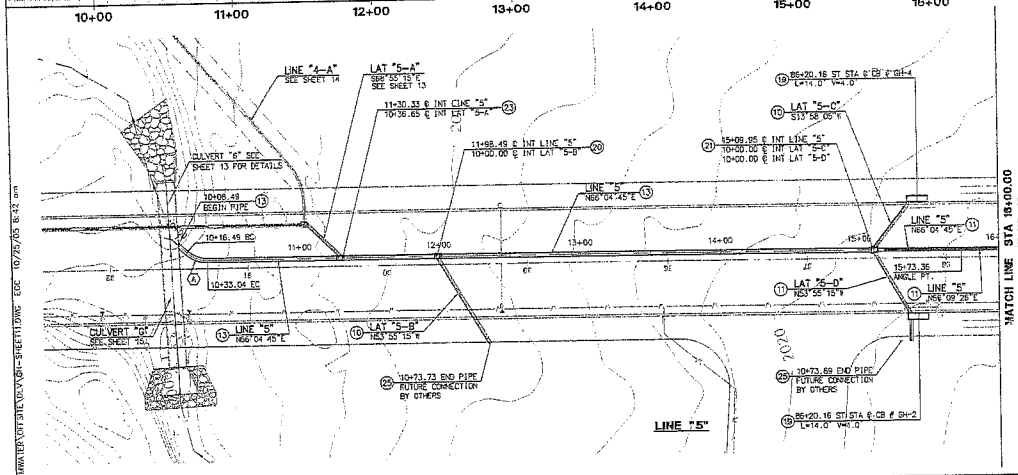

CONSTRUCTION NOTES

(11) INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

(13) INSTALL 36" RCP STORM DRAIN (D-LOAD PER PROFILE)

(19) CONSTRUCT TYPE "A" CATCH BASIN PER SBCTD STD DWG 206 ("V" AND "L" PER PLAN).

(20) CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 320-1.

(21) CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 321-1.

(23) CONSTRUCT DIVERSION MANHOLE PER DETAIL 23 ON SHEET 20.

(25) CONSTRUCT BRICK AND MORTAR PLUG PER DETAIL ON SHEET 21.

CURVE DATA				
○	△	RADIUS	LENGTH	TANGENT
A	42°10'01"	22.50'	16.56'	8.67'

GRAPHIC SCALE: 1"=40'

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THOMAS J. RYAN
DATE 10-25-05
RCE NO. 061701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER
THOMAS J. RYAN
No. C61701
Exp. 6-30-07
CIVIL
STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

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SUBMITTED BY: TJR | TITLE: LAND DEVELOPMENT ENGINEER | DATE: 10-25-05

APPROVED BY: ASST. DIRECTOR OF PUBLIC WORKS | DATE

DIRECTOR OF PUBLIC WORKS | DATE

CHANNEL IMPROVEMENT PLANS

GLEN HELEN PARKWAY
PLAN AND PROFILE
LINE "5"
STA10+00.00 TO STA 16+00.00
LAT "5-B", LAT "5-C" & LAT "5-D"

TOR: LYTLE CREEK DEVELOPMENT

SHEET 11 OF 29

FILE NO.

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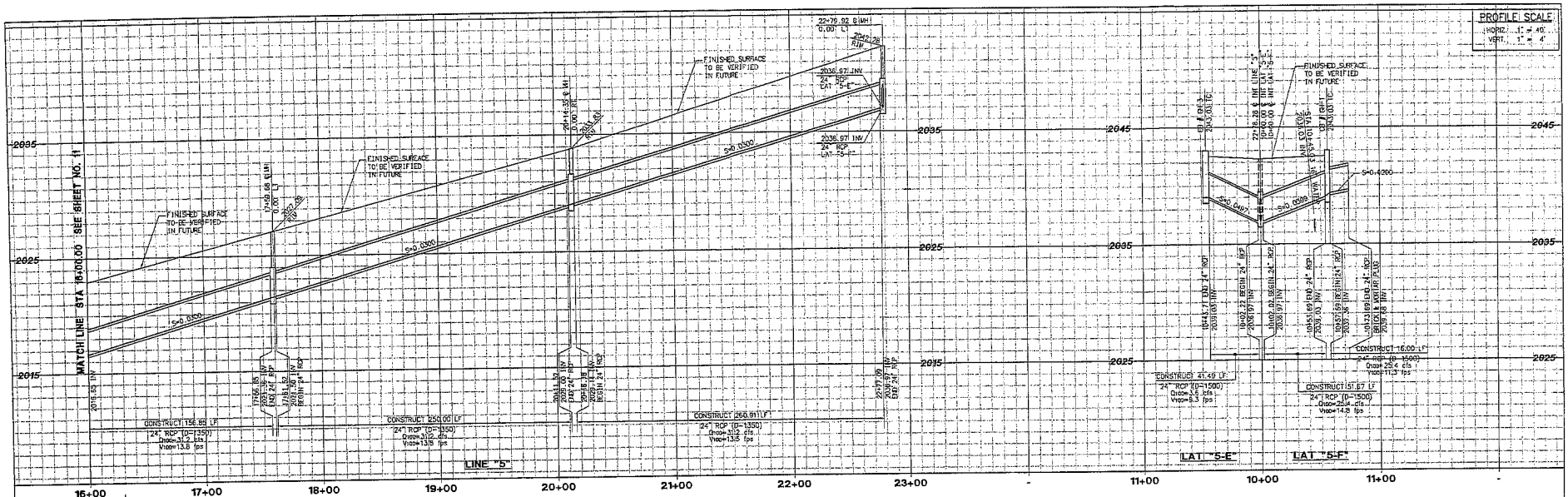

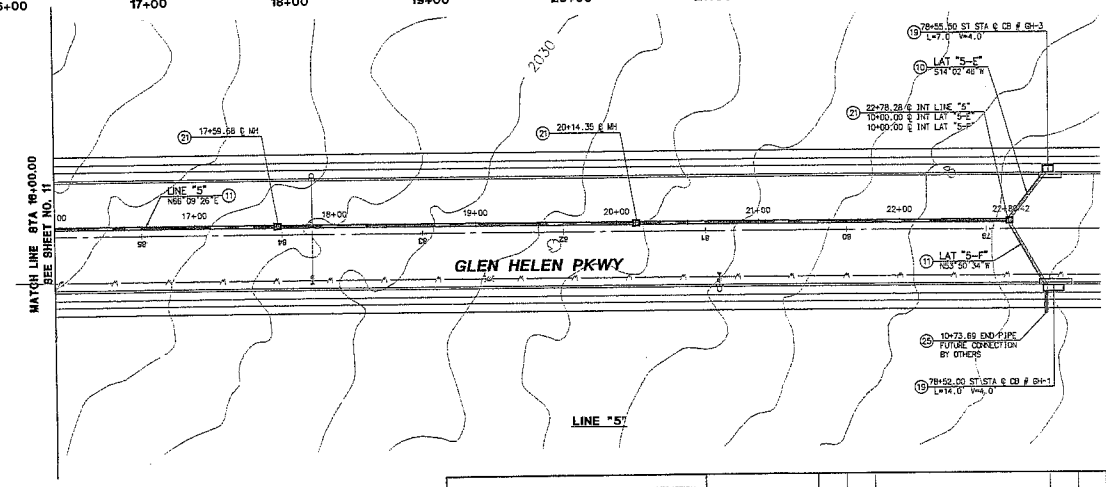

CONSTRUCTION NOTES

(11) — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

(18) — CONSTRUCT TYPE "A" CATCH BASIN PER SBCTD STD DWG 206 ("W" AND "L" PER PLAN).

(21) — CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 321-1.

(25) — CONSTRUCT BRICK AND MORTAR PLUG PER DETAIL ON SHEET 21.

GRAPHIC SCALE: 1"=40'

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THOMAS J. RYAN

DATE 10-25-05
RCE NO. C61701 EXP. 06-30-07

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

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APPROVED BY:

SUBMITTED BY: RECOMMENDED/APPROVED BY: 12-1-05
LAND DEVELOPMENT ENGINEER — DATE

ASST DIRECTOR OF PUBLIC WORKS — DATE

DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS

GLEN HELEN PARKWAY
PLAN AND PROFILE
LINE "5"
STA16+00.00 TO STA 22+78.28
LAT "5-E" & LAT "5-F"

BY: LYTLE CREEK DEVELOPMENT

SHEET 12 OF 29

FILE NO.

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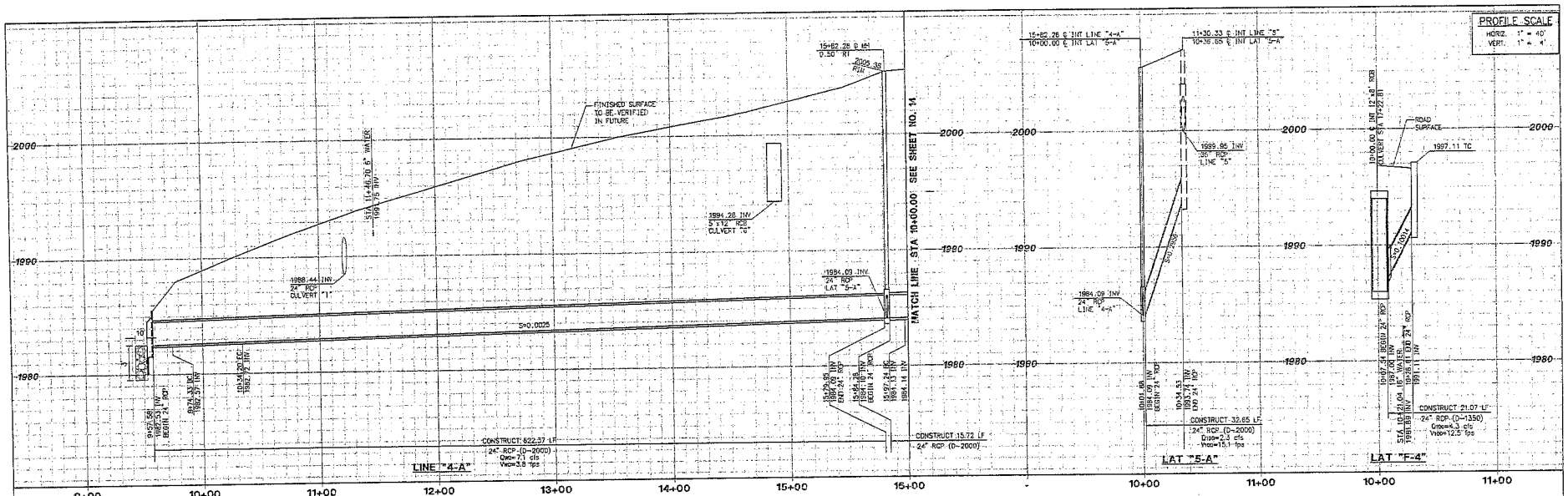

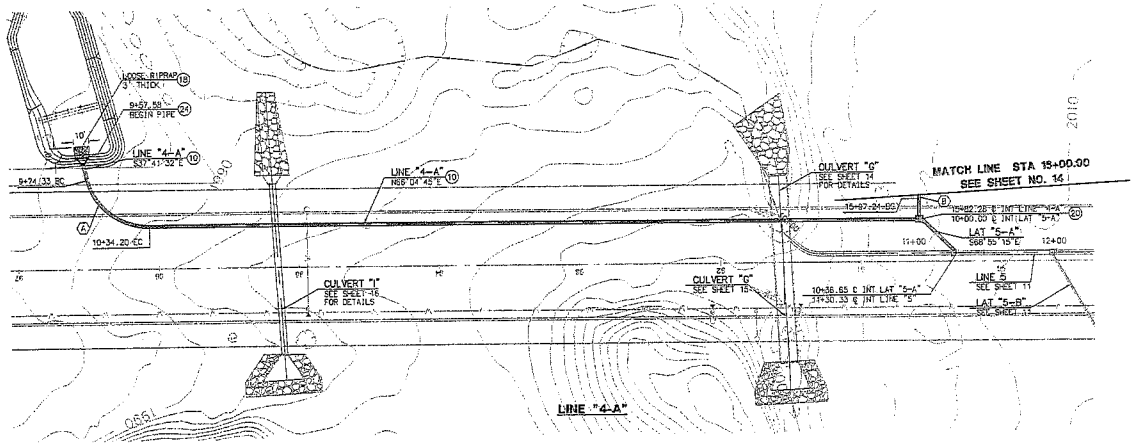

CONSTRUCTION NOTES

(11) INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

(18) CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAIL HEREON.

(20) CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD PLAN 320-1.

(24) CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 209.

CURVE DATA				
○	△	RADIUS	LENGTH	TANGENT
A	75°13'43"	45.00'	59.87'	35.30'
B	03°30'42"	45.00'	2.76'	1.38'

GRAPHIC SCALE: 1"=40'

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THOMAS J. RYAN — DATE 10-25-05 — RCE NO. C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — C61701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: CC — CHECKED BY: TJR — APPROVED BY:

SUBMITTED BY: — RECOMMENDED FOR APPROVAL — LAND DEVELOPMENT ENGINEER — DATE 12-1-05 — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
LINE "4-A"
STA 9+57.58 TO STA 16+00.00
LAT "5-A" & LAT "F-4"
LYTLE CREEK DEVELOPMENT

SHEET 13 OF 29

FILE NO.

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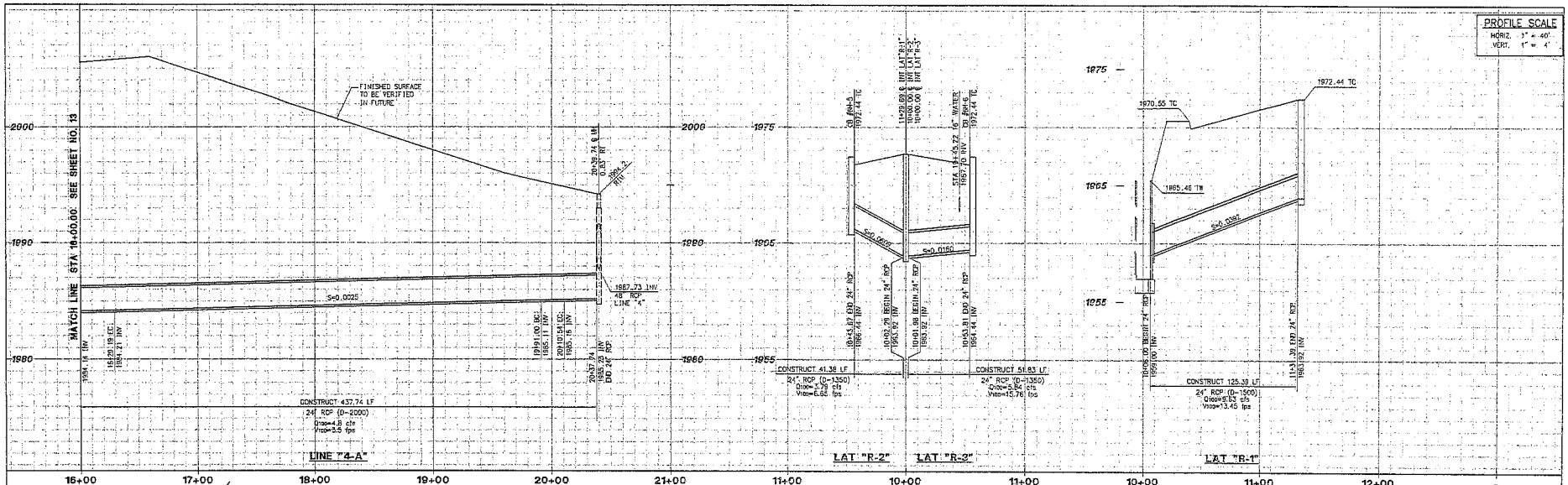

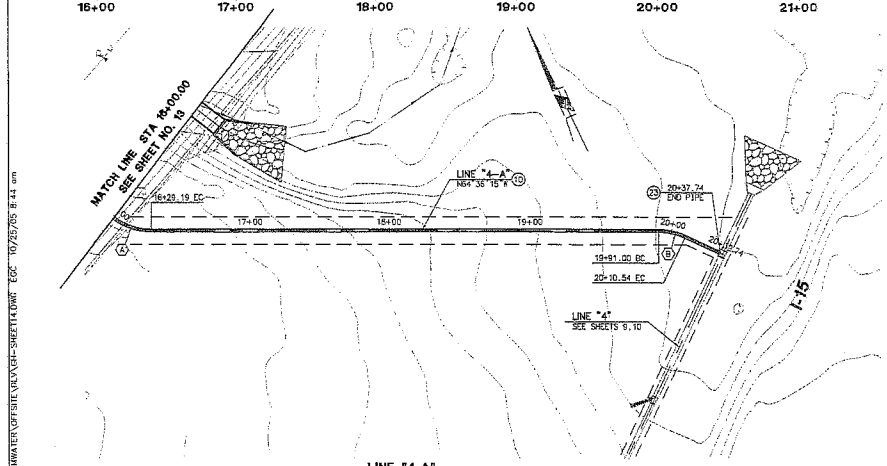

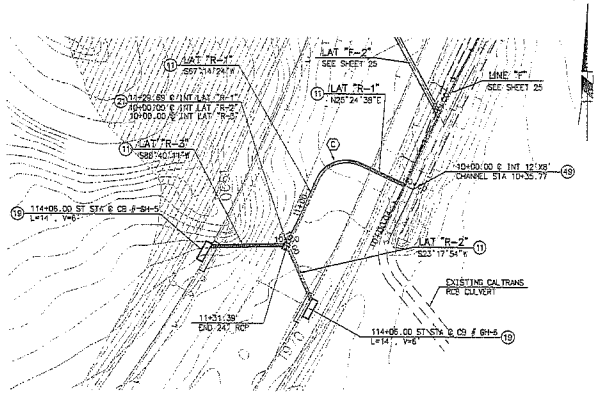

CONSTRUCTION NOTES

11 — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

19 — CONSTRUCT TYPE "A" CATCH BASIN PER SBCTD STD. DWG 206 ("V" AND "L" PER PLAN)

21 — CONSTRUCT MANHOLE PIPE TO PIPE PER APWA STD. PLAN 321-1

23 — CONSTRUCT DIVERSION MANHOLE PER DETAIL 23 ON SHEET 20.

49 — CONSTRUCT JUNCTION STRUCTURE, PIPE TO RCB PER APWA STD. PLAN 333-1

CURVE DATA

○	Δ	RADIUS	LENGTH	TANGENT
A	37°10'17"	45.00'	29.19'	15.13'
B	24°52'54"	45.00'	19.54'	9.93'
C	92°39'02"	22.50'	36.38'	23.57'

40' 20' 0' 40' 80'
GRAPHIC SCALE: 1"=40'

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THOMAS J. RYAN
DATE 10-25-05
RCE NO. C61701 EXP 06-30-07

REGISTERED PROFESSIONAL ENGINEER
THOMAS J. RYAN
C61701
06-30-07
CIVIL
STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR
DRAWN BY: ES
CHECKED BY: TJR
APPROVED BY:
SUBMITTED BY: CSSE
RECOMMENDED/APPROVED BY: LEAD
LAND DEVELOPMENT ENGINEER DATE 12-1-05
ASST DIRECTOR OF PUBLIC WORKS DATE
DIRECTOR OF PUBLIC WORKS DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
LINE "4-A"
STA 16+00.00 TO STA 20+37.74
LAT "R-1", LAT "R-2" & LAT "R-3"
LYTLE CREEK DEVELOPMENT

SHEET 14 OF 29
FILE NO.

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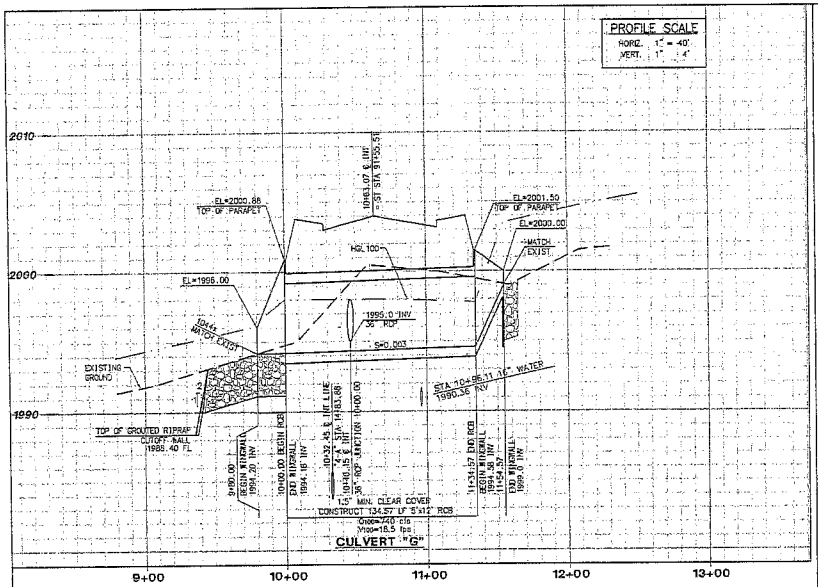
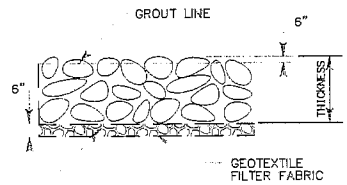


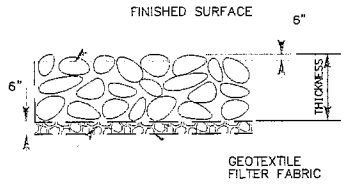


GRADATIONS SHALL BE 1/4 TON PER CALTRANS STANDARD SPECIFICATION FOR THE GIVEN SIZES BELOW.
METHOD "B" PLACEMENT

MINIMUM FABRIC WEIGHT OF 5 OZ. LIMITS ENCOMPASS ENTIRE BEDDING SURFACE.

17 GROUTED RIPRAP DETAIL

N.T.S.



GRADATIONS SHALL BE PER CALTRANS STANDARD SPECIFICATION FOR THE GIVEN SIZES BELOW.
METHOD "B" PLACEMENT

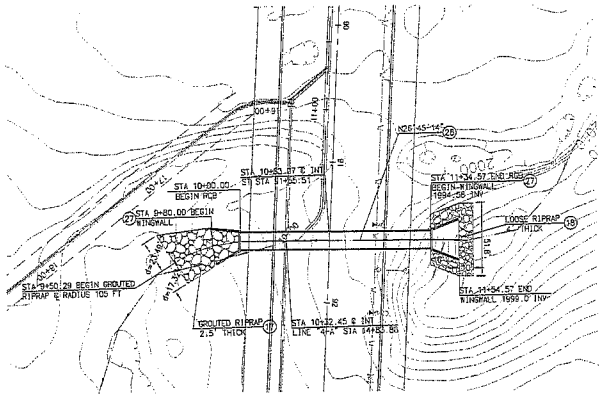
MINIMUM FABRIC WEIGHT OF 5 OZ. LIMITS ENCOMPASS ENTIRE BEDDING SURFACE.

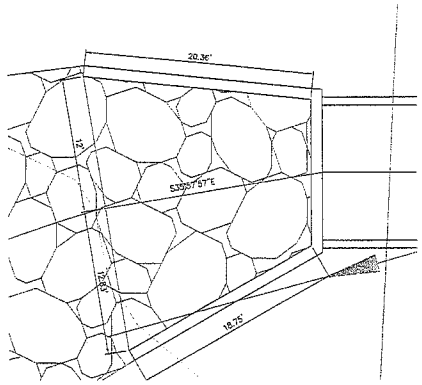
LOOSE RIPRAP SHALL BE PLACED USING CALTRANS METHOD "B"

THICKNESS	GRADATION
3'	1/4 TON
4'	1/2 TON

18 LOOSE ROCK RIRAP DETAIL

N.T.S.





CULVERT "G" OUTLET SIDE WINGWALL
PLAN
NTS

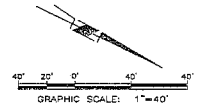
CONSTRUCTION NOTES

17 — CONSTRUCT GROUTED RIPRAP PER PLAN, PROFILE, AND DETAIL HEREON.

18 — CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAIL HEREON.

27 — CONSTRUCT PIPE CULVERT HEADWALL, ENDWALL, AND WARPED WINGWALL PER CALTRANS STD PLAN D86S.

28 — CONSTRUCT 12'X5' BOX CULVERT PER CALTRANS STD PLAN D80



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THOMAS J. RYAN
DATE 10-25-05
RCE NO. 061701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER
THOMAS J. RYAN
C61701
Exp. 6-30-07
CIVIL
STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

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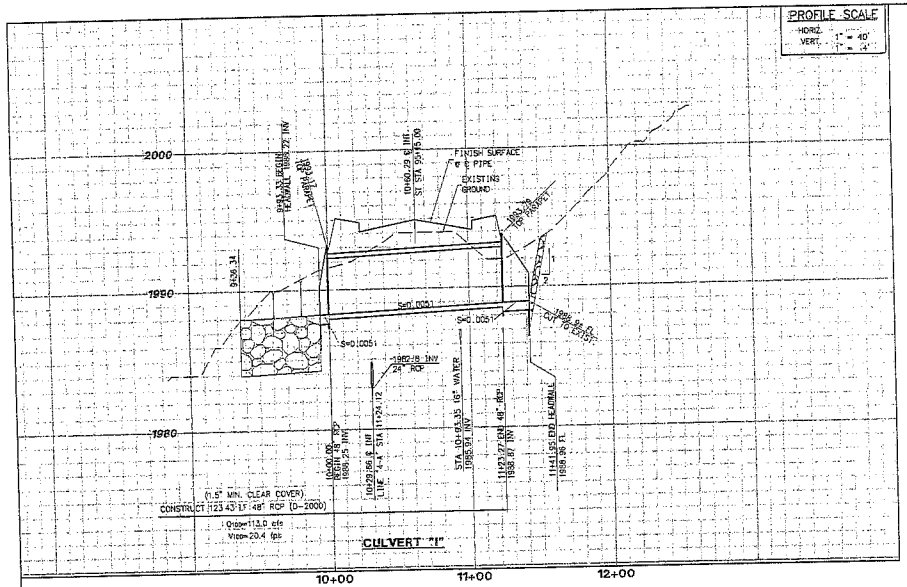
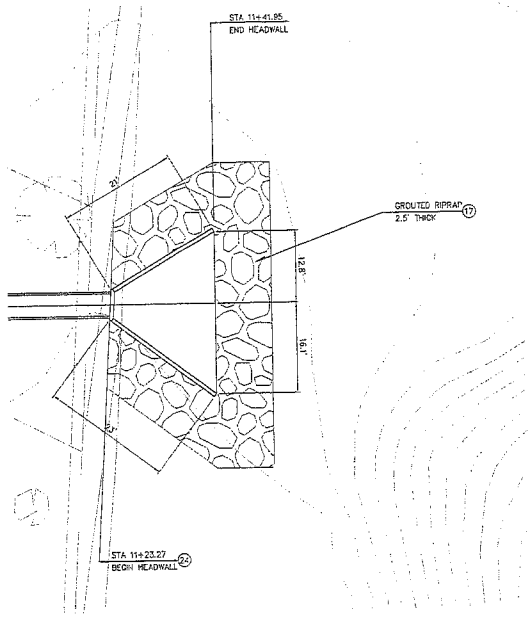
TJR	EC	TJR	

SUBMITTED BY: [illegible] 10-25-05
RECOMMENDED FOR APPROVAL: [illegible] 11-1-05
LAND DEVELOPMENT ENGINEER DATE
ASST. DIRECTOR OF PUBLIC WORKS DATE
DIRECTOR OF PUBLIC WORKS DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
CULVERT "G"
LYTLE CREEK DEVELOPMENT

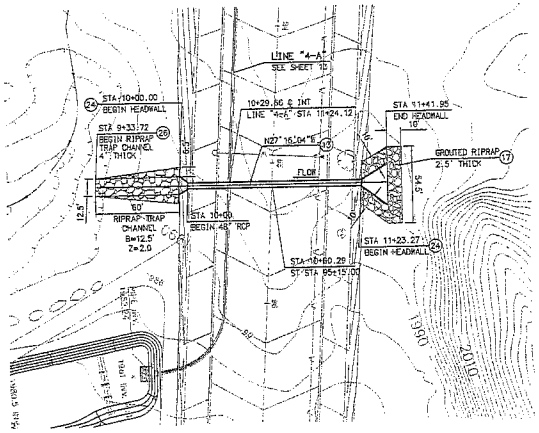
SHEET 15 OF 29
FILE NO.





CULVERT "I" INLET SIDE HEADWALL PLAN

SCALE: 1"=10'



CULVERT "I"

CONSTRUCTION NOTES

15 — INSTALL 48" RCP STORM DRAIN (D-LOAD PER PROFILE)

17 — CONSTRUCT GROUTED RIPRAP PER PLAN, PROFILE, AND DETAIL ON SHEET 15.

24 — CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 209.

26 — CONSTRUCT GROUTED RIPRAP TRAPEZOIDAL CHANNEL PER PLAN AND DETAIL 17 ON SHEET 15.

40' 20' 0' 40' 80'

GRAPHIC SCALE: 1"=40'

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TJR	EC	TJR

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RECOMMENDED: DATE
LAND DEVELOPMENT ENGINEER DATE

APPROVED BY:
ASST DIRECTOR OF PUBLIC WORKS DATE
DIRECTOR OF PUBLIC WORKS DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
CULVERT "I"
FOR LYTLE CREEK DEVELOPMENT

SHEET 16 OF 29
FILE NO.

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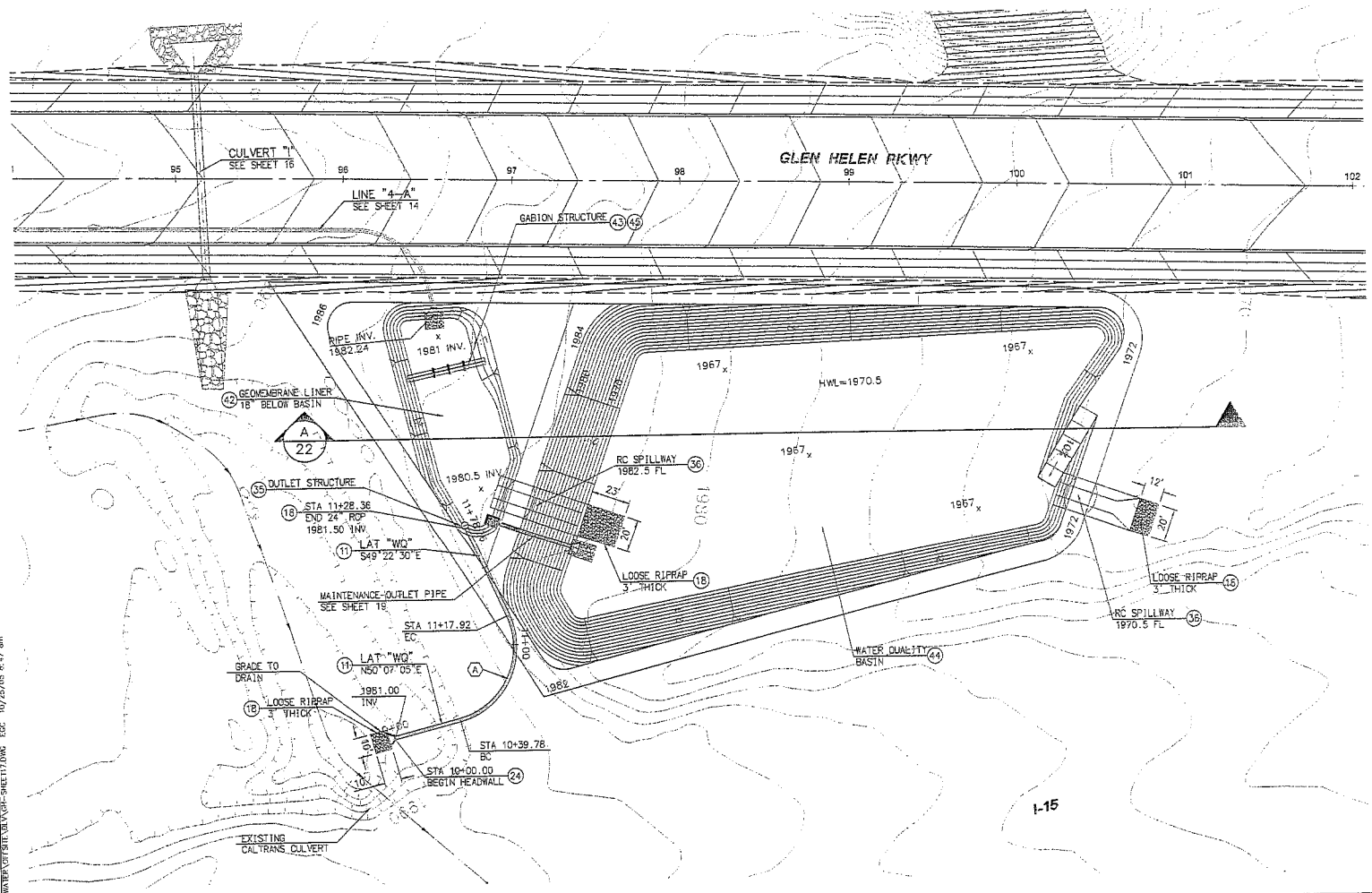

CONSTRUCTION NOTES

11 — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

18 — CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAIL ON SHEET 15.

24 — CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 205.

33 — CONSTRUCT INTAKE STRUCTURE, GATE, STEM, AND OPERATOR PEDESTAL PER DETAILS ON SHEET 19.

35 — CONSTRUCT BASIN OUTLET STRUCTURE PER PLAN, AND DETAILS ON SHEET 19.

36 — CONSTRUCT RC SPILLWAY PER PLAN AND DETAIL ON SHEET 20.

42 — INSTALL LAYFIELD PVC 30 GEOMEMBRANE LINER OR APPROVED EQUAL.

43 — INSTALL MACCAFERRI GABION STRUCTURES (OR APPROVED EQUAL) PER PLAN AND DETAIL ON SHEET 22.

44 — EXCAVATE BASIN PER PLAN AND PROFILE.

45 — INSTALL GRAVEL BEDDING PER PLAN AND DETAILS ON SHEET 22.

CURVE DATA

○	Δ	RADIUS	LENGTH	TANGENT
A	99°29'35"	45.00'	78.14'	53.15'

GRAPHIC SCALE: 1"=30'

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RCE NO. C61701 EXP. 06-30-07

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

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SUBMITTED BY: RECOMMENDED APPROVAL — LAND DEVELOPMENT ENGINEER — DATE 12-1-05

APPROVED BY: ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY

PLAN
WATER QUALITY
GRADING PLAN

FOR: LYTLE CREEK DEVELOPMENT

SHEET 17 OF 29

FILE NO.

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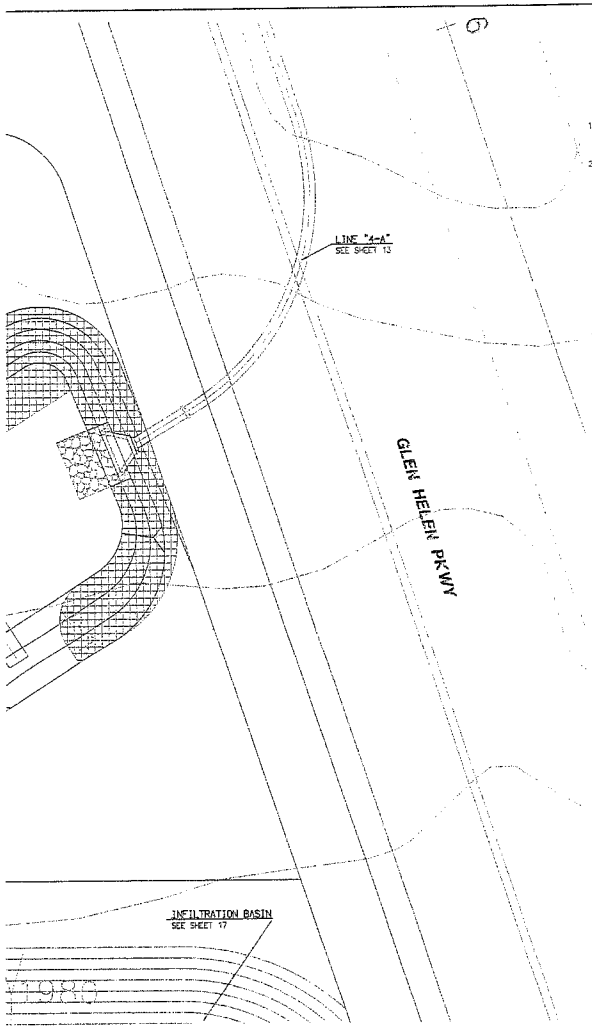


LEGEND

AREA TO BE HYDROSEEDED. SEE NOTES BELOW.

HYDROSEEDING NOTES

1. GENERAL SPECIFICATIONS

   ALL AREAS INDICATED ON THESE PLANS SHALL BE HYDROSEEDED.

2. HYDROSEEDING MIXTURES AND RATES OF APPLICATION

SPECIES	BULK SEED LBS/ ACRE
ARISTIDA TERNIPES VAR. HAMULOSA	4.0
DESCHAMPSIA DESPITOSA	4.0
FESTUCA RUBRA "MOLATE"	10.0
HORDEUM CALIFORNICUM	6.0
HORDEUM DEPRESSUM	4.0
MUHLENBERGIA MICROSPERMA	4.0
VULPIA MICROSTACHYS	5.0
	37.0

   SEED MIX AVAILABLE FROM S & S SEEDS (805/684-0436)

3. HYDROSEEDING SUSPENSION OR SLURRY COMPOSITION

   A. SEED MIXTURE @ REQ. RATE PER ACRE
   B. VIRGIN WOOD CELLULOSE FIBER "CONWED" OR EQUAL @ 1,500# PER ACRE
   C. ECOLOGY CONTROL "M" BINDER @ 150# PER ACRE

4. APPLICATION PROCEDURES AND EQUIPMENT:

   A. EQUIPMENT. HYDRAULIC EQUIPMENT USED FOR THE APPLICATION OF THE FERTILIZER, SEED, AND SLURRY OF PREPARED WOOD PULP SHALL BE OF THE "SUPER HYDROSEEDER" TYPE. THIS EQUIPMENT SHALL HAVE A BUILT-IN AGITATION SYSTEM AND OPERATING CAPACITY SUFFICIENT TO AGITATE, SUSPEND AND HOMOGENEOUSLY MIX A SLURRY CONTAINING NOT LESS THAN 40# OF FIBER MULCH PLUS A COMBINED TOTAL OF 7# FERTILIZER SOLIDS FOR EACH 100 GALLONS OF WATER.

   THE SLURRY DISTRIBUTION LINES SHALL BE LARGE ENOUGH TO PREVENT STOPPAGE AND SHALL BE EQUIPPED WITH A SET OF HYDRAULIC SPRAY NOZZLES WHICH WILL PROVIDE A CONTINUOUS NON-FLUCTUATING DISCHARGE. THE SLURRY TANK SHALL HAVE A MINIMUM CAPACITY OF 1500 GALLONS AND SHALL BE MOUNTED ON A TRAVELING UNIT, EITHER SELF-PROPELLED OR DRAWN BY A SEPARATE UNIT, WHICH WILL PLACE THE SLURRY TANK SPRAY NOZZLES WITHIN SUFFICIENT PROXIMITY TO THE AREAS TO BE SEEDED.

   B. PREPARATION. THE SLURRY PREPARATION SHALL TAKE PLACE AT THE SITE OF WORK AND SHALL BEGIN BY ADDING WATER TO THE TANK WHEN THE ENGINE IS AT HALF-THROTTLE. WHEN THE WATER LEVEL HAS REACHED THE EIGHT OF THE AGITATOR SHAFT, GOOD RECIRCULATION SHALL BE ESTABLISHED AND, AT THIS TIME, THE SEED SHALL BE ADDED. FERTILIZERS SHALL THEN BE ADDED, FOLLOWED BY WOOD PULP MULCH.

   MULCH SHALL ONLY BE ADDED TO THE MIXTURE AFTER THE SEED AND WHEN THE TANK IS AT LEAST ONE-THIRD (1/3) FILLED WITH WATER.

   THE ENGINE THROTTLE SHALL BE OPENED TO FULL SPEED WHEN THE TANK IS AT LEAST ONE-THIRD (1/3) FILLED WITH WATER.

   THE ENGINE THROTTLE SHALL BE OPENED TO FULL SPEED WHEN THE TANK IS HALF-FILLED WITH WATER. ALL THE WOOD PULP MULCH SHALL BE ADDED BY THE TIME THE TANK IS TWO THIRDS (2/3) TO THREE FOURTHS (3/4) FULL. SPRAYING SHALL COMMENCE IMMEDIATELY WHEN THE TANK IS FULL.

   C. APPLICATION. THE OPERATOR SHALL SPRAY THE AREA WITH A UNIFORM, VISIBLE COAT BY USING THE GREEN COLOR OF THE WOOD PULP AS A GUIDE. THE SLURRY SHALL BE APPLIED IN A SWEEPING MOTION, IN AN ARCHED STREAM SO AS TO FALL LIKE RAIN, ALLOWING THE WOOD FIBERS TO BUILD ON EACH OTHER UNTIL A GOOD COAT IS ACHIEVED, AND THE MATERIAL IS SPREAD AT THE REQUIRED RATE PER ACRE.

   D. ALL BARE SPOTS SHALL BE RESEEDED WITHIN THIRTY (30) DAYS TO THE SATISFACTION OF THE OWNER OR OWNER'S REPRESENTATIVE.

   E. DESIGNATED AREAS MUST BE HYDROSEEDED AND ESTABLISHED PRIOR TO RAINY SEASON.

CONSTRUCTION NOTES

(47) — APPLY HYDROSEED PER PLAN AND DETAILS HEREON.

10' 5' 0' 10' 20'

GRAPHIC SCALE: 1"=10'

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJN | DRAWN BY: EC | CHECKED BY: TJN | APPROVED BY:

SUBMITTED BY: | RECOMMENDED APPROVAL BY: | ASST DIRECTOR OF PUBLIC WORKS DATE

LAND DEVELOPMENT ENGINEER DATE | DIRECTOR OF PUBLIC WORKS DATE

CHANNEL IMPROVEMENT PLANS

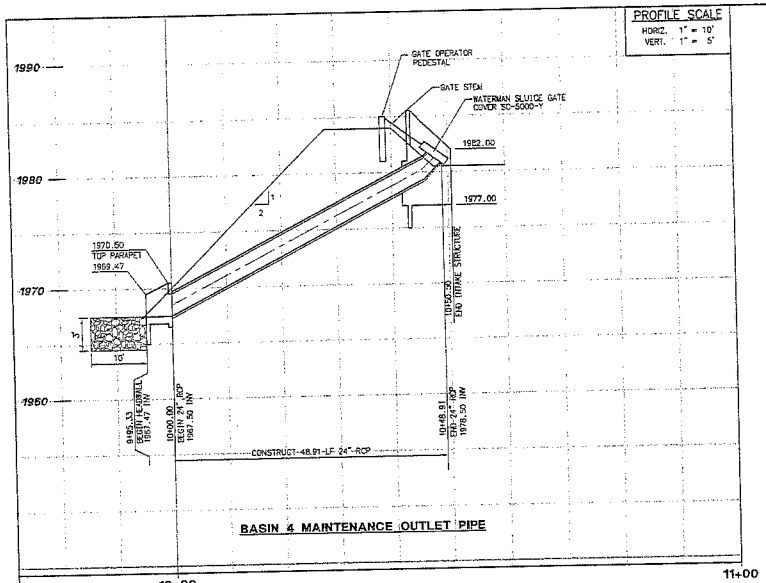
GLEN HELEN PARKWAY

BASIN 4
WATER QUALITY
VEGETATION PLAN

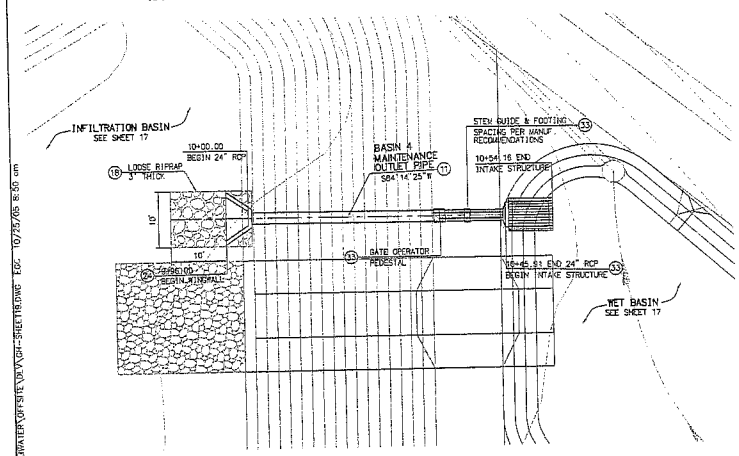
FOR: LYTLE CREEK DEVELOPMENT

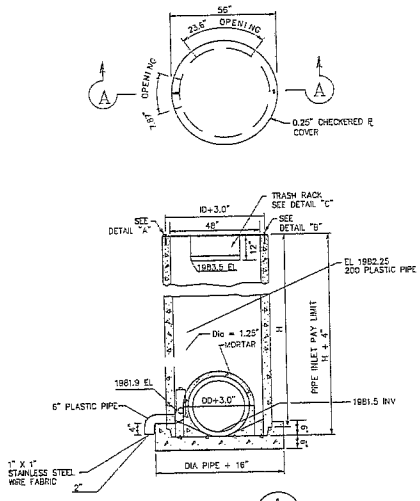
SHEET 18 OF 29

FILE NO.



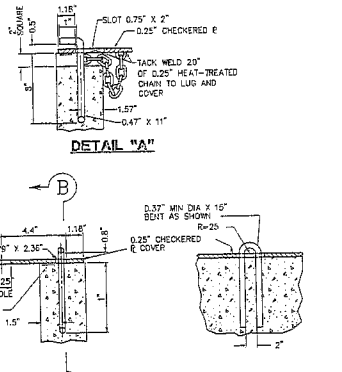
BASIN 4 MAINTENANCE OUTLET PIPE

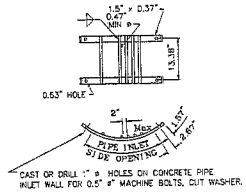




SECTION A
NO SCALE

BASIN OUTLET STRUCTURE
CONCRETE PIPE INLET WITH STEEL COVER





DETAIL "C"
(See Note 6)

NOTES

1. INSTALL POLYPROPYLENE STEPS PER STANDARD PLAN D74C.
2. SEE STANDARD PLANS D77A AND D77B FOR GRATE AND FRAME DETAILS AND WEIGHTS OF MISCELLANEOUS IRON AND STEEL.
3. FOR DETAILS OF LADDER AND STEPS AND WHEN LADDER OR STEPS ARE REQUIRED. SEE NEW STANDARD PLAN NSP D75C.

35 WETBASIN OUTLET DETAILS
N.T.S.

CONSTRUCTION NOTES

(11) — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)
(24) — CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 209.
(18) — CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAILS ON SHEET 15.
(33) — CONSTRUCT INTAKE STRUCTURE, GATE, STEM, AND OPERATOR PEDESTAL PER DETAILS HEREON.

20' 10' 0' 20' 40'
GRAPHIC SCALE: 1"=20'

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THOMAS J. RYAN — DATE 10-25-05 — RCE NO. C51701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — No. C51701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

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DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: EC — CHECKED BY: TJR — APPROVED BY:
SUBMITTED BY: — RECOMMENDED: — APPROVED: — ASST DIRECTOR OF PUBLIC WORKS — DATE
COUNTY DEVELOPMENT ENGINEER — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
STA 10+00.00 TO STA 10+54.16
BASIN 4 OUTLET PIPE
LYTLE CREEK DEVELOPMENT

SHEET 19 OF 29
PLAN NO.

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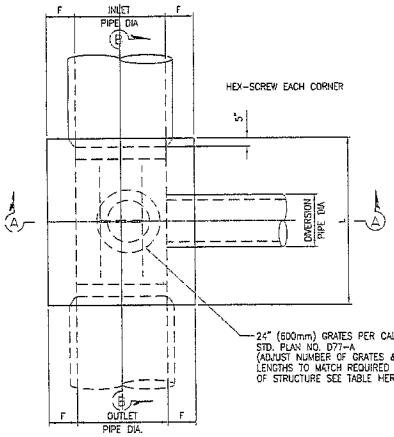
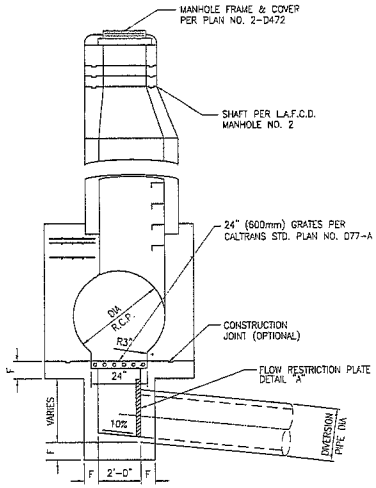
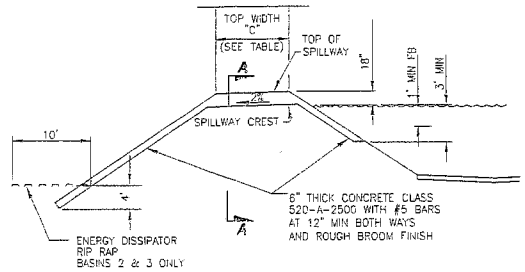


PLAN
NO SCALE



SECTION A-A
NO SCALE



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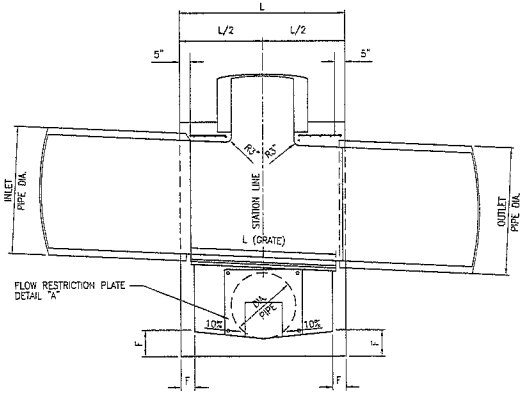

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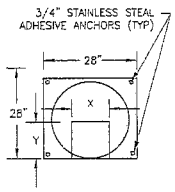
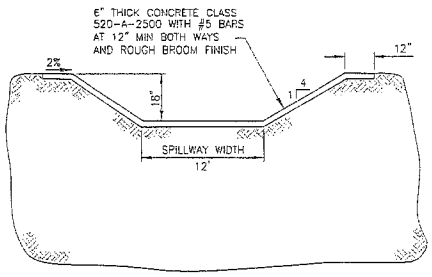


DETAIL A
NO SCALE

DIVERSION STRUCTURE	X	Y
LINE "5" INT. LAT "5-A"	5 1/4"	5 1/4"
LINE "4" INT. LINE "4-A"	9 1/2"	9 1/2"

23 **DIVERSION STRUCTURE DETAILS**
N.T.S.



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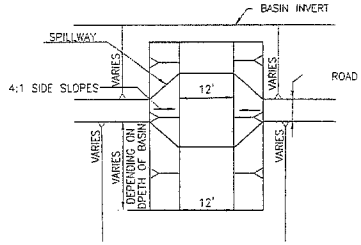

36 **SPILLWAY OUTLET TRANSITION**
NO SCALE

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THOMAS J. RYAN — DATE 10-25-05 — RCE NO: C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — C61701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: EC — CHECKED BY: TJR — APPROVED BY:

SUBMITTED BY: — DATE — RECOMMENDED APPROVAL: — DATE 12-1-05 — LAND DEVELOPMENT ENGINEER — DIRECTOR OF PUBLIC WORKS — DATE — ASST DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
DRAINAGE DETAILS
LYTLE CREEK DEVELOPMENT

SHEET 20 OF 29
FILE NO.

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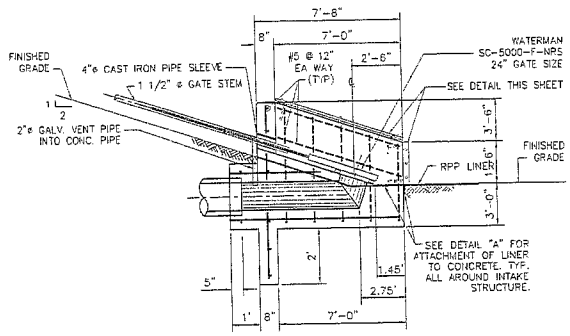
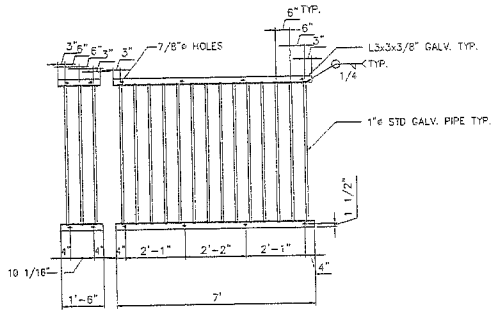
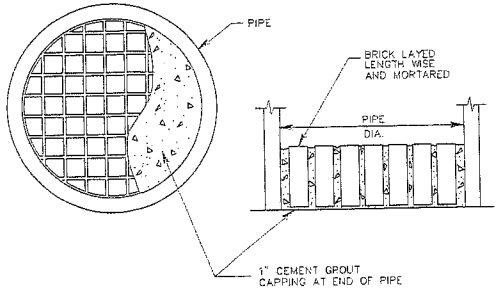


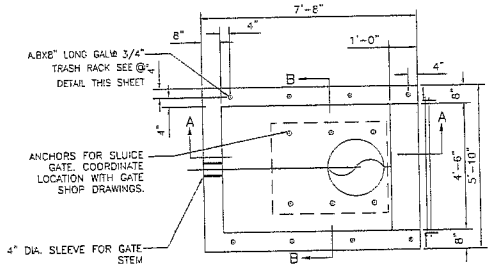
SECTION A-A
NO SCALE



TRASH RACK PLAN VIEW
NO SCALE



25 **BRICK AND MORTAR**
N.T.S.



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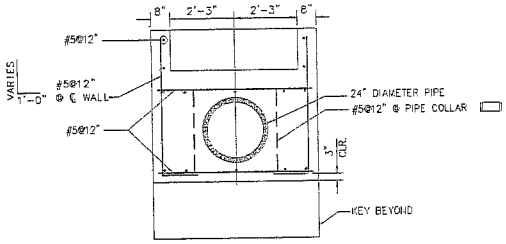

SECTION B-B
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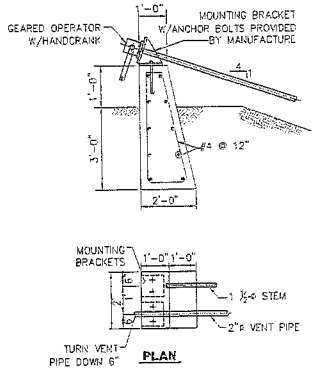

PLAN

GATE OPERATOR PEDESTAL
NO SCALE

33 **INTAKE STRUCTURE**
NO SCALE

NOTE: ALL ADDITIONAL REINF. DIMENSIONS AND GENERAL NOTES NOT SHOWN ARE L.A.C.F.D.C. MANHOLE NO. 2, PLAN NO. 2-0184

R:\DATA\1010.0510\C-BD\STRUMATER\PFSTE\DLX\GH-SHEET21.DWG EGC 10/25/05 8:53 am

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

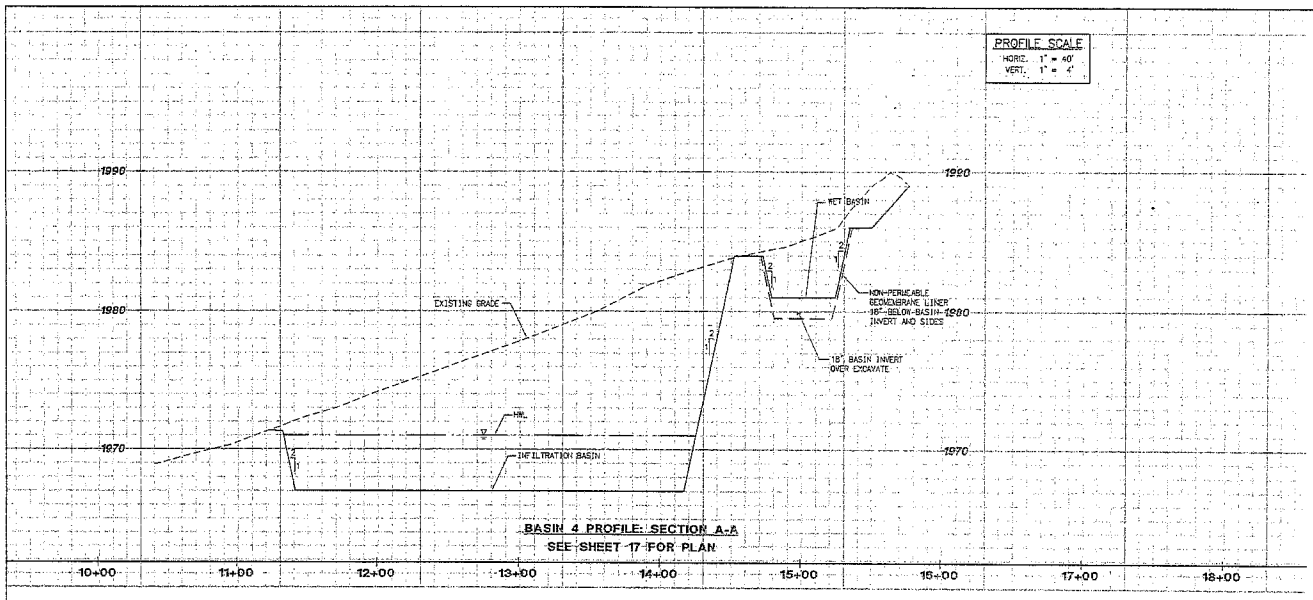
DESIGNED BY: TJR — DRAWN BY: EC — CHECKED BY: TJR

SUBMITTED BY: C.G.C. — RECOMMENDED FOR APPROVAL: 12-1-05 — LAND DEVELOPMENT ENGINEER — DATE

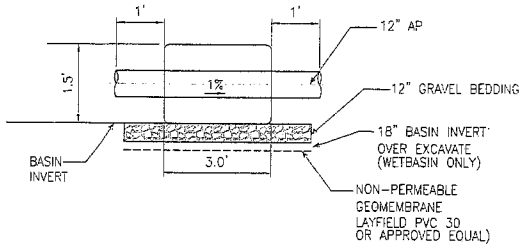
APPROVED BY: — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
-
BASIN 4 DETAILS
FOR: LYTLE CREEK DEVELOPMENT

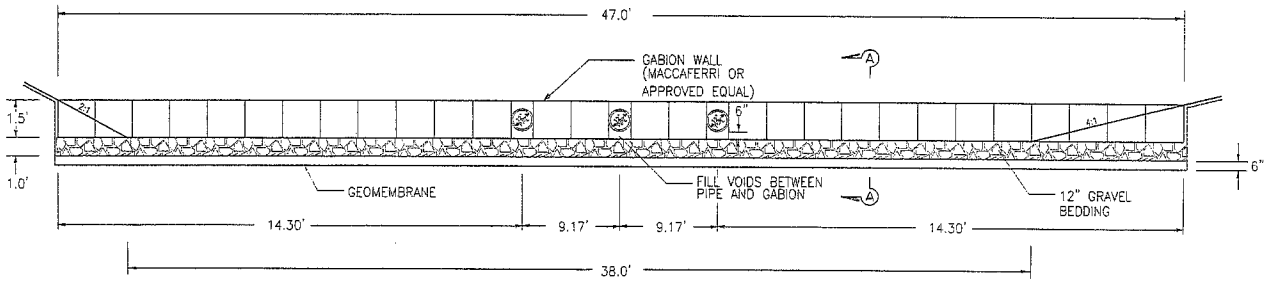
SHEET 21 OF 29
FILE NO.



BASIN 4 PROFILE: SECTION A-A
SEE SHEET 17 FOR PLAN



SECTION A-A
NO SCALE



43 GABION WALL
NO SCALE

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR — DRAWN BY: EE — CHECKED BY: TJR — APPROVED BY:

SUBMITTED BY: CDE
RECOMMENDED FOR APPROVAL: 10-10-05
LAND DEVELOPMENT ENGINEER — DATE
ASST. DIRECTOR OF PUBLIC WORKS — DATE
DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PROFILE & DETAILS
BASIN 4
FOR: LYTLE CREEK DEVELOPMENT

SHEET 22 OF 29
FILE NO.

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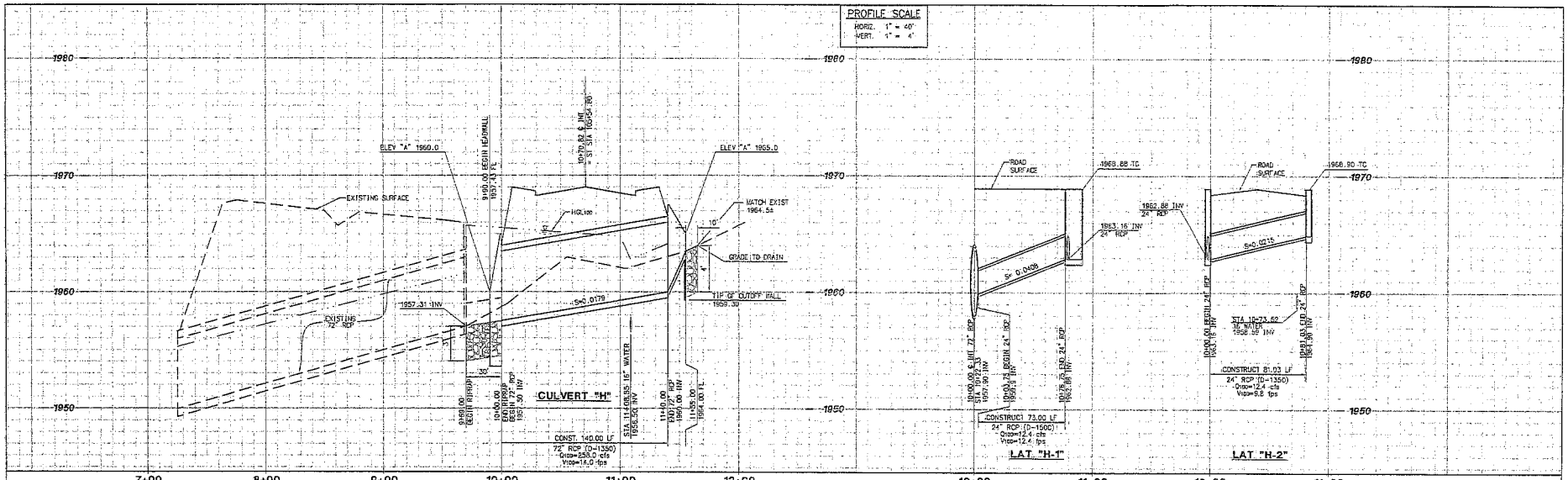

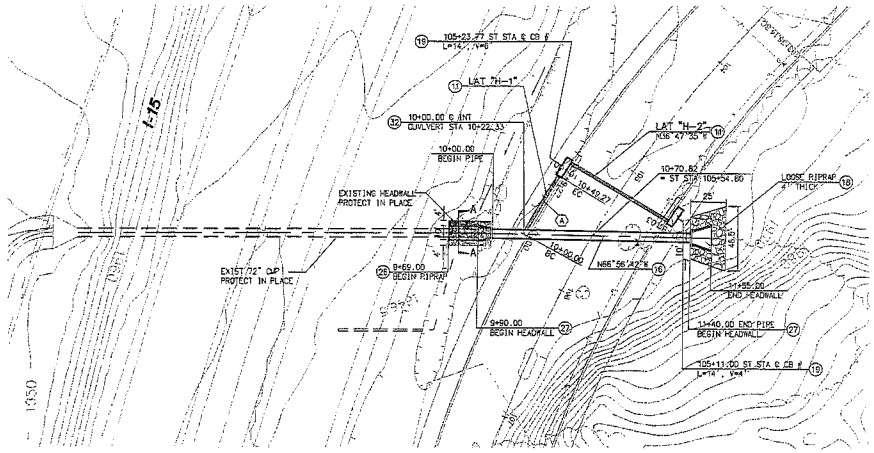

CULVERT "H"

CURVE DATA				
○	△	RADIUS	LENGTH	TANGENT
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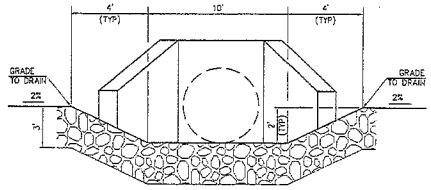


SECTION A-A
RIPRAP LINED TRAPEZOIDAL CHANNEL
N.T.S.

CONSTRUCTION NOTES

11 — INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

16 — INSTALL 72" RCP STORM DRAIN (D-LOAD PER PROFILE)

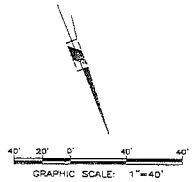
15 — CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAILS ON SHEET 15.

18 — CONSTRUCT TYPE "A" CATCH BASIN PER SBCTD STD DWG 205 ("V" AND "L" PER PLAN.

26 — CONSTRUCT GROUTED RIPRAP TRAPEZOIDAL CHANNEL PER PLAN AND DETAIL 17 ON SHEET 15.

27 — CONSTRUCT PIPE CULVERT HEADWALL, ENDWALL, AND WARPED WINGWALL PER CALTRANS STD PLAN D89B.

32 — CONSTRUCT JUNCTION STRUCTURE PIPE TO PIPE PER APWA STD PLAN 332-1.



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RCE NO. C61701 EXP. 06-30-07

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: MP — DRAWN BY: EC — CHECKED BY: SP
APPROVED BY:
SUBMITTED BY: ASST DIRECTOR OF PUBLIC WORKS — DATE
RECOMMENDED BY: LAND DEVELOPMENT ENGINEER — DATE
APPROVED BY: DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
-
-
LYTLE CREEK DEVELOPMENT

SHEET 23 OF 29

FILE NO.

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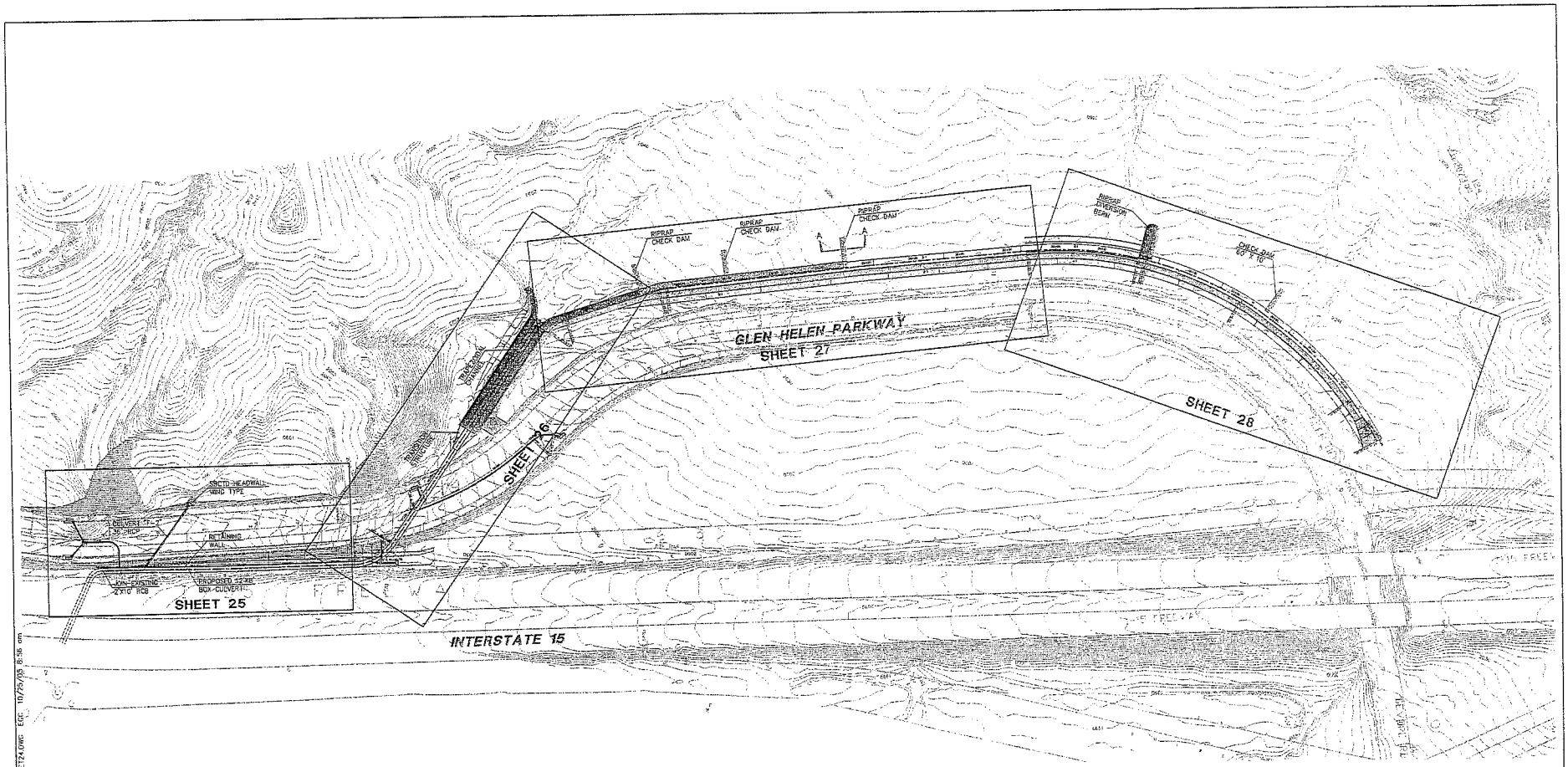

GRAPHIC SCALE: 1"=100'

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THOMAS J. RYAN — DATE 10-25-05
RCE NO. C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — C61701 — 06-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
TJR	ZC	TJR	

SUBMITTED BY: — DATE
RECOMMENDED FOR APPROVAL BY: — DATE 11-1-05
LAND DEVELOPMENT ENGINEER — DATE
ASST DIRECTOR OF PUBLIC WORKS — DATE
DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
INDEX SHEET 3

FOR: LYTLE CREEK DEVELOPMENT

SHEET 24 OF 29
FILE NO.

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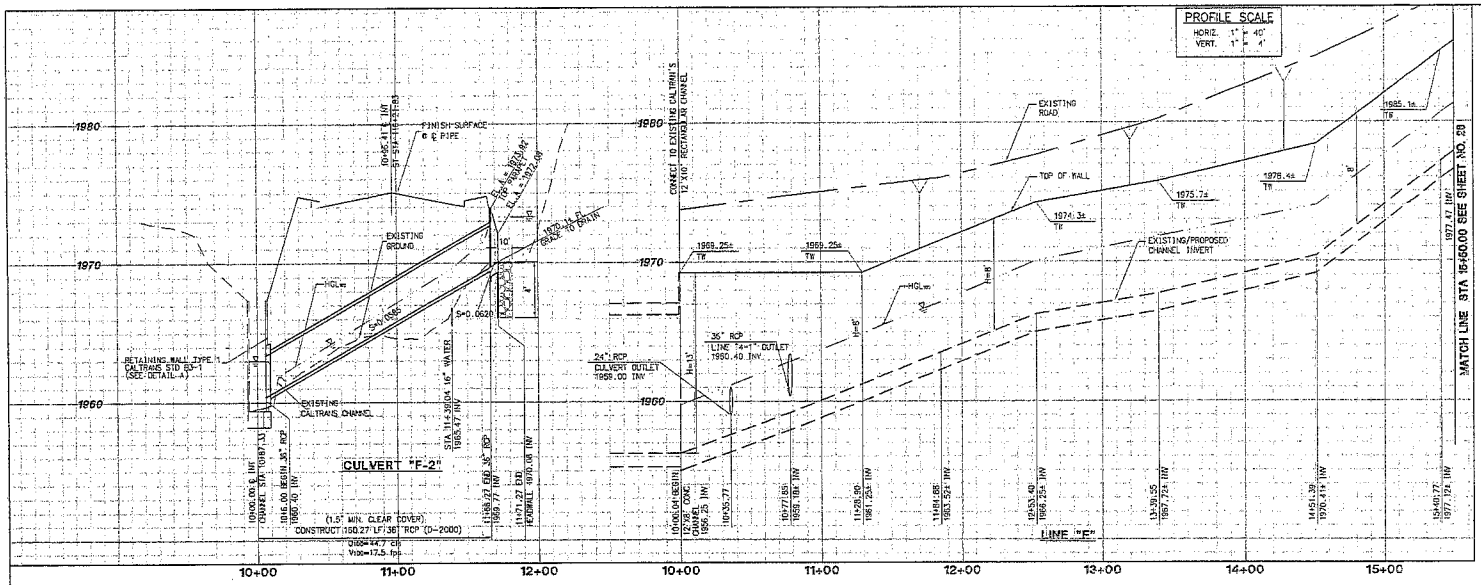


CONSTRUCTION NOTES

(13)— INSTALL 36" RCP STORM DRAIN (D-LOAD PER PROFILE)

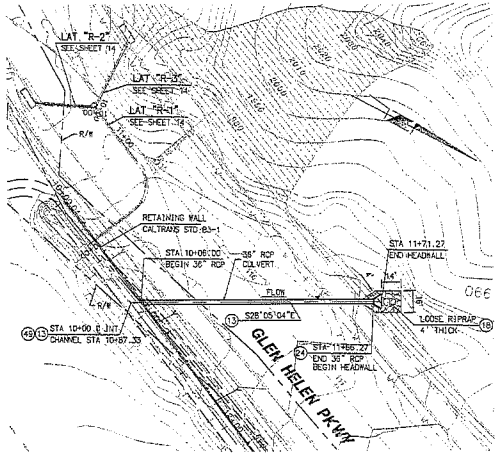
(18)— INSTALL LOOSE RIPRAP PER PLAN, PROFILE, AND DETAILS ON SHEET 15

(24)— CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 209.

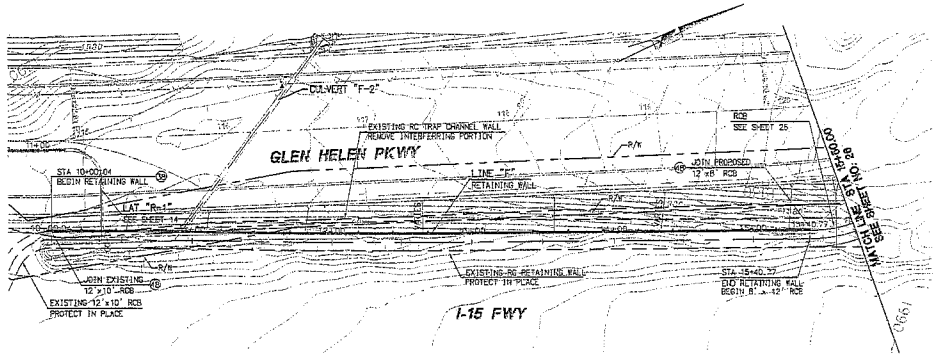
(38)— CONSTRUCT RC RETAINING WALL (TYPE 1) PER CALTRANS STD. PLAN B3-1 AND DETAILS ON SHEET 29.

(48)— CONSTRUCT JOINT PER DETAILS ON SHEET 29.

(49)— CONSTRUCT JUNCTION STRUCTURE - PIPE TO RCB PER APWA STD. PLAN 333-1



CULVERT "F-2"



GRAPHIC SCALE: 1"=40'

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RCE NO. C51701 EXP 06-30-07

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
TJR	CC	TJR

SUBMITTED BY: RBF CONSULTING — LAND DEVELOPMENT ENGINEER — DATE 12-1-05

APPROVED BY: — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

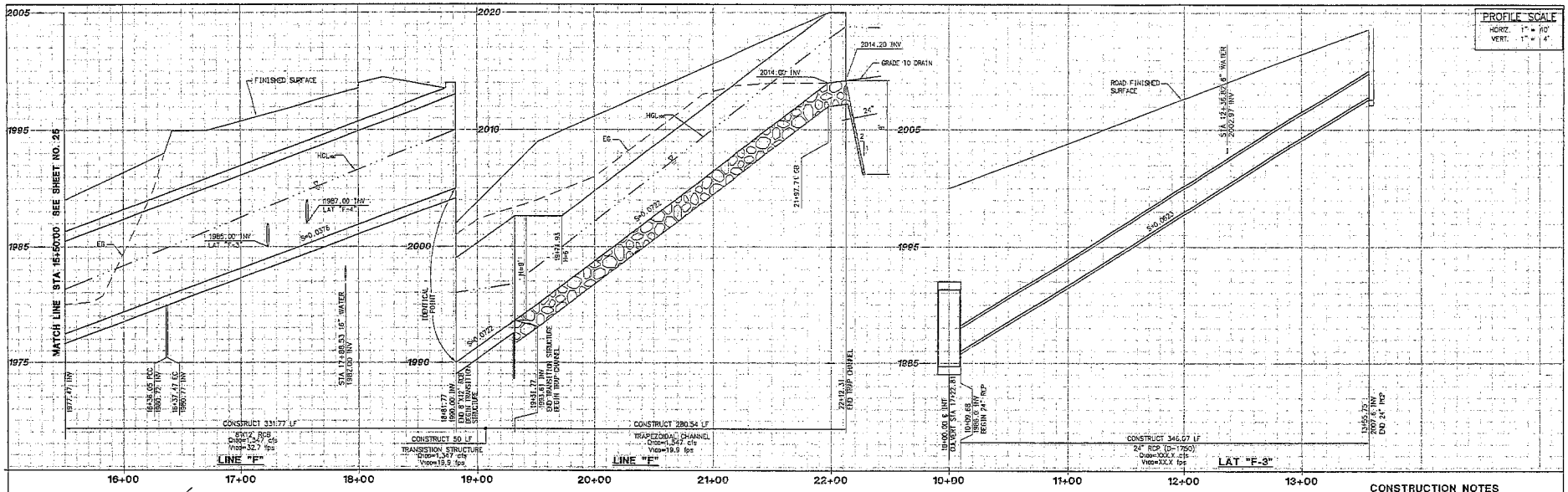
CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY

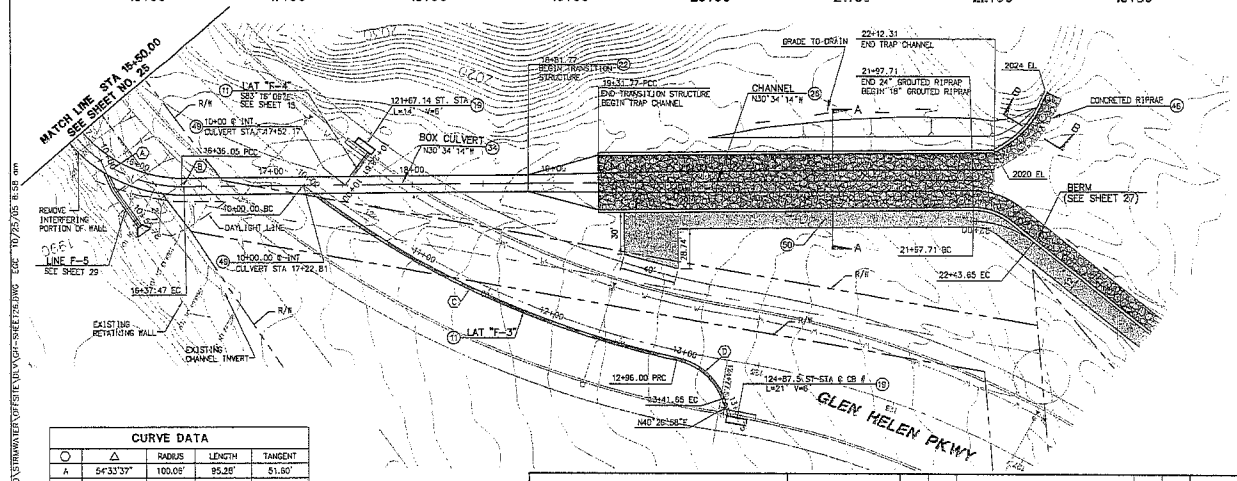
PLAN AND PROFILE - CULVERT "F-2"
STA 10+00 TO STA 15+40.77
12' X 8' CONC. CHANNEL & DETAILS

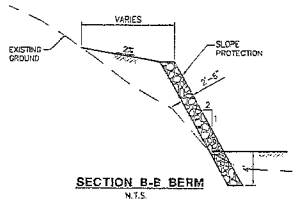
LYTLE CREEK DEVELOPMENT

SHEET 25 OF 29

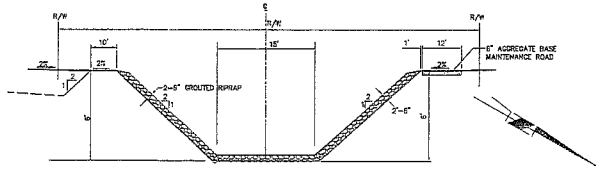
H:\PDATA\10103515\CADD\STRUWATER\OFFSITE\DLV\GH-SHEET25.DWG FOC 10/25/05 8:56 am







SECTION B-B BERM
N.T.S.



SECTION A-A
N.T.S.

GRAPHIC SCALE: 1" = 40'

CONSTRUCTION NOTES

(11) INSTALL 24" RCP STORM DRAIN (D-LOAD PER PROFILE)

(19) CONSTRUCT TYPE "A" CATCH BASIN PER SBCTD STD DWG 206 ("V" AND "L" PER PLAN).

(22) CONSTRUCT BOX CULVERT WARPED WINGWALLS PER CALTRANS STD. PLAN D86A

(26) CONSTRUCT GROUTED RIPRAP TRAPEZOIDAL CHANNEL PER PLAN AND DETAIL 17 ON SHEET 15.

(34) CONSTRUCT 8'X12' BOX CULVERT PER CALTRANS STD PLAN D80

(46) CONSTRUCT EARTHEN BERM PER PLAN AND PROFILE HEREON.

(49) CONSTRUCT JUNCTION, PIPE TO RCB PER APWA STD. PLAN 333-1

(50) CONSTRUCT 6" THICK AGGREGATE BASE.

CURVE DATA

○	Δ	RADIUS	LENGTH	TANGENT
A	54°33'37"	100.00'	95.26'	51.60'
B	00°48'48"	100.00'	1.42'	0.71'
C	25°51'10"	656.00'	296.00'	150.56'
D	58°07'39"	45.00'	45.65'	25.01'

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THOMAS J. RYAN — DATE 10-25-05 — RCE NO. C61701 EXP 06-30-07

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DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

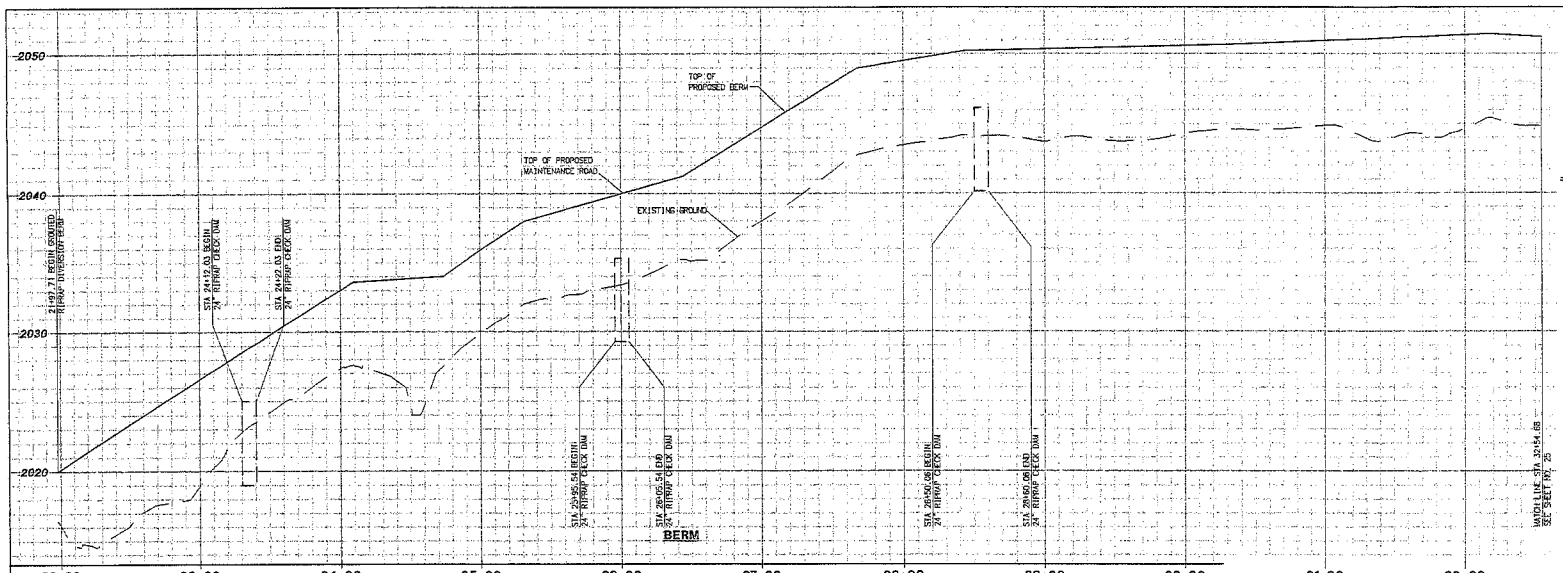
DESIGNED BY: TJR — DRAWN BY: EC — CHECKED BY: TJR — APPROVED BY:

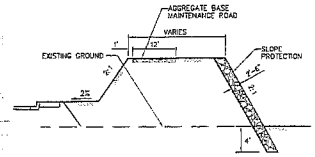
SUBMITTED BY: C.B.E. — RECOMMENDED/APPROVED BY: — 12-1-05
LAND DEVELOPMENT ENGINEER — DATE — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
STA 15+40.77 TO STA 21+97.71
FOR LYTLE CREEK DEVELOPMENT

SHEET 26 OF 29
FILE NO.

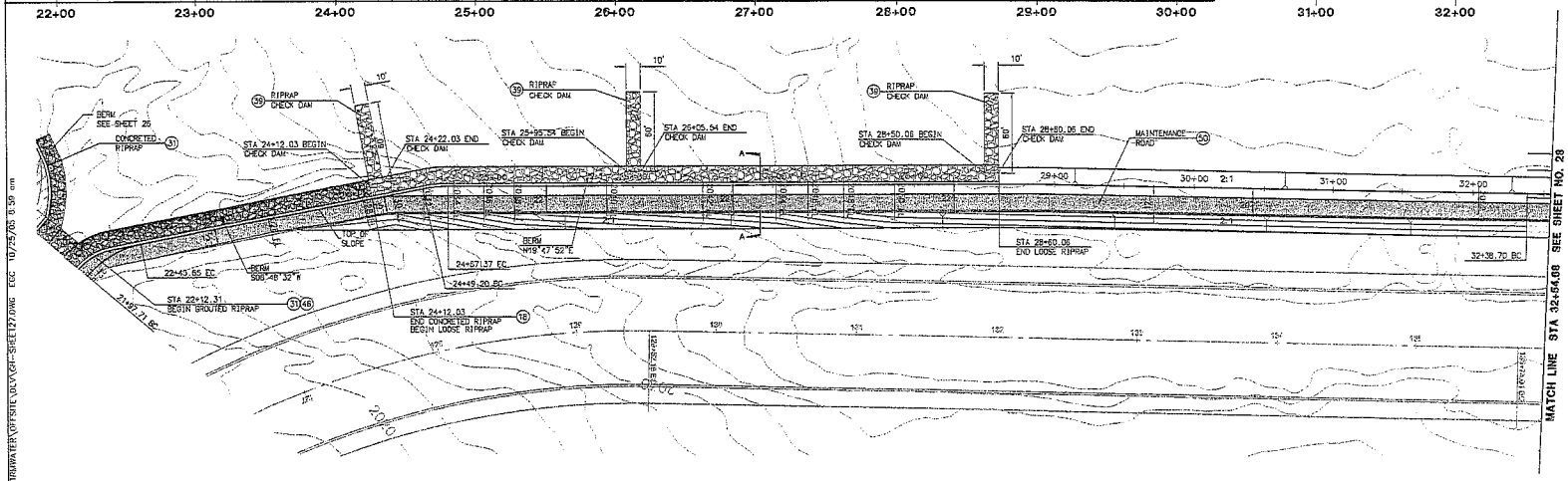
P:\PROJ\A\V0105315\CADD\STORMWATER\OFFSITE\DL\V\GP-SHEET26.DWG LOC 10/25/05 8:58 am





SECTION A-A BERM

NTS



CURVE DATA				
○	△	RADIUS	LENGTH	TANGENT
A	–	–	–	–

CONSTRUCTION NOTES

18 — CONSTRUCT LOOSE RIPRAP PER PLAN, PROFILE, AND DETAIL HEREON.

31 — CONSTRUCT CONCRETED ROCK RIPRAP BANK PROTECTION PER DETAIL ON SHEET 6.

33 — CONSTRUCT INTAKE STRUCTURE, GATE, STEM, AND OPERATOR PEDESTAL PER DETAILS ON SHEET 19.

39 — CONSTRUCT LOOSE RIPRAP CHECK DAM PER PLAN, SECTION A-A, AND DETAIL 18 ON SHEET 15.

46 — CONSTRUCT EARTHEN BERM PER PLAN AND PROFILE HEREON.

50 — CONSTRUCT 6" THICK AGGREGATE BASE.

40' 20' 0' 40' 80'

GRAPHIC SCALE: 1"=40'

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14725 ALTON PARKWAY
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THOMAS J. RYAN
DATE 10-25-05
RCE NO. C61701 EXP 06-30-07
REGISTERED PROFESSIONAL ENGINEER THOMAS J. RYAN C61701 06-30-07 CIVIL STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY: TJR | DRAWN BY: EC | CHECKED BY: TJR | APPROVED BY:

SUBMITTED BY: DPW

RECOMMENDED APPROVAL: 17-1-05

LAND DEVELOPMENT ENGINEER DATE | ASST DIRECTOR OF PUBLIC WORKS DATE | DIRECTOR OF PUBLIC WORKS DATE

CHANNEL IMPROVEMENT PLANS

GLEN HELEN PARKWAY

PLAN AND PROFILE
STA 21+97.71 TO STA 32+54.68

FOR LYTLE CREEK DEVELOPMENT

SHEET 27 OF 29

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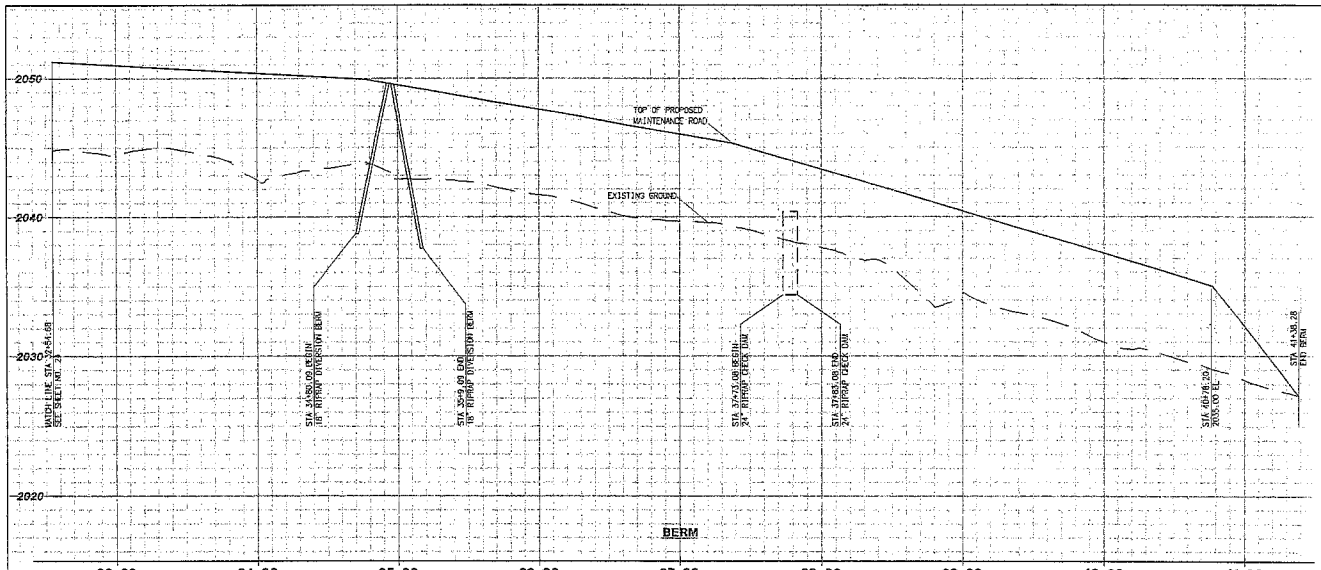

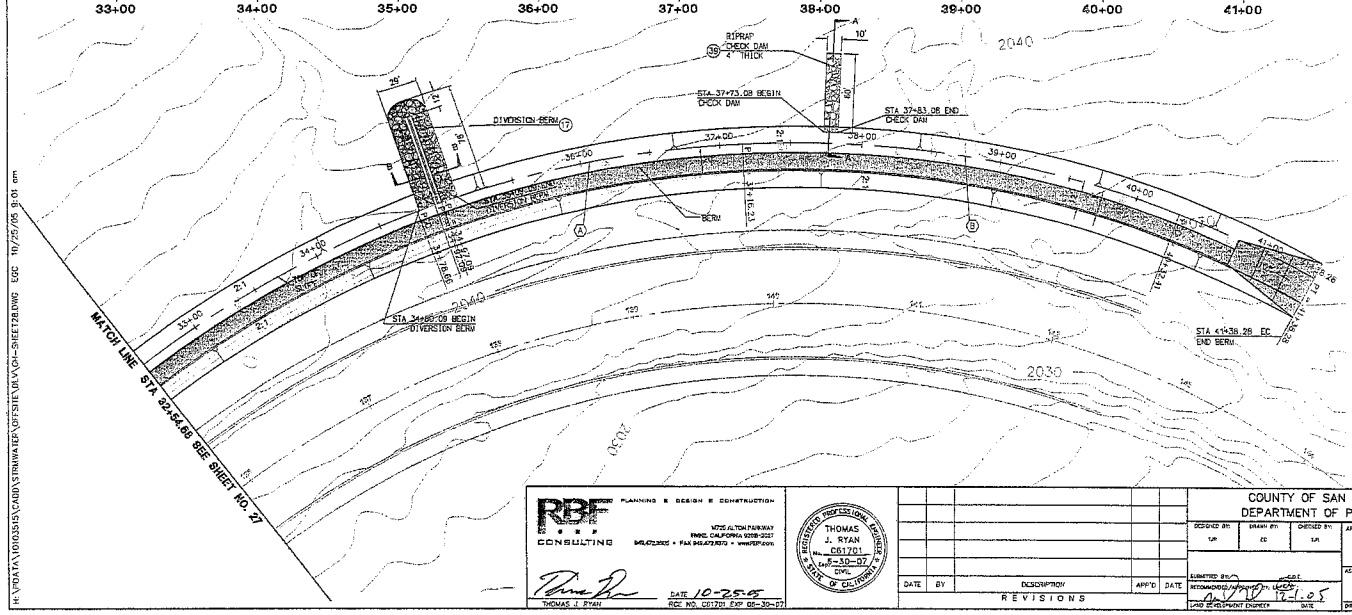

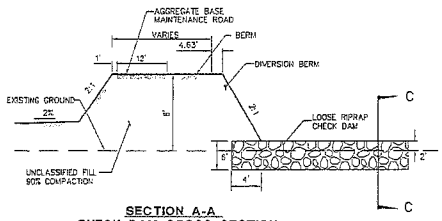

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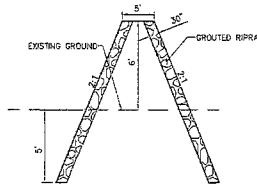
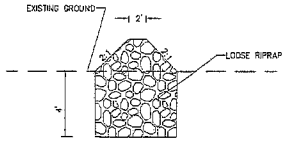
NTS



SECTION B-B DIVERSION BERM
NTS



SECTION C-C CHECK DAM
NTS

CURVE DATA				
	Δ	RADIUS	LENGTH	TANGENT
A	16°33'51"	758.02'	219.14'	110.34'
B	23°48'16"	751.02'	316.18'	160.40'

CONSTRUCTION NOTES

(17) CONSTRUCT GROUTED RIPRAP PER PLAN, PROFILE, AND DETAIL ON SHEET 15.

(39) CONSTRUCT LOOSE RIPRAP CHECK DAM PER PLAN, SECTION A-A, AND DETAIL 18 ON SHEET 15.

(50) CONSTRUCT 6" THICK AGGREGATE BASE.

GRAPHIC SCALE: 1"=40'

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THOMAS J. RYAN — DATE 10-25-05
RCE NO. C61701 EXP 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — No. C61701 — Exp. 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

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DEPARTMENT OF PUBLIC WORKS

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SUBMITTED BY: — RECOMMENDED: — LAND DEVELOPMENT ENGINEER — DATE 10-25-05

APPROVED BY: — ASST DIRECTOR OF PUBLIC WORKS — DATE — DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
PLAN AND PROFILE
STA 32+54.68 TO STA 41+38.28

FOR LYTLE CREEK DEVELOPMENT

SHEET 28 OF 29

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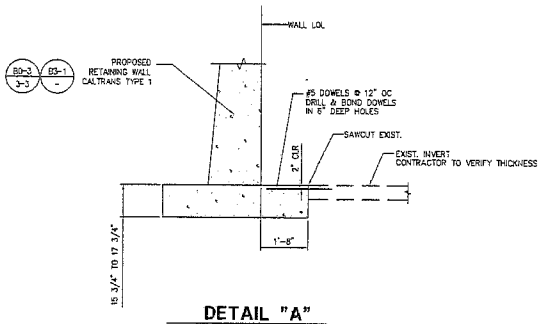

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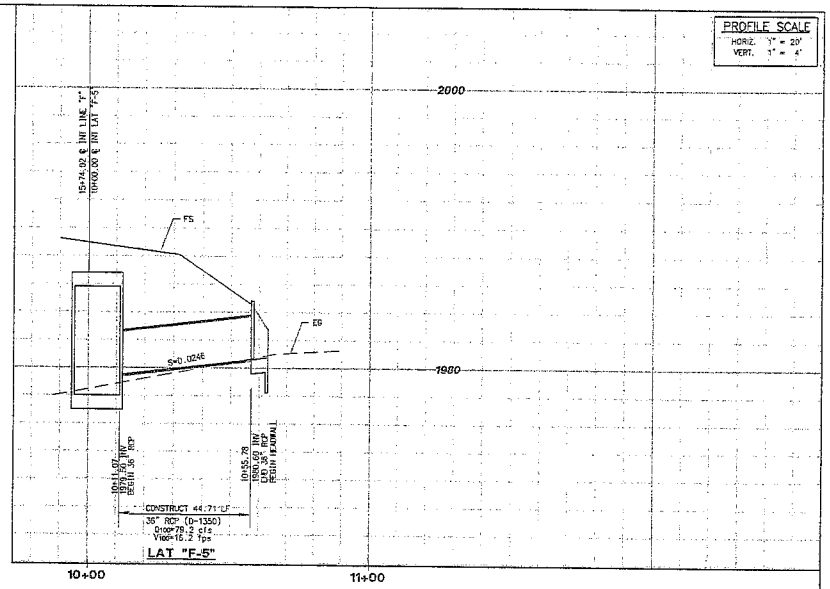

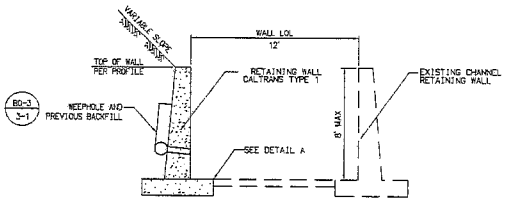

38 **TYPICAL CHANNEL CROSS-SECTION**

SEE SHEET 25
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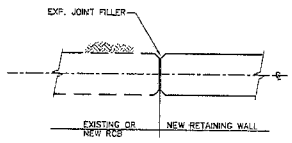

48 **JOIN DETAIL**

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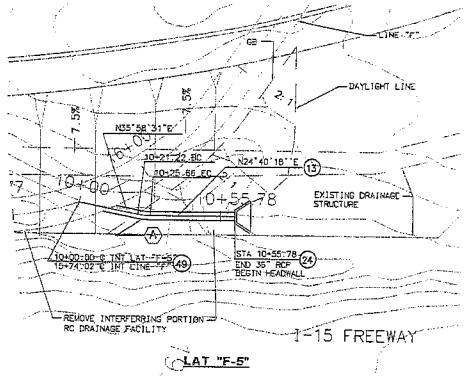

LAT "F-5"

CONSTRUCTION NOTES

13 — INSTALL 36 RCP STORM DRAIN (D-LOAD PER PROFILE)

24 — CONSTRUCT HEADWALL WING TYPE PER SBCTD STD 209

49 — CONSTRUCT JUNCTION STRUCTURE PIPE TO RCP PER APWA STD. PLAN 333-1

CURVE DATA				
⌒	Δ	RADIUS	LENGTH	TANGENT
A	11°18'12"	22.50'	4.44'	2.23'

GRAPHIC SCALE: 1"=20'

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THOMAS J. RYAN

DATE 10-25-05
RCE NO. C61701 EXP. 06-30-07

REGISTERED PROFESSIONAL ENGINEER — THOMAS J. RYAN — No. C61701 — 6-30-07 — CIVIL — STATE OF CALIFORNIA

DATE	BY	DESCRIPTION	APP'D	DATE

REVISIONS

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

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SUBMITTED BY: CBC
RECOMMENDED APPROVAL: 10-26-05
LAND DEVELOPMENT ENGINEER — DATE

ASST. DIRECTOR OF PUBLIC WORKS — DATE

DIRECTOR OF PUBLIC WORKS — DATE

CHANNEL IMPROVEMENT PLANS
GLEN HELEN PARKWAY
RETAINING WALL SECTIONS AND DETAILS
LAT "F-5"

FOR: LYTLE CREEK DEVELOPMENT

SHEET 29 OF 29

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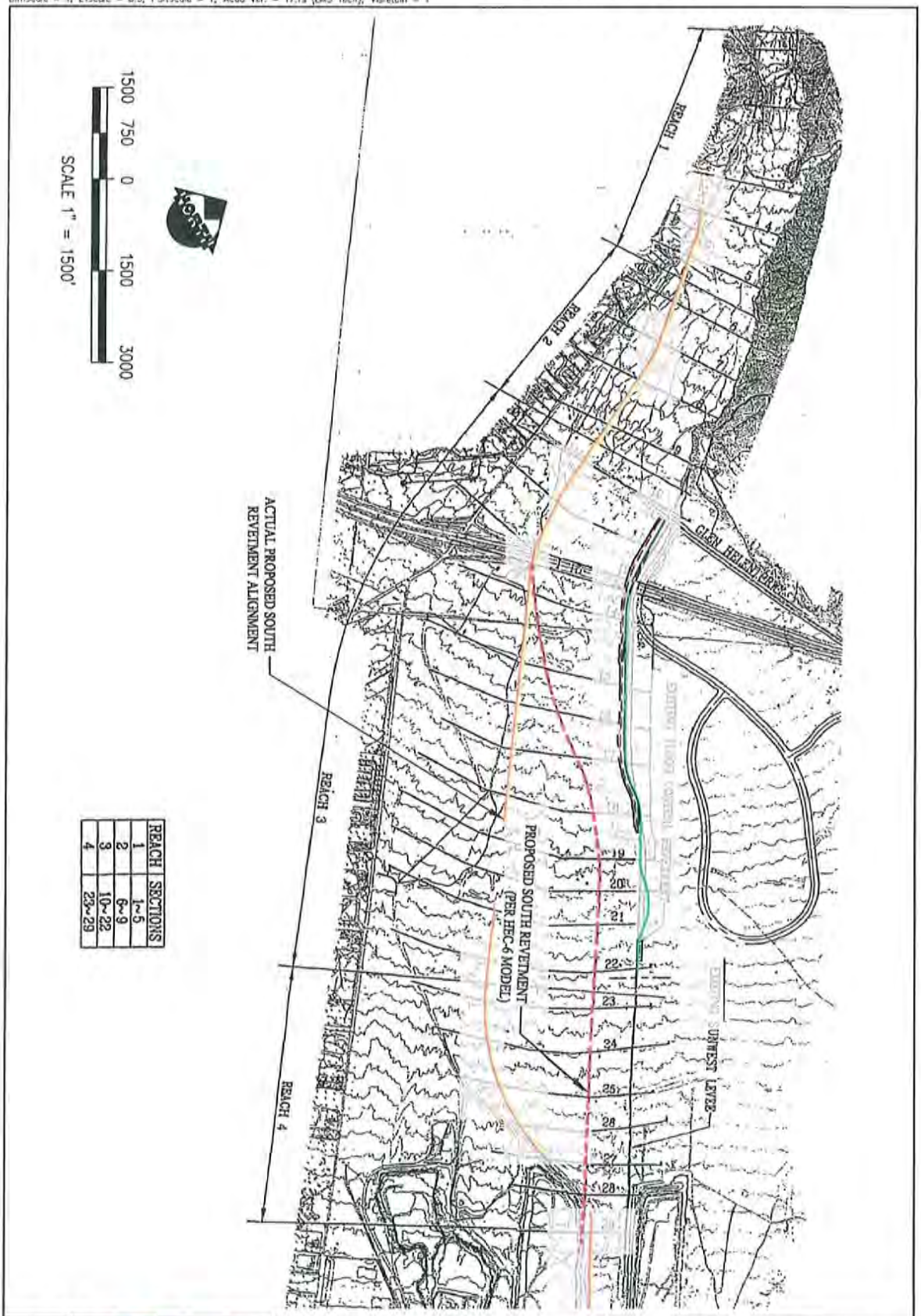

EXHIBIT 24	PACE Advanced Water Engineering 17530 Ventura Blvd., Suite 200	SCALE AS SHOWN	JOB LYTLE CREEK RANCH
	Fountain Valley, CA 92708	DESIGNED S.P.	
	Ph (714) 481-7300 | www.pacewater.com	DRAWN L.T.	
		CHECKED J.S.	
		DATE 09/30/2008	
		JOB NO. 8425-E	RIALTO CA

TITLE
HEC-6 SEDIMENT TRANSPORT ANALYSIS EXISTING VS. PROPOSED CONDITION

C:\Documents and Settings\ltran\Desktop\APPX B.dwg - Tab: APPX B 2 By: ltran on Sep. 30, 2008 at 03:47 pm

Appendix III-D

BIOLOGICAL RESOURCE ASSESSMENT

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Appendix III-D-A

PCR Services Corporation Addendum to the Biological Resources Assessment for the Lytle Creek Ranch Specific Plan (September 2009)

September 29, 2009

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Memorandum

TO: Mr. David Levine, Natural Resource Consultants **DATE:** September 29, 2009
CC: Mr. Jan Dabney, Lytle Development Company
FROM: Crysta Dickson and Steve Nelson, PCR Services Corporation
RE: **ADDENDUM TO THE BIOLOGICAL RESOURCES ASSESSMENT FOR THE LYTLE CREEK RANCH SPECIFIC PLAN (SEPTEMBER 2009)**

Prior to the completion of the Screencheck Environmental Impact Report (EIR) for the Lytle Creek Ranch Specific Plan study area ("LCRSP study area"), the listing status of the Parry's spineflower (*Chorizanthe parryi* var. *parryi*), as determined by the California Native Plant Society (CNPS) was elevated from a CNPS List 3.2 (fairly endangered in California/review list plant/more information needed) to a CNPS List 1B.1 (rare, threatened or endangered in California or elsewhere/seriously endangered in California)[1] species. As such, this memorandum is intended to serve as an addendum to the **PCR Services Corporation (PCR)** Biological Resources Assessment (BRA)[2] relative to this sensitive biological resource using the significance threshold criteria under the California Environmental Quality Act (CEQA).

Approximately 501,280 Parry's spineflower were mapped within the LCRSP study area during focused sensitive plant surveys conducted by Michael Brandman Associates (MBA) and PCR between 1994 and 2006 (Figure 1, *Parry's Spineflower Locations*, attached). In 1994, an estimated 440,000 individuals of Parry's spineflower were mapped within the LCRSP study area by MBA biologists in chamise chaparral, alluvial fan sage scrub, and Riversidean sage scrub habitats. Most of the Parry's spineflower plants were found in Lytle Creek Wash on a 162-acre terrace of chamise chaparral and alluvial fan sage scrub located to the northwest of the CEMEX mining area. During the 2005 and 2006 survey seasons, PCR biologists confirmed the locations of the major populations within the LCRSP study area and also documented several additional small populations (totaling an estimated 61,280 plants) throughout the LCRSP study area.

The proposed project will impact approximately 35,280 individuals over approximately 7.2 acres of the LCRSP study area (Figure 2, *Impacts to Parry's Spineflower*, attached). This would result in the loss of approximately seven percent (7%) of the populations mapped within the LCRSP study area. The BRA found that the loss of 7% of the population was not a significant impact. Taking into consideration the elevation in the CNPS listing status for this species, potential impacts to this species as a result of the proposed project will remain a less than significant impact under CEQA because the proposed project will avoid 93 percent of the Parry's spineflower mapped within

---

[1] California Native Plant Society. 2009. Inventory of Rare and Endangered Plants (online edition, v7-09c 7-14-09). California Native Plant Society. Sacramento, CA. Accessed on September 29, 2009 from http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi/Search?search=parry%27s+spineflower.

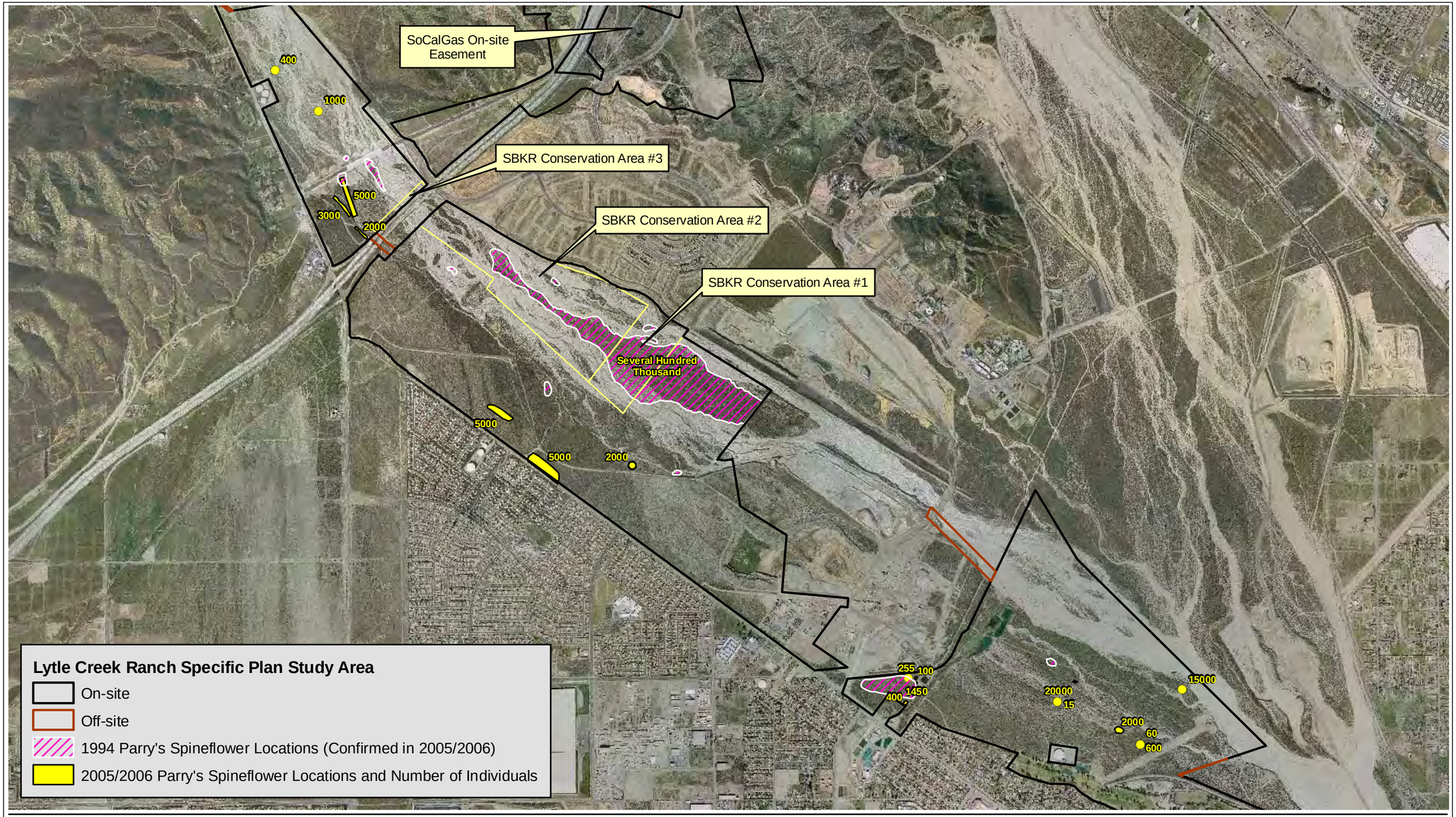
[2] PCR. 2009. Biological Resources Assessment, Lytle Creek Ranch Specific Plan, City of Rialto, San Bernardino County California. September.

One Venture, Suite 150, Irvine, California 92618 INTERNET www.pcrnet.com TEL 949.753.7001 FAX 949.753.7002

the LCRSP study area, including the largest population of this species mapped within the 162-acre terrace of chamise chaparral and alluvial fan sage scrub located to the northwest of the CEMEX mining area. These 162 acres lie partly within an area set aside as conservation open space for the Lytle Creek North Planned Development (LCNPD) and partly within the Habitat Mitigation Area which is proposed for inclusion as conservation open space under the LCRSP. Therefore, even considering the change in status of this sensitive plant, the loss of seven percent (7%) of the Parry's spineflower within the study area is not expected to cause the population to drop below self-perpetuating levels, and impacts are considered less than significant as they do not exceed threshold 1.

Potential indirect impacts to Parry's spineflower remain the same and include dust from adjacent construction activities and invasion by non-native species. As such indirect impacts to Parry's spineflower remain less than significant as they do not exceed threshold 1.

If you should have any questions please do not hesitate to contact Crysta Dickson at c.dickson@pcrnet.com or Steve Nelson at s.nelson@pcrnet.com.



PCR

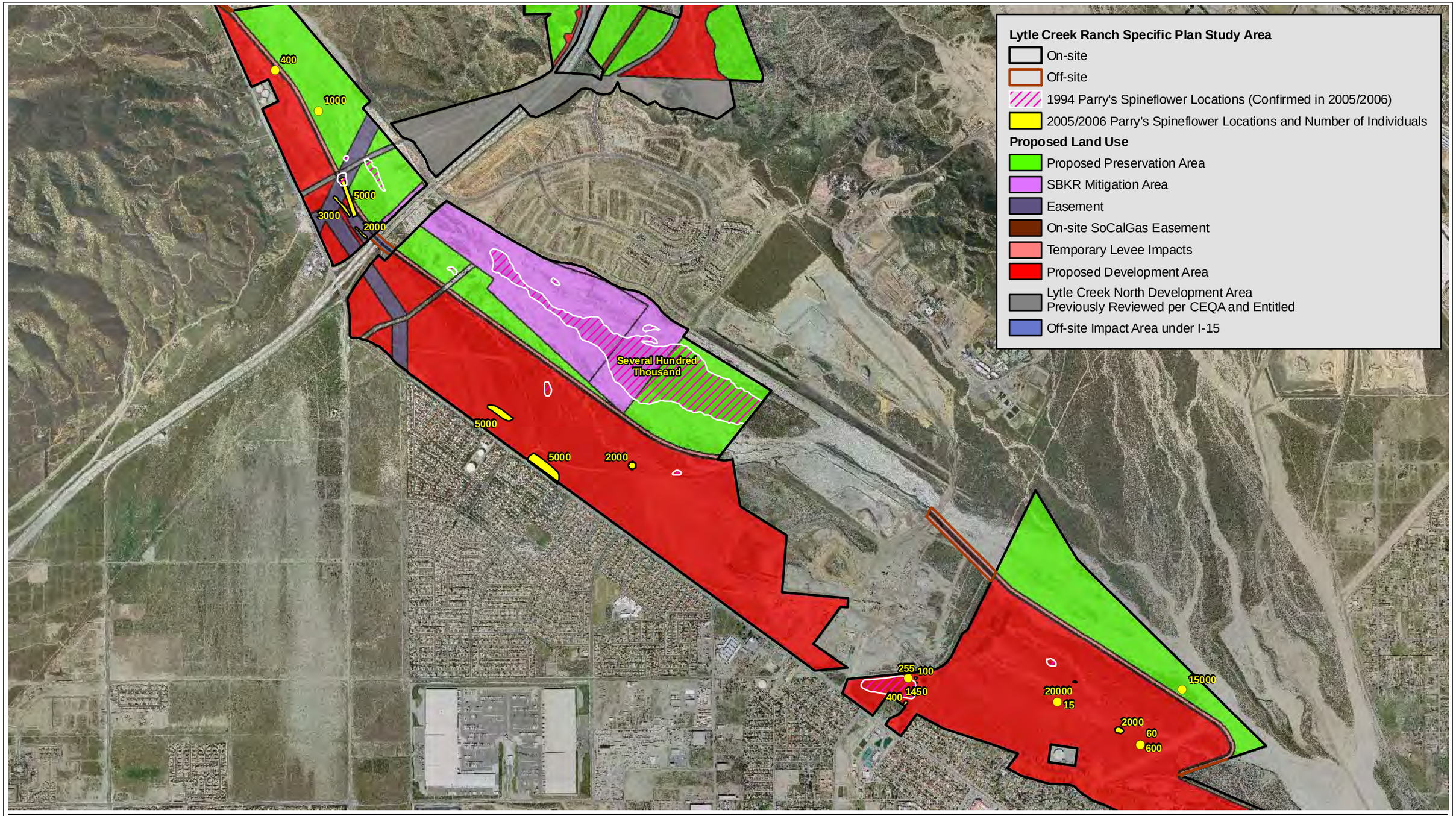
N

2,000 0 2,000 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 1

Lytle Creek Ranch
Parry's Spineflower Locations



PCR

N

2,000 0 2,000 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 2

Lytle Creek Ranch
Impacts to Parry's Spineflower Locations

Appendix III-D-B

PCR Services Corporation
Biological Resources Assessment
Lytle Creek Specific Plan
City of Rialto, San Bernardino County, California
September 2009

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BIOLOGICAL RESOURCES ASSESSMENT

Lytle Creek Ranch Specific Plan

City of Rialto, San Bernardino County, California

Prepared For:

Lytle Development Company
285 W. Rialto Avenue, Suite B
Rialto, California 92376
Contact: Ron Pharris
Jan Dabney

Prepared By:

PCR Services Corporation
One Venture, Suite 150
Irvine, California 92618
Tel: 949.753.7001
Contact: Steven G. Nelson, Director of Biological Services
Crysta Dickson,Senior Biologist II

September 2009

PCR

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Biological Resources Assessment

Lytle Creek Ranch Specific Plan
City of Rialto
San Bernardino County, California

Prepared For:
Lytle Development Company
285 W. Rialto Ave. Suite B
Rialto, CA 92376

Contact:
Ron Pharris
Jan Dabney

Prepared By:
PCR Services Corporation
One Venture, Suite 150
Irvine, California 92618
(949) 753-7001

Contact:
Steven G. Nelson, Director of Biological Services
Crysta Dickson, Senior Biologist II

September 2009

Biological Resources Assessment

Lytle Creek Ranch Specific Plan
City of Rialto
San Bernardino County, California

The undersigned certify that this report is a complete and accurate account of the findings and conclusions of a comprehensive biological assessment for the above-referenced project.

PCR Services Corporation

Steven G. Nelson, Director of Biological Services

Crysta Dickson, Senior Biologist II

September 2009

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EXECUTIVE SUMMARY

BACKGROUND

Lytle Development Company (the Applicant) is requesting discretionary approval for the development of the Lytle Creek Ranch Specific Plan (referred to herein as the "LCRSP project"), a proposed residential and mixed-use development located partially within the City of Rialto and partly within unincorporated San Bernardino County (County), California (Figure 1, *Regional Map,* on page 4). The 2,447.3-acre project site, generally located adjacent to a reach of Lytle Creek Wash, consists of several neighborhoods referred to as Neighborhood I [comprised of property in County planning areas known as Sycamore Flat East and West and portions of County-approved Lytle Creek North Planned Development Project (LCNPD)], Neighborhood II [eastern portion, including the existing El Rancho Verde Golf Course in the City of Rialto), Neighborhood III (southern portion), and Neighborhood IV (western portion, west of Interstate 15 (I-15)]. As part of the project, approximately 610.8 acres (of which 443.1 acres are immediately adjacent to and surrounding the existing 216.8-acre San Bernardino kangaroo rat (SBKR) Conservation Area) of natural open space, including a portion of Lytle Creek Wash and the hills above the Sycamore Flat area, will be used as mitigation and set aside in perpetuity (Habitat Mitigation Area). In addition to the 2,447.3-acre project site, this analysis analyzes impacts to an additional 19.2 acres of off-site areas that lie adjacent to the project site and are either potentially affected by the proposed project or that the Applicant requested be examined. In total, the study area for biological resources consists of 2,466.5 acres ("LCRSP study area"). Off-site portions of the LCRSP study area include: 1) a 2.3-acre road under the I-15 that will be improved by the project; 2) an approximately 3.6-acre portion of a Southern California Gas Company (So Cal Gas) easement that extends off-site to the north of Neighborhood I on County-owned property; 3) an approximately 2.6-acre existing utility road at the downstream end of Neighborhood II; 4) an 10.1-acre area associated with proposed improvements to an off-site levee north of Neighborhood II; and 5) a 0.6-acre area north of Neighborhood IV and south of Neighborhood II that will be temporarily impacted during levee construction. It should be noted that the 2,447.3-acre project site includes a 3.9-acre segment of the So Cal Gas easement within neighborhood I, 137.8 acres within Neighborhood I that was previously entitled and approved for development as part of LCNPD, and the existing 216.8-acre SBKR Conservation Area previously set aside for SBKR habitat by Lytle Development Company in connection with the LCNPD development. The components of the LCRSP study area are shown in Figure 3, *Prescribed Land Uses,* on page 7).

SCOPE AND METHODOLOGY

The scope of this assessment includes a description of all methods employed, survey results, and documentation of existing biological resources within the LCRSP study area, and the determination of potential impacts associated with the proposed project for the purpose of complying with the California Environmental Quality Act (CEQA) and providing biological information for subsequent state and federal regulatory permitting. Methods of study included a review of relevant literature, field surveys, and an impact analysis. This report is consistent with accepted scientific and technical standards and the requirements of the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG). While general biological resources are discussed in a summary manner, the focus of this assessment is on those resources considered to be sensitive and/or significant.

EXISTING CONDITIONS

The approximately 2,466.5-acre LCRSP study area is located partly within the City of Rialto and partly within an unincorporated portion of southwestern San Bernardino County. Elevations within the LCRSP study area range from a high of approximately 2,270 feet above mean sea level (MSL) in the western portion of Neighborhood I to a low of approximately 1,450 feet above MSL at the downstream end of Lytle Creek Wash within Neighborhood II.

The LCRSP study area supports 38 distinct plant communities and/or associations including 1,143.7 acres of Riversidean alluvial fan sage scrub (where Riversidean alluvial fan sage scrub is the only or primary community), 1.2 acre of white sage scrub, 19.4 acres of southern willow scrub (of which 1.8 acres are within the on-site So Cal Gas easement and 1.9 acres within the off-site So Cal Gas easement), 0.3 acre of California sycamore alliance, and 1.7 acres of southern cottonwood willow riparian all of which are considered sensitive by the CDFG due to their limited distribution or their potential to support sensitive wildlife species.

Of the approximately 1,143.7 acres of Riversidean alluvial fan sage scrub communities occurring within the LCRSP study area, 473.2 acres (472.2 acres on-site and 1.0 acre off-site) are hydrologically disconnected (i.e., outside the existing 100-year floodplain). These areas are no longer exposed to the natural flood regime characteristic of this community.

Sensitive plant species observed within the study area include Plummer's mariposa lily (*Calochortus plummerae*), a California Native Plant Society (CNPS) List 1B.2 species and historically, the slender-horned spineflower (*Dodecahema leptoceras*), a state and federally-listed endangered species and CNPS List 1B.1. The CNPS recently updated their lists to utilize "Threat Codes", represented by decimal ranks following the list number. Threat code .1 indicates the species is seriously endangered in California (over 80% of occurrences

threatened / high degree and immediacy of threat) while threat code .2 indicates the species is fairly endangered in California (20-80 percent of identified occurrences threatened).

Over 127,300 Plummer's mariposa lilies were mapped primarily within the proposed on-site Habitat Mitigation Area portion of the LCRSP study area. Although slender-horned spineflower was documented on-site by Michael Brandman Associates (MBA) in 1994, it has not been observed during consecutive focused surveys conducted by PCR and is considered absent from the LCRSP study area today. In addition, there is a low probability that the species would occur on-site in the future based upon PCR's recent survey results and California Natural Diversity Database (CNDDB) and USFWS occurrence data from 2005 that are outside the Lytle Creek Wash. Another sensitive species surveyed for was the Santa Ana River woollystar (*Eriastrum densifolium* ssp *sanctorum*). In 2006, PCR conducted a sampling effort of corolla lengths which determined that the woollystar[1] (*Eriastrum densifolium*) within the LCRSP study area most closely resembles the subspecies *elongatum* (not the federally and state-listed endangered subspecies). Under the proposed rule on hybridization (USFWS 1996), the LCRSP population would not be considered to be part of the listed taxon. The results of PCR's 2006 analysis, which was based upon work and peer-reviewed by Dr. Mark Brunell, indicate that the LCRSP study area does not support the endangered subspecies *Eriastrum densifolium* ssp. *sanctorum*. Further, the endangered subspecies is known to occur within the Santa Ana River, at least 5 miles up- and downstream of its confluence with Lytle Creek (CNDDB 2008a). Seed dispersal of the Santa Ana River woollystar is such that seeds fall within the immediate vicinity of the parent plant, limiting the dispersal (Chambers Group, Inc. 1993). Therefore, it would be highly unlikely that this subspecies could somehow disperse several miles upstream to colonize the LCRSP study area in the future.

CNPS List 3 and 4 species observed on-site include Parry's spineflower (*Chorizanthe parryi* var. *parryi*), a CNPS List 3.2 species, and southern California black walnut (*Juglans californica* var. *californica*), a CNPS List 4.2 species. Although CNPS List 3 plants require more information before rarity can be determined, they are included in this assessment in order to provide full disclosure during the CEQA review process. CNPS List 4 species are limited in distribution and are therefore monitored, but they are not considered rare in California.

With respect to CNPS List 3 and 4 species, an estimated total of 501,280 Parry's spineflower individuals were mapped within the LCRSP study area. In addition, one southern California black walnut was observed within the LCRSP study area.

[1] *The reader should note that the spelling of woollystar varies across a number of reputable sources. For the purposes of this assessment, the spelling used herein is woollystar and covers all other spellings of the common name for Eriastrum densifolium.*

Sensitive wildlife species observed within the LCRSP study area include coast (San Diego) horned lizard [(*Phrynosoma coronatum* ssp. *blainvillei*), California Species of Special Concern (CSC)], golden eagle [(*Aquila chrysaetos*), State fully protected (SFP)], northern harrier [(*Circus cyaneus*), CSC], American peregrine falcon [(*Falco peregrinus anatum*), state-endangered, SFP], white-tailed kite [(*Elanus leucurus*), SFP], burrowing owl [(*Athene cunicularia*), CSC], loggerhead shrike [(*Lanius ludovicianus*), CSC], Vaux's swift [(*Chaetura vauxi*), CSC], willow flycatcher [(*Empidonax traillii*), state-endangered], least Bell's vireo [(*Vireo bellii pusillus*), stated and federally-endangered], yellow warbler [(*Dendroica petechia brewsteri*), CSC], yellow-breasted chat [(*Icteria virens*), CSC], western mastiff bat [(*Eumops perotis*), CSC], pocketed free-tailed bat [(*Nyctinomops femorosaccus*), CSC], San Diego black-tailed jack rabbit [(*Lepus californicus bennettii*), CSC], northwestern San Diego pocket mouse [(*Chaetodipus fallax fallax*), CSC], Los Angeles pocket mouse [(*Perognathus longimembris brevinasus*), CSC], and San Bernardino kangaroo rat [(*Dipodomys merriami parvus*), federally-endangered, CSC].

Several additional sensitive wildlife species were not observed but have at least some potential to occur within the LCRSP study area. These include the western spadefoot (*Spea hammondii*), orange-throated whiptail (*Aspidoscelis hyperythra*), silvery legless lizard (*Anniella pulchra pulchra*), coast patch-nosed snake (*Salvadora hexalepis virgultea*), long-eared owl (*Asio otus*), tricolored blackbird (*Agelaius tricolor*), California leaf-nosed bat (*Macrotus californicus*), pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), San Diego desert woodrat (*Neotoma lepida intermedia*), and southern grasshopper mouse (*Onychomys torridus Ramona*). Habitat assessments were performed in order to determine the level of potential; however, targeted surveys were not conducted for these species, all of which are CSC species. This level of study is an industry-wide accepted standard for the species mentioned above.

Wildlife species for which focused surveys or habitat assessments resulted in negative findings include the federally-listed threatened coastal California gnatcatcher (*Polioptila californica californica*). Focused protocol surveys performed in 2005, 2006, and 2007 did not detect this species within the LCRSP study area.

The burrowing owl was incidentally observed within the LCRSP study area but outside the development footprint in the SBKR Conservation Area in September of 2006 and February of 2007 during trapping for the San Bernardino kangaroo rat; and again in January 2009. However, the Phase I, Habitat Assessment and Phase II, Burrow Survey in 2006 and 2007 did not detect this species within the development portion of the LCRSP study area.

Focused surveys were conducted for the state and federally-listed endangered southwestern willow flycatcher in 2006, 2007, and 2008. This species was not detected in 2006, 2007, or 2008 within the LCRSP study area. One transient willow flycatcher (a species that is

state-listed as endangered but is not federally-listed as either threatened or endangered) was observed within the LCRSP study area in 2006, and another single transient willow flycatcher was observed within the LCRSP study area in 2007 and 2008. Based on willow flycatcher migration patterns and periods, these birds are considered to be transient, as they were not observed on any previous or subsequent surveys for the southwestern willow flycatcher.

In 2006, two pairs of the state and federally-listed endangered least Bell's vireo were observed during the survey period within the Sycamore Flat riparian corridor in Neighborhood I and at least one least Bell's vireo was observed numerous times within a narrow riparian corridor along the western portion of Neighborhood II. During protocol surveys in 2007, only one pair of least Bell's vireo was observed within the Sycamore Flat riparian corridor just north of the Neighborhood I boundary within the County Parks parcel and none in Neighborhood II. However, protocol surveys conducted in 2008 did not detect the presence of least Bell's vireo within the LCRSP study area.

The San Bernardino kangaroo rat is known to occur on-site and is generally found in pioneer and intermediate phases of Riversidean alluvial fan sage scrub habitat. An extensive trapping program was carried out in all potentially suitable habitat within the LCRSP study area with repetitive trapping bouts in 2005, 2006, and 2007. For the purposes of this assessment, San Bernardino kangaroo rat habitat is defined as consisting of Riversidean alluvial fan sage scrub that has been occupied at some point between 2005 and 2007 ("occupied habitat") and is within the 100-year floodplain. Based upon actual trapping results, 702.7 acres (696.8 acres and 5.9 acres off-site) of the LCRSP study area are considered occupied. This includes 217.6 acres within Neighborhood II, 402.7 acres within Neighborhood III, 76.5 acres within Neighborhood IV, 0.1 acre off-site within the road under I-15, and 5.8 acres off-site within the area proposed for levee improvements between Neighborhoods II and III. These 702.7 acres (696.8 acres on-site and 5.9 acres off-site) also include 51 acres on-site that are occupied on only an ephemeral basis due to physical and hydrologic isolation. The Los Angeles pocket mouse, a CSC species, was incidentally observed during trapping for the San Bernardino kangaroo rat and occupies 397.8 acres within Neighborhood III and Neighborhood IV.

IMPACTS

For the purposes of this executive summary, only those impacts determined in this assessment to be potentially significant are discussed below (Table ES-1, *Summary of Potentially Significant Biological Impacts*, on page ES-6).

Table ES-1

Summary of Potentially Significant Biological Impacts

	Impacts Before Mitigation			Impacts After Mitigation		
Significant Biological Impact	**Direct**	**Indirect**	**Cumulative**	**Direct**	**Indirect**	**Cumulative**
Southern cottonwood willow riparian	X					
Riversidean alluvial fan sage scrub	X		X			
Least Bell's vireo	X	X				
San Bernardino kangaroo rat	X	X	X			

Source: PCR Services Corporation, 2009.

Permanent impacts to sensitive plant communities include 478.0 acres (476.2 acres on-site and 1.8 acres off-site) and 41.6 acres (35.7 acres on-site and 5.9 acres off-site) of temporary impacts to Riversidean alluvial fan sage scrub where Riversidean alluvial fan sage scrub is the only or primary community. Specifically, these permanent and temporary impacts include: (1) 56.2 acres (54.6 acres on-site and 1.6 acres off-site as a result of construction the levee) of permanent and 21.4 acres (17.2 acres on-site and 4.2 acres off-site as a result of constructing the levee) of temporary impacts to pioneer Riversidean alluvial fan sage scrub; (2) 213.2 acres (213.0 acres on-site and 0.2 acre off-site as a result of construction the road under the I-15) of permanent and 18.1 acres (16.5 acres on-site and 1.6 acres off-site as a result of construction the levee and road under the I-15) of temporary impacts to intermediate Riversidean alluvial fan sage scrub; and (3) 208.6 acres on-site of permanent and 2.1 acres (2.0 acres on-site and 0.1 acre off-site as a result of construction the levee) of temporary to mature Riversidean alluvial fan sage scrub. In addition, 1.7 acres of southern cottonwood willow riparian will be permanently impacted. Project-related impacts to Riversidean alluvial fan sage scrub and southern cottonwood willow riparian are considered potentially significant as they may have a substantial adverse affect on a sensitive natural community (CEQA Threshold 2).

The proposed project will directly and permanently impact marginally suitable least Bell's vireo habitat within Neighborhood II. In 2006, at least one least Bell's vireo was observed numerous times within a narrow riparian corridor along the western portion of Neighborhood II. Although this corridor supports mule fat scrub and southern cottonwood willow riparian vegetation, it is relatively narrow and is supported by overflow from a pump station near the southern LCRSP study area boundary. The individuals detected within Neighborhood II are believed to have been transient birds as they were not observed during surveys after May 30, 2006 (including focused surveys in 2007 and 2008) and were found in non-suitable or marginally-suitable breeding habitat when they were seen. The least Bell's vireo was not

identified in the LCRSP study area during focused surveys conducted within the LCRSP study area in 2008.

Indirect impacts to the least Bell's vireo include potential noise impacts from adjacent construction and potential predation by pets associated with nearby human habitat. Potential direct and indirect impacts to this species as a result of the proposed project are considered potentially significant under Threshold 1.

San Bernardino kangaroo rat is known to occur within 702.7 acres (696.8 acres and 5.9 acres off-site) of the LCRSP study area. The proposed project will permanently impact approximately 140.6 acres (139.2 acres on-site and 1.4 acres off-site) and temporarily impact 41.0 acres (35.8 acres on-site and 5.2 acres off-site) of the 702.7 acres of SBKR-occupied habitat that exists in the LCRSP study area. These impacts include 51.0 acres of San Bernardino kangaroo rat occupation that are outside the 100-year floodplain and hydrologically disconnected due to past levee construction and past and on-going mining activities. As these isolated 51.0 acres are no longer subject to flooding that would help maintain open habitat conditions suitable for the species, preservation of these areas are not part of a viable long-term strategy for the recovery or conservation of the San Bernardino kangaroo rat in Lytle Creek. Overall the direct impacts to occupied San Bernardino kangaroo rat habitat are considered potentially significant under Threshold 1.

CUMULATIVE IMPACTS

A cumulative impact analysis was conducted to determine the scope of impacts from the proposed project and other related projects (i.e., past, present, or foreseeable future projects with similar impacts to those of the proposed project) on sensitive plant communities, sensitive wildlife species, and wildlife corridors within a defined geographic region. This region is bounded on the north by higher mountain elevations, on the south by extensive urban development within Riverside and San Bernardino counties, on the east by the desert environs of the Banning Pass, and on the west by substantial urban development within incorporated foothill cities. Two potentially significant cumulative impacts were identified: Riversidean alluvial fan sage scrub and San Bernardino kangaroo rat.

Based upon the results of the regional analysis of remaining Riversidean alluvial fan sage scrub, on the order of 10,638 acres of Riversidean alluvial fan sage scrub remains within the previously defined region. Of this, approximately 1,098 acres (10 percent) are within the borders of approved, planned, or foreseeable projects, including 519.6 acres within the LCRSP study area. In the case of habitats constituting the broader region of historically defined Riversidean alluvial fan sage scrub, there remains 14,674 acres of habitat, of which 1,178 acres (8 percent) is

projected to be impacted by projects, including the LCRSP build-out. Within the greater cismontane Southern California floristic province, some 16,770 acres of alluvial fan sage scrub habitat remains today, of which approximately 1,181 acres (7 percent) are projected to be impacted based upon our analysis. Although these expanded regional analyses provide context, the most biologically meaningful analysis is that which looks at the originally defined region generally within southwestern San Bernardino County. Due to the unique assemblage of plant and animal species associated with Riversidean alluvial fan sage scrub, its limited distribution, and susceptibility to edge effects due to its high perimeter to area ratio, cumulative impacts to ten percent of Riversidean alluvial fan sage scrub within the defined region is considered potentially significant absent mitigation.

As mentioned above, a total of ten percent (or 1,098 acres out of 10,638 acres) of Riversidean alluvial fan sage scrub will be cumulatively impacted within the region. For the purposes of this assessment, however, it is meaningful as an approach to identifying potentially suitable habitat for the San Bernardino kangaroo rat to consider only alluvial scrub that is both within active hydrological regimes and viable in the long-term and pioneer Riversidean alluvial fan sage scrub. These categories total 7,530 acres within the defined region. Of these, 769 acres or ten percent will be cumulatively impacted by approved, planned, or foreseeable projects. Therefore, on a regional basis, the level of potential cumulative loss is considered to be significant in the absence of mitigation.

MITIGATION

Mitigation for significant impacts to Riversidean alluvial fan sage scrub communities within the LCRSP study area will include components of both on- and off-site preservation. Of the 1,143.7 acres of Riversidean alluvial fan sage scrub within the LCRSP study area, a total of 478.0 acres (476.2 acres on-site and 1.8 acres off-site) and 41.6 acres (35.7 acres on-site and 5.9 acres off-site) of temporary impacts to Riversidean alluvial fan sage scrub where Riversidean alluvial fan sage scrub is the only or primary community will be impacted. Preservation of this community within the LCRSP study area under the proposed project totals 395.4 acres including 275.0 acres of pioneer, 112.0 acres of intermediate, and 8.4 acres of mature Riversidean alluvial fan sage scrub for a mitigation ratio of 0.8:1 on-site. The remaining approximately 230 acres of Riversidean alluvial fan sage scrub acreage within the LCRSP study area occur within the SBRK Conservation Area, the existing utility road south of Neighborhood II, and the easement within Neighborhood IV; and are not considered part of the impact or preservation analysis. In order to establish an appropriate mitigation ratio, a review of available environmental documents that address mitigation for impacts to alluvial fan sage scrub was conducted. The results showed that mitigation ratios of less than 2:1 have been accepted for projects impacting large areas of Riversidean alluvial fan sage scrub as well as for recent projects impacting this community. As the project proposes to preserve Riversidean alluvial fan sage scrub adjacent to large contiguous

blocks of preserved alluvial fan sage scrub and enhance the functions and values of this plant community as a result of adjacency, a mitigation ratio of 2:1 represents an appropriate threshold to mitigate impacts to a level less than significant.

Off-site opportunities were examined through a regional inventory of such habitats, their ownerships, and acres of potential off-site acquisition and preservation by the applicant. This analysis identified a total of approximately 16,770 acres of alluvial fan sage scrub[2] remaining in the region, as defined by Holland's California floristic province for southern California. This total consists of: 7,569 acres of alluvial fan sage scrub that is still within an active hydrologic regime; 2,009 acres of alluvial fan sage scrub that is cut off from a hydrologic regime; 1,881 acres of disturbed alluvial fan sage scrub; and 5,311 acres of pioneer alluvial fan sage scrub (barren wash). Of the remaining alluvial fan sage scrub existing today, only 1,624 acres, or 10 percent, are within private ownership and the feasibility of acquisition is questionable. The remaining 15,146 acres, or 90 percent, are publicly owned and, although not available for acquisition, some of this habitat may be available to be enhanced or restored for mitigation credit. In addition to strict preservation of alluvial fan sage scrub, proposed mitigation for the San Bernardino kangaroo rat includes restoration and management of this community both on- and off-site. Within the LCRSP study area, approximately 34.5 acres of chamise chaparral will be restored to Riversidean alluvial fan sage scrub immediately adjacent to the SBKR Conservation Area within Neighborhood III. Another 40 acres of chamise chaparral will be restored or enhanced to Riversidean alluvial fan sage scrub habitat and managed in an off-site conservation area in the vicinity of the Lytle/Cajon Wash confluence. Thus, if the proposed project is able to mitigate at a 2:1 ratio utilizing habitat restoration, enhancement and/or creation on public lands; restoration, enhancement and/or creation on private lands that are assured for preservation as open space; acquisition and protection of habitat on private lands; and/or some combination of all three, the impacts to this plant community can be reduced to a less than significant level under CEQA.

Habitat Equivalency Analysis (HEA) is being proposed as an alternative means to provide mitigation for impacts to alluvial fan sage scrub that will result from the proposed project as it is built-out over time. The principle concept underlying the HEA approach, as it applies to this assessment, is that adequate compensation for losses of habitat services can be achieved by providing net gains in habitat services (at mitigation sites) of the same type according to combinations of habitat quantity and quality. For alluvial fan sage scrub biodiversity conservation, the HEA approach has been designed to assess habitat quality at both impact and mitigation sites in terms of their potential contribution to a cumulative and coordinated region-wide conservation strategy. Recognizing that alluvial fan sage scrub is a

[2] *Although more specific terminology (i.e., Riversidean alluvial fan sage scrub) has been used when referring to the plant community mapped within the study area, the characterization of alluvial fan sage scrub is consistent with current scientific literature and will be used in this discussion of off-site mitigation opportunities.*

habitat of concern that possesses value to a unique assemblage of plant and animal species, HEA provides a consistent basis to expand opportunities to mitigate impacts in a manner that promotes the conservation of alluvial fan sage scrub habitats and the associated biological diversity in a sustainable manner. In the context of mitigation for impacts to biological resources, intermediate alluvial fan sage scrub within active hydrological regimes and occupied by San Bernardino kangaroo rat was considered to be the most appropriate basis, or benchmark, for establishing metrics. The appropriate metrics were determined to be vegetation analysis, landscape analysis, and net/gain/improvements analysis. HEA is a methodology shown to be effective and applicable in a wide variety of circumstances and settings where appropriately-scaled mitigation is being sought for biological impacts.

Mitigation for impacts to 1.7 acres of southern cottonwood willow riparian will include preservation, enhancement, and restoration of 3.4 acres of existing southern willow scrub riparian habitat within the Sycamore Flat riparian corridor at a 2:1 ratio to benefit the least Bell's vireo. Restoration activities will include southern willow scrub, southern cottonwood willow riparian, and mule fat scrub communities to ensure a diversity of flora for the benefit of this species. A total of 18.9 acres of existing riparian habitat within the on-site Sycamore Flat area are within the open space portion of the project and available for mitigation opportunities.

Mitigation for impacts to occupied San Bernardino kangaroo rat habitat will include: 1) avoidance, preservation, and creation of occupied and suitable habitat on-site; 2) preservation, creation, and connectivity of habitat off-site, particularly upland refugia habitat downstream of the CEMEX mine; 3) avoidance and minimization of direct individual San Bernardino kangaroo rat mortality during construction; 4) minimization of indirect individual San Bernardino kangaroo rat mortality through edge effects; and 5) management programs to assure the ability to sustain on-site San Bernardino kangaroo rat populations in the long-term. These measures will also contribute to the regional conservation of suitable habitat for this species and will therefore also mitigate cumulative impacts to this species to a less than significant level.

In particular, the on- and off-site preservation and creation of habitat for the San Bernardino kangaroo rat will provide pioneer and intermediate phases of Riversidean alluvial fan sage scrub for the species equal to the amount that will be lost and sufficient mature Riversidean alluvial fan sage scrub as upland refugia which will allow for recolonization of the wash area following catastrophic flood events. On-site restoration and management will include approximately 34.5 acres of chamise chaparral within Neighborhood III immediately downstream of, and adjacent to, the SBKR Conservation Area. Off-site, another 40 acres of publicly or privately owned conservation land in the vicinity of the study area will be enhanced and/or restored and managed for the species in perpetuity.

Mitigation for impacts to 2.9 acres of least Bells' vireo habitat will include on-site enhancement, restoration, and preservation of 5.8 acres within the Sycamore Flat riparian

corridor within Neighborhood I, at a minimum 2:1 ratio. A total of 18.9 acres of existing riparian habitat within the on-site Sycamore Flat area are within the open space portion of the project and available for mitigation opportunities. Mitigation measures during construction activities will be employed to minimize indirect impacts to this species.

UNAVOIDABLE SIGNIFICANT IMPACTS

Inclusive of project-related proposed mitigation measures, no significant adverse impacts (direct or cumulative), which are considered to be unavoidable under the proposed project, would remain.

1.0 INTRODUCTION

1.1 PURPOSE

This report presents the findings of an in-depth biological resources assessment, conducted by **PCR Services Corporation (PCR)**, within the approximately the 2,447.3-acre project site. In addition to the project site, this section analyzes impacts to an additional 19.2 acres of off-site areas that lie adjacent to the project site and are either potentially affected by the proposed project or that the Applicant has requested be examined. In total, the Lytle Creek Ranch Specific Plan (LCRSP) study area for biological resources consists of 2,466.5 acres. Off-site portions of the LCRSP study area include: 1) an approximately 2.3-acre road located under the I-15 Freeway that will be improved by the project; 2) an approximately 3.6-acre existing Southern California Gas Company (So Cal Gas) easement located north of Neighborhood I on County-owned property; 3) an approximately 2.6-acre existing utility road situated near the southeastern end of Neighborhood II; 4) an 10.1-acre area associated with proposed improvements to an off-site levee north of Neighborhood II; and a 0.6-acre area north of Neighborhood IV and south of Neighborhood II that will be temporarily impacted during levee construction. In addition to these 19.2 acres of largely unimproved off-site property, an additional 0.7 acre of existing developed right-of-way in Lytle Creek Road will be impacted off-site as a result of the removal and replacement of storm drain facilities south of Neighborhood IV. As these improvements will be made within existing developed areas, there will be no biological impacts and only minimal short-term construction impacts (e.g., construction traffic) associated with these improvements. Therefore, for purposes of the biological resources analysis, the LCRSP study area does not consider impacts to the 0.7-acre of off-site improvements south of Neighborhood IV. It should be noted that the 2,447.3-acre project site includes a 3.9 acre on-site segment of the So Cal Gas easement within Neighborhood I, 137.8 acres within Neighborhood I that was previously entitled and approved for development as part of the Lytle Creek North Planned Development (LCNPD), and the existing 216.8-acre San Bernardino Kangaroo Rat Conservation Area (SBKR Conservation Area)[3] previously set aside for SBKR habitat by Lytle Development Company in connection with the LCNPD (Table 1, *Lytle Creek Ranch Specific Plan Study Area*, on page 2.

[3] *As part of the LCNPD, an approximately 216.8-acre portion of Lytle Creek (referred to as the "SBKR Conservation Area") was set aside to promote conservation of the SBKR. This 216.8-acre area encompasses the 160.6-acre SBKR conservation area previously set aside by Lytle Development Company for the long-term preservation of the species and the 52.2-acre SBKR conservation area set aside by Lytle Development Company as mitigation in connection with the County's approval and adoption of the LCNPD. This area also include an approximate 4.0 acres of additional SBKR habitat in Lytle Creek purchased by the West Valley Water District and set aside as an expansion of the SBKR conservation area.*

Table 1

Lytle Creek Ranch Specific Plan Study Area

Lytle Creek Ranch Specific Plan Study Area	Acres On-site	Acres Off-site	Total
Proposed development area	2,088,8	0.0	2,088.8
So Cal Gas Company easement[a]	3.9	3.6	7.5
Areas formerly included in LCNPDP[b]	137.8	0.0	137.8
SBKR Conservation Area[c]	216.8	0.0	216.8
Existing utility road south of Neighborhood II	0.0	2.6	2.6
Road under I-15	0.0	2.3	2.3
Off-site levee between Neighborhoods II and III (located immediately north of Neighborhood II)	0.0	10.1	10.1
Off-site levee north of Neighborhood IV and south of Neighborhood II	0.0	0.6	0.6
Total	**2,447.3**	**19.2**	**2,466.5**

[a] *So Cal Gas holds an easement for an interstate gas line of which a segment traverses a portion of Neighborhood I. The land use planning for the LCRSP study area takes into account this existing easement (which includes a 3.9-acre segment of the gas line easement through Neighborhood I and the 3.6-acre portion of this easement which extends off-site to the north within a parcel to the immediate north owned by the County); however, construction of the gas line is not a component of the LCRSP project. The pipeline is not needed to serve the project. Any decision to construct a gas pipeline would be made by So Cal Gas in the future, and separate environmental review would be undertaken at that time by So Cal Gas. It should be noted that the 3.9 acres located within the on-site portion of the 7.5-acre easement are in an area that the LCRSP project does not propose to disturb.*

[b] *Certain study areas were previously entitled under the LCNPD and impacts to these areas were previously analyzed and mitigated in the Lytle Creek North FEIR. Portions of these areas have been disturbed by development activities (e.g., grading for roads and utilities for the LCNPD) and any existing habitat and/or vegetation removed. For the remaining previously-analyzed and previously-mitigated areas, the existing conditions were examined as part of the biological work for this assessment. This was then compared against the description of existing conditions and analysis of biological resources impacts in the LCNPD EIR to confirm no substantial changes had occurred that would trigger new environmental review.*

[c] *As part of the LCNPD, an approximately 216.8-acre portion of Lytle Creek (referred to as the "SBKR Conservation Area") was set aside to promote conservation of the SBKR. This 216.8-acre area encompasses the 160.6-acre SBKR conservation area previously set aside by Lytle Development Company for the long-term preservation of the species and the 52.2-acre SBKR conservation area set aside by Lytle Development Company as mitigation in connection with the County's approval and adoption of the LCNPD. This area also include an approximate 4.0 acres of additional SBKR habitat in Lytle Creek purchased by the West Valley Water District and set aside as an expansion of the SBKR conservation area.*

Source:

The purpose of this biological resources assessment is to evaluate existing conditions and impacts of the proposed project in accordance with California Environmental Quality Act (CEQA) and the applicable regulatory framework. The submittal of this report is intended to satisfy the biological resource information needs of the CEQA compliance process. Lytle Development Company (the "Applicant") is requesting discretionary approval for the implementation of the Lytle Creek Ranch Specific Plan, a master-planned residential and mixed-use development project.

1.2 STUDY AREA LOCATION AND BACKGROUND

The LCRSP study area is generally located in southwestern San Bernardino County, as shown in Figure 1, *Regional Map*, on page 4. The majority of the LCRSP study area is in the jurisdiction of the City of Rialto (City); however, portions of the LCRSP study area are currently in unincorporated San Bernardino County. The LCRSP study area can be found within the U. S. Geological Survey (USGS) 7.5-minute Devore topographic quadrangle map in Sections 4, 5, 17, 22, and an unsectioned portion, T. 1 N., R. 5 W. as shown in Figure 2, *Vicinity Map*, on page 5. Lytle Creek is a major drainage course originating in the eastern San Gabriel Mountains to the north, and joining Cajon Creek and the Santa Ana River downstream from the LCRSP study area (Figure 2, *Vicinity Map*). The I-15 crosses the northwestern portion of the LCRSP study area; Riverside Avenue forms the southwestern boundary; a set of hills, generally termed Muscupiabe, border the northeastern boundary; and the confluence of Lytle Creek and Cajon Wash generally demarks the southeastern (downstream) boundary. Neighborhood I (including Sycamore Flat) exists north of Lytle Creek Wash and on either side of the I-15. The eastern portion of Neighborhood I abuts a County Parks parcel and Glen Helen Regional Park in the northeast portion and the western portion of Neighborhood I is a private holding partially within the Congressional boundary of the San Bernardino National Forest.

The majority of the LCRSP study area has, at one time, been disturbed. Recent natural disturbances include extensive fire damage that occurred in October of 2003 while less extensive fire damage occurred in November 2006 and October 2007, and heavy rains in the winter of 2004 to 2005. However, native vegetation is reestablishing itself over most of the LCRSP study area. Today, a fairly widespread system of existing flood control dikes and diversion channels are found throughout Lytle Creek Wash in the LCRSP study area. In addition, there are a number of unimproved roads and trails, several groundwater recharge areas, and numerous illegal dump sites within the LCRSP study area. A roof tile manufacturing plant borders the south and southwestern portion of the LCRSP study area, and a CEMEX sand and gravel extraction operation exists near the south central portion. Several County of San Bernardino facilities are located just off-site to the east, including Glen Helen Regional Park, Verdemont Ranch, Glen Helen Rehabilitation Facility, a sheriff's training facility, and an off-road vehicle recreation area. The approved LCNPD (now under construction) borders a portion of the LCRSP study area to the northeast and is located primarily east of the I-15 between the eastern portion of Neighborhood I and the Lytle Creek Wash. As noted above; however, this area was previously entitled under the LCNPD and impacts to these areas were previously analyzed and mitigated in the Lytle Creek North FEIR. Portions of these areas have been disturbed by development activities (e.g., grading for roads and utilities for the LCNPD) and any existing habitat and/or vegetation removed. For the remaining previously-analyzed and previously-mitigated areas, the existing conditions were examined as part of the biological work for this assessment. This was then compared against the description of existing conditions and analysis of biological resources impacts in the LCNPD EIR to confirm no substantial changes had occurred that would trigger new environmental review.

PCR

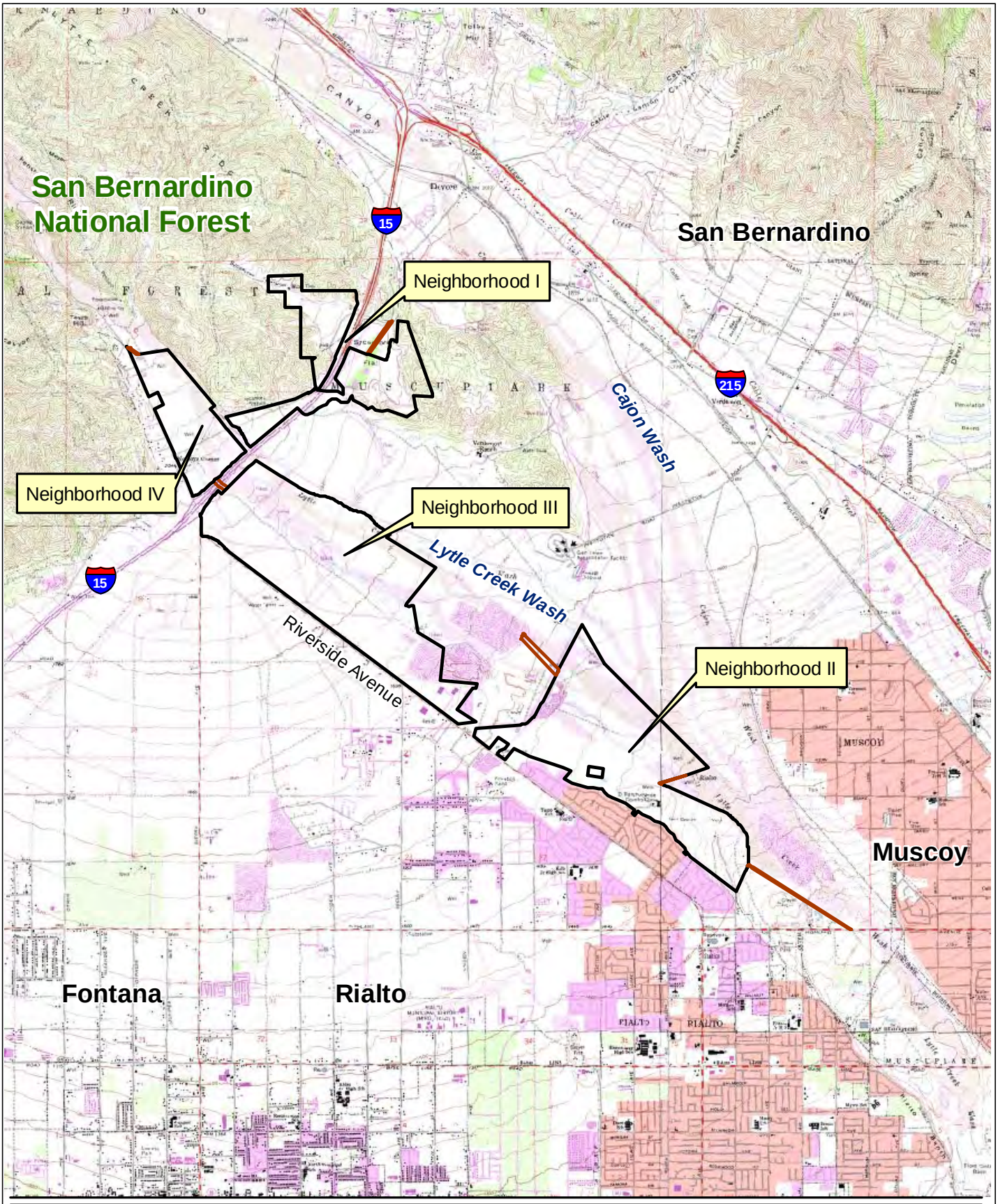
N

6 0 6 Miles

Source: ESRI StreetMap, 2009; PCR Services Corporation, 2009.

Figure 1

Lytle Creek Ranch Specific Plan Regional Map



PCR

N

1 0 1 Miles

Source: USGS Topographic Series (Devore, Fontana, San Bernardino North and South, CA); PCR Services Corporation, 2009.

Figure 2

Lytle Creek Ranch Specific Plan Vicinity Map

The LCRSP study area encompasses several prescribed land uses, which are not subject to the activities proposed for the LCRSP, including dedicated open space areas, Edison and Caltrans easements, and land uses pre-approved under the LCNPD (Figure 3, *Prescribed Land Uses*, on page 7). Previously entitled areas that are included in the LCRSP include portions of Neighborhood I and areas adjacent to the I-15 that were entitled under the LCNPD and the El Rancho Verde Specific Plan entitled within the City.

In addition, as part of the LCNPD, an approximately 216.8–acre portion of the Lytle Creek Wash (referred to as the "SBKR Conservation Area") was set aside to promote conservation of the San Bernardino kangaroo rat (*Dipodomys merriami parvus*) (Figure 3, *Prescribed Land Uses*). This 216.8-acre area encompasses the 160.6-acre San Bernardino kangaroo rat conservation area previously set aside by Lytle Development Company for the long-term preservation of the species and the 52.2-acre San Bernardino kangaroo rat conservation area set aside by Lytle Development Company as mitigation in connection with the County's approval and adoption of the LCNPD. This area also includes an approximate 4.0 acres of additional SBKR habitat in Lytle Creek purchased by the West Valley Water District and set aside as an expansion of the SBKR Conservation Area. During the federal Endangered Species Act Section 7 consultation process for the LCNPD, a mitigation and monitoring program was developed which included restoration of San Bernardino kangaroo rat habitat on 40 acres of a 75 plus-acre upland habitat "island" within the SBKR Conservation Area. Habitat manipulation, to improve the habitat quality for the San Bernardino kangaroo rat, has been implemented, which includes reducing the cover of non-native grasses and dense chamise (*Adenostoma fasciculatum*).

As designed and implemented, the management plan (O'Farrell Biological Consulting 2003) for the existing SBKR Conservation Area includes enhancement and restoration of 40 acres of a 75 plus-acre island, protection of an additional 22.5 acres of combined uplands elsewhere within the Conservation Area, and the preservation of 150.2 acres of adjacent San Bernardino kangaroo rat occupied wash. The islands and other adjacent upland areas, by way of their being above the 100-year floodplain limit, act as "refugia" to maintain a founder population[4] of San Bernardino kangaroo rats during episodic flood events. In addition, by their very nature, the islands contain a high ratio of edge to surface area, which promotes the exchange of animals from the upland to the wash.

The management plan determined that after conservation, enhancement, and restoration, there will be an increase in both the size and carrying capacity of upland refugia within the

[4] *A founder population is defined as a population that initially colonizes an area following disturbance and, once established, provides colonizers to adjacent areas. For the purposes of this Biological Resources Assessment, the founder population refers to the population that is manually relocated from the impacted areas and subsequently establishes itself on the newly restored refugia habitat.*

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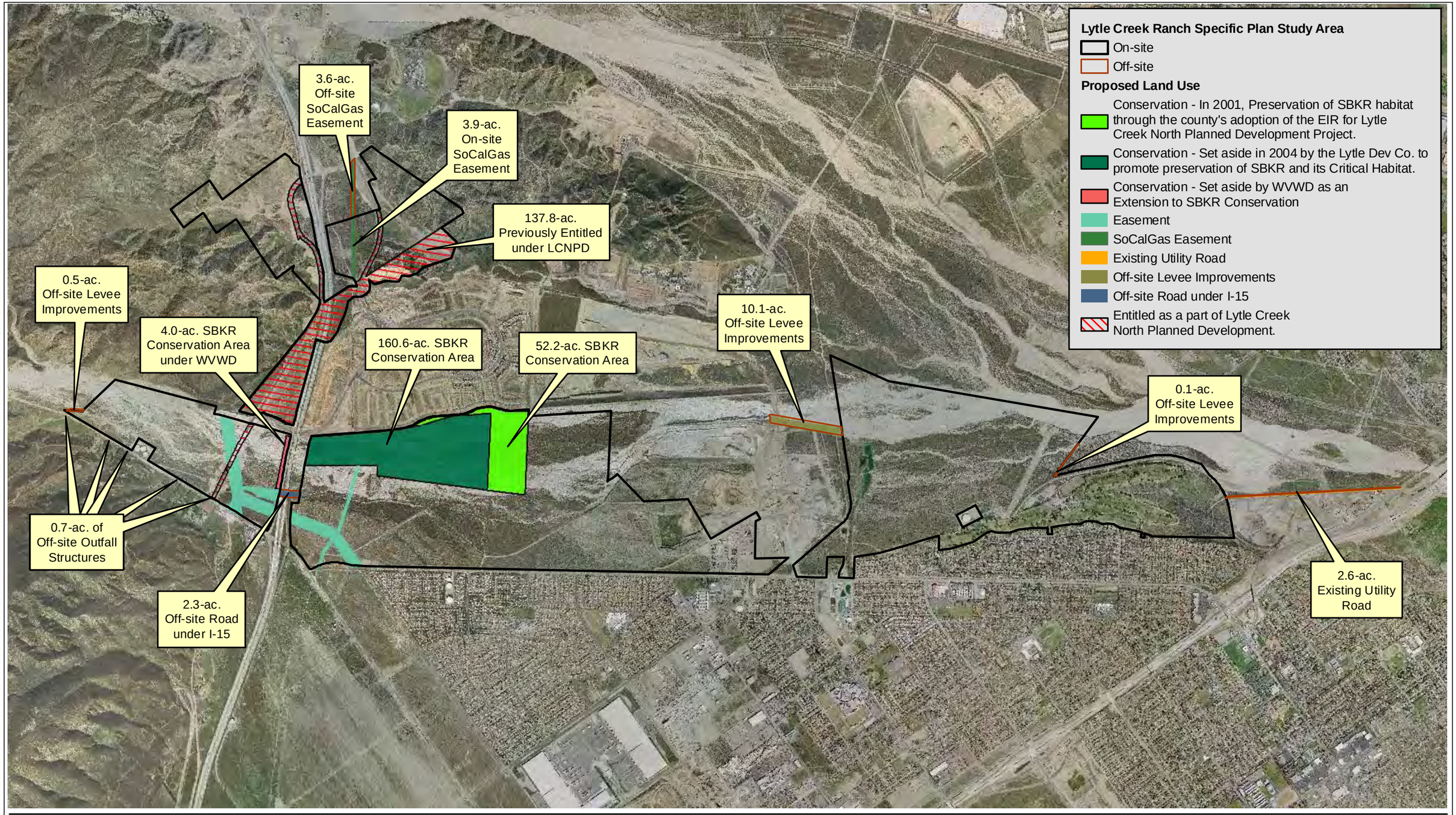

PCR

N

2,500 0 2,500 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 3

Lytle Creek Ranch Specific Plan Prescribed Land Uses

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conservation area. Therefore, the plan concluded that the outcome of implementation will result in a far more stable population of San Bernardino kangaroo rat in the vicinity of Lytle Creek Wash than exists at present and one more capable of withstanding perturbations during weather extremes.

A previous biological survey of the LCRSP study area was completed by Michael Brandman Associates (MBA) in 1995. As part of their work, MBA reviewed several previous biological surveys from the vicinity, obtained a computer search of the California Natural Diversity Database (CNDDB), and conducted field investigations of on-site vegetation and wildlife populations in 1993 and 1994.

For purposes of this assessment, the MBA report served as preliminary baseline information. However, due to the dated nature of their fieldwork and changes to the status of several natural communities and plant and wildlife species within the study area, this assessment relies heavily on data generated during associated field investigations in 2004, 2005, 2006, 2007, and 2008.

1.3 SCOPE OF STUDY

The scope of this assessment encompasses the comprehensive documentation of existing biological resources within the LCRSP study area. This assessment updates a Biological Resources Assessment completed in 1995 which was based upon surveys performed in 1993 and 1994 (MBA 1995). The documentation of existing resources includes the findings of an extensive current literature review and field investigations conducted during the spring and summer of 2004, 2005, 2006, 2007, and 2008. The field investigations included the development of a detailed map of the plant communities, focused sensitive plant surveys, a burrowing owl (*Athene cunicularia*) habitat assessment and burrow survey, focused coastal California gnatcatcher (*Polioptila californica californica*) surveys, focused southwestern willow flycatcher (*Empidonax traillii extimus*) surveys, focused least Bell's vireo (*Vireo bellii pusillus*) surveys, and San Bernardino kangaroo rat trapping. During these investigations, biologists also assessed the potential for the LCRSP study area to host additional sensitive species and/or habitats and regulated resources. This document does not address areas potentially under the jurisdiction of the U.S. Army Corps of Engineers (ACOE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Game (CDFG) for purposes of identifying jurisdictional boundaries. A formal jurisdictional delineation and report was completed by Glenn Lukos Associates under separate cover (Glenn Lukos Associates 2009).

This document also addresses project-related impacts associated with the proposed project, as well as recommendations regarding measures to alleviate any resulting potentially significant adverse impacts to a level below significant. This documentation is consistent with

accepted scientific, technical, and professional standards pursuant to CEQA, and U.S. Fish and Wildlife Service (USFWS), CDFG, and ACOE protocols and standards, where appropriate. While general biological resources are discussed in a comprehensive manner, the focus of this assessment is on those resources considered to be sensitive.

2.0 METHODS OF STUDY

2.1 APPROACH

This assessment of biological resources is based upon information compiled through field investigations, focused surveys, previous documentation, and relevant reference materials. As part of the effort to update the status of existing biological resources within the LCRSP study area, a team of PCR biologists spent three days mapping the plant communities during July of 2004 and November of 2005. During the spring and summer of 2004, 2005, 2006, 2007, and 2008, PCR biologists also surveyed the LCRSP study area to determine the locations of sensitive plant and wildlife species and to evaluate the status of sensitive and/or significant biological resources in the LCRSP study area. The approach and processes described within this report are consistent with accepted scientific and technical standards and methodology and conducted under circumstances suitable for such surveys or processes.

2.2 LITERATURE REVIEW

The study began with a review of relevant literature on the biological resources of the LCRSP study area and vicinity. The current version of the CNDDB (CDFG 2007a), a CDFG sensitive resources account database, was reviewed for all pertinent information regarding the locations of known observations of sensitive species and habitats in the vicinity of the LCRSP study area. Federal Register listings (USFWS 2007b), protocols, and species data provided by the USFWS and CDFG were reviewed in conjunction with anticipated federally and state-listed species potentially occurring within the vicinity. A number of primary and secondary sources were reviewed, including: the previous Biological Resources Assessment (MBA 1995); a number of focused surveys conducted by PCR on the adjacent LCNPD (PCR 1997a, 1997b, 1998, 1999, 2000a, 2000b, 2000c, 2001a, 2001b, 2001c, 2001d, 2001e, 2002, 2006a, 2006b, 2006c, 2007d, 2006e, 2007a, 2007b, 2007c, 2007d, 2008a, 2008b, PCR and Hewitt & O'Neil 2002); several government wildlife agencies' publications (CDFG 1991, 1994, 2003, 2007a, 2008a, 2008b, 2008c, 2008d, and 2008e); and several regional flora and fauna field guides. These and all pertinent references used are listed in the "References" section of this report. Combined, the sources reviewed provided an excellent baseline from which to inventory the biological resources potentially occurring within the LCRSP study area, as well as the surrounding area.

2.3 FIELD INVESTIGATIONS

Surveys conducted in 2004, 2005, 2006, 2007, and 2008 were performed on foot with the assistance of four wheel-drive vehicles. The PCR survey team included Steve Nelson, Susan Anon (formerly Erickson), Linda Robb, Kristin Szabo, Jason Berkley, Joseph B. Platt, Ph.D., Miriam Hermann, Crysta Dickson, Jenni Snibbe, Stephanie Picha, Robert Freese, Ph.D., Francis Lin, Sundeep Amin, Ryan Henry, Maile Tanaka, Chris Jones, Erin Hardison, and Joanna Nigro. In addition, Mike O'Farrell, Ph.D. of O'Farrell Biological Consulting performed San Bernardino kangaroo rat trapping across the LCRSP study area to assess the occupation of the LCRSP study area by this species.

Systematic survey coverage of the entire LCRSP study area, with special attention to sensitive habitats or those areas potentially supporting sensitive flora or fauna, was ensured using current aerial photographs (1"=400') and a USGS topographic map. In some areas of particularly steep terrain, binoculars were used to assist in the identification of resources.

2.3.1 Plant Community Mapping

Plant communities, or associations, were mapped in 2004 with the aid of 1"=400' scale aerial photography and subsequently refined in 2005 with the aid of 1"=400' scale 2005 color aerial photography. With respect to areas entitled under the LCNPD EIR, current conditions were re-assessed on August 13, 2007 and again on November 16, 2007 due to on-going grading activities, weed abatement, and a wildfire that occurred in October 2007. Plant community boundaries were delineated directly onto the aerial photograph while in the field. Plant communities were then digitized using Geographic Information System (GIS) technology to calculate acreage. Plant community names and hierarchical structure generally follows the CDFG *List of California Terrestrial Natural Communities Recognized by the Natural Diversity Data Base* (September 2003). Plant community descriptions were based on PCR findings and descriptions contained in Sawyer and Keeler-Wolfe's *A Manual of California Vegetation* (1995) and Holland's *Preliminary Descriptions of the Terrestrial Natural Communities of California* (1986).

2.3.2 General Plant Inventory

All plant species observed during surveys were either identified in the field or collected and later identified using taxonomic keys. Plant taxonomy follows Hickman (1993). Common plant names were taken from Hickman (1993), Munz (1974), and/or McAuley (1996). Because common names vary significantly between references, scientific names are included upon initial mention of each species; common names consistent throughout the report are employed thereafter. All plant species observed in 2004, 2005, 2006, and 2007 are included in

Appendix A, *Floral and Faunal Compendia*. Sensitive plant species are discussed below in Section 2.3.3.

2.3.3 Sensitive Plant Surveys

Sensitive plant species include those listed by the USFWS, the CDFG, and those listed by the California Native Plant Society (CNPS) on their Lists 1A, 1B, and 2. The CNPS recently updated their Lists to include Threat Codes representing their view of the level of endangerment in California.

Many sensitive plant species were reported in the CNDDB as occurring within the nine USGS 7.5-minute quads including the LCRSP study area and surrounding area: Devore, Cajon, Silverwood Lake, San Bernardino North, San Bernardino South, Fontana, Guasti, Cucamonga Peak, and Telegraph Peak. Focused sensitive plant surveys were conducted by PCR biologists in the spring and summer of 2004, 2005, 2006, and 2007 as an update to the previous survey effort by MBA in 1994. Special attention was given to all potential habitat for the federally and state-endangered slender-horned spineflower (*Dodecahema leptoceras*) and federally-endangered Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*) within the LCRSP study area. Other species of concern anticipated to occur based on previous survey results included Plummer's mariposa lily (*Calochortus plummerae*) and Parry's spineflower (*Chorizanthe parryi* var. *parryi*) (discussed in more detail below in Section 2.3.4). To determine the presence or absence of these species, the LCRSP study area was systematically surveyed in May through July 2004, May through June 2005, May through June 2006, and May 2007 which encompassed the blooming period of all potentially occurring sensitive and CNPS List 3 and List 4 plant species (see Table 2, *Sensitive and CNPS List 3 and 4 Plant Species Survey Dates*, on page 13, for a complete list of survey dates). The surveys were conducted on foot within all suitable habitat and with the aid of binoculars. In addition, the herbarium collections at the Rancho Santa Ana Botanical Gardens in Claremont were visited in 2004 to examine voucher specimens of the various sensitive plant species potentially occurring within the LCRSP study area. Curators at this institution were interviewed about the phenology (i.e., blooming periods) and microhabitats of sensitive plants in the area.

Slender-horned Spineflower

PCR biologists performed focused surveys for the federally and state-endangered slender-horned spineflower for four consecutive years throughout the LCRSP study area with particular attention to areas of suitable habitat (i.e., sandy benches exposed to periodic flooding within alluvial fan sage scrub). Prior to conducting the 2005, 2006, and 2007 surveys, a reference site in Redlands (Fred Roberts, Botanist, email Comm. with Linda Robb, April and

Table 2

Sensitive and CNPS List 3 and 4 Plant Species Survey Dates

Date of Survey	Target Plant Species Surveyed
2004	
May 19, 2004	Slender-horned spineflower, Parry's spineflower
May 20, 2004	Slender-horned spineflower
June 28, 2004	Santa Ana River woollystar
July 8, 2004	Santa Ana River woollystar
2005	
May 10, 2005	Slender-horned spineflower, Parry's spineflower
May 11, 2005	Slender-horned spineflower, Parry's spineflower
May 18, 2005	Plummer's mariposa lily, Slender-horned spineflower, Parry's spineflower
May 20, 2005	Slender-horned spineflower, Parry's spineflower
May 26, 2005	Plummer's mariposa lily
June 7, 2005	Santa Ana River woollystar
June 8, 2005	Plummer's mariposa lily
June 14, 2005	Plummer's mariposa lily
June 16, 2005	Plummer's mariposa lily, Slender-horned spineflower, Parry's spineflower
June 17, 2005	Plummer's mariposa lily
2006	
May 8, 2006	Slender-horned spineflower
May 10, 2006	Slender-horned spineflower
May 16, 2006	Slender-horned spineflower
May 23, 2006	Slender-horned spineflower
June 15, 2006	Plummer's mariposa lily, Parry's spineflower
2007	
May 29, 2007	Slender-horned spineflower

Source: PCR Services Corporation, 2009.

May 2005) for the slender-horned spineflower was visited by PCR biologists to verify the species was blooming during the survey periods.

Santa Ana River Woollystar

PCR biologists reviewed a body of scientific literature on the woollystar[5] (*Eriastrum densifolium*) in an attempt to determine the subspecies that occurs within the LCRSP study area. In a 1997 study by Brunell and Whitkus, Random Amplified Polymorphic DNA (RAPD) markers (i.e., DNA testing) were not conclusive in distinguishing between subspecies. In order

[5] *The reader should note that the spelling of woollystar varies across a number of reputable sources. For the purposes of this assessment, the spelling used herein is woollystar and covers all other spellings of the common name for Eriastrum densifolium.*

to differentiate the federally-endangered Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*) from one of its four non-listed closely related subspecies (*Eriastrum densifolium* ssp. *austromontanum*, *Eriastrum densifolium* ssp. *densifolium*, *Eriastrum densifolium* ssp. *elongatum*, and *Eriastrum densifolium* ssp. *mohavense*), recent research indicates that the subspecies sanctorum is best characterized by morphological features. *Eriastrum densifolium* ssp. *sanctorum* has greater corolla tube length than other subspecies and its mean filament (i.e., a flower part) length is statistically the largest in the species (Brunell and Whitkus 1999a). Brunell and Whitkus even state that of all the subspecies of *Eriastrum densifolium*, only the subspecies *sanctorum* is distinct enough to be classified as a separate subspecies because of its morphology (Brunell and Whitkus 1999a and 1999b).

Following the literature review, PCR biologist Robert Freese, Ph.D. designed a sampling protocol with input from Dr. Mark Brunell (Mark Brunell, email comm. with Robert Freese, June 15, 2006). PCR biologists sampled 60 individual *Eriastrum densifolium* plants within the study area on June 28, 2006. Samples were taken from throughout the range of the species mapped within the LCRSP study area during focused sensitive plant surveys performed in 2004 and 2005. The corolla tube length was measured in millimeters (mm) and recorded for three separate flowers per plant. The height of each plant was also recorded, as well as any other characteristics that appeared significantly different for any given plant. The data were analyzed and an average corolla tube length was calculated for each plant as well as for the sample population as a whole. This was then compared to the range of corolla tube lengths suggested by the scientific literature for *E*riastrum *densifolium* ssp. *sanctorum* and *Eriastrum densifolium* ssp. *elongatum*. More detail on the methodology of this analysis may be found in Appendix B, *Subspecies Identification of the Woolly-star at the Lytle Creek Ranch Specific Plan project site, San Bernardino County, California.*

Plummer's Mariposa Lily

PCR biologists performed focused surveys for the CNPS List 1B.2 Plummer's mariposa lily in 2005 throughout the LCRSP study area, with the exception of Neighborhood I. Particular attention was given to areas of suitable habitat (i.e., a variety of dry habitat including Riversidean alluvial fan sage scrub, Riversidean sage scrub, and chaparral). In 2006, focused surveys were completed within Neighborhood I. Also in 2006, suitable habitat within the remainder of the LCRSP study area previously surveyed including Neighborhoods II, III, and IV was investigated and previously documented populations verified.

2.3.4 CNPS List 3 and 4 Plant Species

With regard to CNPS List 3 and 4 species, while they may not be considered sensitive at this time due to the lack of information and natural rarity in the wild, respectively, species

occurring within the LCRSP study area with these designations are discussed to provide more information and to avoid neglecting species of potential concern during the CEQA review process.

Parry's Spineflower

As discussed above, Parry's spineflower was previous observed within the LCRSP study area by MBA. Therefore, PCR biologists performed focused surveys for the CNPS List 3.2 Parry's spineflower in 2004 and 2005 throughout the LCRSP study area (see Table 2, *Sensitive and CNPS List 3 and 4 Plant Species Survey Dates*, for a complete list of survey dates), with particular attention to areas of suitable habitat (i.e., open areas within Riversidean alluvial fan sage scrub, Riversidean sage scrub, and chaparral). In 2006, areas previously mapped were verified and any new significant populations observed were added to the data set.

2.3.5 General Wildlife Inventory

All wildlife species observed during the field surveys by sight, call, tracks, nests, scat (fecal droppings), remains, or other sign were recorded. Binoculars and regional field guides were utilized for the identification of wildlife, as necessary. All wildlife species observed within the LCRSP study area, as well as diagnostic sign, were recorded in field notes. In addition to species actually detected, expected use of the LCRSP study area by other wildlife was derived from the analysis of habitats within the LCRSP study area combined with known habitat preferences of regionally-occurring wildlife species.

Wildlife taxonomy follows Stebbins (2003) for amphibians and reptiles, the American Ornithologists' Union (1998) for birds, and Jameson and Peeters (1988) for mammals. Scientific names are used during the first mention of a species; common names only are used in the remainder of the text. A list of all wildlife species detected within the LCRSP study area is included in Appendix A, *Floral and Faunal Compendia*. Sensitive wildlife species are discussed below in Section 2.3.5.

Amphibian Surveys

General surveys for amphibians were conducted in appropriate habitat only during diurnal activity periods. The intent of these surveys was not to extensively search for individual amphibians, but to ascertain the presence of potential amphibian habitat and the location of amphibians within the LCRSP study area. The discussions in this document of amphibians potentially present within the LCRSP study area are based on the habitats used by the species and their geographic ranges. Surveys were conducted on foot in suitable habitat types concurrently with all other surveys of the LCRSP study area. Habitats were examined for

diagnostic amphibian sign; such as egg masses, larvae, vocalizations, and direct observations. Surface litter, stones, fallen bark, tree branches, and cracks in mud were examined. Observed amphibian species, as well as diagnostic sign, were recorded in field notes.

Reptile Surveys

General surveys for reptiles were conducted in appropriate habitat only during diurnal activity periods. The intent of these surveys was not to extensively search for individual reptiles, but to ascertain the presence of potential reptile habitat and the location of reptiles within the LCRSP study area. The discussions in this document of reptiles potentially present within the LCRSP study area are based on the habitats used by the species and their geographic ranges. Surveys were conducted on foot in suitable habitat types concurrently with all other surveys of the LCRSP study area. Habitats were examined for diagnostic reptile sign; such as eggs, shed skins, scat, tracks, snake prints, lizard tail drag marks, and direct observations. All areas containing potentially suitable habitat were surveyed. While searching for resting reptiles, surface litter, stones, fallen bark, tree branches, and cracks in mud were examined. Observed reptile species, as well as diagnostic sign, were recorded in field notes.

Avian Surveys

General surveys for birds were conducted in appropriate habitat only during diurnal activity periods. The intent of these surveys was not to extensively search for individual birds, but to ascertain the presence of potential bird habitat and the location of birds within the LCRSP study area. The discussions in this document of birds potentially present within the LCRSP study area are based on the habitats used by the species and their geographic ranges. Surveys were conducted on foot in suitable habitat types concurrently with all other surveys of the LCRSP study area. Birds were detected both by direct observations and by vocalizations. All areas containing potentially suitable habitat were surveyed. Bird species observed were recorded in field notes. Special attention was made to identify any bands or markings on avian species.

Surveys for the presence of nesting raptors (birds of prey) within the LCRSP study area and in the vicinity of the LCRSP study area were conducted simultaneously with other field surveys. Such efforts included directed and incidental observation of raptor nests, owl pellets, and the identification of raptor species flying over the LCRSP study area. Observed raptor species, as well as diagnostic sign, were recorded in field notes. Previous raptor surveys conducted in 1994 were updated during the recent survey effort to include observations of raptorial species during all site visits.

Mammal Surveys

General surveys for mammals were conducted in appropriate habitat only during diurnal activity periods. The intent of these surveys was not to extensively search for individual mammals, but to ascertain the presence of potential mammal habitat and the location of mammals within the LCRSP study area. The discussions in this document of mammals potentially present within the LCRSP study area are based on the habitats used by the species and their geographic ranges. Surveys were conducted on foot in suitable habitat types concurrently with all other surveys. Many mammals are nocturnal and secretive, making daytime observations difficult. Therefore, the majority of the information on mammals within the LCRSP study area comes from diagnostic sign such as scat, burrows, tracks, dens, browsed vegetation or other feeding sign, hair, nests, bones, vocalizations, and direct observations. All areas containing potentially suitable habitat were surveyed. Methods employed while searching for mammals included searching the ground and adjacent vegetation, locating and following mammal trails, and surveying muddy banks of small streams and pools, and noting "road kill" while traveling to and from the LCRSP study area. Observed or expected mammal species, as well as diagnostic sign, were recorded in field notes.

In addition, all small mammals caught in traps during the San Bernardino kangaroo rat focused trapping survey (as described in more detail below) were recorded. Further, O'Farrell utilized an acoustic passive unit during the 2007 trapping to identify bats utilizing the drainage. This provided strong insight into the identity and distribution of small mammals throughout the LCRSP study area.

2.3.6 Sensitive Wildlife Surveys

Coastal California Gnatcatcher

Focused surveys for the federally-threatened coastal California gnatcatcher were conducted in 2005, 2006, and 2007 by PCR biologists Susan Anon (formerly Erickson) (Permit No. TE085187-0), Kristin Szabo (Permit No. TE016487-2), Jenni Snibbe (Permit No. TE044520-0), Linda Robb (Permit No. TE093591-0), and Jason Berkley (Permit No. TE009015-1) in accordance with the USFWS *Coastal California Gnatcatcher Presence/Absence Survey Guidelines*, issued July 28, 1997 (USFWS 1997). Accordingly, six surveys were performed at least one week apart, between 6:00 A.M. and 12:00 P.M., within all portions of the LCRSP study area containing suitable habitat. A maximum of 80 acres per person per survey day were surveyed. To ensure coverage of adjacent areas, vocalizations were broadcast outside the boundaries where suitable coastal California gnatcatcher habitat exists. Temperatures during surveys ranged between 62 and 96 degrees Fahrenheit in 2005, between 46 and 94 degrees Fahrenheit in 2006, and between 53 and 95 degrees Fahrenheit in 2007. Weather conditions were suitable for surveys, with skies ranging from 0 to 100 percent overcast during all

survey years. Winds ranged from 0-7 miles per hour in 2005, 0-12 miles per hour in 2006, and 0-6 miles per hour in 2007.

The field investigators slowly walked through all potentially suitable habitat, stopping at approximately 200-foot intervals, uttering pishing sounds and playing a tape of recorded coastal California gnatcatcher vocalizations. The tape was played for several seconds at each interval, followed by a brief pause to listen for a response. Surveys were conducted on May 17, 18, 24, 26, 31, June 2, 7, 9, 14, 16, 21, and 23, 2005, on March 21, 23, 30, April 6, 11, 20, 21, May 1, 2, 4, 9, 11, 16, 23, and 30, 2006, and on April 3, 5, 10, 12, 17, 19, 24, 26, May 1, 4, 7, 11, 22, 25, June 7 and 14, 2007.

Burrowing Owl

PCR biologist Jason Berkley conducted the Phase I (Habitat Assessment) and Phase II (Burrow Survey) surveys for burrowing owl, a California Species of Special Concern (CSC), on May 25, 2005 and on April 21, 2006. The Phase I survey was repeated on May 7 and the Phase II on May 14, 2007 by PCR biologists Susan Anon (formerly Erickson), Joanna Nigro, Erin Hardison, and Chris Jones. To determine presence/absence of suitable habitat for burrowing owl, the LCRSP study area was thoroughly searched for areas containing suitable habitat indicators. A Phase II, Burrow Survey was conducted immediately following the Phase I, Habitat Assessment to determine if any of the existing small fossorial mammal burrows contained evidence of burrowing owl.

The habitat assessment and burrow survey were conducted within the LCRSP study area and a 150-meter (492-foot) buffer zone beyond the boundaries of the LCRSP study area. Transects were utilized in all accessible areas, spaced no more than 100 feet apart, to allow for 100 percent visibility of the survey area. The habitat assessment and burrow survey were conducted from 5:45 A.M. to approximately 9:30 A.M. in 2005 and from 1:20 P.M. to 3:30 P.M. in 2006. In 2007, the habitat assessment was conducted from 8:30 A.M. to 11:30 A.M. and the burrow survey was conducted from 8:20 A.M. to 12:00 P.M. Conditions at the time of the assessments were characterized by clear skies and no wind, with an air temperature of low to mid 80 degrees Fahrenheit.

Southwestern Willow Flycatcher

Focused surveys for the federally and state-endangered southwestern willow flycatcher were performed in 2006 and 2007 by PCR biologist Jason Berkley (Permit No. TE009015-1) and in 2008 by PCR biologist Joseph Platt (Permit No. TE122620-1) in accordance with USFWS *Southwestern Willow Flycatcher Presence/Absence Survey Guidelines*, issued July 11, 2000. Accordingly, five surveys of all riparian habitat within the LCRSP study area were conducted within three survey periods. All surveys were conducted at least five days apart and began at dawn and ended between 9:00 and 11:00 A.M., within all portions of the LCRSP study area

containing suitable habitat. Temperatures during surveys ranged between 50 and 7 degrees Fahrenheit in 2006, between 52 and 93 degrees Fahrenheit in 2007, and 56 and 78 degrees Fahrenheit in 2008. Weather conditions were suitable for surveys, with skies ranging from clear to 100 percent overcast, and winds at or below Beaufort scale 1 in 2006, 2007, and 2008.

The permitted field investigator slowly walked over the site, stopping at appropriate intervals, uttered pishing sounds, and played a tape of recorded southwestern willow flycatcher vocalizations. The tape was played for several seconds at each interval, followed by a brief pause to listen for a response. Surveys were conducted on May 23, June 2, 22, July 5, and 12, 2006; on May 17, June 4, 25, July 5, and 18, 2007; and on May 29, June 11, 26, July 7 and 16, 2008.

Least Bell's Vireo

Focused surveys for the federally and state-endangered least Bell's vireo were performed in 2006 and 2007 by PCR biologist Jason Berkley and in 2008 by PCR biologists Susan Anon, Joseph Platt, Chris Jones, and Linda Robb in accordance with USFWS *Least Bell's Vireo Survey Guidelines* issued January 19, 2001. Accordingly, eight (8) surveys were performed between April 10 and July 31, 2006; April 10 and July 31, 2007; and April 10 and July 31, 2008. Surveys were conducted no less than ten (10) days apart, between dawn and 11:00 AM, within all portions of the LCRSP study area containing suitable riparian habitat and adjacent habitat potentially used for foraging. Weather conditions were suitable for surveys, with skies ranging from clear to 100 percent overcast and winds at or below Beaufort scale 1. Surveys were suspended if conditions became less than favorable. Temperatures during surveys ranged between 40 and 74 degrees Fahrenheit in 2006, between 52 and 93 degrees Fahrenheit in 2007, and between 60 and 92 degrees Fahrenheit in 2008.

The field investigator slowly walked along or within the riparian habitat, stopping at approximately 150- to 200-foot intervals, looking and listening for least Bell's vireo. Surveys were conducted on April 11, 21, May 1, 11, 23, June 2, 12, and 22, 2006; on April 10, May 1, 17, June 4, 14, 25 and July 5 and 16, 2007; and on April 15, 29, May 13, 29, June 12, 27, and July 7 and 24, 2008.

San Bernardino Kangaroo Rat

O'Farrell Biological Consulting has conducted focused trapping surveys for the federally-endangered San Bernardino kangaroo rat from November 2002 through August 2007 throughout the LCRSP study area, with particular attention to the area of Lytle Creek Wash and on suitable upland and terrace habitats near the wash. The results of 2005, 2006, and 2007 trapping surveys are documented in the *Lytle Creek Ranch SBKR Trapping Report (2007)* and *SBKR Survey for Sycamore Flat East and West (2006)*, under separate covers; however, a summary of the

methodology and findings are included in this biological resources assessment. These activities were conducted both on, and adjacent to, Neighborhoods I, II, III, IV and the northern Habitat Mitigation Area as well as on portions of the approved LCNPD. More specifically, traps were located in 20 areas (e.g. the northern 40 acres of the roughly 120-acre (approximately 75 acres above 100-year floodplain) island within this area of Lytle Creek Wash, Lytle Creek Wash completely around the SBKR restoration island, Neighborhoods II, III, IV, northern bank revetment right-of-way, and Neighborhood I). Sampling locations were selected in order to determine current distribution and abundance of San Bernardino kangaroo rat on the northern 40 acres of the larger (roughly 120-acre, of which approximately 75 acres are above 100-year floodplain) island that is located, in part, within the SBKR Conservation Area and Neighborhoods I, II, III, and IV. Wash locations were selected to reflect the current distribution and abundance of San Bernardino kangaroo rat within the drainage, excluding the unoccupied, active drainage channel. Trapping within the revetment right-of-way was designed to adequately sample all areas in order to capture all resident San Bernardino kangaroo rats so that they could be displaced outside the barrier fencing to avoid individual mortality during construction on the LCNPD.

Trapping activities were conducted according to guidelines for small mammal trapping under federal permit TE744707-3 and a Memorandum of Understanding from the CDFG. No trapping was conducted during inclement weather. During the 2005 sampling season, each sampling plot consisted of two roughly parallel lines with traps spaced approximately 15 meters (m) apart and the parallel lines approximately 50 m apart. Within the wash, each line contained 20 stations; thus each plot contained 40 traps. For Neighborhoods II, III, and IV, each line contained 28 stations; thus each plot contained 56 traps. The revetment right of way, the terrace portion of the LCNPD, and that portion of the large upland island in Lytle Creek Wash that lies within the SBKR Conservation Area were subjected to 100 percent coverage. Traps were opened in late afternoon and baited with a mixture of wild birdseed and peanut butter. Traps were checked at sunrise. All animals were identified to species and sex, assessed for relative age and reproductive activity, marked by clipping a patch of hair on the right flank, weighed and released at point of capture. Capture locations were recorded with a global positioning system (GPS) for more precise mapping.

Additional focused trapping was conducted in 2006 and 2007 to better understand the areas of occupied habitat within Neighborhoods II, III, and IV. Due to near record precipitation in 2005 and subsequent flooding within the wash, trapping in 2006 was critical to assessing population numbers under more normal weather conditions. Most of the same trapping plots were used in 2006 as were used in 2005, with some exceptions. Trap lines were removed from areas of unsuitable habitat and were added to areas where the San Bernardino kangaroo rat distribution was previously patchy or where distribution could be further clarified. Similarly, 2007 trap lines were the same as those used in 2006 with the exception of Neighborhood IV

where a new trap line was relocated to replace one previously located along Glen Helen Parkway.

Los Angeles Pocket Mouse

The Los Angeles pocket mouse (*Perognathus longimembris brevinasus*), a CSC species, was simultaneously surveyed with the San Bernardino kangaroo rat trapping surveys described above. Capture methodology is consistent with that described above for the San Bernardino kangaroo rat.

2.3.7 Regional Connectivity/Wildlife Movement Corridor Assessment

The analysis of wildlife movement corridors associated with the LCRSP study area and its immediate vicinity is based on information compiled from the literature, input from wildlife agency personnel, observations made in the field during other survey work, and analysis of aerial photographs and topographic maps. Little quantitative data exist on the movements of animals through corridors. A literature review was conducted that included documents on island biogeography (studies of fragmented and isolated habitat "islands"), reports on wildlife home range sizes and migration patterns, and studies on wildlife dispersal. Wildlife movement studies conducted in southern California were also reviewed including *Missing Linkages: Restoring Connectivity to the California Landscape* (South Coast Wildlands Project 2000). The relationship of the LCRSP study area to large open space areas in the immediate vicinity (i.e., San Bernardino National Forest, Sycamore Flat, Muscupiabe, and Cajon Wash) was also evaluated in terms of connectivity and habitat linkages. Relative to corridor issues, the discussions in this report are intended to focus on wildlife movement associated with the LCRSP study area and the immediate vicinity, and how they may relate to the more regional movement patterns.

The focus of this study effort was to determine if the alteration of current land use within the LCRSP study area will have potentially significant impacts on the regional movement of wildlife. This study did not include the use of track plates, camera stations, scent stations, or snares. Instead, notation was made during field visits of locations of animal sign and inspection of resource maps for the vicinity. Conclusions contained in the report are based on the knowledge of desired topography and resource requirements for wildlife potentially utilizing the LCRSP study area and vicinity.

3.0 EXISTING CONDITIONS

3.1 CHARACTERISTICS OF THE STUDY AREA AND THE SURROUNDING AREA

As described in Section 1.0, the LCRSP study area consists of approximately 2,466.5 acres. This includes the 2,447.3-acre project area, and 19.2 acres of additional off-site areas including: 1) an approximately 2.3-acre road located under the I-15 Freeway that will be improved by the project; 2) an approximately 3.6-acre existing So Cal Gas easement located north of Neighborhood I on County-owned property; 3) an approximately 2.6-acre existing utility road situated near the southeastern end of Neighborhood II; 4) an 10.1-acre area associated with proposed improvements to an off-site levee north of Neighborhood II; and a 0.6-acre area north of Neighborhood IV and south of Neighborhood II that will be temporarily impacted during levee construction. The 2,447.3-acre project site also includes a 3.9 acre on-site segment of the So Cal Gas easement within Neighborhood I, 137.8 acres within Neighborhood I that was previously entitled and approved for development as part of the LCNPD, and the existing 216.8-acre SBKR Conservation Area previously set aside for SBKR habitat by Lytle Development Company in connection with the LCNPD.

The LCRSP study area is crossed by the I-15 and is generally bounded by Riverside Avenue along the southwestern boundary, the Muscupiabe Hills along the northeastern boundary, the confluence of Lytle Creek and Cajon Wash along the southeastern (downstream) boundary, and the San Bernardino National Forest along the northwest and southwest boundaries. Neighborhood I (i.e., Sycamore Flat) is north of Lytle Creek Wash on either side of the I-15.

Residential development exists immediately off-site to the southwest of Riverside Avenue within the City of Rialto. Several County of San Bernardino facilities are located just off-site to the east, including Glen Helen Regional Park, Verdemont Ranch, Glen Helen Rehabilitation Facility, a sheriff's training facility, and an off-road vehicle recreation area. In addition, residential development (the LCNPD) is currently being constructed along a portion of the northeastern boundary of the LCRSP study area primarily east of the I-15 between the eastern portion of Neighborhood I and the Lytle Creek Wash. Elevation within the LCRSP study area ranges from 2,270 feet above mean sea level (MSL) in the western portion of Neighborhood I to 1,450 feet above MSL at the downstream end of Lytle Creek Wash within Neighborhood II.

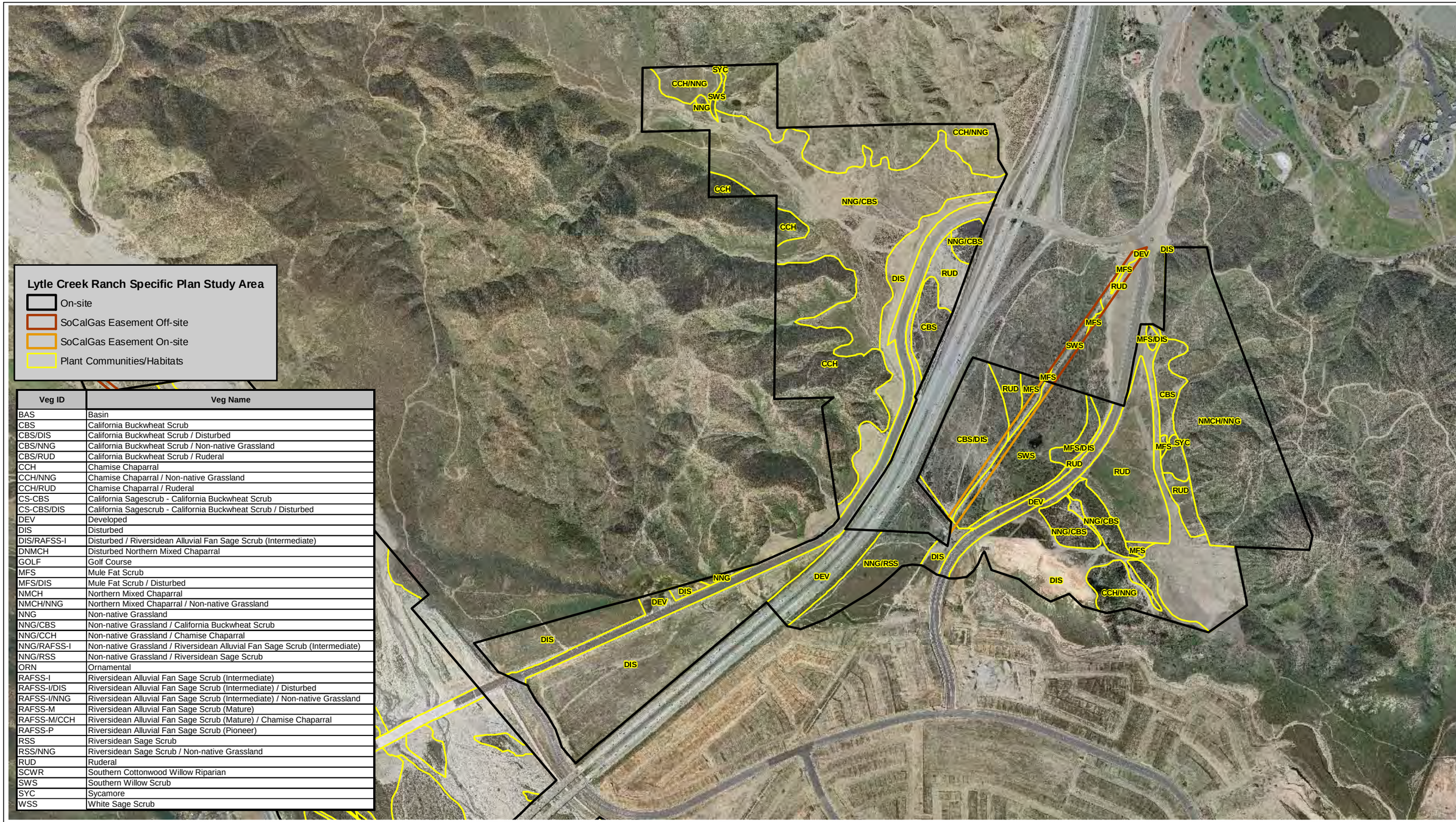
3.2 PLANT COMMUNITIES

Discussions of the plant associations, or communities, mapped within the LCRSP study area are provided below. For the purposes of this assessment, the terms "plant association" and "plant community" are used interchangeably. Locations of each of the plant communities are shown in Figure 4, *Plant Communities/Habitats (Neighborhood I)*, on page 24, Figure 5, *Plant Communities/Habitats (Neighborhood II)*, on page 25, Figure 6, *Plant Communities/Habitats (Neighborhood III east)*, on page 26, Figure 7, *Plant Communities/Habitats (Neighborhood III west)*, on page 27, and Figure 8, *Plant Communities/Habitats (Neighborhood IV)*, on page 28.

Table 3, *Plant Communities*, on page 29, lists each of the plant communities observed as well as the acreage they cover within the LCRSP study area. Mixed plant communities (e.g., California Buckwheat Scrub/Non-native Grassland) are named so that the more dominant or majority community component occurs first and the minority component second.

Although sensitive plant communities are presented in Section 3.6.2, it is important to identify in this discussion of plant communities in general how sensitivity is evaluated. The CDFG's *List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database* (2003) is the commonly accepted source and standard for determining sensitivity of natural communities. According to this classification source, the following communities within the LCRSP study area are considered sensitive and a high priority for inventory in the CNDDB: Riversidean alluvial fan sage scrub (where Riversidean alluvial fan sage scrub is the sole or dominant plant community), white sage scrub, southern willow scrub, California sycamore alliance, and southern cottonwood willow riparian. It should be noted that the CDFG recently published an updated List of California Vegetation Alliances (Barbour et al. 2007) but the updated sensitivity ranking list for full alliances and associations has not yet been released.

In addition, other scrub habitats in southern California may also be considered sensitive due to their being significant to: the long-term sustainability of sensitive species' populations (for example, the coastal California gnatcatcher); their contribution to important ecotones (such as at the edge of riparian habitat; and their being relatively large blocks of relatively undisturbed habitat within a regional habitat linkage. In the case of the LCRSP study area, the scrub habitats that are not identified as sensitive by the CDFG in their CNDDB do not meet these criteria. Rather, they occur as relatively small isolated patches, are often disturbed at their edges, and are fragmented so as to diminish their values and functions as natural communities. Therefore, Riversidean sage scrub, California buckwheat scrub, and California sagebrush-California buckwheat scrub (including mixed communities where these communities are dominant) are not considered sensitive for the purposes of this assessment.



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

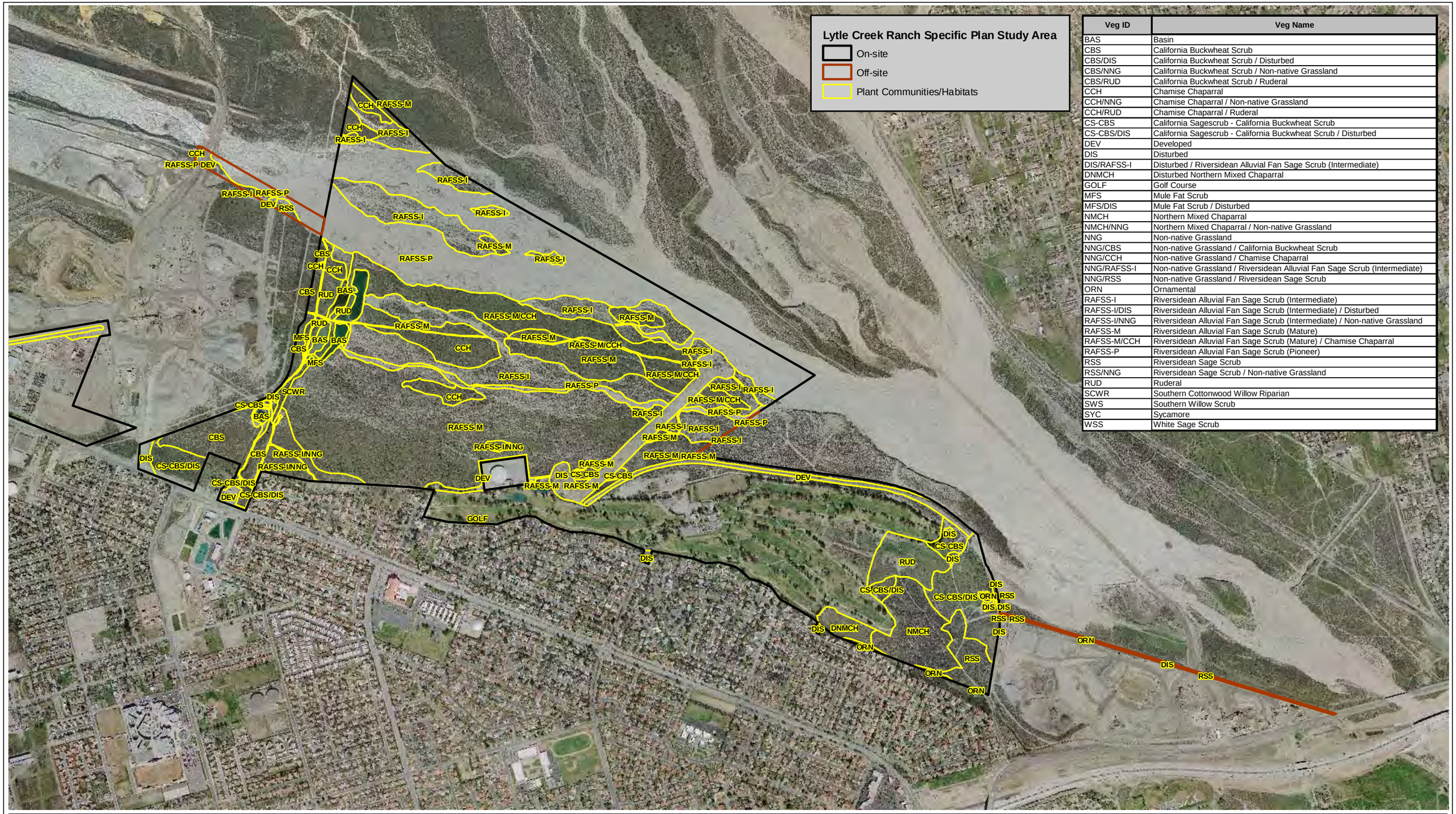
N

900 0 900 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 4

Lytle Creek Ranch Specific Plan
Plant Communities/Habitats (Neighborhood I)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

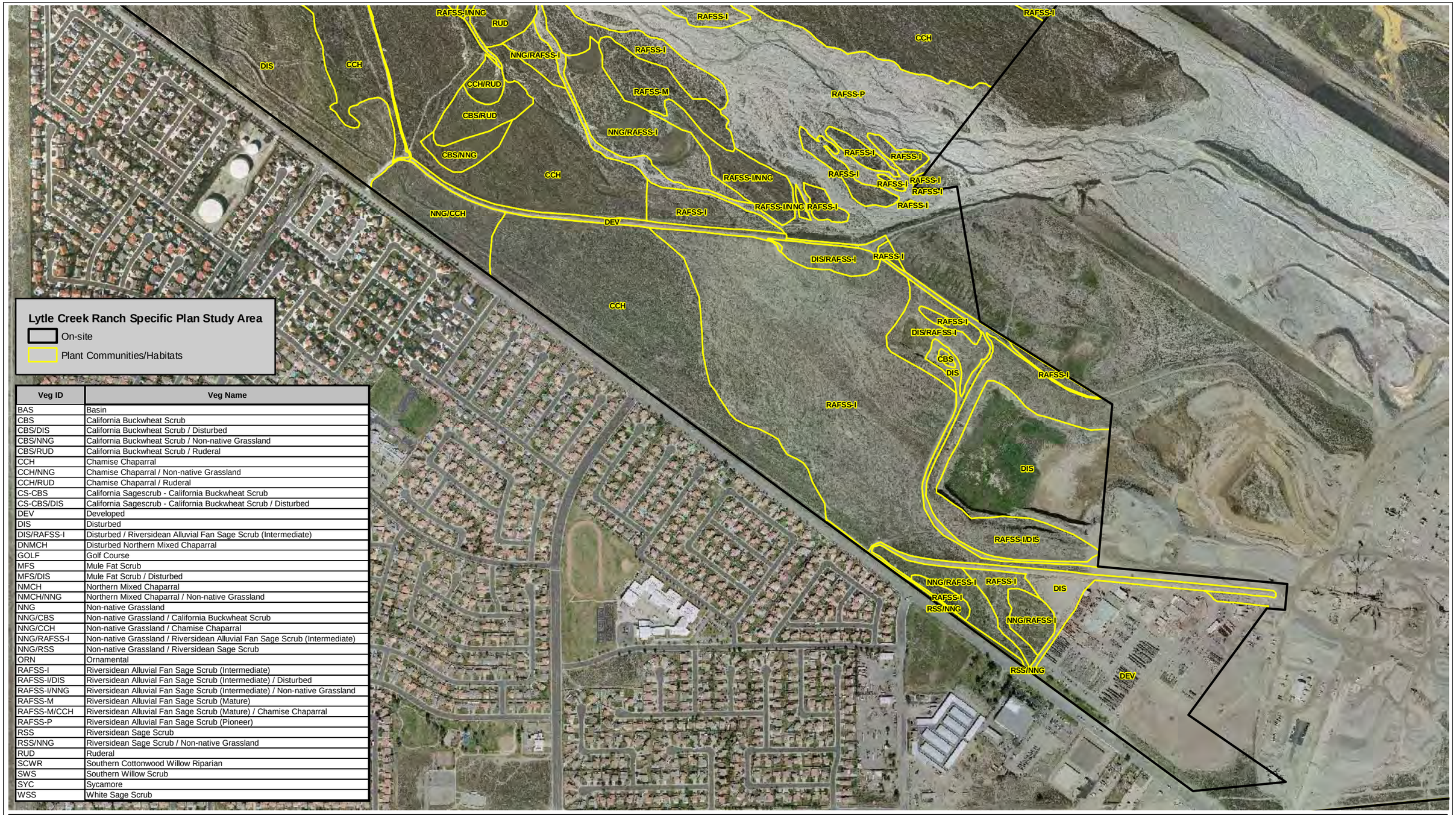
N

1,250 0 1,250 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 5

Lytle Creek Ranch Specific Plan
Plant Communities/Habitats (Neighborhood II)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

N

700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 6

Lytle Creek Ranch Specific Plan
Plant Communities/Habitats (Neighborhood III East)

Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

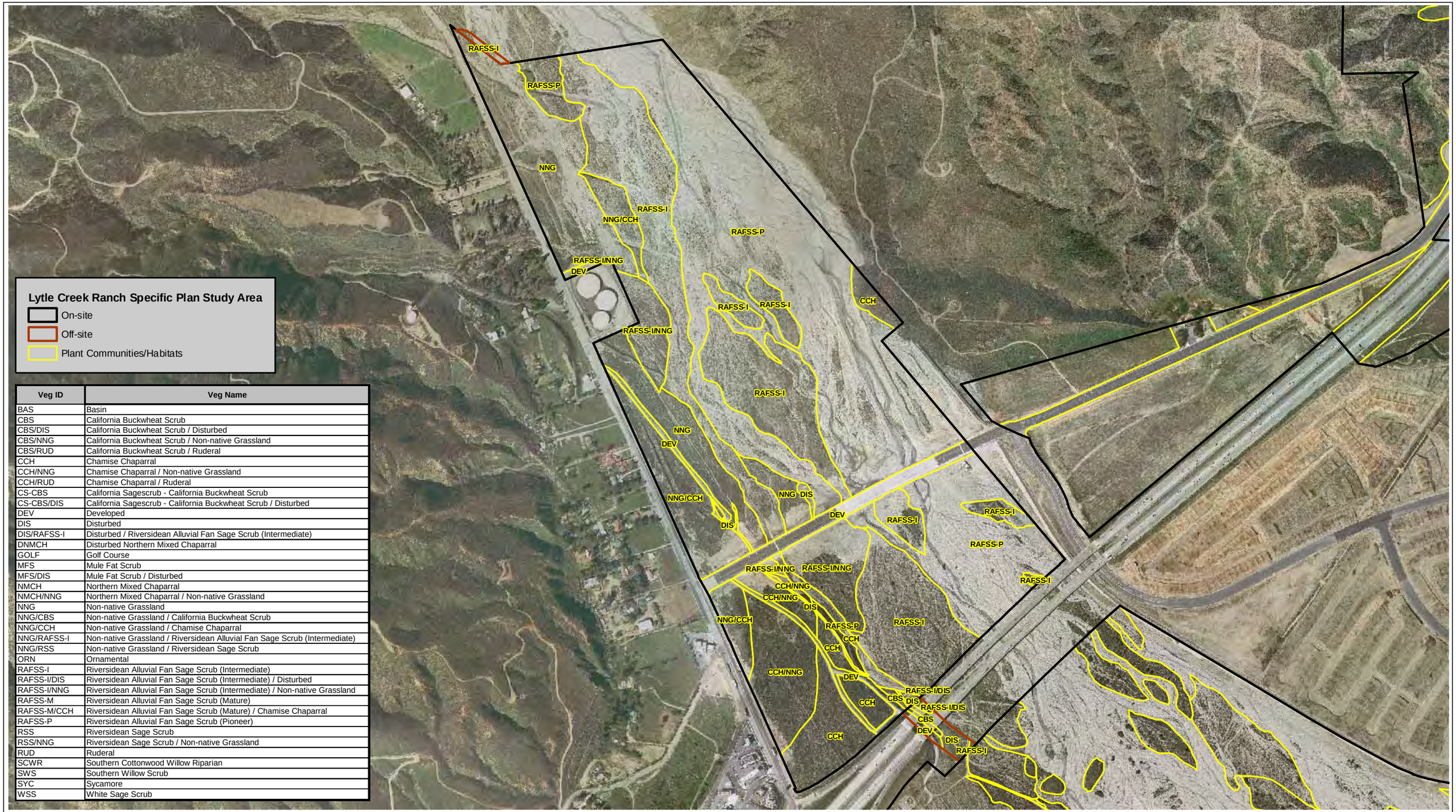
N

700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 7

Lytle Creek Ranch Specific Plan
Plant Communities/Habitats (Neighborhood III West)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

N

700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 8

Lytle Creek Ranch Specific Plan
Plant Communities/Habitats (Neighborhood IV)

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Table 3

Plant Communities

Plant Community[a]	On-Site Portions of the Study Area			Off-site Portions of the Study Area					Total Acres within Study Area
	Acres within Project Site	Acres within SoCalGas Easement[c]	Acres within LCNPDP[d]	Acres within SoCalGas Easement[c]	Acres within Existing Utility Road[e]	Acres within Road Under I-15[e]	Acres within Off-site Levee[e]	Acres Associated with off-site Temporary Levee Impacts	
Scrub Communities									
Riversidean Sage Scrub	12.6	0.0	0.0	0.0	0.0	0.0	1.1	0.0	13.7
Riversidean Sage Scrub/Non-native Grassland	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Riversidean Alluvial Fan Sage Scrub (Pioneer)[b]	484.2	0.0	0.0	0.0	0.0	0.0	5.8	0.0	490.0
Riversidean Alluvial Fan Sage Scrub (Intermediate)[b]	356.9	0.0	0.0	0.0	0.0	0.1	0.9	0.5	358.4
Riversidean Alluvial Fan Sage Scrub (Intermediate)/Non-native Grassland[b]	31.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.9
Riversidean Alluvial Fan Sage Scrub (Intermediate)/Disturbed[b]	16.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	16.1
Riversidean Alluvial Fan Sage Scrub (Mature)[b]	207.9	0.0	0.0	0.0	0.0	0.0	0.0	0.1	208.0
Riversidean Alluvial Fan Sage Scrub (Mature)/Chamise Chaparral[b]	39.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.3
White Sage Scrub[b]	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
California Buckwheat Scrub	33.7	0.0	0.0	0.0	0.0	0.3	0.0	0.0	34.0
California Buckwheat Scrub/Non-native Grassland	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
California Buckwheat Scrub/Disturbed	15.9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9
California Buckwheat Scrub/Ruderal	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4
California Sagebrush-California Buckwheat Scrub	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
California Sagebrush-California Buckwheat Scrub/Disturbed	30.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.1
Subtotal – Scrub Communities[f]	*1,242.9*	*1.0*	*0.0*	*0.0*	*0.0*	*0.5*	*7.8*	*0.6*	*1,252.8*

Table 3 (Continued)

Plant Communities

Plant Community[a]	On-Site Portions of the Study Area			Off-site Portions of the Study Area					Total Acres within Study Area
	Acres within Project Site	Acres within SoCalGas Easement[c]	Acres within LCNPDP[d]	Acres within SoCalGas Easement[c]	Acres within Existing Utility Road[e]	Acres within Road Under I-15[e]	Acres within Off-site Levee[e]	Acres Associated with off-site Temporary Levee Impacts	
Chaparral Communities									
Northern Mixed Chaparral	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6
Northern Mixed Chaparral/Non-native Grassland	52.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.6
Chamise Chaparral	240.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	240.9
Chamise Chaparral/Non-native Grassland	40.5	0.0	7.0	0.0	0.0	0.0	0.0	0.0	47.5
Chamise Chaparral/Ruderal	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
Subtotal – Chaparral Communities[f]	*356.2*	*0.0*	*7.0*	*0.0*	*0.0*	*0.0*	*0.1*	*0.0*	*363.3*
Grassland Communities									
Non-native Grassland	32.3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	32.8
Non-native Grassland/Riversidean Sage Scrub	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0	9.8
Non-native Grassland/Riversidean Alluvial Fan Sage Scrub (Intermediate)	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
Non-native Grassland/California Buckwheat Scrub	67.8	0.0	1.4	0.0	0.0	0.0	0.0	0.0	69.2
Non-native Grassland/Chamise Chaparral	24.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.1
Subtotal – Grassland Communities[f]	*145.2*	*0.0*	*11.7*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*156.9*
Riparian Communities									
Southern Cottonwood Willow Riparian[b]	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
Southern Willow Scrub[b]	15.7	1.8	0.0	1.9	0.0	0.0	0.0	0.0	19.4
California Sycamore Alliance[b]	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Mule Fat Scrub	2.2	1.0	0.5	0.7	0.0	0.0	0.0	0.0	4.4
Mule Fat Scrub/Disturbed	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
Subtotal – Riparian Communities	*22.6*	*2.8*	*0.5*	*2.6*	*0.0*	*0.0*	*0.0*	*0.0*	*28.5*
Disturbed Communities									
Basin	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9

Table 3 (Continued)

Plant Communities

Plant Community[a]	On-Site Portions of the Study Area			Off-site Portions of the Study Area					Total Acres within Study Area
	Acres within Project Site	Acres within SoCalGas Easement[c]	Acres within LCNPDP[d]	Acres within SoCalGas Easement[c]	Acres within Existing Utility Road[e]	Acres within Road Under I-15[e]	Acres within Off-site Levee[e]	Acres Associated with off-site Temporary Levee Impacts	
Ruderal	55.3	0.0	0.0	0.9	0.0	0.0	0.0	0.0	56.2
Disturbed	244.3	0.1	79.8	0.0	2.6	1.3	0.0	0.0	328.1
Disturbed/ Riversidean Alluvial Fan Sage Scrub (Intermediate)	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
Disturbed/ Northern Mixed Chaparral	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9
Golf Course	158.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	158.6
Ornamental	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
Subtotal – Disturbed Communities[f]	*484.0*	*0.1*	*79.8*	*0.9*	*2.6*	*1.3*	*0.0*	*0.0*	*568.7*
Developed Communities									
Developed	54.7	0.0	38.8	0.1	0.0	0.5	2.2	0.0	96.3
Subtotal – Developed Communities[f]	*54.7*	*0.0*	*38.8*	*0.1*	*0.0*	*0.5*	*2.2*	*0.0*	*96.3*
TOTAL[f]	**2,305.6**	**3.9**	**137.8**	**3.6**	**2.6**	**2.3**	**10.1**	**0.6**	**2,466.5**

[a] *The plant communities are composed of numerous plant species. General plant species observations were completed during the 2004-2007 surveys of the LCRSP study area.*

[b] *Plant communities considered rare or warranting consideration by the CNDDB.*

[c] *So Cal Gas holds a 7.5-acre, 100-foot easement for an interstate gas line (which includes a 3.9-acre segment through Neighborhood I and a 3.6-acre segment which extends off-site to the north). The project proposes no improvements within the easement area; however, it is anticipated that So Cal Gas, at a future date and independent of the LCRSP project, may undertake improvements to the existing maintenance road, including installing rip-rap and constructing a V-ditch in this easement area to address drainage and erosion issues. This improvement will be addressed independent of the LCRSP project.*

[d] *Acreage in this column represents the portion of this community that falls within the area previously entitled and approved for development as part of the LCNPDP.*

[e] *Off-site areas include the 2.6-acre existing utility road at the downstream end of Neighborhood II, the 2.3-acre road easement under the I-15 Freeway, the 3.6 acre off-site So Cal Gas segment, a 10.1-acre area associated with the off-site levee, and an additional 0.6 acre associated with temporary impacts associated with the levee construction.*

[f] *Due to rounding of GIS calculated acreages throughout the table to the neaerst0.1 acre, plant community acreages ma not add to the exact subtotals and totals indicated.*

Source: PCR Services Corporation, 2009

In addition, it should be noted that certain areas within the LCRSP study area were previously entitled under the LCNPD (137.8 acres) and impacts to these areas analyzed and mitigated in the LCNPD EIR. Portions of these areas have been disturbed by development activities (e.g., grading for roads and utilities for the LCNPD) and any existing habitat and/or vegetation removed. For the remaining previously-analyzed and previously-mitigated areas, the existing conditions were examined as part of the biological work for this report. This was then compared against the description of existing conditions and analysis of biological resources impacts in the LCNPD EIR to confirm no substantial changes had occurred that would trigger new environmental review.

3.2.1 Riversidean Sage Scrub

Riversidean sage scrub is the driest, most inland expression of the collection of sage scrub or coastal scrub series and ranges throughout southern California. It typically occurs on steep slopes, severely drained soils, or clays that release soil moisture slowly. Typical stands of this type of sage scrub are fairly open and dominated by California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and foxtail chess (*Bromus madritensis* ssp. *rubens*). Additional species characteristic of this plant community include deerweed (*Lotus scoparius*), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), our Lord's candle (*Yucca whipplei*), matchweed (*Gutierrezia californica*), and bushmallow (*Malacothamnus fasciculatus*).

The dominant shrubs in the Riversidean sage scrub within the study area include California sagebrush, California buckwheat, and white sage. Associated shrub species include black sage and deerweed. The Riversidean sage scrub community comprises 13.7 acres (12.6 acres on-site and 1.1 acres off-site). It is found in the southeastern portion of Neighborhood II, in the western portion of Neighborhood III (along an existing dirt road south of Lytle Creek), and within the off-site levee north of Neighborhood II.

Another 0.9 acre are characterized as **Riversidean sage scrub/non-native grassland** and support non-native grasses such as slender wild oat (*Avena barbata*), foxtail chess, and soft chess (*Bromus hordeaceus*) within a more open mosaic of native shrubs. Additional weedy species observed include filaree (*Erodium* spp.), tocalote (*Centaurea melitensis*), and black mustard (*Brassica nigra*). Riversidean sage scrub/non-native grassland is found within the southeast portion of Neighborhood III.

3.2.2 Riversidean Alluvial Fan Sage Scrub

Alluvial fan sage scrub is a plant community that grows on sandy, rock alluvia deposited by streams that experience infrequent episodes of severe overbank flooding. This

vegetation dominates major outwash fans at the mouths of canyons along the coastal side of the Transverse and Peninsular Ranges of southern California.

Alluvial scrub is composed of an assortment of drought-deciduous subshrubs and large evergreen wood shrubs that are adapted to porous, low-fertility substrates and to survival of intense, periodic flooding and erosion. Early classification work on this plant community commonly recognized three types or phases of alluvial scrub related to such factors as the scouring action of flood channels, distance from the flood channel, time since the last catastrophic flood, and substrate features such as texture and moisture content (Smith 1980; Hanes, et al. 1989). These three types are commonly referred to as: 1) pioneer – where vegetation is sparse, with a low species' diversity and stature and is found within active stream channels or recently scoured streambeds; 2) intermediate – where vegetation is rather dense and is composed mainly of subshrubs; and 3) mature – where vegetation is composed of fully developed subshrubs and wood shrubs. According to the earlier studies, however, when areas supporting alluvial fan sage scrub are permanently precluded from experiencing flooding, such as in the case of areas "downstream" of flood control improvements or protected by flood control structures, they commonly develop into an upland, often dominated by chaparral where they remain as a climax community. Conversely, episodic floods can eliminate existing stands of intermediate or mature alluvial scrub and thus initiate new pioneer stands. In a study of the floristic composition and diversity of alluvial sage scrub vegetation in San Diego County, Smith (1996) generally supports this successional concept by stating that "shrubs and sub-shrub overstories are reduced only in large-scale catastrophic floods", as is the generalized successional scenario put forth by Smith (1980) and Hanes, et al. (1989).

According to even more recent scientific studies and literature on alluvial scrub in southern California, the processes described above may be generalizations that do not apply in all cases. Specifically, Barbour and Wirka (1997) suggest: 1) the three-phase classification of alluvial scrub may oversimplify succession throughout this community; 2) the true timeframe over which succession occurs may be longer than previously thought; and 3) the specific dynamics of succession may differ by drainage and geography.

In any case, the alluvial scrub community is distinguished by its vegetative composition, which according to the body of research available and referenced herein contrasts in several respects with that of the Riversidean and coastal sage scrub community, the plant association that characterizes most of the coastal plains and slopes of southern California. These contrasts are: (1) greater numbers of alluvial scrub species are mesic (adapted to moist habitats), whereas most coastal sage scrub species are xeric (adapted to dry habitats); (2) coastal sage scrub vegetation is composed primarily of drought-deciduous shrubs and sparse evergreens, while alluvial scrub vegetation consists of numerous evergreen shrubs and a diverse assemblage of subshrubs; (3) scale-broom (*Lepidospartum squamatum*), a plant with high fidelity to alluvial substrates, is found throughout alluvial scrub plant communities but seldom in coastal sage scrub vegetation;

(4) species commonly found in chaparral or xeric plant assemblages, such as spiny redberry (*Rhamnus crocea*) and California juniper (*Juniperus californica*), are also common in the alluvial scrub community; (5) lemonadeberry (*Rhus integrifolia*) is usually sparse in coastal sage scrub communities but occurs frequently in alluvial scrub vegetation; and (6) alluvial scrub vegetation exhibits a greater species diversity than coastal sage scrub vegetation (Hanes, et al. 1989).

As a vegetation type or plant community, alluvial scrub has been classified more specifically by the CNDDB as Riversidean alluvial fan sage scrub and is considered rare and worthy of consideration according to the *List of California Terrestrial Natural Communities Recognized by The California Natural Diversity Database* (CDFG 2003). Earlier work by Kirkpatrick and Hutchinson (1977) has classified the California coastal sage scrub community as Riversidean, Venturan, and San Diegan based upon floristic characteristics and this distinction has been applied to alluvial scrub as well. According to Sawyer and Keeler-Wolfe's *A Manual of California Vegetation* (1995), Riversidean alluvial fan sage scrub is categorized within the scale-broom series. The new *Terrestrial Vegetation of California* (Barbour et al. 2007) acknowledges this previous classification but describes the difficulty in assigning series (now termed alliances) to communities that experience successional transitions. Barbour et al. (2007) defines alluvial scrub as a specific type of interior sage scrub or Riversidean sage scrub that occurs on alluvial fans and floodplains. This new classification defers to the current scientific literature on this community, including Barbour and Wirka (1997) for Los Angeles, Riverside, and San Bernardino Counties and Smith (1996) for San Diego County, for more detailed descriptions and groupings.

Despite the likelihood that studies on the most appropriate way of classifying floristic variations in alluvial scrub will continue, this plant community as a whole remains distinct and unique due to its dependency upon active fluvial processes which influence its functions and values as a habitat; and it is this distinction that is important to this assessment. Therefore, for the purposes of this biological resources assessment, the alluvial scrub that occurs within the study area will be referred to as Riversidean alluvial fan sage scrub (to date, the most widely used terminology). Furthermore, because this CEQA assessment focuses on the subjects of existing plant communities, wildlife populations, and sensitive biological resources, it remained appropriate to divide the alluvial fan sage scrub into the three phases due to the distinctions in relative age, topography, and vegetation present within the study area and the varying habitat functions and values these phases represent.

Total Riversidean alluvial fan sage scrub vegetation occurring within the LCRSP study area, including pioneer, intermediate, and mature phases but excluding mixed communities, is 1,056.4 acres (1,049.0 acres on-site and 7.4 acres off-site). Including mixed communities, where Riversidean alluvial fan sage scrub is dominant, these communities total 1,143.7 acres (1,136.2 acres on-site and 7.5 acres off-site) within the LCRSP study area, of which a total of 473.2 acres (472.2 acres on-site and 1.0 acres off-site) are no longer hydrologically connected to Lytle Creek

(i.e., outside the existing 100-year floodplain) and, therefore, these acres are expected to convert to non- Riversidean alluvial fan sage scrub habitat over the long-term. Riversidean alluvial fan sage scrub that is hydrologically connected includes 670.5 acres (664.0 acres on-site and 6.5 acres off-site) of the 1,143.7 acres within the LCRSP study area. The Riversidean alluvial fan sage scrub vegetation within the LCRSP study area is described below and summarized in Table 3, *Plant Communities*. Table 4, *Hydrologically Connected Riversidean alluvial fan sage scrub within the LCRSP Study Area,* on page 36, summarized the amount of Riversidean alluvial fan sage scrub within the LCRSP study are that is hydrologically connected.

It should be noted that the phrase "long-term" is relative and the time required for succession to a non-Riversidean alluvial fan sage scrub community cannot be quantified at this time based upon currently available scientific literature. However, as mentioned above, the study by Barbour and Wirka (1997) suggests that succession may, at least in some circumstances, take much longer than previously thought, possibly on the order of hundreds of years. Nevertheless, for the purposes of this assessment, the ecological functions and values of hydrologically disconnected Riversidean alluvial fan sage scrub are not decreased or discounted. It is simply presented herein as factual data regarding the existing conditions of this community within the LCRSP study area. The three phases occurring within the study area are described below.

3.2.2.1 Pioneer Riversidean Alluvial Fan Sage Scrub

Pioneer Riversidean alluvial fan sage scrub is characterized by sparse vegetation within the open channel areas of the LCRSP study area. Species composition is similar to the intermediate zones, although vegetation does not exceed 10 percent cover. In addition to the characteristic shrubs of Riversidean alluvial fan sage scrub, "weedy" species and other disturbance-followers also occur in this phase. Within the LCRSP study area, a total of 490.0 acres (484.2 acres onsite and 5.8 acres off-site) of pioneer Riversidean alluvial fan sage scrub occur in a narrow band through the central portion of Neighborhoods II, III, and IV, primarily within and along the active wash and within the off-site levee. Of this total, 33.7 acres (33.6 acres on-site and 0.1 acre off-site) are hydrologically disconnected (i.e., outside the existing 100-year floodplain) and therefore are no longer exposed to the natural flood regime characteristic of this community.

3.2.2.2 Intermediate Riversidean Alluvial Fan Sage Scrub

Intermediate Riversidean alluvial fan sage scrub within the LCRSP study area is dominated by California sagebrush, scale-broom, our Lord's candle, California buckwheat, deerweed, hairy yerba santa (*Eriodictyon trichocalyx*), and slender buckwheat (*Eriogonum gracile* var. *gracile*). Within the LCRSP study area, a total of 358.4 acres (356.9 acres on-site and 1.5 acres off-site) of intermediate Riversidean alluvial fan sage scrub occurs along the

Table 4

Hydrologically Connected Riversidean alluvial fan sage scrub within the LCRSP Study Area

Riversidean alluvial fan sage scrub Type	Hydrologically Connected (acres)		Hydrologically Disconnected (acres)		Total	
	On-site	Off-site	On-site	Off-site	On-site	Off-site
Intermediate Riversidean alluvial fan sage scrub	170.2	0.7	186.7	0.8	356.9	1.5
Intermediate Riversidean alluvial fan sage scrub/Disturbed	0.2	0.1	15.8	0.0	16.0	0.1
Intermediate Riversidean alluvial fan sage scrub/Non-native grassland	19.2	0.0	12.7	0.0	31.9	0.0
Mature Riversidean alluvial fan sage scrub	15.6	0.0	192.3	0.1	207.9	0.1
Mature Riversidean alluvial fan sage scrub /Chamise chaparral	8.2	0.0	31.1	0.0	39.3	0.0
Pioneer Riversidean alluvial fan sage scrub	450.6	5.7	33.6	0.1	484.2	5.8
Total	**664.0**	**6.5**	**472.2**	**1.0**	**1,136.2**	**7.5**

Source: PCR Services Corporation, 2009

northern and central portions of Neighborhoods II, III, and IV, and within the off-site road and levee. Of this, 187.5 acres (186.7 acres on-site and 0.8 acre off-site) are hydrologically disconnected (i.e., outside the existing 100-year floodplain) (refer to discussion in Section 3.2.2).

Intermediate Riversidean alluvial fan sage scrub/Non-native grassland supports dominant shrubs characteristic of this community comprising on the order of 30 percent cover. Non-native grasses such as ripgut grass (*Bromus diandrus*), foxtail chess, and slender wild oat comprise approximately 40 percent cover. A total of 31.9 acres of this community occurs throughout the LCRSP study area. Of this, 12.7 acres on-site are hydrologically disconnected (i.e., outside the existing 100-year floodplain).

Intermediate Riversidean alluvial fan sage scrub/Disturbed is characterized by Riversidean alluvial fan sage scrub with evidence of disturbance. This community comprises a total of 16.1 acres (16.0 on-site and 0.1 acres) in Neighborhoods III, IV, and the off-site road. Of this, approximately 15.8 acres on-site are hydrologically disconnected (i.e., outside the existing 100-year floodplain).

3.2.2.3 Mature Riversidean Alluvial Fan Sage Scrub

Mature Riversidean alluvial fan sage scrub within the LCRSP study area is dominated by scale-broom, California buckwheat, birch-leaf mountain mahogany (*Cercocarpus betuloides*), spiny redberry, and California juniper. Other species present throughout this community include our Lord's candle, pinebush (*Ericameria pinifolia*), California sagebrush, deerweed, beavertail cactus (*Opuntia basilaris*), western sycamore (*Platanus racemosa*), squawbush (*Rhus trilobata*),

and matchweed. Forb species include nest straw (*Stylocline* sp.), California filago (*Filago californica*), chia (*Salvia columbariae*), yarrow (*Eriophyllum* sp.), Parry's spineflower (*Chorizanthe parryi* var. *parry*), Turkish rugging (*Chorizanthe staticoides*), lastarriaea (*Lastarriaea coriacea*), and oat (*Avena* spp.). Within the LCRSP study area, a total of 208.0 acres (207.9 acres on-site and 0.1 acre off-site) of mature Riversidean alluvial fan sage scrub occurs in benches throughout the southern portion of Neighborhood II and throughout the northern portion of Neighborhood III.

Of note, the majority of the assemblages of mature Riversidean alluvial fan sage scrub in the LCRSP study area [approximately 192.4 acres (192.3 acres on-site and 0.1 acre off-site**)**] have been removed from exposure to episodic flooding by flood control structures and/or mining operations. **Mature Riversidean alluvial fan sage scrub/Chamise chaparral** within the LCRSP study area is an ecotone community and supports species characteristic of both communities for which it is named. This community comprises approximately 39.3 acres within Neighborhood II. Of this, 31.1 acres on-site are hydrologically disconnected (i.e., outside the existing 100-year floodplain) (refer to discussion in Section 3.2.2).

3.2.3 White Sage Scrub

White sage scrub within the LCRSP study area is dominated by white sage. This community may be in a transitional phase from some form of Riversidean sage scrub to white sage scrub due to recent fire and other disturbances that have created a more monotypic scrub community in this area. This community is located along the northern boundary of the northern portion of Neighborhood III and comprises approximately 1.2 acres.

3.2.4 California Buckwheat Scrub

This community is dominated by California buckwheat. Other species observed within this community include California sagebrush, deerweed, scale-broom, oat, and other non-native grasses. Approximately 34.0 acres (33.7 acres on-site and 0.3 acre off-site) of California buckwheat scrub are found within the LCRSP study area primarily near roads and disturbed slopes along the western edges of Neighborhoods II and III.

California buckwheat scrub/Non-native grassland is dominated by California buckwheat, foxtail chess, slender wild oat, Mediterranean schismus (*Schismus barbatus*), soft chess, and cheat grass (*Bromus tectorum*). Associated species within this community include common fiddleneck (*Amsinckia menziesii*) and black mustard. This community comprises approximately 2.7 acres within Neighborhood III.

California buckwheat scrub/Disturbed exhibits evidence of disturbance including clearing and continual use of dirt roads. This community within the LCRSP study area is dominated by California buckwheat, hairy golden-aster (*Heterotheca sessiliflora*), black mustard, foxtail chess, California sagebrush, slender buckwheat, and twiggy wreathplant (*Stephanomeria virgata*). This community occurs within the southwest corner of the eastern portion of Neighborhood I and comprises 16.9 acres (15.9 acres on-site and 1.0 acre on-site within the So Cal Gas easement).

California buckwheat scrub/Ruderal is dominated by California buckwheat and non-native weedy species. This community totals 4.4 acres within Neighborhood III.

3.2.5 California Sagebrush-California Buckwheat Scrub

As the name implies, California sagebrush-California buckwheat scrub is dominated by California sagebrush and California buckwheat. Other component species observed within the LCRSP study area include pinebush, deerweed, hairy yerba santa, and California croton (*Croton californicus*). This vegetation community may also contain common sunflower (*Helianthus annuus*), patches of non-native ruderal species such as mustard (*Brassica* sp.), and non-native grasses in areas where disturbances have occurred. There are approximately 5.3 acres of California sagebrush-California buckwheat scrub in small patches along the southern boundary and in the southwest corner of Neighborhood II.

California sagebrush-California buckwheat scrub/Disturbed is dominated by California sagebrush and California buckwheat, but shows evidence of disturbance. Non-native species found within this community include slender wild oat, tocalote, black mustard, horehound (*Marrubium vulgare*), and red-stemmed filaree (*Erodium cicutarium*). This community occurs in the southeastern and western portions of Neighborhood II and comprises 30.1 acres.

3.2.6 Northern Mixed Chaparral

Northern mixed chaparral is normally dominated by robust, broad-leaved sclerophyll shrubs. Usually, there is little or no understory vegetation but often there is a thick accumulation of leaf litter. Suitable site factors include dry, rocky, often steep slopes with little soil. On-site, northern mixed chaparral is dominated by buck brush (*Ceanothus cuneatus*), redberry (*Rhamnus* sp.), chamise, California sagebrush, squawbush, and California buckwheat. This community accounts for approximately 20.6 acres of the LCRSP study area and occurs in the southeastern section of Neighborhood II.

Northern Mixed Chaparral/Non-native grassland within the LCRSP study area supports tall, dense shrubs that do not form a dense, continuous canopy due to invasion by non-native grasses. This community is dominated by ceanothus species (*Ceanothus* spp.), scrub oak (*Quercus berberidifolia*), chamise, and non-native grasses. This community comprises approximately 52.6 acres along the slopes in the eastern half of Neighborhood I.

3.2.7 Chamise Chaparral

Chamise chaparral consists of a relatively low-growing chaparral dominated by chamise. This community often occurs on xeric slopes and ridges and is adapted to frequent fires by crown sprouting. California buckwheat occurs throughout this community within the LCRSP study area as a subdominant species. Associated species observed within the LCRSP study area include white sage, California sagebrush, pinebush, black sage, deerweed, hairy yerba santa, and California croton. Understory species include oat, telegraph weed (*Heterotheca grandiflora*), and horehound. Approximately 240.9 acres (240.8 acres on-site and 0.1 acre off-site) of chamise chaparral occur throughout the LCRSP study area.

Chamise chaparral/Non-native grassland is dominated by chamise and oat. This community supports subdominant and associated shrubs characteristic of chamise chaparral; however, there is a greater presence of non-native and disturbance-tolerant species including ripgut grass, annual sunflower, and black mustard. This community comprises a total of 47.5 acres (of which 7.0 acres is located within the previously entitled LCNPD) on-site within the northwestern portion of Neighborhood I and the eastern portion of Neighborhood IV.

Chamise Chaparral/Ruderal is dominated by chamise and disturbance tolerant species such as mustard. This community occurs in the central portion of Neighborhood III and totals 1.7 acres.

3.2.8 Non-native Grassland

Non-native grasslands typically occur in upland areas with deep soils of relatively flat terrain or gradual slopes below 3,000 feet above MSL. Typical species include annual grasses of Mediterranean origin and numerous associated annual forbs. Dominant non-native grassland species observed within the LCRSP study area include ripgut grass, foxtail chess, oat, and soft chess. Approximately 32.8 acres (of which 0.5 acre is located within the previously entitled LCNPD) of non-native grassland occur primarily within Neighborhood IV with small patches found in Neighborhood I.

Non-native grassland/Riversidean sage scrub is dominated by non-native grasses, especially oats, with scattered shrubs such as California sagebrush, California buckwheat,

deerweed, and white sage. This community, totaling 9.8 acres, was mapped adjacent to Neighborhood I in the portion of the study area that is part of the LCNPD (impacts to which were previously considered and mitigated under the LCNPD EIR).

Non-native grassland/Intermediate Riversidean alluvial fan sage scrub is dominated by non-native grasses including oat, foxtail chess, and ripgut grass as well as scattered shrubs characteristic of Riversidean alluvial fan sage scrub. This community totals 21.0 acres within Neighborhood III.

Non-native grassland/California buckwheat scrub is dominated by hairy golden-aster, oat, cheat grass, nest straw, dove weed (*Eremocarpus setigerus*), and common sunflower with California buckwheat and slender buckwheat scattered throughout. This community, totaling 69.2 acres (of which 1.4 acres located within the previously entitled LCNPD), occurs throughout Sycamore Canyon within the western portion of Neighborhood I and a small portion along the southern boundary of the eastern portion of Neighborhood I.

Non-native grassland/Chamise chaparral is dominated within the LCRSP study area by non-native grasses that comprise at least 40 percent cover. Shrubs account for about 30 percent cover with chamise as the dominant and hairy yerba santa as a co-dominant shrub. Additional species observed in this community within the LCRSP study area include California everlasting (*Gnaphalium californicum*), stephanomeria (*Stephanomeria* sp.), and peak rush-rose (*Helianthemum scoparium*). This community occurs in Neighborhoods III and IV and comprises 24.1 acres.

3.2.9 Southern Cottonwood Willow Riparian

Southern cottonwood willow riparian is dominated within the study area by Fremont cottonwood (*Populus fremontii*), arroyo willow (*Salix lasiolepis*), and mule fat (*Baccharis salicifolia*). A few eucalyptus trees (*Eucalyptus* sp.) also occur within this community within the study area. Approximately 1.7 acres of southern cottonwood willow riparian occur in the western portion of Neighborhood II adjacent to water flowing from basins (refer to Section 3.2.14) to the north.

3.2.10 Southern Willow Scrub

Southern willow scrub is characterized by dense, broad-leaved, winter-deciduous, riparian thickets dominated by several willow species (*Salix* spp.), with scattered emergent Fremont's cottonwood and western sycamore, and a sparse understory. Within the LCRSP study area, southern willow scrub is dominated by arroyo willow, mule fat, and Mexican elderberry (*Sambucus mexicanus*). This community totals 19.4 [17.5 on-site (of which 1.8 acres is located

within the on-site So Cal Gas easement) and 1.9 acres off-site within the So Cal Gas easement] and is primarily located within the drainage within the eastern portion of Neighborhood I (at Sycamore Flat). A small patch is also located within a drainage in the northwest corner of Neighborhood I.

Within the LCRSP study area, stands of southern willow scrub are recovering from the fire that occurred in the area in October 2003 that burned this vegetation in its entirety. Consequently, stands of southern willow scrub on-site are under developed at the present time.

3.2.11 California Sycamore Alliance

The California sycamore alliance is a floristic group within the more general riparian forest and woodland habitat type (CDFG 2003). This community occurs in two small patches within Neighborhood I and exists as remnant riparian habitat with evidence of disturbance in the surrounding area. This community is dominated by western sycamore and totals 0.3 acre.

3.2.12 Mule Fat Scrub

Mule fat scrub is dominated by mule fat. Other species occurring in this community within the LCRSP study area include willow (*Salix* sp.), tamarisk (*Tamarix ramosissima*), California buckwheat, and deerweed. Within the LCRSP study area, a total of 4.4 acres [3.7 acres on-site (of which 1.0 acre is located within the on-site So Cal Gas easement and 0.5 within the LCNPD) and 0.7 acre off-site within the off-site So Cal Gas easement) of mule fat scrub are found in the eastern portion of Neighborhood I within the Sycamore Flat riparian corridor and in small area along the western boundary of Neighborhood II near the basins (refer to Section 3.2.14).

Mule fat scrub/Disturbed is dominated by mule fat but exhibits evidence of disturbance such as bare patches and the presence of weedy species. A total of 2.7 acres of mule fat scrub/disturbed occur in the eastern portion of Neighborhood I within a portion of the Sycamore Flat riparian corridor.

3.2.13 Basin

The term basin has been designated for those areas of the LCRSP study area that are man-made structures for holding water. The basins may be maintained periodically and generally exist in an unvegetated state. These are differentiated from developed areas due to the presence of water which may support certain wildlife species. Several basins occur within the western portion of Neighborhood II and are associated with mining activities. Other basins existing on-site and used for groundwater recharge are not included in this category as they do

not hold water for most of the year and therefore do not provide an aquatic habitat. Basins comprise a total of 9.9 acres.

3.2.14 Ruderal

Ruderal areas, which typically have few native species and resources, are characterized by a predominance of non-native weedy species that readily colonize disturbed ground. Species characterizing this community within the study area include black mustard, red-stemmed filaree, horehound, horseweed (*Conyza canadensis*), tree tobacco (*Nicotiana glauca*), tocalote, and hairy golden-aster. Ruderal areas occupy approximately 56.2 acres (55.3 on-site and 0.9 acres off-site within the off-site So Cal Gas easement) within Neighborhoods I, II, and III.

3.2.15 Disturbed

Disturbed areas consist of regularly maintained areas that lack vegetation. Disturbed areas within the LCRSP study area primarily include dirt roads, cleared areas/easements, an area cleared for geotechnical testing, areas recently damaged by wildfire (such as that which occurred near the intersection of Sierra Avenue and Riverside Avenue in Neighborhood III in early November 2006), and an area adjacent to the CEMEX mine at the eastern end of Neighborhood III. In addition, portions of Neighborhood I that were approved as part of the Lytle Creek North PDP have been disturbed as part of construction activities. These areas occupy approximately 328.1 acres [324.2 acres on-site (of which 0.1 acre is located within the on-site So Cal Gas easement and 79.8 within the LCNPD) and 3.9 acres off-site (of which 1.3 acres off-site within the off-site road and 2.6 acres within the existing utility road)] within Neighborhoods I through IV of the LCRSP study area.

Disturbed/Intermediate Riversidean alluvial fan sage scrub has species characteristic of Riversidean alluvial fan sage scrub but with evidence of significant disturbance. This community comprises 9.5 acres within Neighborhood III.

Disturbed/Northern mixed chaparral supports dominant plant species similar to those of northern mixed chaparral communities, such as buck brush, redberry, chamise, California sagebrush, squawbush, and California buckwheat, and also includes plant species supported in disturbed areas. The disturbed/northern mixed chaparral community accounts for approximately 4.9 acres of the LCRSP study area and occurs in the southeastern portion of Neighborhood II.

3.2.16 Golf Course

The area designated as golf course is currently the El Rancho Verde Golf Club. This area supports 158.6 acres and occurs in the southeastern portion of Neighborhood II.

3.2.17 Ornamental

Ornamental vegetation includes olive trees and other non-native tree species generally used for landscaping. A total of 1.5 acres of ornamental vegetation occurs in several small patches within and near the golf course open space area in Neighborhood II.

3.2.18 Developed

Developed areas are mostly devoid of vegetation due to on-going disturbances. Types of developed areas found within the study area include paved roads, water tanks, areas associated with mining operations, other existing infrastructure. Approximately 96.3 [93.5 on-site (of which 38.8 acres is located within the previously entitled LCNPD) and 2.8 acre off-site (of which 0.1 acre is located within the So Cal Gas easement, 0.5 acre located within the off-site road and 2.2 acres located within the off-site levee] have been characterized as developed. Approved areas categorized as recently developed include paved roads, buildings, graded pads, and other cleared areas that are in the process of conversion to fully developed areas.

3.3 GENERAL PLANT INVENTORY

The plant communities discussed above are composed of numerous plant species. General plant species observations were completed during the 2004, 2005, 2006, and 2007 surveys of the LCRSP study area. Plant species actually observed within the LCRSP study area are indicated in Appendix A, *Floral and Faunal Compendia*. Sensitive plant species occurring or potentially occurring within the LCRSP study area are discussed in Section 3.6.3, Sensitive Plant Species.

3.4 WILDLIFE POPULATIONS

The plant communities discussed above provide wildlife habitat. While a few wildlife species are entirely dependent on a single natural community or on only a few of these communities, other wildlife species use most or all of the entire mosaic of all the plant communities within the LCRSP study area and adjoining areas. Thus, the LCRSP study area potentially constitutes functional habitat for a variety of wildlife species, both within the LCRSP study area and within the larger biological region. The following section discusses wildlife populations within the LCRSP study area, segregated by taxonomic group. Representative examples of each taxonomic group either observed or expected within the LCRSP study area are provided. Wildlife species actually observed, as well as those expected to occur, within the LCRSP study area are indicated in Appendix A, *Floral and Faunal Compendia*. Sensitive

wildlife species occurring or potentially occurring within the LCRSP study area are discussed in Section 3.6.4, Sensitive Wildlife Species.

3.4.1 Amphibians

Terrestrial amphibian species may or may not require standing water for reproduction. Terrestrial species avoid desiccation by burrowing underground within crevices in trees, rocks, and logs and under stones and surface litter during the day and dry seasons. Due to their secretive nature, terrestrial amphibians are infrequently observed, but may be quite abundant if conditions are favorable. Aquatic amphibians are dependent on standing or flowing water for reproduction. Such habitats include fresh water marshes and open water (reservoirs, permanent and temporary pools and ponds, and perennial streams).

Although the LCRSP study area supports both aquatic and terrestrial amphibian habitats, most of the habitat within the LCRSP study area is too dry to support more than a few species. Two amphibians, the western toad (*Bufo boreas*) and Pacific treefrog (*Hyla regilla*), were observed or detected during the 2006 field visits and the following species have the potential to occur: black-bellied slender salamander (*Batrachoseps nigriventris*), Pacific slender salamander (*Batrachoseps pacificus*), yellow-blotched salamander (*Ensatina eschscholtzi crocreater*), western spadefoot (*Spea hammondii*), California treefrog (*Hyla cadaverina*), and bullfrog (*Rana catesbeiana*).

3.4.2 Reptiles

Reptilian diversity and abundance typically varies with habitat type and character. Some species prefer only one or two natural communities; however, most will forage in a variety of communities. A number of reptile species prefer open habitats that allow free movement and high visibility. Most species occurring in open habitats rely on the presence of small mammal burrows for cover and escape from predators and extreme weather.

The fine sandy soils of the alluvial fan sage scrub within the LCRSP study area are the most suitable for most of the reptile species that occur or that are expected to occur within the LCRSP study area. Most of these species will also use the Riversidean sage scrub and chaparral habitats within the LCRSP study area. Perennial sources of water typically attract several species of snakes, although most reptiles prefer dry conditions and avoid wet areas. Within the LCRSP study area, ponded water and the basins containing perennial water within the western edge of Neighborhood II may be frequented by the common kingsnake (*Lampropeltis getulus*), gopher snake (*Pituophis melanoleucus*), and western rattlesnake (*Crotalus viridis*).

Reptile species observed within the LCRSP study area include, but are not limited to, the common zebra-tailed lizard (*Callisaurus draconoides draconoides*), coast horned lizard (*Phrynosoma coronatum*), western fence lizard (*Sceloporus occidentalis*), spiny granite lizard (*Sceloporus orcutti*), side-blotched lizard (*Uta stansburiana*), coastal whiptail (*Cnemidophorus tigris stejnegeri*), southern Pacific rattlesnake (*Crotalus viridis helleri*), and San Diego gopher snake (*Pituophis melanoleucus annectens*). A number of additional species have a potential to be resident within the LCRSP study area.

3.4.3 Avian

The habitat within the LCRSP study area provides foraging and cover habitat for year-round and seasonal avian residents. Avian species commonly observed within the LCRSP study area include, but are not limited to, the California towhee (*Pipilo crissalis*), California thrasher (*Toxostoma redivivum*), northern mockingbird (*Mimus polyglottos*), common raven (*Corvus corax*), mourning dove (*Zenaida macroura*), Costa's hummingbird (*Calypte costae*), Anna's hummingbird (*Calypte anna*), Bewick's wren (*Thryomanes bewickii*), cactus wren (*Campylorhynchus brunneicapillus*), Bell's sage sparrow (*Amphispiza belli belli*), white-throated swift (*Aeronautes saxatalis*), bushtit (*Psaltriparus minimus*), house finch (*Carpodacus mexicanus*), and California quail (*Callipepla californica*).

Birds observed in the manmade ponds, or basins, include great blue heron (*Ardea herodias*), mallard (*Anas platyrhynchos*), cinnamon teal (*Anas cyanoptera*), American coot (*Fulica americana*), killdeer (*Charadrius vociferus*), and great egret (*Ardea alba*). Only a few individuals of each of these species were observed. The basins are small and are not expected to support numerous waterfowl or shorebirds.

The habitats within the LCRSP study area do provide some foraging and breeding habitat for raptors. Scrub habitats such as Riversidean sage scrub, Riversidean alluvial fan sage scrub, California buckwheat scrub, and California sagebrush-California buckwheat scrub provide more cover for prey species than grasslands and other open habitats, making scrub habitats less desirable for foraging. The barren wash areas do not provide habitat for prey species. Cliff faces for nesting do not exist within the LCRSP study area and only exist adjacent to the LCRSP study area in the sand and gravel mine. With the exception of the golf course in Neighborhood II and the Sycamore Flat area within Neighborhood I, where a red-tailed hawk (*Buteo jamaicensis*) nest was observed by PCR biologists during the 2006 survey season, the LCRSP study area also generally lacks large stands of trees and riparian habitat that would provide breeding habitat for raptors. Nevertheless, the trees in the alluvial fan sage scrub and chamise chaparral habitats provide perches for foraging raptors, including the red-tailed hawk, in the area. In addition, adjacent ranch and low density housing areas support stands of large exotic trees that provide suitable nest sites for raptorial bird species. The following raptor species have been observed within the LCRSP study area during the 2004 through 2007 survey season: white tailed kite

(*Elanus leucurus*) osprey (*Pandion haliaetus*), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperi*), red-tailed hawk, red-shouldered hawk (*Buteo lineatus*), golden eagle (*Aquila chrysaetos*), American kestrel (*Falco sparverius*), and American peregrine falcon (*Falco peregrinus anatum*).

3.4.4 Mammals

Mammals observed or otherwise detected within the LCRSP study area include the desert cottontail (*Sylvilagus audubonii*), California ground squirrel (*Spermophilus beecheyi*), San Diego pocket mouse (*Chaetodipus fallax*), San Bernardino kangaroo rat, Dulzura kangaroo rat (*Dipodomys simulans*), desert wood rat (*Neotoma lepida*), California mouse (*Peromyscus californicus*), cactus mouse (*Peromyscus eremicus*), deer mouse (*Peromyscus maniculatus*), western harvest mouse (*Reithrodontomys megalotis*), San Diego black-tailed jackrabbit (*Lepus californicus bennettii*), coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), and bobcat (*Felis rufus*). A number of other species are expected to be resident within the region and may occasionally utilize the LCRSP study area to forage or for cover.

3.5 WILDLIFE MOVEMENT

3.5.1 Overview

Wildlife corridors link together areas of suitable habitat that are otherwise separated by rugged terrain, changes in vegetation, inhospitable environments, human disturbance, etc. The fragmentation of open space areas by urbanization creates isolated "islands" of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas providing suitable habitat, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic material (MacArthur and Wilson 1967; Soulé 1987; Harris and Gallagher 1989; Bennett 1990). Corridors effectively act as links between different populations of a species. A group of smaller populations (termed "demes") linked together via a system of corridors is termed a "metapopulation". The long-term health of each deme within the metapopulation is dependent upon its size and the frequency of interchange of individuals (immigration vs. emigration). The smaller the deme, the more important immigration becomes, because prolonged inbreeding with the same individuals can reduce genetic variability. Immigrant individuals that move into the deme from adjoining demes mate with individuals and supply that deme with new genes and gene combinations that increase overall genetic variability. An increase in a population's genetic variability is generally associated with an increase in a population's health.

Corridors mitigate the effects of habitat fragmentation by: (1) allowing animals to move between remaining habitats, which allows depleted populations to be replenished and promotes genetic diversity; (2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk that catastrophic events (such as fires or disease) will result in population or local species extinction; and (3) serving as travel routes for individual animals as they move within their home ranges in search of food, water, mates, and other needs (Noss 1983, Fahrig and Merriam 1985, Simberloff and Cox 1987).

Wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas, individuals extending range distributions); (2) seasonal migration; and, (3) movements related to home range activities (foraging for food or water, defending territories, searching for mates, breeding areas, or cover). A number of terms have been used in various wildlife movement studies, such as "wildlife corridor", "travel route", and "wildlife crossing" to refer to areas in which wildlife move from one area to another. To clarify the meaning of these terms and facilitate the discussion on wildlife movement in this study, these terms are defined as follows:

Travel Route: A landscape feature (such as a ridgeline, drainage, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and provide access to necessary resources (e.g., water, food, cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another; it contains adequate food, water, and/or cover while moving between habitat areas; and provides a relatively direct link between target habitat areas.

Wildlife Corridor: A piece of habitat, usually linear in nature that connects two or more habitat patches that would otherwise be fragmented or isolated from one another (except for potentially other wildlife corridors). Wildlife corridors are usually bounded by urban land areas or other areas unsuitable for wildlife. The corridor generally contains suitable cover, food, and/or water to support species and facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to as "habitat or landscape linkages") can provide both transitory and resident habitat for a variety of species.

Wildlife Crossing: A small, narrow area, relatively short in length and generally constricted in nature, that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are manmade and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles.

It is important to note that, within a large open space area in which there are few or no man-made or naturally occurring physical constraints to wildlife movement, wildlife corridors as defined above may not yet exist. Given an open space area that is both large enough to maintain

viable populations of species and provide a variety of travel routes (canyons, ridgelines, trails, riverbeds, and others), wildlife will use these "local" routes while searching for food, water, shelter, and mates, and will not need to cross into other large open space areas. Based on their size, location, vegetative composition, and availability of food, some of these movement areas (e.g., large drainages and canyons) are used for longer lengths of time and serve as source areas for food, water, and cover, particularly for small- and medium-sized mammals. This is especially true if the travel route is within a larger open space area. However, once open space areas become constrained and/or fragmented as a result of urban development or construction of physical obstacles such as roads and highways, remaining landscape features or travel routes that connect the larger open space areas can "become" corridors as long as they provide adequate space, cover, food, and water, and do not contain obstacles or distractions (man-made noise, lighting) that would generally hinder wildlife movement.

3.5.2 Wildlife Movement Associated With the Study Area

As previously described, wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas, or individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (foraging for food or water, defending territories, searching for mates, breeding areas, or cover). Although the nature of each of these types of movement is species specific, large open spaces will generally support a diverse wildlife community and will provide for all types of movement. Each type of movement may also be represented at a variety of scales from immobile plants to many square-mile home ranges of large mammals and raptorial birds. The resources available within the LCRSP study area support all categories of movement on some scale.

Local Wildlife Movement

The LCRSP study area provides the natural resources necessary (e.g., seasonal water source within the wash, scrub and chaparral vegetative cover on the floodplain terraces, limited riparian habitat, and relatively flat topography) to support a variety of wildlife that utilize the LCRSP study area for local movement. Biological surveys within the LCRSP study area have detected wildlife trails, bedding areas, burrows, tracks, and scat. Observations made during the course of field work for this assessment confirmed the presence of a variety of reptiles, birds, and medium to large mammals (such as coyote and mule deer). The home range and average dispersal distance of many of the species detected may be entirely contained within the LCRSP study area and immediate vicinity. Populations of animals such as insects, amphibians, reptiles, small mammals, and a few bird species may find all their resource requirements without moving far from or outside of the LCRSP study area. Daily movement by these animals in search of food, water, shelter, and mates is likely concentrated on the vegetated floodplain terraces and upland habitat islands within the wash due to the lack of vegetation in most of the active wash.

Nevertheless, wildlife species such as coyote were observed in the unvegetated portions of the wash. Many species present are also expected to occasionally expand their home range or disperse from their natal territory to eventually move outside the LCRSP study area and vicinity.

Although wildlife movement along the upper terrace between Neighborhoods II and III is somewhat hindered by the presence of a gravel mine, the open channel portion of Lytle Creek Wash remains relatively unobstructed along the entire length of the LCRSP study area. However, it should be noted that the existing Glen Helen Parkway which crosses over Lytle Creek Wash upstream of the I-15 in Neighborhood IV was recently improved or widened. Nevertheless, four culverts have been built to accommodate wildlife not making surface crossings. Three of the culverts are 6 ft. high by 4 ft. wide box culverts and one is an arch culvert that is 12 ft. high and 42 ft. wide. These dimensions are sufficient to allow crossing of small and medium sized animals. Continuous wildlife movement through the LCRSP study area is made possible by the presence of Lytle Creek Wash. Although wildlife may utilize upland areas outside the floodplain for cover and foraging, these areas do not function as a continuous corridor for species moving through the LCRSP study area. The wash and the associated network of islands within it is the main wildlife movement corridor within the LCRSP study area between the San Bernardino National Forest to the northwest and the confluence with Cajon Wash downstream. Sycamore Flat is a smaller corridor allowing movement in a north-south direction within the LCRSP study area between Lytle Creek Wash and the Muscupiabe Hills.

Regional Movement

In the discussion that follows, the criteria used to identify and characterize wildlife movement corridors associated with the LCRSP study area are based on the body of theoretical and empirical knowledge of corridors discussed above, the nature of habitat areas within and surrounding the LCRSP study area, the analysis of regional aerial photographs and topographic maps, and observations of wildlife within the LCRSP study area.

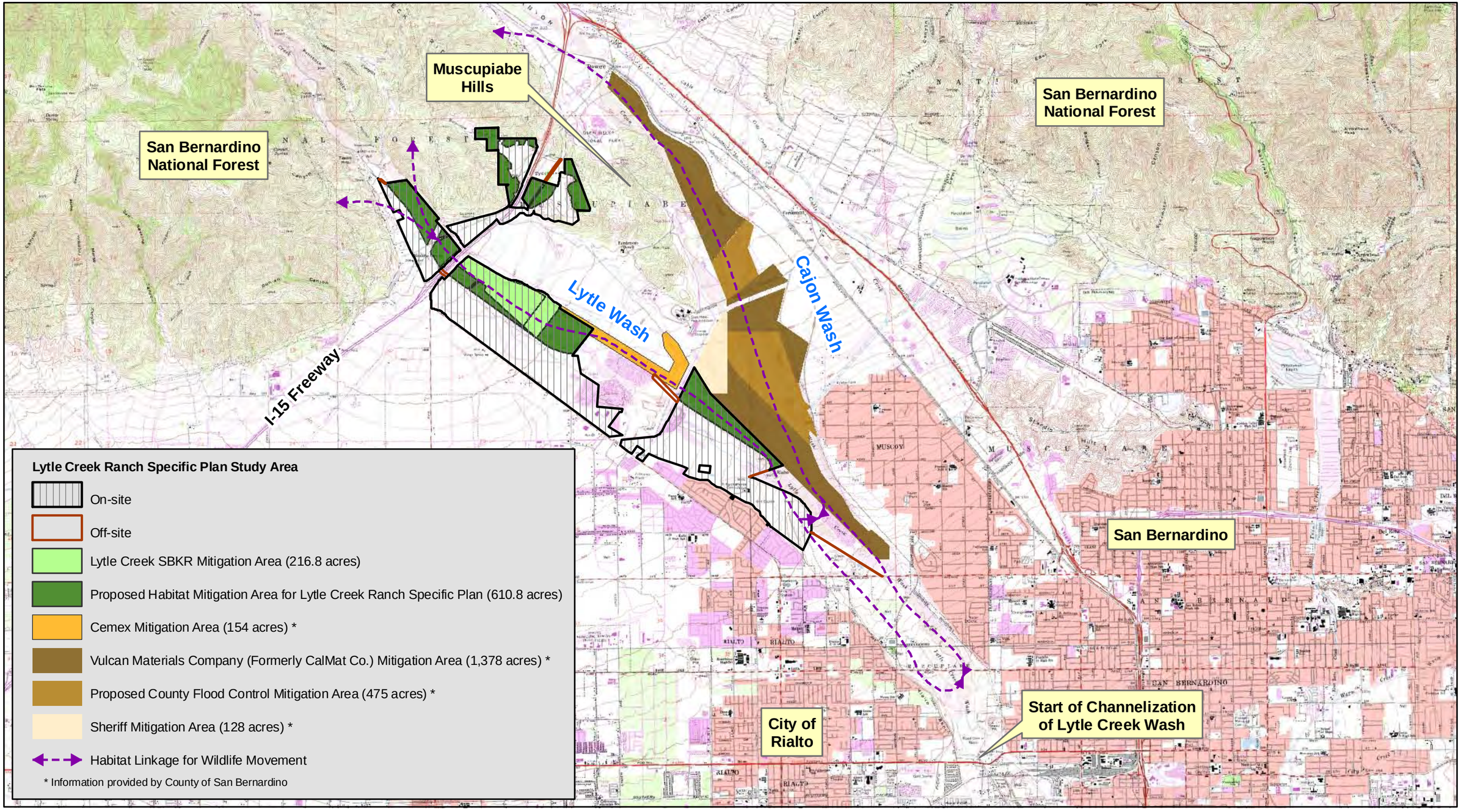
The Missing Linkages report (South Coast Wildlands Project 2000) depicts one linkage within the Lytle Creek Ranch study area: Lytle Creek Wash. Lytle Creek Wash is characterized as a constrained landscape linkage with the major constraints to wildlife movement being gravel mining, roads, and urbanization. The severity of the threats to the connectivity function of the linkage is moderately low (it was rated a 2 out of 5 for overall degree of threat to connectivity function; 1 being no threat/secure and 5 being severe threat/loss imminent).

From a regional perspective, the LCRSP study area is a topographic low point which is connected to, and south of, a large open space area, the San Bernardino National Forest, and north of (but not connected to) a smaller open space area, the Jurupa Mountains. Northwest-bound wildlife movement within Lytle Creek Wash is unobstructed into the western portion of the San Bernardino Mountains (north and west of the I-15). However, as described in the

Missing Linkages Report, several constraints to movement exist along this regional corridor. The presence of the I-15 and Interstate 215 limit the LCRSP study area's function as a point of connectivity to the north and northwest. East- and west- bound wildlife movement from the LCRSP study area to the downstream portions of Lytle Creek Wash is inhibited by the presence of dense urban development (i.e., Cities of Fontana, Rialto, and San Bernardino). Southbound movement is also restricted by the lack of vegetative cover within existing urban development (as described in detail below). Nevertheless, the presence of several mitigation banks northeast of the LCRSP study area ensures connectivity for wildlife movement near the confluence of Lytle Creek Wash and Cajon Wash (Figure 9, *Areawide Proposed and Dedicated Open Space*, on page 51).

Although the I-15 bisects the LCRSP study area, movement along the Lytle Creek Wash is allowed due to the presence of a large freeway overpass (approximately 2,100 feet in length). Glen Helen Parkway also bisects Lytle Creek Wash just upstream of the I-15 but accommodates wildlife movement due to the presence of four culverts, one of which is 12 ft. high and 42 ft. wide. Similarly, the approximately 3,635 ft. long Cajon Creek freeway overpass (where the I-15 meets Interstate 215) allows movement of wildlife along this drainage north of the LCRSP study area. However, movement is limited downstream from the LCRSP study area by the absence of habitat areas which have been removed by urbanization and mining operations. Approximately four miles downstream from the southeastern LCRSP study area boundary Lytle Creek Wash flows into a flood control basin. From the flood control basin, the wash splits into two concrete-lined, man-made channels that do not contain the natural resources (i.e., vegetative cover) to support a high diversity of wildlife species. These channelized portions of the wash could be used by wildlife species that are adapted to the urban environment such as coyote, raccoon, skunk, and opossum; that is, species that do not necessarily require a "wildlife corridor" to move through an urban area. However, the channelized, concrete-lined portions would not be expected to support mule deer, bobcat, grey fox, or mountain lion which utilize more native habitat areas and shy away from urban areas. Furthermore, the channelized, concrete-lined portions of the wash would not be expected to support a high diversity of other wildlife (i.e., amphibians, reptiles, and birds) due to the lack of vegetation and suitable substrates. Lytle Creek Wash remains channelized, concrete-lined and unvegetated for approximately three miles before its confluence with Warm Creek. Warm Creek then flows for approximately one mile before its confluence with the Santa Ana River. As a result of the three miles of channelized, concrete-lined wash with no vegetative cover, most wildlife would not be expected to continue downstream from the LCRSP study area. The channelized and unvegetated three-mile portion of the wash effectively acts as a barrier to regional movement for most species.

In summary, the LCRSP study area supports a high diversity of wildlife species and contains the resources to support both local and regional wildlife movement. The value of the LCRSP study area as a regional corridor is highly constrained downstream to the south due to dense urban development, the concrete-lined nature of the wash, and the lack of vegetative



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1 0 1 Miles

Source: County of San Bernardino, 2003 (Mitigation Areas); USGS Topographic Series, 1980; PCR Services Corporation, 2009.

Figure 9
Lytle Creek Ranch Specific Plan Areawide Proposed and Dedicated Open Space

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cover. However, Lytle Creek Wash functions as a regional wildlife corridor between the San Bernardino Mountains to the north and the confluence of Lytle Creek and Cajon Creek to the southeast.

3.6 SENSITIVE BIOLOGICAL RESOURCES

The following discussion describes the plant and wildlife species present, or potentially present, within the LCRSP study area that have been afforded special recognition by USFWS, CDFG, or CNPS, principally due to the species' declining or limited population sizes. Also discussed are habitats that are unique, of relatively limited distribution, or of particular value to wildlife. Protected sensitive species are classified by either state or federal resource management agencies, or both, as threatened or endangered, under provisions of the state and federal Endangered Species Acts.

3.6.1 Sensitive Resource Classification

Federal Protection and Classifications

The Federal Endangered Species Act of 1973 (FESA) defines an "endangered" species as "any species which is in danger of extinction throughout all or a significant portion of its range". A "threatened" species is defined as "any species which is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range". Under provisions of Section 9(a)(1)(B) of the FESA it is unlawful to "take" any listed species. "Take" is defined in Section 3(18) of FESA as to: "...harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Further, the USFWS, through regulation, has interpreted the terms "harm" and "harass" to include certain types of habitat modification as forms of "take". These interpretations, however, are generally considered and applied on a case-by-case basis and often vary from species to species. In a case where a property owner seeks permission from a federal agency for an action which could affect a federally-listed plant or animal species, the property owner and agency are required to consult with USFWS. Section 9(a)(2)(b) of the FESA addresses the protections afforded to listed plants.

Within the last ten years the USFWS instituted changes in the listing status of candidate species abandoning the C1/C2 model. Former C1 candidate species are now considered federal candidate species (FC). Some of the USFWS field offices (e.g., Sacramento) maintain lists of federal Species of Concern (FSC). These species receive no legal protection and the use of the term FSC does not mean that they will eventually be proposed for listing (http://sacramento.fws.gov/es/spp_concern.htm). The Carlsbad Fish and Wildlife Office does not maintain such a list for their jurisdiction, which includes Los Angeles, Orange, Riverside, San Bernardino, Imperial, and San Diego counties. All references to federally-protected species

in this report include the most current published status to which each species has been assigned by USFWS.

For purposes of this assessment, the following acronyms are used for federal status species:

FE Federally listed as Endangered

FT Federally listed as Threatened

FPE Federally proposed for listing as Endangered

FPT Federally proposed for listing as Threatened

FPD Federally proposed for delisting

FC Federal candidate species (former Category 1 candidates)

State of California Protection and Classifications

California's Endangered Species Act (CESA) defines an "endangered" species as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease". The state defines a "threatened" species as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an Endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter. Any animal determined by the commission as rare on or before January 1, 1985 is a Threatened species." Candidate species are defined as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that the commission has formally noticed as being under review by the department for addition to either the list of Endangered species or the list of Threatened species, or a species for which the commission has published a notice of proposed regulation to add the species to either list." Candidate species may be afforded temporary protection as though they were already listed as Threatened or Endangered at the discretion of the Fish and Game Commission. Unlike the FESA, CESA does not include listing provisions for invertebrate species.

Article 3, Sections 2080 through 2085, of the CESA addresses the taking of Threatened or Endangered species by stating "No person shall import into this state, export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the commission determines to be an endangered species or a threatened species, or attempt any of those acts, except as otherwise provided." Under the CESA, "take" is defined as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill". Exceptions authorized by the state to allow the "take" of listed animal species require permits or memoranda

of understanding and can be authorized for "Endangered species, Threatened species, or candidate species for scientific, educational, or management purposes." Sections 1901 and 1913 of the California Fish and Game Code provide that notification is required prior to ground disturbance that would result in the removal of threatened or endangered plant species.

Additionally, some sensitive mammals and birds are protected by the state as Fully Protected Mammals or Fully Protected Birds, as described in the California Fish and Game Code, Sections 4700 and 3511, respectively. California Species of Special Concern are species designated as vulnerable to extinction due to declining population levels, limited ranges, and/or continuing threats. The CDFG maintains a Special Animals list that is updated bi-annually with the current status of sensitive wildlife species. This list is primarily a working document for the CDFG's CNDDB project. Informally listed taxa are not protected per se, but warrant consideration in the preparation of biotic assessments for CEQA compliance and other purposes, such as Lake and Streambed Alteration Agreements. For some species, the CNDDB is only concerned with specific portions of the life history, such as roosts, rookeries, or nest sites. A 2008 California Bird Species of Special Concern list, which contains 74 species, was created in collaboration with the CDFG to determine which species may warrant state listing if present trends continue and to stimulate further research to aid conservation (Shuford and Gardali, 2008).

For the purposes of this assessment, the following acronyms are used for state status species:

SE	State listed as Endangered
ST	State listed as Threatened
SR	State listed as Rare
SCE	State candidate for listing as Endangered
SCT	State candidate for listing as Threatened
SFP	State Fully Protected
CSC	California Species of Special Concern

California Native Plant Society

The CNPS is a private plant conservation organization dedicated to the monitoring and protection of sensitive species in California. CNPS has compiled an inventory comprised of the information focusing on geographic distribution and qualitative characterization of rare, threatened, or endangered plant species of California (CNPS 2001). CNPS has developed five categories of rarity:

List 1A Presumed extinct in California

List 1B Rare or Endangered in California and elsewhere

List 2 Rare or Endangered in California, more common elsewhere

List 3 Plants about which we need more information before rarity can be determined– Review list

List 4 Plants of limited distribution in California (i.e., naturally rare in the wild), but whose existence does not appear to be susceptible to threat– Watch list

In addition, the CNPS recently updated their Lists with Threat Codes. There are three new Threat Code extensions that follow the List number as a decimal:

1. Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
2. Fairly endangered in California (20-80% of occurrences threatened)
3. Not very endangered in California (<20% of occurrences threatened or no current threats known)

The identification of sensitive species in this biological resources assessment that occur or potentially could occur within the study area is based on one or more of the following: (1) the direct observation of the species within the study area during one of the biological surveys; (2) a record reported in the CNDDB; and (3) the study area is within the known distribution of a species and contains appropriate habitat.

3.6.2 Sensitive Plant Communities

The 1,143.7 acres of Riversidean alluvial fan sage scrub (where Riversidean alluvial fan sage scrub is the sole or dominant plant community), 1.2 acre of white sage scrub, 19.4 acres [17.5 on-site (of which 1.8 acres is located within the on-site So Cal Gas easement) and 1.9 off-site within the off-site So Cal Gas easement] of southern willow scrub, 0.3 acre of California sycamore alliance, and 1.7 acres of southern cottonwood willow riparian within the LCRSP study area constitute plant communities which generally are considered a sensitive biological resource and warrant consideration by the CNDDB (i.e., high priority for inventory in the CNDDB) (CDFG 2003). Some of these are also considered sensitive because they support several sensitive species. The Riversidean alluvial fan sage scrub within the LCRSP study area supports the San Bernardino kangaroo rat while southern willow scrub supports the least Bell's vireo.

3.6.3 Sensitive Plant Species

Sensitive plants include those listed, or candidates for listing, by the USFWS and CDFG, and species considered sensitive by the CNPS (as either List 1A, 1B, or 2). The new CNPS Threat Codes are also taken into consideration for rarity.

Several sensitive plant species were reported in the CNDDB from the vicinity of the LCRSP study area. Based upon the results of focused surveys, the only sensitive plant species observed within the LCRSP study area is the Plummer's mariposa lily (CNPS List 1B.2). CNPS List 3 and 4 species observed on-site are discussed below in Section 3.6.4. A summary of each sensitive plant species observed, as well as those not expected to occur within the LCRSP study area, is presented in Table 5, *Sensitive and CNPS List 3 and 4 Plant Species*, on page 57.

Several other sensitive plant species and CNPS List 3 and 4 plant species were reported in the CNDDB from the vicinity of the LCRSP study area. Due to the timing of the focused plant surveys, all sensitive and CNPS List 3 and 4 species potentially occurring were covered by the surveys and should have been detected if present and/or blooming. However, no other sensitive or CNPS List 3 and 4 plant species were observed during the surveys from 2004 to 2007.

One plant that is federally and state-listed as endangered, slender-horned spineflower, was found within the LCRSP study area during focused surveys conducted by MBA in 1994, but was not detected during focused surveys conducted by PCR in 2004, 2005, 2006, or 2007. In addition, morphological sampling performed in 2006 confirmed the subspecies of woollystar that occurs within the LCRSP study area as being *Eriastrum densifolium* ssp. *elongatum* (not the listed subspecies). Prior to this analysis, the subspecies of woollystar within the LCRSP study area was tentatively identified by biologists as the subspecies *elongatum* or a hybrid between *elongatum* and the subspecies *sanctorum* (the listed subspecies); and without more conclusive evidence up to that point, the USFWS had maintained that the woollystar population found within the LCRSP study area was considered to be the federally and state-listed endangered subspecies. More detailed accounts of these species are provided below.

Slender-horned Spineflower

The slender-horned spineflower is a federally and state-listed endangered species. It is an annual herb that grows on sandy benches in alluvial fan sage scrub. The slender-horned spineflower requires periodic flooding to maintain its habitat. It is known to occur in San Bernardino, Riverside, and Los Angeles counties. In 1994, MBA biologists observed three populations of this species in the northwest portion of the LCRSP study area on both sides of the I-15 (MBA 1995). The populations, from upstream to downstream, contained 366, 92, and 9 individuals, respectively, for a total of 467 slender-horned spineflower plants observed within the LCRSP study area in 1994. However, slender-horned spineflower was not observed during

Table 5

Sensitive and CNPS List 3 and 4 Plant Species

VASCULAR PLANTS							
Scientific Name	**Common Name**	**Flowering Period**	**Federal**	**State**	**CNPS List**	**Preferred Habitat**	**Occurrence within the Study Area**
ANGIOSPERMS (DICOTYLEDONS)							
Asteraceae	**Aster Family**						
Deinandra mohavensis	Mohave tarplant	July-Oct.	NONE	SE	1B.3	Chaparral, coastal scrub, and riparian scrub/mesic.	NO
Berberidaceae	**Barberry Family**						
Berberis nevinii	Nevin's barberry	Mar.-April	FE	SE	1B.1	Chaparral, cismontane woodland, coastal scrub, riparian scrub on sandy or gravelly soil.	NO
Brassicaceae	**Mustard Family**						
Lepidium virginicum var. *robinsonii*	Robinson's pepper-grass	Jan.-July	NONE	NONE	1B.2	Chaparral and coastal scrub.	NO
Cactaceae	**Cactus Family**						
Opuntia basilaris var. *brachyclada*	Short-joint beavertail	April-June	NONE	NONE	1B.2	Chaparral, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland.	NO
Crassulaceae	**Stonecrop Family**						
Dudleya multicaulis	Many-stemmed dudleya	April-July	NONE	NONE	1B.2	Chaparral, coastal scrub, valley and foothill grassland often on clay soils.	NO
Grossulariaceae	**Gooseberry Family**						
Ribes divaricatum var. *parishii*	Parish's gooseberry	Feb.-April	NONE	NONE	1B.1	Riparian woodland.	NO
Juglandaceae	**Walnut Family**						
Juglans californica var. *californica*	southern California black walnut	Mar.-May	NONE	NONE	4.2	Sage scrub, chaparral, cismontane woodland; often in association with oaks/oak woodland; frequently found on steep hillsides with northern exposures; deep alluvial soils.	OB

OB = observed; NO = species not observed or not expected to occur within the study area due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range.

Table 5 (Continued)

Sensitive and CNPS List 3 and 4 Plant Species

VASCULAR PLANTS							
Scientific Name	**Common Name**	**Flowering Period**	**Federal**	**State**	**CNPS List**	**Preferred Habitat**	**Occurrence within the Study Area**
Comments: One immature individual of this species was observed within Neighborhood IV near the southern property boundary near Glen Helen Parkway.							
Nyctaginaceae	**Four O'clock Family**						
Abronia villosa var. *aurita*	Chaparral sand-verbena	Jan.-Sept.	NONE	NONE	1b.1	Chaparral, coastal scrub, and desert dunes/sandy areas.	NO
Polygonaceae	**Buckwheat Family**						
Chorizanthe parryi var. *parryi*	Parry's spineflower	April-June	NONE	NONE	3.2	Openings/clearings in coastal or desert sage scrub, chaparral or interface; dry slopes or flat ground; sandy soils.	OB
Comments: A total of 61,280 plants were estimated during the 2005 and 2006 survey season in addition to the 440,000 plants estimated in 1994. Of the total 501,280 plants within the LCRSP study area, the largest population occurs within the approximately 162-acre terrace within the proposed on-site Habitat Mitigation Area (Figure 12, *Parry's Spineflower Locations*, on page 67).							
Dodecahema leptoceras	Slender-horned spineflower	April-June	FE	SE	1B.1	Scrub and chaparral in sandy soils and alluvial fans.	NO
Comments: Three populations of slender-horned spineflower were observed by MBA in 1994 near the eastern boundary of Neighborhood IV and along the western boundary of Neighborhood III. However, focused sensitive plant surveys performed by PCR biologists in 2004, 2005, 2006, and 2007 did not detect this species within the LCRSP study area. Therefore, this species is considered absent from the LCRSP study area.							
Polemonaiceae	**Phlox Family**						
Eriastrum densifolium ssp. *sanctorum*	Santa Ana River woollystar	July-Aug.	FE	SE	1B.1	Chaparral, sage scrub on alluvial fans.	NO
Comments: In 2005, PCR biologists estimated 1,253 individuals of woollystar within Neighborhood II. In 2006, PCR's sampling effort of corolla lengths determined that the woollystar within the LCRSP study area most closely resembles the subspecies *elongatum* (not the listed subspecies) (Figure 11 , *2005 Woollystar Locations*, on page 62). Under the proposed rule on hybridization (Department of Interior and Department of Commerce 1996), the LCRSP population would not be considered a listed taxon. The results of PCR's 2006 analysis, which was based upon work and peer-reviewed by Dr. Mark Brunell, indicate that the LCRSP study area supports *Eriastrum densifolium* ssp. *elongatum*.							
Rosaceae	**Rose Family**						
Horkelia cuneata ssp. *puberula*	Mesa horkelia	Feb.-Sept.	NONE	NONE	1B.1	Chaparral, cismontane woodland, coastal scrub/sandy or gravelly.	NO

OB = observed; NO = species not observed or not expected to occur within the study area due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range.

Table 5 (Continued)

Sensitive and CNPS List 3 and 4 Plant Species

VASCULAR PLANTS							
Scientific Name	**Common Name**	**Flowering Period**	**Federal**	**State**	**CNPS List**	**Preferred Habitat**	**Occurrence within the Study Area**
ANGIOSPERMS (MONOCOTYLEDONS)							
Liliaceae	**Lily Family**						
Calochortus clavatus var. *gracilis*	slender mariposa lily	Mar.-May	NONE	NONE	1B.2	Chaparral and coastal scrub.	NO
Calochortus palmeri var. *palmeri*	Palmer's mariposa lily	May-July	NONE	NONE	1B.2	Chaparral, lower montane coniferous forest, meadows and seeps on mesic soil.	NO
Calochortus plummerae	Plummer's mariposa lily	May-July	NONE	NONE	1B.2	Chaparral (openings), cismontane woodland, coastal scrub, valley and foothill grassland, granitic/rocky.	OB
Comments: In 2005, 103 individuals were observed scattered throughout Neighborhood II, III, and IV and another estimated 127,200 plants were observed within the proposed on-site Habitat Mitigation Area (Figure 12, *2005 Plummer's Mariposa Lily Locations*, on page XX).							
Calochortus weedii var. intermedius	Intermediate mariposa lily	May-July	NONE	NONE	1B.2	Coastal scrub, chaparral, valley and foothill grassland on rocky soil.	NO

Key to Species Listing Status Codes

FE	*Federally Listed as Endangered*	SE	*State Listed as Endangered*
FT	*Federally Listed as Threatened*	ST	*State Listed as Threatened*
FPE	*Federally Proposed as Endangered*	SCE	*State Candidate for Endangered*
FPT	*Federally Proposed as Threatened*	SCT	*State Candidate for Threatened*
FPD	*Federally Proposed for Delisting*	SFP	*State Fully Protected*
		SR	*State Rare*
		CSC	*California Special Concern Species*

OB = observed; NO = species not observed or not expected to occur within the study area due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range.

Table 5 (Continued)

Sensitive and CNPS List 3 and 4 Plant Species

VASCULAR PLANTS							
Scientific Name	**Common Name**	**Flowering Period**	**Federal**	**State**	**CNPS List**	**Preferred Habitat**	**Occurrence within the Study Area**
California Native Plant Society (CNPS)							
List 1A: Presumed extinct in California. *List 1B: Rare, threatened, or endangered throughout their range.* *List 2: Rare, threatened, or endangered in California, but more common in other states.* *List 3: Plant species for which additional information is needed before rarity can be determined.* *List 4: Species of limited distribution in California (i.e., naturally rare in the wild), but whose existence does not appear to be susceptible to threat.* *Source: PCR Services Corporation 2007.*						*New Threat Code extensions and their meanings:* *1 Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)* *2 Fairly endangered in California (20-80% occurrences threatened)* *3 Not very endangered in California (<20% of occurrences threatened or no current threats known)*	

the 2004, 2005, 2006, and 2007 sensitive plant surveys despite focused surveys following normal and above normal rainfall seasons and confirmation of this species blooming at a known reference site. Therefore, this species is no longer believed to be extant in the LCRSP study area.

Although possible, it is unlikely that the slender-horned spineflower will occur in the future for the following reasons. The distribution of this species is dependent upon a narrow range of soil types (Allen 1996), the age of the geomorphic surface (Wood and Wells 1996), and the presence of depth features that allow for upwelling of water and nutrients (Young, Zink, and Allen 2000). The locations of the 1994 observations on-site may have been exposed to subsequent disturbances that render these sites unsuitable. While there is little known about the dispersal capabilities of the slender-horned spineflower (Wood and Wells 1996), the nearest CNDDB location from 2005 is about 2 miles north of the study area within Cajon Creek while another USFWS and CNDDB location, also from 2005, is more than 3 miles upstream in Cajon Creek. As these relatively recent occurrences are not in the same wash and four consecutive years of recent focused surveys have not detected the species in the study area, there is a low probability that the species would occur on-site in the future.

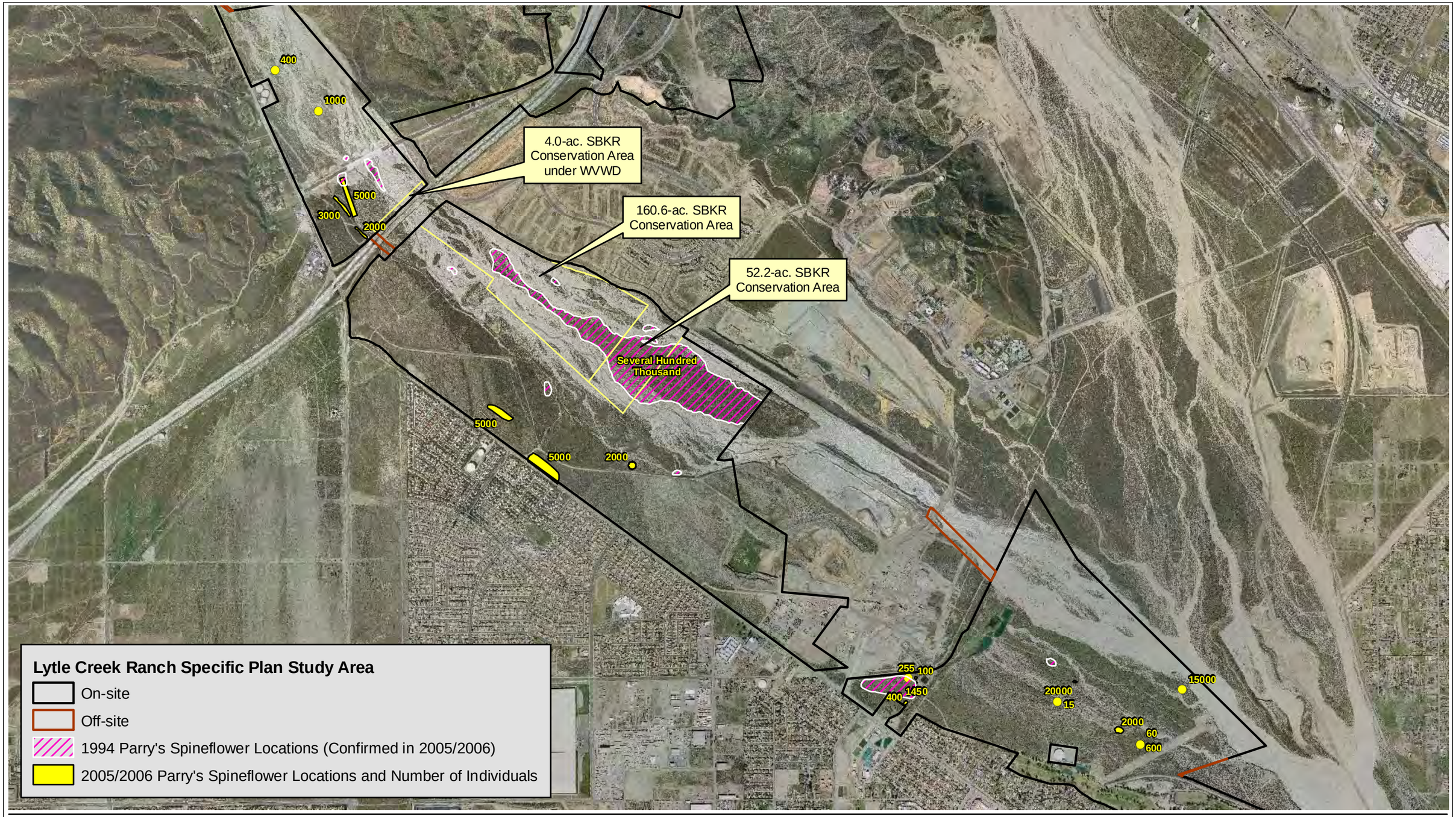
OB = observed; NO = species not observed or not expected to occur within the study area due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range.

Santa Ana River Woollystar

The Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*) is a federally and state-listed endangered species. It is a perennial herb that grows in pioneer alluvial fan sage scrub in San Bernardino County. Periodic flooding is necessary to maintain pioneer stage alluvial fan sage scrub. The blooming period is July-August. During the 1994 survey period, MBA biologists observed three populations of woollystar (*Eriastrum densifolium*) of unconfirmed subspecies containing approximately 1,300 woollystar plants on 21 acres in the southeastern end of the LCRSP study area. In 2005, approximately 1,253 individuals were observed by PCR biologists within the same area as previous locations within Neighborhood II, Figure 10, *2005 Woollystar Locations.*, on page 62). It should be noted that the most current survey by PCR (2005) entailed the use of GPS equipment and the actual counting of individual plants. For the 1994 MBA survey, GPS was not yet commercially available so MBA's surveying entailed mapping by defining polygons containing plants which were estimated in number. Therefore, and notwithstanding natural cycles of population fluctuations, the most recent PCR data (2005) is considered to be a more accurate representation of population size and distribution within the LCRSP study area.

In 1988, Environmental Audit, Inc. (1988) concluded that the woollystar found in the Lytle Creek drainage are of the subspecies *elongatum* (not the listed subspecies), or are a hybrid between *elongatum* and the subspecies *sanctorurn* (the listed subspecies). *Eriastrum densifolium* ssp. *elongatum* is not considered sensitive by the USFWS, CDFG, or CNPS and is more widely distributed throughout southern and central California than the sensitive subspecies *sanctorum*. While *sanctorum* is limited to the eastern South Coast bioregion along the Santa Ana River in southwest San Bernardino County, *elongatum* occurs in 12 California counties in the southern Sierra Nevada, the southern Outer South Coast Ranges, the Inner South Coast Ranges, southwestern California, and the western edge of the Mojave Desert (Hickman 1993, CNPLX 2005). With respect to habitat preferences, the subspecies *sanctorum* is restricted to sandy or gravelly riverbeds and alluvial fans below about 2,000 feet above MSL. The subspecies *elongatum* is more widely adapted to dry areas below about 5,900 feet above MSL. The blooming period for the *elongatum* subspecies is generally between June and September.

In 1993, one branch and the terminal inflorescence of a woollystar plant within the LCRSP study area was collected and taken to the University of California, Riverside, Herbarium. Upon inspection by Mr. Andy Sanders, Curator, and comparison to vouchered specimens on hand, Mr. Sanders concluded that this population was of the subspecies *elongatum*, or a hybrid, but not the subspecies *sanctorum* (Andy Sanders, curator, pers. comm., 1993). Subsequently, in a letter to the California RWQCB, the USFWS (1994) restated their earlier position that the woollystar populations in the Lytle Creek-Cajon Wash are recognized as federally-listed endangered. The USFWS states that "it would be impossible to draw a line depicting where



PCR

N

2,000 0 2,000 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 10

Lytle Creek Ranch Specific Plan
Parry's Spineflower Locations

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one subspecies ends and the next one begins" due to the high degree of genetic variability among woollystar subspecies.

To address the issue of possible hybridization between individuals of listed and non-listed taxa, the USFWS and National Oceanographic Atmospheric Administration published a proposed rule in the Federal Register focusing on the treatment of intercrosses and intercross progeny (i.e., hybridization) (Department of Interior and Department of Commerce 1996). The proposed policy, which was never finalized, would have extended protection of intercross progeny if "(1) the progeny share the traits that characterize the taxon of the listed parent, and (2) the progeny more closely resemble the listed parent's taxon than an entity intermediate between it and the other known or suspected non-listed parental stock."

The exact subspecies identification and status of the woollystar within the LCRSP study area has been the subject of debate over several years. However, it has been concluded in several recent scientific papers that morphological characteristics are more reliable than genetic testing in classifying subspecies, especially *sanctorum*. Research by Brunell and Rieseberg (1993) examined genetic evidence from 15 subpopulations of the subspecies *sanctorum*, two *elongatum* populations, two *austromontanum* populations, and two Lytle Creek subpopulations and concluded that no clear genetic discontinuities exist between the populations. Later, Brunell and Whitkus (1999b) examined the floral and vegetative morphology and concluded that only one clear discontinuity exists: "the only character that exhibits discontinuous variation among populations is corolla tube length for population SANCT" (SANCT refers to the endangered Santa Ana River population, *sanctorum*).

As a result, following a procedure developed in consultation with Dr. Mark Brunell, PCR biologists collected corolla length data at the LCRSP study area in the summer of 2006 to morphologically determine the subspecies present (PCR 2007a). The average corolla length measured for the sample population was 12.9 mm (0.51 in.) with samples ranging from 11.0 mm (0.43 in.) to 15.7 mm (0.62 in.). Based upon personal communication with Dr. Mark Brunell, a corolla tube length of at least 18 mm (0.71 in.) indicates the subspecies *sanctorum* (Dr. Mark Brunell, email comm. with Steve Nelson, June 15, 2006). According to Hickman (1993), corolla tube length for *sanctorum* is greater than 30 mm (1.18 in.), while that of *elongatum* is 14-18 mm (0.55 – 0.71 in.). The 99 percent confidence interval for the mean is between 12.5 (0.49 in.) and 13.3 mm (0.52 in.). This indicates that the true mean for the population of corolla lengths is well below the 18 mm threshold. Therefore, the results of PCR's analysis, which was peer-reviewed by Dr. Mark Brunell, indicate that the LCRSP study area supports *Eriastrum densifolium* ssp. *elongatum* (PCR 2007a). This subspecies is not considered sensitive by the USFWS, CDFG, or CNPS and is more widely distributed throughout southern and central California than the federally and state-listed endangered subspecies *sanctorum*.

In order to assess the probability that the federally and state-listed endangered Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*) could occur on-site in the future and be affected by the proposed project, recent occurrence data was consulted. This subspecies is known to occur within the Santa Ana River, both up- and downstream of its confluence with Lytle Creek (CNDDB 2008a). These locations are on the order of five or six miles away from the study area, in a downstream direction. Seed dispersal of the Santa Ana River woollystar is such that seeds fall within the immediate vicinity of the parent plant, limiting the dispersal rate and geographic extent (Chambers Group, Inc. 1993). Therefore, it would be highly unlikely that this subspecies could somehow disperse several miles upstream to colonize the LCRSP study area in the future.

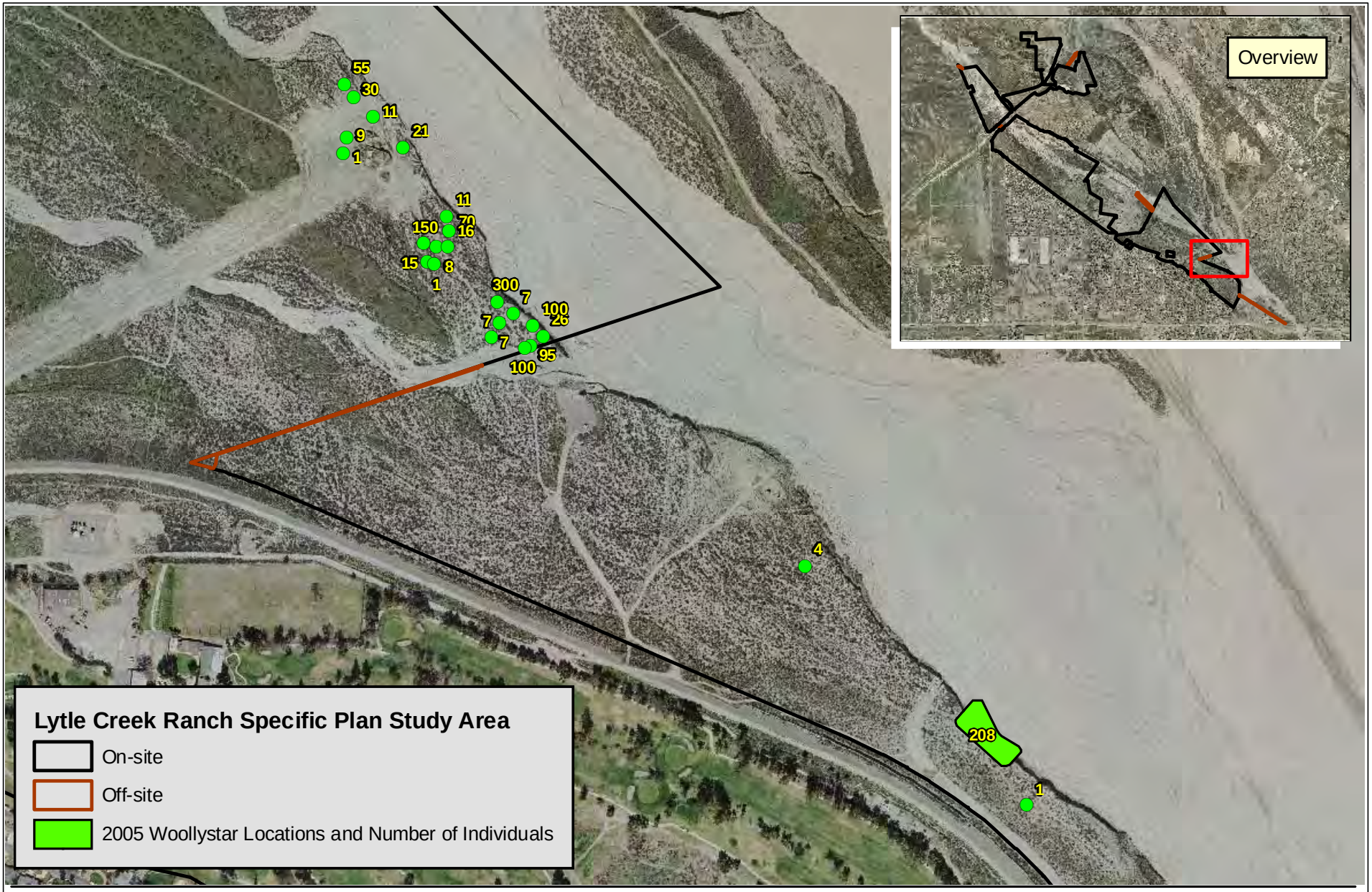
Plummer's Mariposa Lily

Plummer's mariposa lily is a CNPS List 1B.2 species. It is a perennial herb that blooms from May-June. Plummer's mariposa lily grows at an elevation of less than 5,000 feet in a variety of dry habitats ranging from coastal sage scrub to yellow pine forest. It is found from the Santa Monica Mountains to the San Jacinto Mountains and has been documented in San Bernardino, Riverside, Orange, Los Angeles, and Ventura counties (CNPS 2005). In 1994, MBA biologists located a population of 15 individuals in Riversidean sage scrub to the northwest of the mining area. In 2005, PCR biologists observed 103 individuals within Neighborhoods II, III, and IV and another estimated 127,200 plants over approximately 45.1 acres in the eastern portion of the large island, adjacent to the SBKR Conservation Area, within the Lytle Creek Wash portion of the LCRSP study area (Figure 11, *2005 Plummer's Mariposa Lily Locations*, on page 65). The populations mapped in 2005 were verified in 2006 by PCR. Populations remained stable from one year to the next and there were no significant changes between the 2005 and 2006 observations.

3.6.4 CNPS List 3 and 4 Plant Species

Plant species on the CNPS Lists 3 and 4 have been included for consideration for this assessment. However, Lists 3 and 4 constitute categories of plants for which additional information on status is needed before rarity can be determined (i.e., a review list), or the distribution is naturally limited but the threat appears to be low (i.e., a watch list), respectively. Therefore, plants in these categories are not considered to have the same level of sensitivity as plants designated as CNPS List 1A, 1B, and 2. Nevertheless, the CNPS Inventory strongly recommends that List 3 and 4 species be analyzed under CEQA.

Species in these categories that have been previously observed within the LCRSP study area include southern California black walnut (CNPS List 4.2) and Parry's spineflower (CNPS List 3.2). A summary of these plant species is presented in Table 5, *Sensitive and CNPS List 3 and 4 Plant Species*, while more detailed accounts of these species are provided below.



PCR

N

500 0 500 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial);
PCR Services Corporation, 2009.

Figure 11

Lytle Creek Ranch Specific Plan
2005 Woollystar Locations

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Parry's Spineflower

Parry's spineflower is a CNPS List 3.2 species. It is an annual herb that blooms from April-June. Parry's spineflower grows in sandy openings in alluvial fan sage scrub, coastal sage scrub, and chaparral. It is known to occur in San Bernardino and Riverside counties. In 1994, Parry's spineflower was found within the LCRSP study area by MBA biologists in 157 acres of chamise chaparral, alluvial fan sage scrub, and Riversidean sage scrub habitats. At that time, thirteen populations of Parry's spineflower containing an estimated 440,000 individuals were identified within the LCRSP study area. The populations varied in size, ranging from 5 to several hundred thousand individuals. Most of the Parry's spineflower plants were found in Lytle Creek Wash on a 162-acre terrace of chamise chaparral and alluvial fan sage scrub located to the northwest of the mining area. These 162 acres lie partly within an area set aside as conservation open space for the LCNPD and partly within the Habitat Mitigation Area which is proposed for inclusion as conservation open space by Lytle Development Company. There may be additional small populations of this species in patches of chamise chaparral throughout the LCRSP study area that were not detected. During the 2005 and 2006 survey seasons, PCR biologists confirmed the locations of the major populations within the LCRSP study area and also documented several additional small populations (totaling 61,280 plants) throughout the LCRSP study area (Figure 12, *Parry's Spineflower Locations*, on page 67). Therefore, an estimated 501,280 plants have been mapped as occurring within the LCRSP study area.

Southern California Black Walnut

The southern California black walnut is a CNPS List 4.2 species. California black walnut is a deciduous tree that grows in southern California at elevations below 4,500 feet. It grows in several habitats including alluvial fan sage scrub, chaparral, and cismontane woodlands. One California black walnut tree is located within the LCRSP study area at the corner of Sierra Highway and Glen Helen Parkway.

3.6.5 Sensitive Wildlife Species

Sensitive wildlife species include those species listed as endangered or threatened under FESA or CESA, candidates for listing by USFWS or CDFG, and species of special concern to CDFG. A number of sensitive wildlife species were reported in the CNDDB and are known to occur within the region. As previously mentioned, habitat assessments and focused surveys were completed for several species during the 2004, 2005, 2006, 2007, and 2008 survey season. A number of sensitive wildlife species were observed within the LCRSP study area including golden eagle, northern harrier, American peregrine falcon, white-tailed kite, loggerhead shrike (*Lanius ludovicianus*), Vaux's swift (*Chaetura vauxi*), burrowing owl, willow flycatcher, least Bell's vireo, yellow warbler (*Dendroica petechia brewsteri*), yellow-breasted chat (*Icteria virens*), San Diego black-tailed jack rabbit (*Lepus californicus bennettii*), western mastiff bat (*Eumops perotis*), pocketed free-tailed bat (*Nyctinomops femorosaccus*), northwestern San Diego

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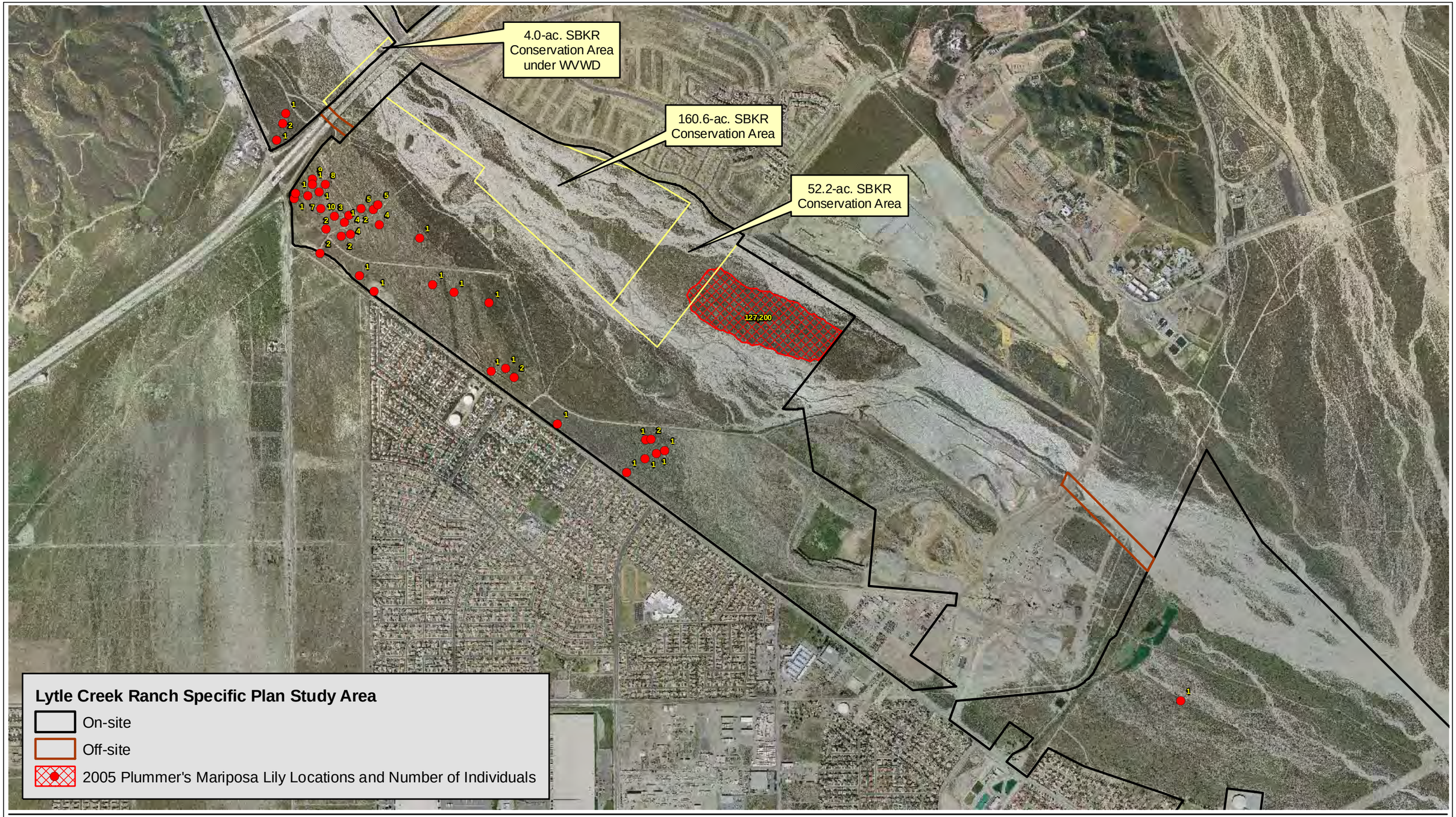

PCR

N

1,500 0 1,500 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 12

Lytle Creek Ranch Specific Plan
2005 Plummer's Mariposa Lily Locations

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pocket mouse (*Chaetodipus fallax fallax*), Los Angeles pocket mouse, and San Bernardino kangaroo rat. A summary of the sensitive wildlife species observed, as well as those potentially present within the LCRSP study area, is presented in Table 6, *Sensitive Wildlife Species*, on page 69. Comments are included in this table for those species requiring further discussion or for which background information supports the determination of occurrence within the LCRSP study area. The results of up-to-date focused surveys for the coastal California gnatcatcher, San Bernardino kangaroo rat, southwestern willow flycatcher, and least Bell's vireo, as well as intrinsic sampling for Los Angeles pocket mouse and the habitat assessment for burrowing owl, are discussed in more detail below. Similarly, species accounts, segregated by taxonomic group, are summarized below.

3.6.5.1 Sensitive Amphibians

No sensitive amphibians were observed within the LCRSP study area and only one species, the western spadefoot, has a low potential to occur. This species occurs within open grassland areas or near quiet washes with loose soil for burrowing and where temporary pools are available for reproduction. This species is a CSC species and is not state or federally-listed as threatened or endangered.

3.6.5.2 Sensitive Reptiles

In addition to the coast horned lizard discussed below, several other sensitive reptile species have the potential to occur within the LCRSP study area due to the presence of suitable habitat. The silvery legless lizard (*Anniella pulchra pulchra*) and coast patch-nosed snake (*Salvadora hexalepis virgultea*) utilize chaparral habitat while the orange-throated whiptail (*Aspidoscelis hyperythra*) utilizes scrub, chaparral, and grasslands. These species are all CSC species and are not state or federally-listed as threatened or endangered.

Coast (San Diego) Horned Lizard

The coast horned lizard occurs throughout the LCRSP study area and is presumed to be of the *blainvillii* subspecies, a CSC species. Although Stebbins, Third Edition (2003), does not classify this species into subspecies, the CDFG recognizes two sensitive populations; *blainvillii* and *frontale* (CDFG 1994). The *blainvillii*, or San Diego population, may occur in cismontane southern California up to northern Los Angeles County. Detailed range maps for coast horned lizard subspecies are lacking and visual identification to subspecies is very difficult (Tim Hovey, CDFG biologist, pers. comm. with Susan Erickson, 2006).

However, based on the current general understanding of the distribution for the subspecies *blainvillii*, the coast horned lizards found within the LCRSP study area are considered sensitive by the CDFG (pers. comm. with Tim Hovey, 2006).

Table 6

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Order Diptera	**Flies**				
Rhaphiomidas terminatus abdominalis	Delhi Sands flower-loving fly	FE	NONE	Found in areas of the Delhi Sands formation in southwestern San Bernardino and northwestern Riverside Counties. Requires fine, sandy soils, often with wholly or partly consolidated dunes and sparse vegetation.	NO
Comments: No suitable habitat for this species occurs within the LCRSP study area.					
FISHES					
Cyprinidae	**Minnows and Carp**				
Gila orcutti	Arroyo chub	NONE	CSC	Slow water stream sections with mud or sand bottoms. Feed heavily on aquatic vegetation and associated invertebrates.	NO
Rhinichthys osculus ssp. *3*	Santa Ana speckled dace	NONE	CSC	Prefer stony habitat where there are hiding spaces between stones, washed by moderate current.	NO
Comments: This species is not expected to occur on-site due to the lack of perennial water flow in the on-site reach of Lytle Creek. Furthermore, the nearest location in the CNDDB is 3.5 miles northwest from the LCRSP study area within the upper reaches of Lytle Creek and was observed in 1996. The project is not anticipated to have any hydro-geomorphic effects on the main channel of Lytle Creek Wash.					
Catostomus santaanae	Santa Ana sucker	FT	CSC	Permanent streams with rocky bottoms.	NO
Comments: This species is not expected to occur on-site due to the lack of perennial water flow in the on-site reach of Lytle Creek. Furthermore, the nearest location in the CNDDB is 6 miles southeast from the LCRSP study area in the Santa Ana River and was observed in 1998. The project is not anticipated to have any hydro-geomorphic effects on the main channel of Lytle Creek Wash.					

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
AMPHIBIANS					
Pelobatidae	**Spadefoot Toads**				
Spea hammondii	Western spadefoot	NONE	CSC	Prefers burrow sites within relatively open areas in lowland grasslands, chaparral, and pine-oak woodlands, areas of sandy or gravelly soil in alluvial fans, washes, and floodplains. Requires temporary pools for reproduction.	P
Bufonidae	**True Toads**				
Bufo californicus	Arroyo toad	FE	CSC	Shallow, exposed streamsides, quiet water stretches, or overflow pools with silt-free sandy or gravelly bottoms. Nearby sandy terraces, dampened in places by capillary action, with some scattered vegetation.	NO
Comments: According to the USFWS database, the arroyo toad has been documented in Cucamonga Creek and Cajon Wash in 1999 and 2000, respectively (USFWS 2007a). PCR performed habitat evaluations for the arroyo toad within Lytle Creek North in 1997. No suitable habitat for this species was found. Concurrently, diurnal surveys for this species were conducted in potentially suitable habitat within Sycamore Flat. No characteristic signs of this species were found in Sycamore Flat. Furthermore, habitat evaluations completed for Neighborhood II, III, IV, and the habitat mitigation area during the 2004 and 2005 survey season did not detect suitable habitat for arroyo toad. Therefore, this species is considered to be absent from the LCRSP study area and surrounding areas.					
Ranidae	**True Frogs**				
Rana muscosa	Sierra Madre yellow-legged frog	FE	CSC	Prefers rocky stream courses in the mountains of southern California. Inhabits mid- to upper-elevation, perennial streams, often in locations with bedrock pools. Always encountered within a few feet of water.	NO

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
REPTILES					
Emydidae	**Box and Water Turtles**				
Emys (=Clemmys) marmorata pallida	Southwestern pond turtle	NONE	CSC	Lakes, marshes, rivers, streams, and irrigation ditches with emergent vegetation such as watercress, cattails, or water lilies.	NO
Comments: Habitat evaluations completed for Neighborhood I, II, III, IV, and the habitat mitigation area during the 2004 and 2005 survey season did not detect suitable habitat for the southwestern pond turtle. Therefore, this species is considered to be absent from the LCRSP study area and surrounding areas.					
Phrynosomatidae	**Iguanid Lizard Family**				
Phrynosoma coronatum (blainvillei)	Coast (San Diego) horned lizard	NONE	CSC	Prefers sandy riparian and sage scrub habitats but also occurs in valley-foothill hardwood, conifer, , pine-cypress, juniper and annual grassland habitats below 6,000 feet, open country, especially sandy areas, washes, flood plains, and windblown deposits.	OB
Comments: The subspecies within the LCRSP study area is presumed by the CDFG to be *blainvillei* and it occurs throughout the LCRSP study area. This species was also previously observed by MBA in the 1993/1994 survey season.					
Teiidae	**Whiptail Family**				
Aspidoscelis hyperythra	orange-throated whiptail	NONE	CSC	Chaparral, non-native grassland, Riversidean sage scrub, and juniper and oak woodlands. Associated with riparian areas and alluvial fan scrub habitats.	P

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Anniellidae	**Legless Lizard Family**				
Anniella pulchra pulchra	Silvery legless lizard	NONE	CSC	Frequents sparse vegetation of beaches, chaparral, pine-oak woodland, and streamside growth of sycamores, cottonwoods, and oaks. Needs loose soil for burrowing, moisture, warmth, and plant cover.	P
Colubridae	**Colubrid Snakes**				
Salvadora hexalepis virgultea	Coast patch-nosed snake	NONE	CSC	Desert and rocky areas in chaparral covered hillsides and canyons.	P
Thamnophis hammondii	two-striped garter snake	NONE	CSC	Coastal California along watercourses permanent fresh water, and near streams with rocky beds and riparian growth.	NO
Viperidae	**Vipers**				
Crotalus ruber ruber	Northern red-diamond rattlesnake	NONE	CSC	Chaparral, woodland, grassland, and desert. In rocky areas and dense vegetation.	NO

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
BIRDS					
Accipitridae	**Hawks, Kites, Harriers and Eagle Family**				
Aquila chrysaetos	golden eagle	NONE	SFP	Mountains, deserts, and open country; prefer to forage over grasslands, deserts, savannahs and early successional stages of forest and shrub habitats.	OB
Comments: This species was observed on several occasions near the most northern portions of the LCRSP study area and within the western portion of Neighborhood I. This species was also previously observed by MBA in the 1993/1994 survey season.					
Elanus leucurus	white-tailed kite	NONE	SFP	Grasslands with scattered trees, near marshes, along highways.	OB, F
Circus cyaneus	Northern harrier	NONE	CSC	Coastal salt marshes, freshwater marshes, grasslands, and agricultural fields; occasionally forages over open desert and brushlands.	OB, F
Comments: One individual northern harrier was observed on one occasion in the spring of 2005 and again in the spring of 2006 within Neighborhood II.					
Falconidae	**Falcons**				
Falco peregrinus anatum	American peregrine falcon	NONE	SE, SFP	Found in a variety of habitats including mixed conifer, pinyon-juniper, sagebrush, riparian, grassland habitats, agricultural, and urban areas	OB, F
Comments: One individual American peregrine falcon was observed during the winter season in early 2006 perched on a snag within Neighborhood II.					

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Strigidae	**Owls**				
Athene cunicularia	burrowing owl	NONE	CSC	Dry grasslands, desert habitats, open-pinyon-juniper and ponderosa pine woodlands below 5,300 feet elevation. Prefers berms, ditches, and grasslands adjacent to rivers, agricultural, and scrub areas.	OB
Comments: A habitat assessment and burrow survey conducted by PCR in 2005, 2006, and again in 2007 determined that the proposed development area is not occupied by this species. No evidence of occupation by burrowing owls (past or present) was observed; therefore, Phase III (census and mapping) surveys for this species were not deemed necessary within the development footprint. Habitat within the project area is generally too dense to support this species. However, burrowing owl was incidentally observed in September of 2006, February of 2007, and January 2009 within the proposed on-site Habitat Mitigation Area, likely due to removal of chamise. Therefore, this species is thought to be overwintering within the SBKR Conservation Area; however, the breeding status of this species within the Habitat Mitigation Area is not known at this time and there is no evidence of breeding within the proposed development area.					
Asio otus	Long-eared owl	NONE	CSC	Riparian bottomlands grown tall with willows and cottonwoods. Also coast live oaks along riparian areas with adjacent open areas for foraging.	P
Apodidae	**Swifts**				
Chaetura vauxi	Vaux's swift	NONE	CSC	Associated with old-growth Douglas fir, redwood, and other coniferous forest with large trees for roosting.	OB
Comments: Vaux's swift was observed within Neighborhood II in the spring of 2006.					
Tyrannidae	**Tyrant Flycatchers**				
Empidonax traillii	willow flycatcher	NONE	SE	Low brushy vegetation in wet areas, especially riparian willow thickets.	OB

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Comments: Two transient willow flycatchers were observed on a single occasion in the spring of 2006 along the southern boundary of Neighborhood II in an area lacking riparian habitat. In 2007, focused surveys detected one migrant willow flycatcher on May 17 in the Sycamore Flat riparian corridor in Neighborhood I. As these birds were not detected on subsequent site visits, it is presumed that they are transient migrants of unknown subspecies, but not of the subspecies *extimus*.					
Empidonax traillii extimus	Southwestern willow flycatcher	FE	SE	Low brushy vegetation in wet areas, especially riparian willow thickets.	NO
Comments: Surveys conducted in 1998 detected seven individual flycatchers on a single survey date. However, due to the date of initial observation on June 8 and the failure to detect any flycatchers during subsequent visits, it was presumed that the observations were migratory birds of unknown subspecies. Surveys for the southwestern willow flycatcher performed in 1997, 1999, and 2002 within Neighborhood I (Sycamore Flat) did not detect this species within the LCRSP study area. Two transient willow flycatchers were observed during 2006 in Neighborhood II in an area lacking riparian habitat. In 2007 and 2008, focused surveys detected one migrant willow flycatcher on May 17, 2007 and May 29, 2008, respectively, in the Sycamore Flat riparian corridor in Neighborhood I. These individual are also believed to be a migratory transient as they were not seen on subsequent focused surveys. In addition, due to recent fires, the quality of the riparian habitat within Sycamore Flat has diminished. Therefore, this subspecies is not expected to occur within the LCRSP study area.					
Laniidae	**Shrike Family**				
Lanius ludovicianus	loggerhead shrike	NONE	CSC	Open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches.	OB
Comments: The loggerhead shrike was observed on several occasions in the spring of 2006 within the western portion of Neighborhood III.					
Vireonidae	**Vireo Family**				
Vireo bellii pusillus	least Bell's vireo	FE	SE	Found especially in willow and mesquite thickets near water.	OB
Comments: Focused surveys performed for this species in 1997, 1999, and 2002 within Flat Neighborhood I did not detect this species within the LCRSP study area. However, at least one male and two pairs of least Bell's vireo were observed in 2006. In addition, one breeding pair was observed off-site just north of Neighborhood I in 2007. In 2008, this species was not observed within the LCRSP study area.					

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Porulidae	**Wood Warblers**				
Dendroica petechia brewsteri	yellow warbler	NONE	CSC	Riparian woodlands, montane chaparral, open ponderosa pine and mixed coniferous habitat with significant brush.	OB
Comments: This species was detected on a few occasions within the eastern portion of Neighborhood I in the spring of 2006.					
Icteria virens	yellow-breasted chat	NONE	CSC	In southern California, nest in dense willow woodlands and thickets or other riparian areas with a developed understory.	OB
Comments: This species was detected during focused least Bell's vireo and southwestern flycatcher surveys within Neighborhood I (Sycamore Flat).					
Sylviidae	**Old World Warblers, Gnatcatchers**				
Polioptila californica californica	Coastal California gnatcatcher	FT	CSC	Coastal sage scrub vegetation below 2,500 feet elevation in Riverside County and generally below 1,000 feet elevation along the coastal slope; generally avoids steep slopes and dense vegetation for nesting.	NO
Comments: Focused surveys performed for the coastal California gnatcatcher in 2005, 2006, and 2007 did not detect this species within the LCRSP study area.					
Icteridae	**Blackbird Family**				
Agelaius tricolor	Tricolored blackbird	NONE	CSC	Highly colonial species. Required open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	P

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
MAMMALS					
Phyllostomidae	**Leaf-Nosed Bats**				
Macrotus californicus	California leaf-nosed bat	NONE	CSC	Desert scrub. By day, roosts in abandoned mine tunnels. Migrating bat species.	P, F
Molossidae	**Free-tailed Bats**				
Eumops perotis	Western mastiff bat	NONE	CSC	Many open, semi-arid to arid habitats including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral, etc. Roosts in crevices in cliff faces, high buildings, trees, and tunnels.	OB
Comments: This species was detected by O'Farrell in the central portion of Neighborhood III using acoustic equipment in August 2007.					
Nyctinomops femorosaccus	pocketed free-tailed bat	NONE	CSC	More arid habitat such as pinyon-juniper woodlands, desert scrub, desert succulent shrub, desert riparian, desert wash, alkali desert scrub, Joshua tree, and palm oasis. Roosts in rock crevices, caverns, or buildings.	OB
Comments: This species was detected by O'Farrell in Neighborhoods II, III, and IV using acoustic equipment in August 2007.					
Vespertilionidae	**Evening Bats**				
Antrozous pallidus	Pallid bat	NONE	CSC	Wide variety of habitats but most common in open, dry habitats with rocky areas for roosting.	P, F
Corynorhinus townsendii	Townsend's big-eared bat	NONE	CSC	Arid western desert scrub and pine forest regions.	P, F

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Leporidae	**Hares and Rabbit Family**				
Lepus californicus bennettii	San Diego black-tailed jackrabbit	NONE	CSC	Open brushlands and scrub habitats between sea level and 4,000 feet elevation.	OB
Comments: This species was observed throughout the LCRSP study area in suitable habitat at various times of year during the 2004 – 2006 survey seasons. This species was also previously observed by MBA in the 1993/1994 survey season.					
Heteromyidae	**Pocket Mice and Kangaroo Rat Family**				
Perognathus longimembris brevinasus	Los Angeles pocket mouse	NONE	CSC	Coastal sage scrub, and grasslands, desert cactus, creosote bush and sagebrush habitats.	OB
Comments: Although this species was not found within Neighborhood I or II, the Los Angeles pocket mouse was caught during trapping efforts by O'Farrell within the SBKR Conservation Area of Neighborhood III and within Neighborhood IV in 2005 and 2006. Neighborhood IV currently supports highly suitable habitat for this species.					
Chaetodipus fallax fallax	northwestern San Diego pocket mouse	NONE	CSC	Chaparral, coastal sage scrub (Riversidean and Diegan), desert scrub, grassland, juniper woodland and scrub, and Riversidean alluvial fan sage scrub	OB
Comments: O'Farrell trapped this species throughout the study area in 2005 and 2006.					
Dipodomys merriami parvus	San Bernardino kangaroo rat	FE	CSC	Alluvial scrub vegetation on sandy loam substrates characteristic of alluvial fans and flood plains	OB
Comments: Numerous trapping surveys have been conducted to ascertain the presence and distribution of this species within the LCRSP study area PDP as well as within nearby LCNPD. Survey results beginning in 1997 and continuing to the present indicate that this species primarily occupies the active wash. Trapping conducted by O'Farrell determined that a restricted portion of the upland terrace/bench within Neighborhoods II and III (some of which is isolated from the wash) also supports this species (Figure 143, *SBKR and LAPM Occupied Habitat*, on page 86).					

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

Table 6 (Continued)

Sensitive Wildlife Species

INVERTEBRATES					
Scientific Name	**Common Name**	**Federal**	**State**	**Preferred Habitat**	**Occurrence within the Study Area**
Muridae	**Mice, Rats, and Vole Family**				
Neotoma lepida intermedia	San Diego desert woodrat	NONE	CSC	Variety of habitats, often in the vicinity of rocky outcrops; prefer moderate to dense canopies.	P
Onychomys torridus ramona	Southern grasshopper mouse	NONE	CSC	Grasslands, desert areas, especially scrub with friable soils.	P
Mustelidae	**Weasels, Skunks, and Otters Family**				
Taxidea taxus	American badger	NONE	CSC	Drier, open stages of shrubland, forest, and herbaceous habitats with friable soils.	NO

FE *Federally Listed as Endangered*
FT *Federally Listed as Threatened*
FPE *Federally Proposed as Endangered*
FPT *Federally Proposed as Threatened*
FPD *Federally Proposed for Delisting*

SE *State Listed as Endangered*
ST *State Listed as Threatened*
SCE *State Candidate for Endangered*
SCT *State Candidate for Threatened*
SFP *State Fully Protected*
CSC *California Special Concern Species*

Source: PCR Services Corporation 2009.

OB = Observed; P = there remains the possibility for this species to occur on-site due to the presence of potentially suitable habitat; NO = Species not observed or not expected to occur on-site due to the lack of suitable habitat, the negative results of focused surveys, or the study area's location outside of the species' range; F = For raptor and bat species: if present, would utilize the site for foraging only; N = For raptor and bat species: if present, would utilize the site for nesting only; B = For raptor and bat species: if present, would utilize the site for both foraging and nesting.

The coast (San Diego) horned lizard is found in a variety of habitats including sage scrub, chaparral, grassland, riparian, and woodland, but prefers sage scrub habitats with loose, sandy soils for burrowing, native ants for foraging, open areas for basking, and shrubs for cover (CDFG 1994). Historically, this species was most prevalent in coastal sage scrub and riparian habitats occurring on alluvial fans. Although not all portions of the LCRSP study area are occupied by sage scrub plant communities, the majority of the LCRSP study area supports suitable habitat for this species due to its location within the Lytle Creek alluvial fan. However, observations of this species within the LCRSP study area have not been restricted to the alluvial fan. Nevertheless, open scrub areas within the LCRSP study area likely support the highest concentrations of this species due to the presence of nearly all key habitat requirement elements.

3.6.5.3 Sensitive Avian Species

Sixteen sensitive avian species were observed and several others have the potential to occur within the LCRSP study area as noted in Section 3.6.4. The coastal California gnatcatcher, willow flycatcher, least Bell's vireo, and burrowing owl are discussed below. Of the remaining species, only the state-endangered American peregrine falcon is listed under the CESA or FESA while the others are all CSC species. These species are known or expected to utilize a wide variety of habitats and plant associations within the LCRSP study area for various life stages or functions.

Coastal California Gnatcatcher

No coastal California gnatcatchers were observed within the LCRSP study area during the 2005, 2006, and 2007 focused surveys conducted by PCR in accordance with the USFWS protocol guidelines (PCR 2006a; PCR 2006b; PCR 2006c; PCR 2007b). Similarly, previous focused surveys, by MBA in 1994 and 1995, also following the USFWS protocol, did not detect the coastal California gnatcatcher within the study area (MBA 1995). Although the LCRSP study area supports a variety of scrub habitats, the LCRSP study area exists within the northern limits of the species' inland distribution (USFWS 2007). In addition, few occurrences have been documented in the vicinity of the LCRSP study area. In 1990, one coastal California gnatcatcher was observed at the confluence of Lytle Creek and Cajon Wash approximately one-quarter mile north of the study area (CDFG 2007a). One individual was incidentally observed off-site within the Lytle Creek North PDP on a single occasion in March 1993 and is documented in the CNDDB (pers. comm. with Steve Nelson, 2006; CDFG 2006). Based on these occurrence data from the LCRSP study area and vicinity, the LCRSP study area is not considered to be occupied by the coastal California gnatcatcher. Further, the LCRSP study area is not considered to be essential to the conservation of the species, as acknowledged by the removal of USFWS-designated critical habitat in 2007 from the entire LCRSP study area and vicinity.

Burrowing Owl

Results of the Phase I, Habitat Assessment concluded that the LCRSP study area and a 150-meter (492-foot) buffer zone exhibited potentially suitable burrowing owl habitat consisting of disturbed, low growing vegetation, bare ground, and small fossorial mammal burrows. However, results of the Phase II, Burrow Survey did not indicate that burrowing owls occupied the LCRSP study area or buffer zone, nor were any burrowing owls observed.

O'Farrell and PCR biologists incidentally observed burrowing owls on the SBKR Conservation Area in September of 2006, February of 2007, and again in January 2009. Two burrowing owls were observed outside the proposed development area in 2006; one along the southern edge and one along the northern edge of the roughly 80-acre island within the SBKR Conservation Area. The 2007 and 2009 observation was along the southern edge of that island. This occupation by burrowing owl is likely a secondary benefit of the habitat manipulation for San Bernardino kangaroo rat on this island. Burrowing owls have not been observed during any surveys performed by MBA or PCR from 1994 to 2007 prior to these observations. The majority of the project area supports relatively dense vegetation not conducive to this species and the results of Phase I and II surveys indicate the species does not currently occur within the proposed development footprint. The breeding status of burrowing owl within the SBKR Conservation Area is not known at this time.

Willow Flycatcher

Two individual willow flycatchers (*Empidonax traillii*) were observed on May 23, 2006 during a coastal California gnatcatcher survey along the southern boundary of Neighborhood II within the ornamental trees adjacent to the El Rancho Verde Golf Course. Based on willow flycatcher migration patterns and periods, the birds are considered to be transient, as they were not observed on any previous or subsequent surveys, including focused surveys for the southwestern willow flycatcher (PCR 2006d). Furthermore, no suitable habitat is present in the location these birds were observed. In 2007, focused surveys for this species detected one migrant willow flycatcher on May 17 (PCR 2007c) in the Sycamore Flat riparian corridor in Neighborhood I. Similarly, focused surveys for this species conducted in 2008 detected one migrant willow flycatcher on May 29 (PCR 2008b). These individuals were also believed to be migratory transients as they were not seen on the subsequent four focused surveys conducted during the 2007 and 2008 survey season, respectively. The federally- and state-listed endangered southwestern willow flycatcher was not observed and is not expected to occur within the LCRSP study area.

Least Bell's Vireo

Focused surveys for least Bells' vireo were conducted within the LCRSP study area in 2006, 2007, and 2008 (PCR 2006e, PCR 2007d, and PCR 2008a). Least Bell's vireos were observed on several portions of the LCRSP study area in May and June 2006 (PCR 2006e). In

addition, one individual was detected on several occasions during coastal California gnatcatcher surveys. Two pair of least Bell's vireos were observed during the least Bell's vireo survey period within the eastern portion of Neighborhood I and at least one least Bell's vireo was observed numerous times within a narrow riparian corridor along the western portion of Neighborhood II. Although this corridor supports mule fat scrub and southern cottonwood willow riparian vegetation, it is relatively narrow and is supported by overflow from a pump station near the southern study area boundary. The individuals detected outside of the Sycamore Flat area are believed to have been transient birds as they were not observed during surveys after May 30 and were found in non-suitable or marginally-suitable breeding habitat when they were seen. Table 7, *2006 through 2008 Least Bell's Vireo Observations*, on page 83 and Figure 13, *Least Bell's Vireo Locations*, on page 84, displays the various dates and locations where least Bell's vireo were observed within the LCRSP study area.

In conclusion, two pairs of least Bell's vireos are believed to have established breeding territories in the eastern portion of Neighborhood I in 2006. One nest was found, however, it is uncertain whether either of these pairs was successful in breeding. Further, the transient bird within Neighborhood II could not be confirmed as having attempted to breed in 2006. In 2007, one pair of least Bell's vireo was observed on three consecutive survey dates just off-site within the County Parks parcel of the Sycamore Flat riparian corridor (PCR 2007d; Table 7, *2006 through 2008 Least Bell's Vireo Observations* and Figure 13, *Least Bell's Vireo Locations*). However, focused surveys conducted in 2008 did not detect the least Bell's vireo within the LCRSP study area (PCR 2008a).

Sensitive Mammals

Six sensitive mammals, the San Diego black-tailed jackrabbit, western mastiff bat, pocketed free-tailed bat, northwestern San Diego pocket mouse, Los Angeles pocket mouse, and San Bernardino kangaroo rat, were observed or otherwise detected while the California leaf-nosed bat, Townsend's big-eared bat, pallid bat, San Diego desert woodrat, and southern grasshopper mouse have the potential to occur. With the exception of the San Bernardino kangaroo rat discussed below, these species are all CSC species and are not state or federally-listed as threatened or endangered.

San Bernardino Kangaroo Rat

The federally-listed endangered San Bernardino kangaroo rat is a species with relatively narrow habitat requirements, in that, it is found in alluvial scrub habitats that are characterized by gravelly and sandy soils adjoining river and stream terraces, washes, and alluvial fans; and, it rarely occurs in dense, mature vegetation. In a regional context, the species is believed to currently occupy approximately 7,530 acres of suitable habitat, divided among seven locations in San Bernardino and Riverside counties, including the Lytle Creek and Cajon Creek wash complexes (USFWS 2008a). High densities of the San Bernardino kangaroo rat have been

Table 7

2006 through 2008 Least Bell's Vireo Observations

Occurrence # on Figure 15	Date	Results	Location	Quality of Habitat for Breeding	Comments
			2006		
1	05/01/06	LBV* male	In alluvial fan sage scrub in eastern portion of Neighborhood II	Not suitable	Migrant individual observed during coastal California gnatcatcher survey
2	05/11/06	LBV male	In wash and chamise chaparral in northwest portion of Neighborhood III	Not suitable	Migrant individual observed during coastal California gnatcatcher survey
3	05/16/06	LBV male	In mule fat scrub at Neighborhood II near basins	Marginally suitable	Observed during coastal California gnatcatcher survey
4	05/23/06	LBV male	East Neighborhood I	Suitable	Observed during LBV survey
5	05/23/06	LBV male	Neighborhood II near basins	Marginally suitable	Observed during LBV survey
6	05/30/06	LBV male	In mule fat scrub just off-site and west of Neighborhood II	Marginally suitable	Observed during coastal California gnatcatcher survey
7	06/12/06 & 06/22/06	One LBV Pair	East Neighborhood I	Suitable	Observed during LBV survey
8	06/22/06 & 06/12/06	One LBV Pair	East Neighborhood I	Suitable	Observed during LBV survey
			2007		
1	4/10/07	Two LBV	Off-site, just north of East Neighborhood I	Suitable	Observed during LBV survey
2	6/25/07, 7/05/05, & 7/17/07	One LBV Pair	Off-site, just north of East Neighborhood I	Suitable	Observed during LBV survey

* *LBV = least Bell's vireo*

Source: PCR Services Corporation, 2009.

documented in pioneer and intermediate phases of Riversidean alluvial fan sage scrub which generally correlate to areas that have been more recently disturbed by floods (within the past 40 to 70 years; McKernan 1997; MEC Analytical Systems 2000). This species appears to reach its highest densities in areas with low to moderate (30 to 50 percent) perennial vegetative cover and greater than 40 percent bare ground where soils appropriate for burrowing and open alluvial scrub vegetation provide habitat conditions most suitable for its occupancy. It should also be noted that areas of occupied habitat within an alluvial wash system are in a relatively constant state of flux owing to the dynamic fluvial processes at work. That is, the processes of scouring and deposition typically change the nature of wash bottoms, often over short periods of time, with consequent changes in substrates and vegetation cover.

An extensive trapping program was carried out in all potentially suitable habitat within the LCRSP study area with repetitive trapping bouts in 2005, 2006, and 2007. The results of these efforts are shown in Figure 14, *SBKR and LAPM Occupied Habitat*, on page 86. Trapping within Neighborhood I in 2006 did not detect San Bernardino kangaroo rat, which is consistent with the general absence of suitable habitat conditions and the lack of surface sign throughout this area (O'Farrell 2006). The species was captured in 2005, 2006, and 2007 at various locations within Neighborhoods II and III, and within the Lytle Creek Wash itself. Although captured on Neighborhood IV in 2005, no individuals of this species were captured here in 2006 or 2007.

In recognition of the trapping results and the fluvial processes potentially influencing habitat suitability, for purposes of this CEQA assessment, it is appropriate to define habitat for this species in terms of areas that have been found to support populations within the LCRSP study area over the course of the three-year trapping program conducted on-site from 2005 to 2007, regardless of whether the occupancy was continuous from year to year. As such, San Bernardino kangaroo rat habitat is defined as consisting of Riversidean alluvial fan sage scrub that has been occupied at some point between 2005 and 2007 (hereinafter referred to as "occupied habitat") and is within the 100-year floodplain. In total, the San Bernardino kangaroo rat is considered to occupy 702.7 acres (696.8 acres and 5.9 acres off-site) of the LCRSP study area. This includes 217.6 acres within Neighborhood II, 402.7 acres within Neighborhood III, 76.5 acres within Neighborhood IV, 0.1 acre off-site within the road under I-15, and 5.8 acres off-site within the area proposed for levee improvements between Neighborhoods II and III. These 702.7 acres (696.8 acres and 5.9 acres off-site) also include 51 acres on-site that are occupied on only an ephemeral basis, as discussed below.

This definition of San Bernardino kangaroo rat habitat takes into account the results of repetitive trapping over a three-year period, the various phases of Riversidean alluvial fan sage scrub that the species may occupy, including barren wash that is important for dispersal of the species, and the necessity for fluvial processes in sustaining key habitat conditions. Not included are areas of scrub or chaparral vegetation (dense or open) that are outside the 100-year floodplain and, therefore, are in the process of irreversibly developing into a dense, mature sere. The reader

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PCR

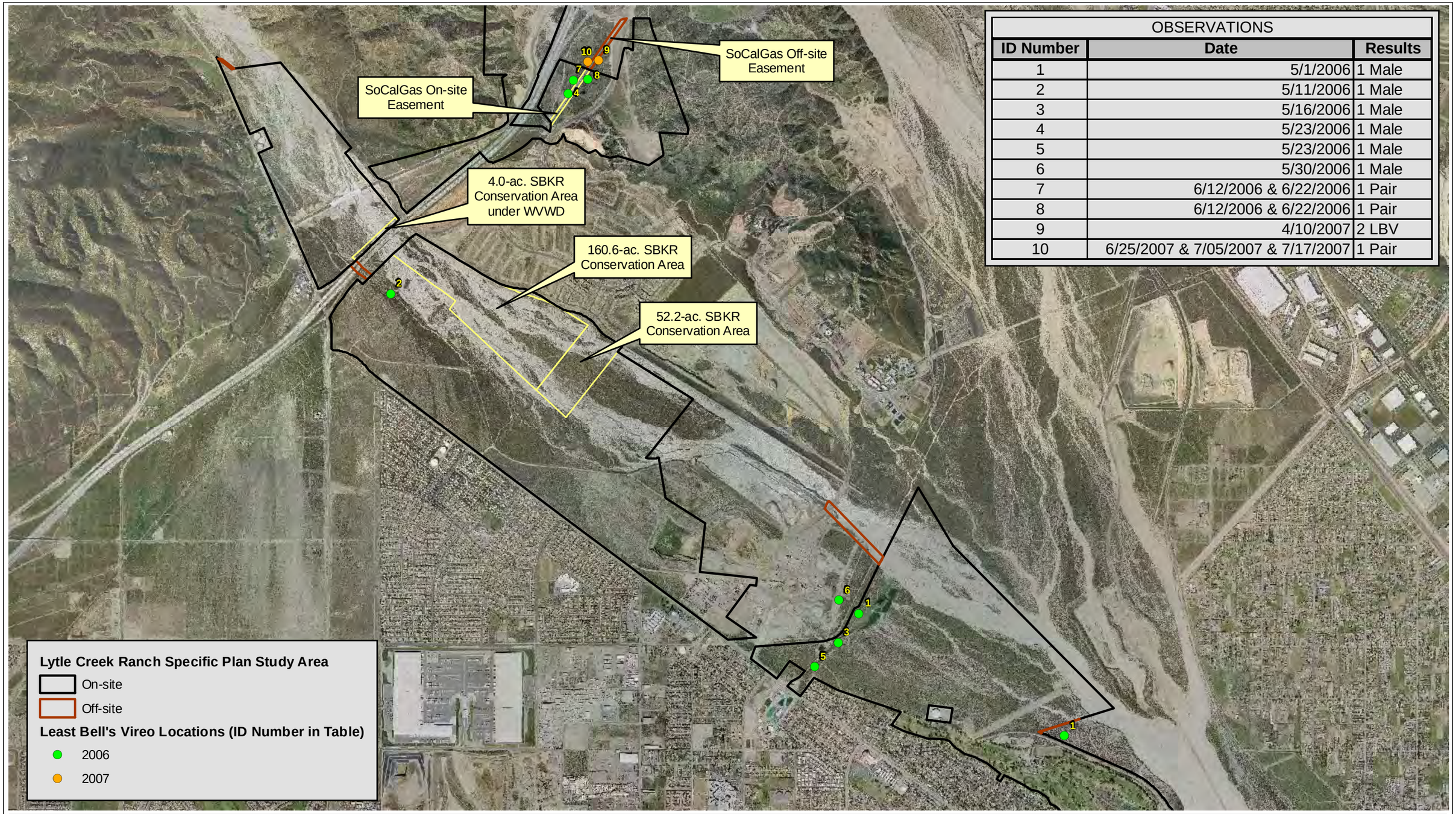
N

2,000 0 2,000 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 13

Lytle Creek Ranch Specific Plan SBKR and LAPM Occupied Habitat



OBSERVATIONS		
ID Number	**Date**	**Results**
1	5/1/2006	1 Male
2	5/11/2006	1 Male
3	5/16/2006	1 Male
4	5/23/2006	1 Male
5	5/23/2006	1 Male
6	5/30/2006	1 Male
7	6/12/2006 & 6/22/2006	1 Pair
8	6/12/2006 & 6/22/2006	1 Pair
9	4/10/2007	2 LBV
10	6/25/2007 & 7/05/2007 & 7/17/2007	1 Pair

PCR

N

2,500 0 2,500 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 14

Lytle Creek Ranch Specific Plan
Least Bell's Vireo Locations

should note that anomalies to this definition of San Bernardino kangaroo rat habitat may occur, such as artificial clearing or levee breaches, where suitable open habitat conditions may result outside the 100-year floodplain. From the viewpoint of a meaningful conservation perspective, it must be kept in mind that these conditions are temporal, lasting a relatively short period of time, until a dense vegetation cover re-establishes itself. Moreover, it is important to consider that although it is difficult to determine the timeframe necessary for the area to become too dense for the species, the isolation of these small populations is not conducive to long-term viability.[6]

Consistent with the definition of San Bernardino kangaroo habitat being used here, it should also be noted that Neighborhoods II and III contain areas of occupation by the species that are artifacts of rare events or anthropomorphic causes, and that will not persist for more than a short period of time. Within Neighborhood II, an area of otherwise mature chaparral/scrub on an upland terrace outside the main wash was scoured to an open vegetation cover in 2005 as the result of diversion associated with a levee and basins at the CEMEX mining operation immediately upstream. In 2005, 2006, and 2007, this area was trapped and San Bernardino kangaroo rat was found to occupy 39.8 acres at this location. Within Neighborhood III, an area of otherwise mature chaparral/scrub outside the flood control levee delineating the 100-year flood plain appears to have been mechanically disturbed, thereby opening up the vegetation cover and allowing the species to colonize this area. In 2005, 2006, and 2007, the species occupied 11.2 acres at this location. In both of these areas, which total 51.0 acres, the habitat is physically isolated from the main wash by both geographic separation and an elevated cement levee or a 10 to 15 feet tall wash bank escarpment. This isolation may affect the vulnerability of these populations, particularly in drought years that result in a scarcity of adequate forage. Moreover, in the absence of either on-going fluvial processes as a result of levee repair which is underway, or, the continuance of mechanical clearance which has ceased, the vegetation will re-establish itself and is anticipated to succeed into a dense, mature chaparral/scrub cover unsuitable for San Bernardino kangaroo rat occupation. Therefore, of the total 702.7 acres (696.8 acres and 5.9 acres off-site) of occupied habitat within the LCRSP study area, 51.0 acres on-site are considered to be occupied on an ephemeral basis only, leaving 651.7 acres of what is considered to be long-term, viable habitat capable of sustaining the population of the species in Lytle Creek Wash into the future.

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[6] *In the context of the San Bernardino kangaroo rat, long-term viability of San Bernardino kangaroo rat habitat is not synonymous with the long-term viability of Riversidean alluvial fan sage scrub. That is, the factors that determine whether habitat for the species will be viable in the long-term are not the same as those that determine whether Riversidean alluvial fan sage scrub will persist. This is due to the fact that although Riversidean alluvial fan sage scrub may, in some circumstances, take many decades or centuries to convert to a more chaparral-type community once hydrology is removed, suitable habitat for the San Bernardino kangaroo rat is more susceptible to more modest increases in vegetation density that may result from a variety of environmental conditions.*

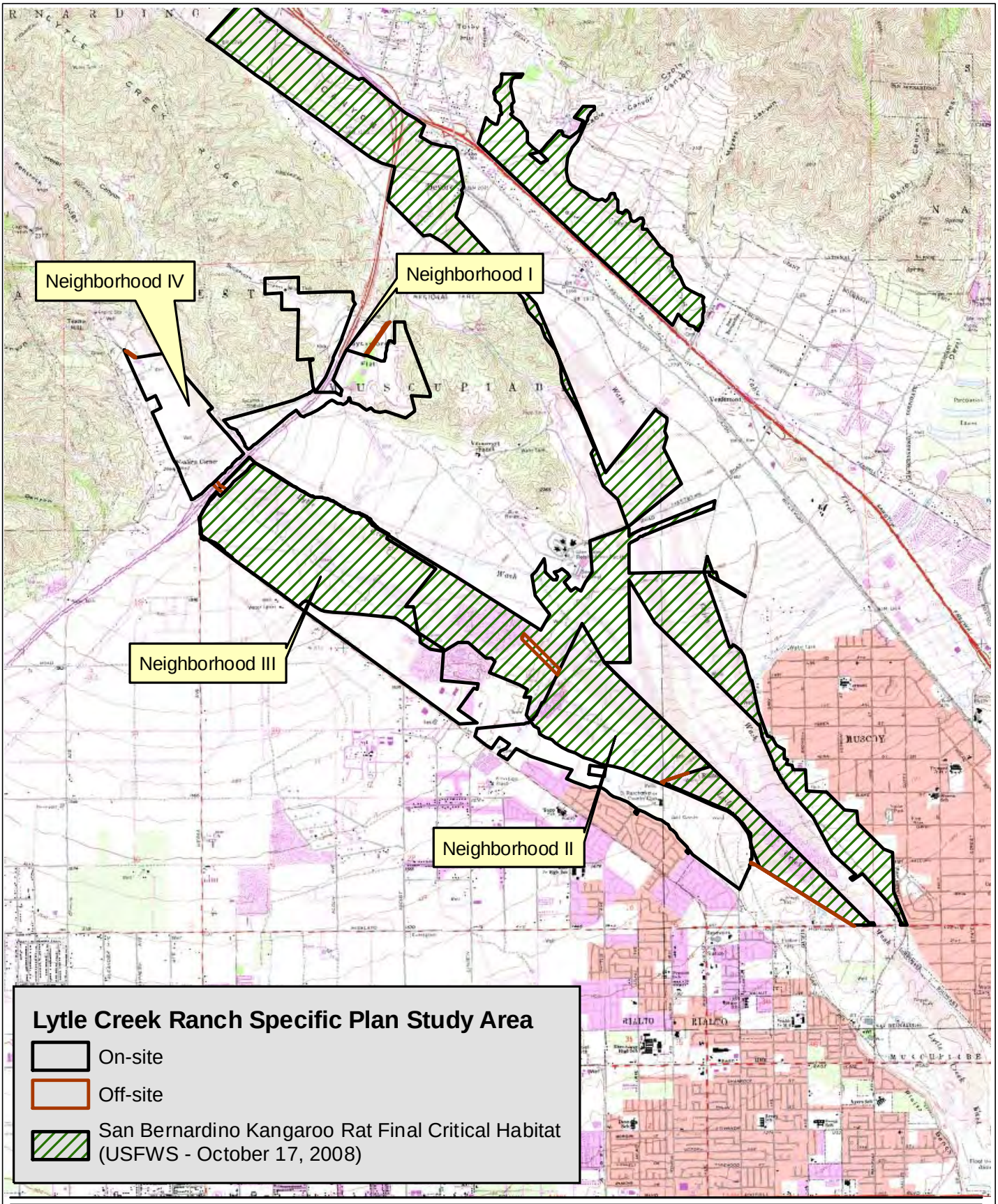
In October 2008, the USFWS published a final revised Critical Habitat designation for the San Bernardino kangaroo rat (50 FR 61955) over approximately 7,779 acres of federal, local, and privately owned land in portions of Riverside and San Bernardino counties (USFWS 2008a). This 2008 designation includes five separate units [Santa Ana River Wash (3,258 acres), Lytle/Cajon Creek Wash (3,421 acres), San Jacinto River Wash (506 acres), Cable Creek Wash (483 acres), and Bautista Creek (Ill acres)] in San Bernardino and Riverside Counties. The majority of the LCRSP study area (1,171.2 acres on-site and 12.4 acres off-site) is within the 2008 Critical Habitat designation (USFWS 2008a). Portions of the LCRSP study area outside of the Critical Habitat designation include Neighborhoods I and IV and the southwestern most portions of Neighborhoods II and III (Figure 15, *San Bernardino Kangaroo Rat Critical Habitat Designation*, on page 89).

It is important to note that the USFWS-designated Critical Habitat is a more broadbrushed, landscape-based designation that does not have the advantage, in most cases, of more detailed and accurate biological data available as is available on a site-specific basis. Critical Habitat designation is intended to be a component in the federal regulatory review process, and its intended purpose is to guide the review and analysis by federal agencies in taking federal actions within such designated areas.

For purposes of CEQA, it is not the amount of Critical Habitat that is the key to determining the level of impact to the species, but rather the amount of actual, existing suitable habitat and the amount of occupied habitat within the LCRSP study area. The analysis of the areas designated by the USFWS as Critical Habitat within the LCRSP study area in this report makes use of more comprehensive information regarding plant community and habitat mapping as well as focused survey results for the San Bernardino kangaroo rat over a three-year period. The reader should note that within the Critical Habitat designation, portions of the LCRSP study area that no longer receive any scour or flood influence, due to flood control structures or otherwise, may become too dense for occupation by the San Bernardino kangaroo rat in the long term. As a result, areas that are isolated from the main wash are not considered viable habitat for the San Bernardino kangaroo rat in the long-term. Therefore, a total of approximately 651.7 acres supporting occupied San Bernardino kangaroo rat habitat within the LCRSP study area are considered viable constituent elements of Critical Habitat for the San Bernardino kangaroo rat under this analysis (Figure 16, *Hydrologically Active RAFSS and SBKR Viable Constituent Elements*, on page 90).

Los Angeles Pocket Mouse

The Los Angeles pocket mouse was captured in relatively high numbers within Neighborhood IV in 2005, 2006, and 2007. This species was also captured in small numbers within the SBKR Conservation Area of Neighborhood III established for the San Bernardino kangaroo rat as part of the LCNPD. This area of occupation within Neighborhood III includes Lytle Creek Wash and the associated vegetated islands, but does not extend into the adjacent

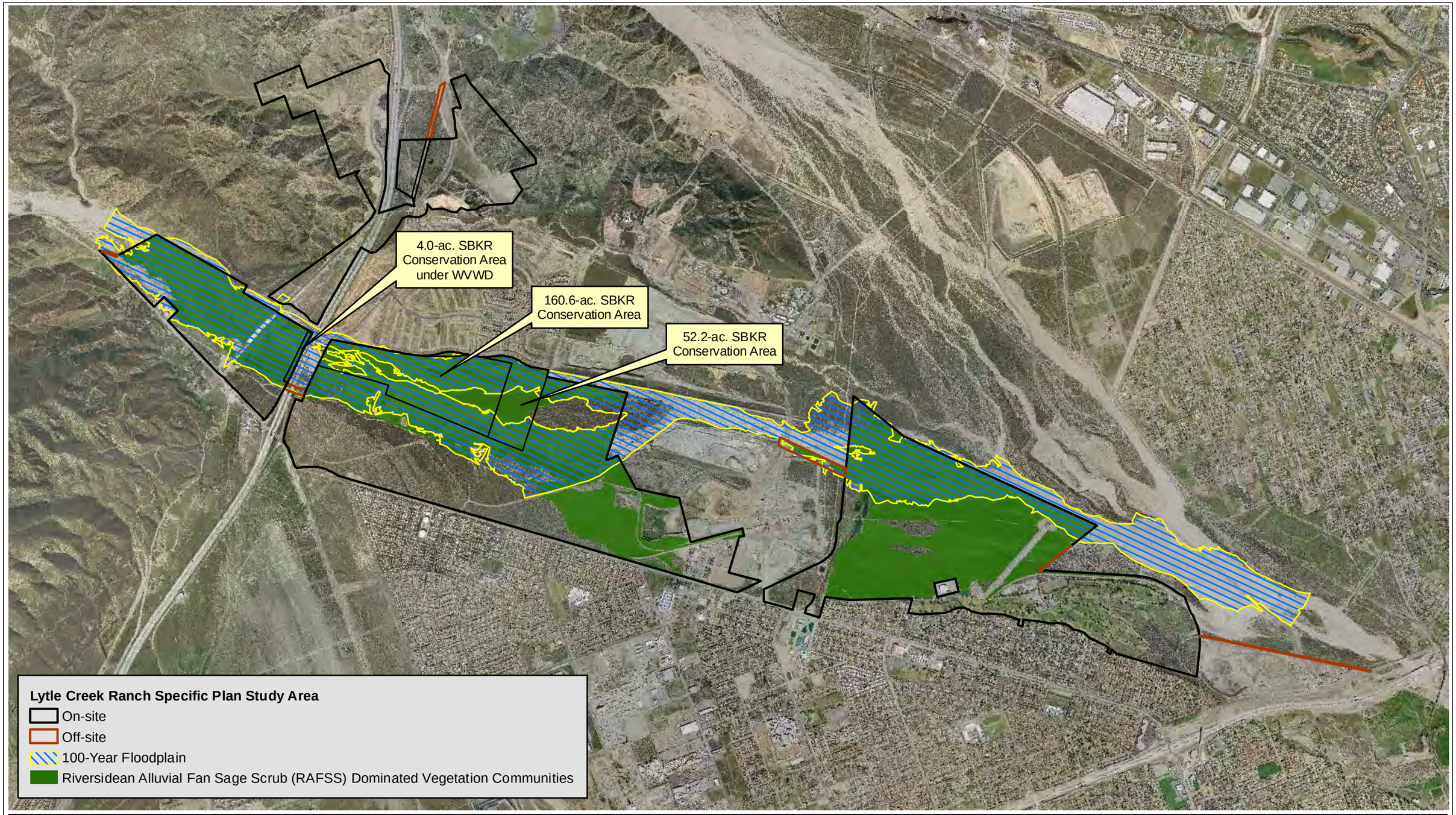


N

1 0 1 Miles

Source: USGS Topographic Series (Devore, Fontana, San Bernardino North and South, CA); USFWS, October 2008; PCR Services Corporation, 2008.

Figure 15
Lytle Creek Ranch Specific Plan San Bernardino Kangaroo Rat Critical Habitat Designation



PCR

N

2,500 0 2,500 Feet

Source: PACE Engineering (100yr Floodplain); Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 16

Lytle Creek Ranch Specific Plan Hydrologically Active RAFSS and SBKR Viable Constituent Elements

upland terrace south of the wash. A total of 397.8 acres of Los Angeles pocket mouse occupied habitat have been mapped within Neighborhoods III and IV. However, this species was not found within Neighborhood I or Neighborhood II during trapping in 2005, 2006, and 2007.

3.6.6 Climate Change and Sensitive Biological Resources

A discussion of the potential impacts that global climate change may have on the proposed Lytle Creek Ranch Specific Plan project is presented in the context of potential impacts to sensitive biological resources. Potential effects resulting from climate change include increased intensity of various climatic events such as floods, drought, and wildfire which in turn may affect plant and wildlife species in the area.

In order to understand the magnitude of change that could potentially result from increased green house gas emissions, a description of the current baseline conditions as they relate to climate and species adaptations is in order. The LCRSP study area is located in an ecological transition zone between the Mediterranean climate of more coastal southern California and the arid Mojave Desert just north and east of the San Bernardino and San Gabriel Mountains. The LCRSP study area has an elevation that ranges from 2,270 feet above MSL to 1,450 feet above MSL as it lies within a topographical transitional area between the lowlands to the west and the higher elevation mountains and desert to the north and east. The area may best be characterized as a semi-arid environment with between 17 inches of precipitation per year on average near the City of San Bernardino and 27 inches of precipitation per year on average near the headwaters of Lytle Creek and average high and low temperatures of 80 degrees Fahrenheit and 49 degrees Fahrenheit (Western Regional Climate Center 2007).

Plant and animal species occurring within the vicinity of the LCRSP study area are adapted to semi-arid conditions. For example, juniper is a plant species that generally occurs in desert habitats or the lower slopes of arid mountainous areas. This species is found in various locations on-site within the Riversidean alluvial fan sage scrub community and reflects the influence of nearby desert areas. Similarly, the common zebra-tailed lizard occurs throughout the LCRSP study area as well as in the desert. This particular species is adapted to desert and semi-arid environments that have more sparse vegetation with open areas (Stebbins 2003).

Increased Flood Events Scenario

The potential for increased green house gas emissions to increase the frequency and scale of flood events is examined due to the location of the LCRSP study area within and adjacent to the 100-year floodplain of Lytle Creek Wash. Lytle Creek Wash is an ephemeral to intermittent alluvial fan drainage system that originates in the eastern San Gabriel Mountains upstream and flows downstream into the Santa Ana River after converging with Cajon Wash. Under the assumption or scenario that floods may become more frequent and more intense in the future, sensitive biological resources (both plant and animal species) within the LCRSP study area are

already adapted to a dynamic flood regime due to the inherent nature of the alluvial fan system. In fact, the dominant plant community, Riversidean alluvial fan sage scrub, depends upon floods to maintain the pioneer, intermediate, and mature phases. Without scouring flood events, this community would not support the diverse vegetative stature and species composition it currently does.

An additional consideration is the possibility that this scenario could result in floods that exceed the current 100-year floodplain limits (Figure 16, *Hydrologically Active RAFSS and SBKR Viable Constituent Elements*) or an expansion of the 100-year floodplain. Given the highly restricted distribution of Riversidean alluvial fan sage scrub and the associated and largely endemic sensitive species occurring within it (e.g. the San Bernardino kangaroo rat and slender-horned spineflower), this could result in an unexpected benefit to these species. The expansion of the amount of Riversidean alluvial fan sage scrub within the Lytle Creek Wash system may occur if areas currently above the 100-year floodplain were exposed to more frequent flooding. Although increased flood events could result in a reduction in the refugia habitat above the 100-year floodplain that is used by the San Bernardino kangaroo rat, it is not likely that a flood large enough to destroy all refugia within the Lytle/Cajon Wash system would occur. On the contrary, catastrophic floods may increase the availability of suitable habitat for this species along the outer limits of the currently existing floodplain.

Common plant and wildlife species occurring in, and adapted to, the upland habitat conditions (which are less restricted in distribution than the Riversidean alluvial fan sage scrub), would not be expected to be significantly affected to the extent that regional populations of these species would be threatened. Further, sensitive species are far less common in the upland habitats within the LCRSP study area than within the 100-year floodplain and Riversidean alluvial fan sage scrub areas and therefore would be negligibly affected by an expansion of the 100-year floodplain of Lytle Creek Wash.

For strictly riparian communities, such as that which exists in the Sycamore Flat riparian corridor, the community would be expected to expand away from the active channel into the floodplain with increasing rainfall and flood events. This would result in a higher water table and an expansion of saturated soils. Willow scrub is tolerant of sustained inundation and frequent flooding (Barbour et. al. 2007).

Increased Drought Scenario

Conversely, increased greenhouse gas emissions also have the potential to result in more frequent and severe droughts. This would have the effect of reduced annual precipitation as well as lower flood levels throughout the Lytle Creek Wash. Lower water levels and fewer flooding events may be detrimental to Riversidean alluvial fan sage scrub if these conditions persist for too long since this community depends upon episodic flooding to create new phases. According

to Smith (1980), mature phases of Riversidean alluvial fan sage scrub may be as old as 35 to 50 years. Lack of flood events within this mature phase of vegetation may slow regeneration of certain evergreen shrub species. However, it has been suggested that flooding of the mature phase within the uppermost terraces of Riversidean alluvial fan sage scrub habitat once or twice a century may be sufficient to allow regeneration and persistence of climax evergreen species characteristic of this phase. Therefore, it is unlikely that increased drought conditions would significantly affect this sensitive community unless there were a significant decrease in the frequency and magnitude of floods events. With respect to riparian communities such as the Sycamore Flat riparian corridor, drought conditions are tolerated to some extent due to the relatively shallow groundwater table but extended drought may reduce the width of the floodplain vegetation thereby restricting it to the main channel.

With respect to individual species, plant species occurring on-site are drought-tolerant and are generally adapted to fluctuations in environmental conditions. However, some plant species adjust to drought conditions by remaining dormant in the seed bank. This adaptation may affect the size of certain plant populations if droughts were to become more frequent and/or severe. However, this would not be expected to significantly affect populations of sensitive plants including the Plummer's mariposa lily and parry's spineflower known to occur on-site due to the relatively widespread occurrences of these species throughout the LCRSP study area.

For sensitive wildlife species, drought would likely have a domino effect up the food chain. Herbivores may have more limited food sources for the reasons described above which may in turn affect carnivores. However, as many of the species are adapted to semi-arid conditions and share characteristics with similar species occurring in the desert region, impacts as a result of drought are not expected to be significant.

Increased Wildfire Scenario

Another potential result of increased green house gas emissions is an increase in the frequency and intensity of wildfires in the vicinity of the LCRSP study area. This may be an indirect result of increased drought conditions described above. In addition to the obvious direct mortality of species caused by fire, indirect impacts may also occur. Certain plant communities within the LCRSP study area such as chaparral and scrub are adapted to a certain frequency of wildfires. However, the natural fire cycle for these communities within southern California is difficult to determine due to fire suppression and abatement practices over the years. Fire cycles for scrub and chaparral in inland southern California may be between 30 to 35 years (Ainsworth and Doss 1995). According to the California Chaparral Institute, chaparral communities are sensitive to fire intervals that are shorter than 15-20 years due to the time required to recover and produce new seed (2007).

With respect to sensitive plant and wildlife species occurring within the LCRSP study area, the scrub-type native habitats they depend upon are generally adapted to fire and would be expected to persist with increased frequency and intensity of wildfires. In addition, the Plummer's mariposa lily is also somewhat adapted to disturbances such as fire as it generally prefers openings in scrub and chaparral. However, fire tends to favor disturbance-followers such as non-native grasses. If fires occur too frequently, invasive species may eventually dominate resulting in a type-conversion from a native plant community such as chaparral to one dominated by non-native grasses. This would indirectly affect both common and sensitive plant and wildlife populations by displacing those that cannot adapt to non-native plant communities.

In conclusion, this analysis provides an environmental baseline and potential outcomes of climate change as they relate to plant and wildlife species that exist within the current climactic conditions of the LCRSP study area. The analysis provided above is qualitative in light of the lack of information regarding the magnitude and certainty of the potential future impacts associated with climate change and the difficulty in predicting the potential effects of climate change. The potential impacts described are generalizations as more detailed predictions cannot be made due to the speculative nature of potential future changes and impacts.

4.0 PROJECT RELATED IMPACTS

4.1 APPROACH TO THE ANALYSIS

The following discussion analyzes the potential impacts to plant and wildlife resources that may occur as a result of implementation of the proposed project. The CEQA Guidelines recognize three forms of potential impacts that are addressed herein: direct, indirect, and cumulative. As defined in the CEQA Guidelines, direct impacts, or physical changes, in the environment are those which are caused by and are immediately related to a project. For purposes of this assessment, direct impacts are considered to be those that involve the physical loss, modification, or disturbance of natural habitats (i.e., vegetation or plant communities), which in turn, directly affect plant and wildlife species dependent on that habitat. Direct impacts also include the destruction of individual plants or wildlife, which is typically the case in species of low mobility (i.e., plants, amphibians, reptiles, and small mammals).

Indirect impacts, as defined in the CEQA Guidelines, are those impacts or physical changes which are not immediately related to a project, but which are caused indirectly by a project. For purposes of this assessment, indirect impacts are considered to be those that involve the effects of increases in ambient levels of sensory stimuli (e.g., noise, light), unnatural predators (e.g., domestic cats and other non-native animals), and competitors (e.g., exotic plants, non-native animals). Indirect impacts may be associated with the construction and/or eventual habitation/operation of a project; therefore, these impacts may be both short-term and long-term in their duration. These impacts are commonly referred to as “edge effects” and may change the behavioral patterns of wildlife and reduce wildlife diversity and abundance in habitats adjacent to project sites. Cumulative impacts are discussed separately in Section 5.0.

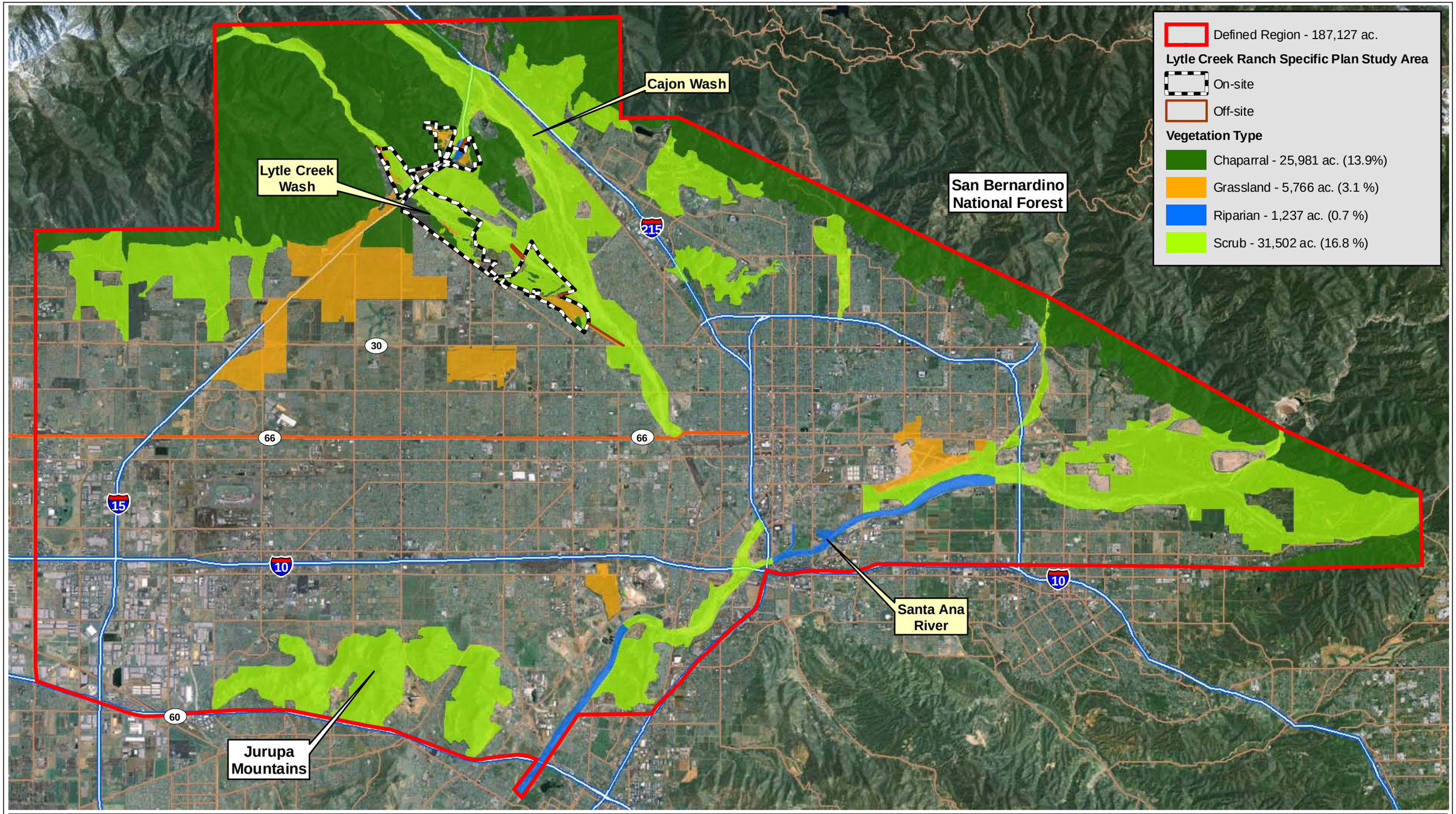
The determination of impacts in this analysis is based on both the features of the proposed project and the biological values of the habitat and/or sensitivity of plant and wildlife species. Relevant project features (e.g., limits of grading, proposed levee limits) were supplied by the project planner (KTGY Group, Inc.). Those portions of the proposed development area that abut Lytle Creek Wash will be stabilized with a levee. For purposes of this assessment, impact calculations are based upon the assumption that construction impacts will be contained within an 80 foot buffer beyond the toe of the levee where it is buried underground. Much of this information was supplied in digital format and impacts were calculated using GIS technology in order to maximize the accuracy and consistency of the assessment. Project design features that avoid, preserve, or restore biological resources are taken into consideration and specifically described below prior to the assessment of potential adverse impacts.

The biological values of resources within, adjacent to, and outside the area to be affected by the project were determined by consideration of several factors. These included: the overall size of habitats to be affected; the study area's previous land uses and disturbance history; the study areas surrounding environment and regional context; the on-site biological diversity and abundance; the presence of sensitive and special-status plant and wildlife species; the study area's importance to regional populations of these species; and the degree to which on-site habitats are limited or restricted in distribution on a regional basis and, therefore, are considered sensitive in and of themselves. Whereas this assessment is comprehensive, the focus is on sensitive plant communities/habitats, resources important to the regional biological systems, and special-status species.

4.1.1 Geographic Setting for Regional Analysis

As mentioned above, a regional perspective is useful in understanding the importance of on-site populations for many habitats and species. For the purposes of establishing a proper context for this impact analysis, the region is defined to be bordered by Haven Avenue on the west, the lower elevation slopes of the mountains leading into the Angeles and San Bernardino National Forests on the north, and generally, but inclusive of, the Jurupa Mountains and the Santa Ana River to the south and east, respectively (Figure 17, *Regional Impact Analysis Study Area*, on page 97). The northern and eastern boundary along the foothills reaches a maximum elevation of 3,500 feet above MSL where the same habitats characterizing the study area generally transition into montane habitats. Farther north and east, deep canyons and high elevations characterize the landscape and represent a different set of habitat types, elevation gradients, and suite of plant and wildlife species than those found within the defined region. The southern boundary is generally congruent with the northern boundary of urban development within metropolitan western Riverside County. The western boundary delineates the eastern limit of dense urban development and is therefore an appropriate boundary from a biological perspective.

Within this geographically defined area, the amount of potentially suitable habitat available for species dependent upon sage scrub communities, including Riversidean alluvial fan sage scrub, is approximately 31,502 acres. For species dependent upon more open habitat including grasslands and agriculture, approximately 5,766 acres of suitable habitat are available within the region. The region supports 25,981 acres and 1,237 acres of potentially suitable habitat for chaparral-dependent and riparian-restricted species, respectively (Table 8, *Regional Inventory of General Habitat Types*, on page 98).



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Source: Aerial Express, 2007; PCR Services Corporation, 2009.

Figure 17

Lytle Creek Ranch Specific Plan Regional Impacts Analysis Study Area

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Table 8

Regional Inventory of General Habitat Types

General Habitat Type	Defined Region (acres)	Study Area (acres)	Percent (%) of Region within Study Area
Scrub (including RAFSS)	31,502	1,252.8	4.0 %
Chaparral	25,981	363.3	1.4 %
Grassland (including other open areas such as vineyards, golf courses, and agriculture)	5,766	371.7[b]	6.4 %
Riparian	1,237	38.4[c]	3.1 %
TOTAL [a]	**64,486**	**2,026.2**	**3.1 %**

[a] *Total habitat acreage represented (2,026.2 acres) within the LCRSP study area does not equal the total acreage for the LCRSP study area (2,466.5 acres) represented elsewhere in the analysis due to exclusion of developed areas for purposes of this regional analysis. In addition, a total of approximately 64,486 acres of habitat were mapped within the 187,127-acre region. The difference is primarily a reflection of the amount of existing development in the defined region.*

[b] *Within the LCRSP study area grassland communities include grasslands and combinations thereof (156.9 acres), golf course (158.6 acres), and ruderal (56.2 acres).*

[c] *Within the LCRSP study area grassland communities include grasslands and combinations thereof (156.9 acres), golf course (158.6 acres), and ruderal (56.2 acres).*

Source: PCR Services Corporation 2009.

4.2 THRESHOLDS OF SIGNIFICANCE

The environmental impacts relative to biological resources were assessed using impact significance threshold criteria which mirror the policy statement contained in CEQA, Section 21001(c) of the California Public Resources Code. Accordingly, the State Legislature has established it to be the policy of the state to:

> *"Prevent the elimination of fish or wildlife species due to man's activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities..."*

Determining whether a project may have a significant effect or impact plays a critical role in the CEQA process. According to CEQA, Section 15064.7, Thresholds of Significance, each public agency is encouraged to develop and adopt (by ordinance, resolution, rule, or regulation) thresholds of significance that the agency uses in determining the significance of environmental effects. A threshold of significance is an identifiable quantitative, qualitative or performance level of a particular environmental standard, the non-compliance of which will normally lead to a finding of significance by the agency. In the development of significance thresholds for impacts to biological resources, CEQA provides guidance primarily in Section 15065, Mandatory

Findings of Significance, and the CEQA Guidelines, Appendix G, Environmental Checklist Form. Section 15065(a) states that a project may have a significant effect where:

> *"The project has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or wildlife community, substantially reduce the number or restrict the range of an endangered, rare, or threatened species,"*

Appendix G of the CEQA Guidelines is more specific in addressing biological resources and encompasses a broader range of resources to be considered, including: candidate, sensitive, or special status species; riparian habitat or other sensitive natural communities; federally-protected wetlands; fish and wildlife movement corridors; local policies or ordinances protecting biological resources; and, adopted Habitat Conservation Plans (HCPs). This is done in the form of a checklist of questions to be answered during the Initial Study leading to the preparation of the appropriate environmental documentation for a project (i.e., Negative Declaration, Mitigated Negative Declaration, or EIR). Because these questions are derived from standards in other laws, regulations, and other commonly used thresholds, it is reasonable to use these standards as a basis for defining significance thresholds in an EIR. The City of Rialto has adopted the significance thresholds checklist within Appendix G of the CEQA Guidelines. Therefore, for the purpose of this analysis, impacts to biological resources are considered potentially significant[7] (before considering offsetting mitigation measures) if implementation of the proposed project would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS.

2. Have a substantial adverse effect on a riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFG or USFWS.

[7] *This Biological Resources Assessment uses the terms "potentially significant impact" and "significant impact" to differentiate between the impact before mitigation is applied and after mitigation is applied. In many cases, an impact is identified as "potentially significant" because the project's effect on the environmental resource exceeds the stated threshold of significance. However, at this point in the analysis, mitigation has not been applied to assess whether implementation of the proposed mitigation measure can mitigate the impact to below a level of significance. If, after application of all feasible mitigation measures, the impact can be reduced to below a level of significance, then the "potentially significant impact" will be determined to be "less than significant." If, however, there are no feasible mitigation measures to reduce the potentially significant impact to less than significant, then the impact will be found to be "significant."*

3. Have a substantial adverse effect on federally-protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native nursery sites.

5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state Habitat Conservation Plan.

In accordance with these requirements, the proposed project would normally be deemed to produce a significant or potentially significant biological resource impact if the project or if project-related activities were to:

7. Result in a violation of any applicable regulations promulgated by a State or federal resource agency for the protection of rare, threatened, endangered, or otherwise protected species and their habitats, including wetlands.

8. Result in a violation of any applicable State or federal laws prohibiting the elimination or net reduction in a site's or an area's biological value through either direct removal of sensitive or protected on-site or near-site biological resources or through the direct or indirect disruption or interference with those resources whose impact is not substantially offset through the avoidance of such impacts or through the provision of substitute resources or environs or other measures providing reasonable and relatively equivalent compensation for such impacts.

Section 1600 of the CFGC finds and declares "that the protection and conservation of the fish and wildlife resources of this state are of utmost public interest. Fish and wildlife are the property of the people and provide a major contribution to the economy of the state, as well as providing a significant part of the people's food supply; therefore their conservation is a proper responsibility of the state." In order to protect those resources, CFGC Section 1602 prohibits activities that "substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake" unless certain conditions are satisfied. In accordance

therewith, the proposed project would be deemed to create a significant or potentially significant biological resource impact if the project or project-related activities were to:

9. Substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

For the purposes of this impact analysis the following definitions apply:

- "Substantial adverse effect" means a significant loss or harm of a magnitude that, based on current scientific data and knowledge would: (1) cause a species or a native plant or animal community to drop below self-perpetuating levels on a Statewide or regional basis; (2) cause a species to become threatened or endangered; (3) substantially reduce population numbers of a listed, candidate, sensitive, rare, or other special status species or: (4) eliminate or substantially impair the functions and values of a biological resource (e.g., streams, wetlands, or oak woodlands) in a geographical area defined by interrelated biological components and systems. As discussed above in Section 4.1.1, the region is defined to be bordered by Haven Avenue on the west, the lower elevation slopes of the mountains leading into the Angeles and San Bernardino National Forests on the north, and the Jurupa Mountains and Santa Ana River to the south and east, respectively.

- "Conflict" means contradiction of a magnitude, which based on foreseeable circumstances would preclude or prevent substantial compliance.

- "Rare" means: (1) that the species exists in such small numbers throughout all, or a significant portion of, its range that it may become endangered if its environment worsens; (2) the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in the FESA; or (3) the species is endangered, rare, or threatened as listed in Section 670.5, Title 14, California Code of Regulations or Title 50, Code of Federal Regulations Section 17.11 or 17.12 pursuant to the FESA as rare, threatened, or endangered (14 California Code of Regulations Section 15380 (b) – (c).).

Moreover, the FESA provides legal protection for threatened and endangered species nationwide. California has similar mandates, including the CESA, the California Species Preservation Act of 1980, and the California Native Plant Protection Act of 1977. Certain species listed as threatened or endangered by the USFWS and/or by the California Fish and Game Commission are also protected by the California Native Plant Protection Act. Certain

plant and animal taxa are considered sensitive as a result of their declining populations, vulnerability to habitat change, and restricted distributions and some habitats are considered sensitive biological resources. The CNPS compiles and maintains an inventory of sensitive plant species, including State and federally recognized rare plant species and those plants determined to be rare by that organization and other experts. In accordance with these requirements, the proposed project would normally be deemed to produce a significant or potentially significant biological resource impact if the project or if project-related activities were to:

- Result in a violation of any applicable regulations promulgated by a State or federal resource agency for the protection of rare, threatened, endangered, or otherwise protected species and their habitats, including wetlands.

- Result in a violation of any applicable State or federal laws prohibiting the elimination or net reduction in a site's or an area's biological value through either direct removal of sensitive or protected on-site or near-site biological resources or through the direct or indirect disruption or interference with those resources whose impact is not substantially offset through the avoidance of such impacts or through the provision of substitute resources or environs or other measures providing reasonable and relatively equivalent compensation for such impacts.

4.3 PROJECT DESCRIPTION

The proposed Lytle Creek Ranch Specific Plan project, as depicted in the proposed land use plan, is a master-planned residential and mixed-use community that will support various land uses in four distinct geographic areas (i.e., Neighborhoods). Proposed land use types include varying density residential, mixed-use (mainly commercial, but may also include higher density residential and industrial), schools, open space/recreation, natural open space, and associated roads. This includes a maximum of 8,407 single-family detached, attached, and multi-family units, including approximately 1,325 dwelling units over 142 acres of mixed use development. The overall build-out density for the proposed project is 3.5 dwelling units per acre. The Specific Plan also proposed a maximum of 849,420 square feet of commercial uses.

Neighborhood I supports a portion of the LCNPD, proposed single-family residential, mixed use, and natural open space. Neighborhood II includes the existing El Rancho Verde Specific Plan area and is planned as a gated Active Adult golf course community. Neighborhood III is planned to include a mix of single-family detached and attached homes, as well as mixed-use development targeted at young families and families with children. Neighborhood IV is planned to include multi-family residential and mixed-use development.

The proposed project is designed as a new northern gateway to the City of Rialto. Development is proposed to be clustered along Riverside Avenue, Glen Helen Parkway, Clearwater Parkway, Lytle Creek Drive, and the I-15 corridor so as to maximize open space preservation. Open space will be in the form of parks, paseos, recreation centers, greenbelts, and natural open space. Proposed natural open space totals 829.2 acres and will include existing preservation areas including the existing 216.8-acre SBKR Conservation Area. This is composed of the 160.6-acre San Bernardino kangaroo rat conservation area previously set aside by Lytle Development Company for the long-term preservation of the species; the 52.2-acre San Bernardino kangaroo rat conservation area set aside by Lytle Development Company as mitigation in connection with the County's approval and adoption of the LCNPD; and four acres on the north side of I-15 purchased by the West Valley Water District for preservation of the San Bernardino kangaroo rat. No public trails will be constructed in the preserved natural open space areas and public access will not be allowed.

As mentioned above, also included within the study area boundaries are areas (approximately 137.8 acres) that are already entitled under the LCNPD (Figure 3, *Prescribed Land Uses*). Impacts to resources within these areas were analyzed in compliance with CEQA in the LCNPD EIR (certified by the County of San Bernardino in October 2001) and determined to be less than significant with mitigation. Portions of these areas have been disturbed by development activities (e.g., grading for roads and utilities for the LCNPD) and any existing habitat and/or vegetation removed. For the remaining previously-analyzed areas, the existing conditions were examined as part of the biological work for this report and compared against the description of existing conditions and analysis of biological resources impacts in the LCNPD EIR. No substantial changes to the existing conditions were identified requiring new analysis of environmental impacts due to the identification of new impacts or conditions not previously considered. The mitigation measures to address impacts to these areas which were adopted in connection with the County's certification of the LCNPD will be applied to these areas to address the previously-identified significant impacts. Therefore, these areas are excluded from this impact analysis.

In addition to these previously-entitled areas, there is an approximately 14.3-acre easement held by So Cal Gas that extends from the northeastern portion of Neighborhood I east of the I-15 to the southwestern boundary of Neighborhood III near the intersection of Sierra Avenue and Riverside Avenue which is approximately 100 feet wide and 11,300 feet in length. Under this easement, the So Cal Gas may, at some point in the future, propose to develop and/or improve drainage and access roads along a 7.5 acres section within Neighborhood I and the adjacent County Parks parcel. However, any potential future impacts within this easement in Neighborhood I and north through the County Parks area will be addressed by So Cal Gas, and are not considered by this Biological Resources Assessment as off-site impacts, and are not a component of the LCRSP project. Off-site impacts associated with the proposed project will result from a 2.3-acre access road under the I-15 Freeway that will be improved by the project

between Neighborhoods III and IV; an approximately 2.6-acre existing utility road situated near the southeastern end of Neighborhood II; an 10.1-acre area associated with proposed improvements to an off-site levee north of Neighborhood II; and a 0.6-acre area north of Neighborhood IV and south of Neighborhood II that will be temporarily impacted during levee construction.

4.3.1 Non-Project-Related Impacts along Gas Company Easement in Neighborhood I and Off-site

As previously described, a 7.5-acre portion of the So Cal Gas easement traverses Neighborhood I (totaling 3.9 acres) and the off-site County Parks property to the north (totaling 3.6 acres) and, although not related to the Lytle Creek Ranch Specific Plan project, may eventually result in impacts associated with grading or improvement activities. Potential impacts include the removal or disturbance of 0.4 acre (0.3 acre on-site and 0.1 acre off-site) of mule fat scrub, 0.7 acre of southern willow scrub (0.4 acre on-site and 0.3 acre off-site), 0.1 acre off-site of ruderal, and 0.1 acre on-site of California buckwheat scrub/disturbed as shown in Table 9, *Impacts to Plant Communities within the So Cal Gas Easement*, on page 105.

4.4 PROJECT DESIGN FEATURES

4.4.1 Avoidance Features

The proposed project includes the avoidance and long-term preservation of Lytle Creek Wash and its associated Riversidean alluvial fan sage scrub, as well as a large portion of the Sycamore Flat riparian corridor and hillsides within Neighborhood I. In total, approximately 829.2 acres of open space within the study area (33.9 percent of the study area), including 216.8 acres already established as the SBKR Conservation Area, will be set-aside in perpetuity. This will also have the positive effect of avoiding and preserving an estimated 466,000 Parry's spineflower plants within the largest populations mapped within the study area; and, a contiguous corridor for wildlife movement will be maintained along Lytle Creek Wash where it courses through the study area.

4.4.2 Protection Elements

4.4.2.1 Nesting Birds

The study area supports trees and shrubs in some areas which could be used by breeding raptors and songbirds. In addition, burrowing owls could utilize burrows on-site for nesting although none have been detected to date within the proposed development footprint. Nesting

Table 9

Impacts to Plant Communities within the So Cal Gas Easement

Plant Community	Existing (acres)		Impacts (acres)	
	On-site	Off-site	On-site	Off-site
Mule Fat Scrub	1.0	0.7	0.3	0.1
Developed	0.0	0.1	0.0	0.0
Southern Willow Scrub	1.8	1.9	0.4	0.3
Ruderal	0.0	0.9	0.0	0.1
Disturbed	0.1	0.0	0.0	0.0
California Buckwheat Scrub/Disturbed	1.0	0.0	0.1	0.0
Total	**3.9**	**3.6**	**0.8**	**0.5**

Source: PCR Services Corporation, 2009

activity typically occurs from February 15 to August 31. To protect nesting birds regulated by the Migratory Bird Treaty Act (MBTA), efforts will be made to schedule vegetation removal between September 1 and February 14 to avoid the nesting season. This would ensure that no active nests would be disturbed. If clearing and/or grading activities cannot be avoided during the nesting season, all suitable habitat will be thoroughly surveyed for the presence of nesting birds by a qualified biologist prior to removal. If any active nests are detected, the area will be flagged, along with a minimum 100-foot buffer (buffer may range between 100 and 300 feet as determined by the monitoring biologist), and will be avoided until the nesting cycle is complete or it is determined by the monitoring biologist that the nest has failed. In addition, a biologist will be present on the site to monitor any vegetation removal to ensure that nests not detected during the initial survey are not disturbed.

4.4.2.2 Burrowing Owl

In order to avoid impacts to any burrowing owls that may colonize the development impact footprint prior to commencement of construction activities, a Phase III protocol survey shall be conducted within 30 days of initiation of ground disturbing activities (California Burrowing Owl Consortium 1993). This preconstruction survey would entail four separate days between two hours before sunset to one hour after or one hour before sunrise to two hours after. This survey applies during both the breeding season (February 1 through August 31) as well as the non-breeding season when wintering owls are most likely detected if present (December 1 through January 31). If burrowing owls are detected within the development impact footprint or within approximately 150 feet of the impact area, on-site passive relocation would be conducted during the non-breeding season in accordance with the established protocol (California Burrowing Owl Consortium 1993).

4.4.2.3 Landscape Design Features

In general, landscaping will be designed to reflect the area's historic agrarian theme as well as the native vegetation and habitat of Lytle Creek Wash. The proposed project will restrict landscape plantings to non-invasive plant species for common areas adjacent to open space in order to minimize potential indirect affects to vegetation within these open space areas. Further, where appropriate, landscaping will consist of drought-tolerant, native species.

4.5 IMPACTS FOUND TO BE LESS THAN SIGNIFICANT

Those impacts determined to be less than significant include impacts to biological resources that are relatively common or exist in a degraded or disturbed state, rendering them less valuable as habitat, or impacts which do not meet or exceed the significance thresholds. Also, conclusions are based on conditions of species ecology and the resource's regional distribution and status. Potential impacts found to be less than significant are discussed below. Throughout the discussion of impacts, the thresholds are referenced by number as outlined in Section 4.2.

4.5.1 Less than Significant Impacts to Non-Sensitive Plant Communities

As shown in Table 10, *Impacts to Plant Communities*, on page 107 and Figure 18, *Impacts to Plant Communities/Habitats (Neighborhood I)*, on page 109, Figure 19, *Impacts to Plant Communities/Habitats (Neighborhood II)*, on page 110, Figure 20, *Impacts to Plant Communities/Habitats (Neighborhood III east)*, on page 111, Figure 21, *Impacts to Plant Communities/Habitats (Neighborhood III west)*, on page 112, and Figure 22, *Impacts to Plant Communities/Habitats (Neighborhood IV)*, on page 113, project implementation would result in direct impacts to 894.8 acres (889.9 acres on-site and 4.9 acres off-site) of non-sensitive plant communities as footnoted in Table 9, *Impacts to Plant Communities*. Temporary impacts to non-sensitive plant communities includes 8.1 acres (5.1 acres on-site and 3.0 acres off-site) which will occur as a result of grading and grubbing activities within the 80 foot temporary construction zones associated with the levee and road under the I-15 constructions. Specifically, direct and temporary impacts include the removal of: (1) 13.9 acres (13.5 acres on-site and 0.4 acre off-site resulting from construction of the levee) of permanent and 0.7 acre off-site of temporary impacts to monotypic and mixed Riversidean sage scrub; (2) 40.9 acres (40.6 acres on-site and 0.3 acre off-site as a result of constructing the road under I-15) of permanent impacts to monotypic and mixed California buckwheat scrub; (3) 34.9 acres on-site permanent impacts to monotypic and mixed California sagebrush-California buckwheat scrub; (4) 187.2 acres on-site of permanent and 0.7 acre on-site of temporary impacts of monotypic and mixed chaparral communities; (5) 1.7 acres on-site of permanent impacts to monotypic and mixed mule fat scrub; (6) 119.9 acres on-site of permanent and 3.2 acres on-site of temporary impacts to monotypic

Table 10

Impacts to Plant Communities

		Impacts to On-Site Portion						Impacts to Off-Site Portion							
	Existing within LCRSP Study Area	LCRSP Project Site	SoCalGas Easement[c]		LCNPD[d]	80-foot Temporary Levee Construct. Zone	Existing Utility Road Easement	SoCalGas Easement[c]		Road Under I-15 Freeway[e]		Off-Site Levee[e]		Impacted within the LCRSP Study Area[f, g]	
Plant Community[a]		**Perm**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**	**Perm**	**Temp**
Scrub Communities															
Riversidean Sage Scrub	13.7	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	13.0	0.7
Riversidean Sage Scrub/Non-Native Grassland	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0
Riversidean Alluvial Fan Sage Scrub (Pioneer)[b]	490.0	54.6	0.0	0.0	0.0	17.2	0.0	0.0	0.0	0.0	0.0	1.6	4.2	56.2	21.4
Riversidean Alluvial Fan Sage Scrub (Intermediate)[b]	358.4	171.8	0.0	0.0	0.0	14.5	0.0	0.0	0.0	0.0	0.1	0.2	1.3	172.0	15.9
Riversidean Alluvial Fan Sage Scrub (Intermediate)/ Non-Native Grassland[b]	31.9	25.4	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.4	1.9
Riversidean Alluvial Fan Sage Scrub (Intermediate)/Disturbed[b]	16.1	15.8	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	15.8	0.3
Riversidean Alluvial Fan Sage Scrub (Mature)[b]	208.0	169.3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	169.3	2.1
Riversidean Alluvial Fan Sage Scrub (Mature)/Chamise Chaparral[b]	39.3	39.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.3	0.0
White Sage Scrub[b]	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California Buckwheat Scrub	34.0	33.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	33.8	0.0
California Buckwheat Scrub/Non-Native Grassland	2.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0
California Buckwheat Scrub/Disturbed	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California Buckwheat Scrub/ Ruderal	4.4	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0
California Sagebrush-California Buckwheat Scrub	5.3	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0
California Sagebrush-California Buckwheat Scrub/Disturbed	30.1	29.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.6	0.0
Subtotal[h]	*1,252.8*	*565.2*	*0.0*	*0.0*	*0.0*	*35.7*	*0.0*	*0.0*	*0.0*	*0.3*	*0.3*	*2.2*	*6.3*	*567.7*	*42.3*
Chaparral Communities															
Northern Mixed Chaparral	20.6	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6	0.0
Northern Mixed Chaparral/ Non-Native Grassland	52.6	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.4	0.0
Chamise Chaparral	240.9	148.8	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	148.8	0.7
Chamise Chaparral/ Non-Native Grassland	47.5	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0
Chamise Chaparral/Ruderal	1.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Subtotal[h]	*363.3*	*187.2*	*0.0*	*0.0*	*0.0*	*0.7*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*187.2*	*0.7*
Grassland Communities															
Non-Native Grassland	32.8	28.8	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.8	2.5
Non-Native Grassland/ Riversidean Sage Scrub	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Native Grassland/ Riversidean Alluvial Fan Sage Scrub (Intermediate)	21.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0
Non-Native Grassland/ California Buckwheat Scrub	69.2	47.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.7	0.0
Non-Native Grassland/ Chamise Chaparral	24.1	22.4	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.4	0.7
Subtotal[h]	*156.9*	*119.9*	*0.0*	*0.0*	*0.0*	*3.2*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*119.9*	*3.2*
Riparian Communities															
Southern Cottonwood Willow Riparian[b]	1.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0
Southern Willow Scrub[b]	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
California Sycamore Alliance[b]	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Mule Fat Scrub	4.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0
Mule Fat Scrub/Disturbed	2.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Subtotal[h]	*28.5*	*3.6*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*3.6*	*0.0*
Disturbed Communities															
Basin	9.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	0.0
Ruderal	56.2	47.8	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.8	0.4

Table 10 (Continued)

Impacts to Plant Communities

Plant Community[a]	Existing within LCRSP Study Area	Impacts to On-Site Portion: LCRSP Project Site Perm	SoCalGas Easement[c] Perm	SoCalGas Easement[c] Temp	LCNPD[d] Perm	80-foot Temporary Levee Construct. Zone Temp	Existing Utility Road Easement Perm	Impacts to Off-Site Portion: SoCalGas Easement[c] Perm	SoCalGas Easement[c] Temp	Road Under I-15 Freeway[e] Perm	Road Under I-15 Freeway[e] Temp	Off-Site Levee[e] Perm	Off-Site Levee[e] Temp	Impacted within the LCRSP Study Area[f, g] Perm	Impacted within the LCRSP Study Area[f, g] Temp
Disturbed	328.1	211.3	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.5	0.7	2.6	0.0	214.4	1.5
Disturbed/Riversidean Alluvial Fan Sage Scrub (Intermediate)	9.5	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	0.0
Disturbed/Northern Mixed Chaparral	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0
Golf Course	158.6	158.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	158.6	0.0
Ornamental	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
Subtotal[h]	*568.7*	*443.5*	*0.0*	*0.0*	*0.0*	*1.2*	*0.0*	*0.0*	*0.0*	*0.5*	*0.7*	*2.6*	*0.0*	*446.6*	*1.9*
Developed Communities															
Developed	96.3	48.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.6	1.6	49.7	1.6
Subtotal[h]	*96.3*	*48.6*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.5*	*0.0*	*0.6*	*1.6*	*49.7*	*1.6*
Total[h]	***2,466.5[f]***	***1,368.0***	***0.0***	***0.0***	***0.0***	***40.8***	***0.0***	***0.0***	***0.0***	***1.3***	***1.0***	***5.4***	***7.9***	***1,374.7***	***49.7***

[a] *The plant communities are composed of numerous plant species. General plant species observations were completed during the 2004, 2005, 2006, and 2007 surveys of the LCRSP study area.*

[b] *Plant communities considered rare or warranting consideration by the CNDDB.*

[c] *So Cal Gas holds a 7.5-acre, 100-foot-wide easement for a natural gas line which traverses a portion of Neighborhood I and continues off the project site. The land use planning for the LCRSP study area takes into account this existing easement (which includes a 3.9-acre segment through Neighborhood I and a 3.6-acre segment which extends off the site to the north). There is currently a 16-foot wide maintenance road that runs within and through the easement area. The project proposes no improvements within the utility easement area; however, it is anticipated that So Cal Gas, at a future date and independent of the LCRSP project, may undertake improvements to the existing maintenance road, including installing rip-rap and constructing a V-ditch in this easement area to address drainage and erosion issues. Those improvements will be addressed independent of the LCRSP project.*

[d] *Acreage in this column represents the portion of this community that falls within the area previously entitled for development as part of the County-approved LCNPD.*

[e] *Off-site areas include 2.6-acre existing utility road at the downstream end of Neighborhood II, 2.3-acre road under the I-15 Freeway, 3.6-acre segment of the So Cal Gas easement (that is connected to the 3.9-acre on-site segment), 10.1-acre area associated with the off-site levee north of Neighborhood II; and 0.6-acre area south of Neighborhood II and north of Neighborhood IV that will be impacted by the construction of the proposed levee.*

[f] *Not included herein is the 0.7 off-site acre area associated with the existing Lytle Creek Road right-of-way which will be impacted as a result of the removal and replacement of storm drain facilities south of Neighborhood IV. Because these improvements will be made within an existing developed area, no biological resource impacts are anticipated.*

[g] *It should be noted that Table 10 calculates the total area of impacts to plant communities to be 1,368 acres on-site and 1,374.7 acres when the off-site areas that were included in the LCRSP Study Area were taken into consideration. This figure differs from the "Total Graded Acreage" of 1,539.3 acres that was identified in the project grading plans. The difference between the two acreage figures is 171.3 acres. The land that comprises the 171.3 acres is land that has been previously disturbed and therefore not included as "Total Area of Disturbance" which is defined to mean land which is in an undeveloped, "natural" state presently and which will be graded or its vegetation otherwise disturbed as part of the proposed Lytle Creek Ranch Development. All of the 171.3 acres omitted from the "Total Area of Disturbance" have already been graded or its vegetation disturbed or removed. Moreover, 137.8 acres of the 171.3 acres were previously analyzed, and its impacts addressed and mitigated for as part of the development and permitting of the Lytle Creek North project. Of the remaining areas, the rest were previously disturbed during construction of roads and the SCE easement work within Neighborhoods III and IV. Therefore, as these areas were already graded or its vegetation removed, these areas were not considered either "undeveloped" or in a "natural state" and were not included within the calculation of "Total Area of Disturbance" for purposes of this biological analysis. Nevertheless, because these areas will most likely require remedial grading, the acreage was included within the grading plan and considered part of the "Total Graded Acreage" of 1,539.3 acres. These 171.3 acres should also be distinguished from the other acreage included in Table 10 and designated as "Disturbed." Those acres consist of land that has been disturbed due to constant edge effects from human activities along Glen Helen Parkway; operations at CEMEX and Vulcan Materials; and areas that were previously burned along Riverside Avenue during the fires in 2006 and 2007, and were included in the BRA's total of "Total Area of Disturbance" because none of these lands had been previously analyzed as part of another development project nor had impacts to these areas been previously permitted or mitigated.*

[h] *Due to rounding of GIS calculated acreages throughout the table to the neaerst0.1 acre, plant community acreages ma not add to the exact subtotals and totals indicated.*

Source: PCR Services Corporation, 2009

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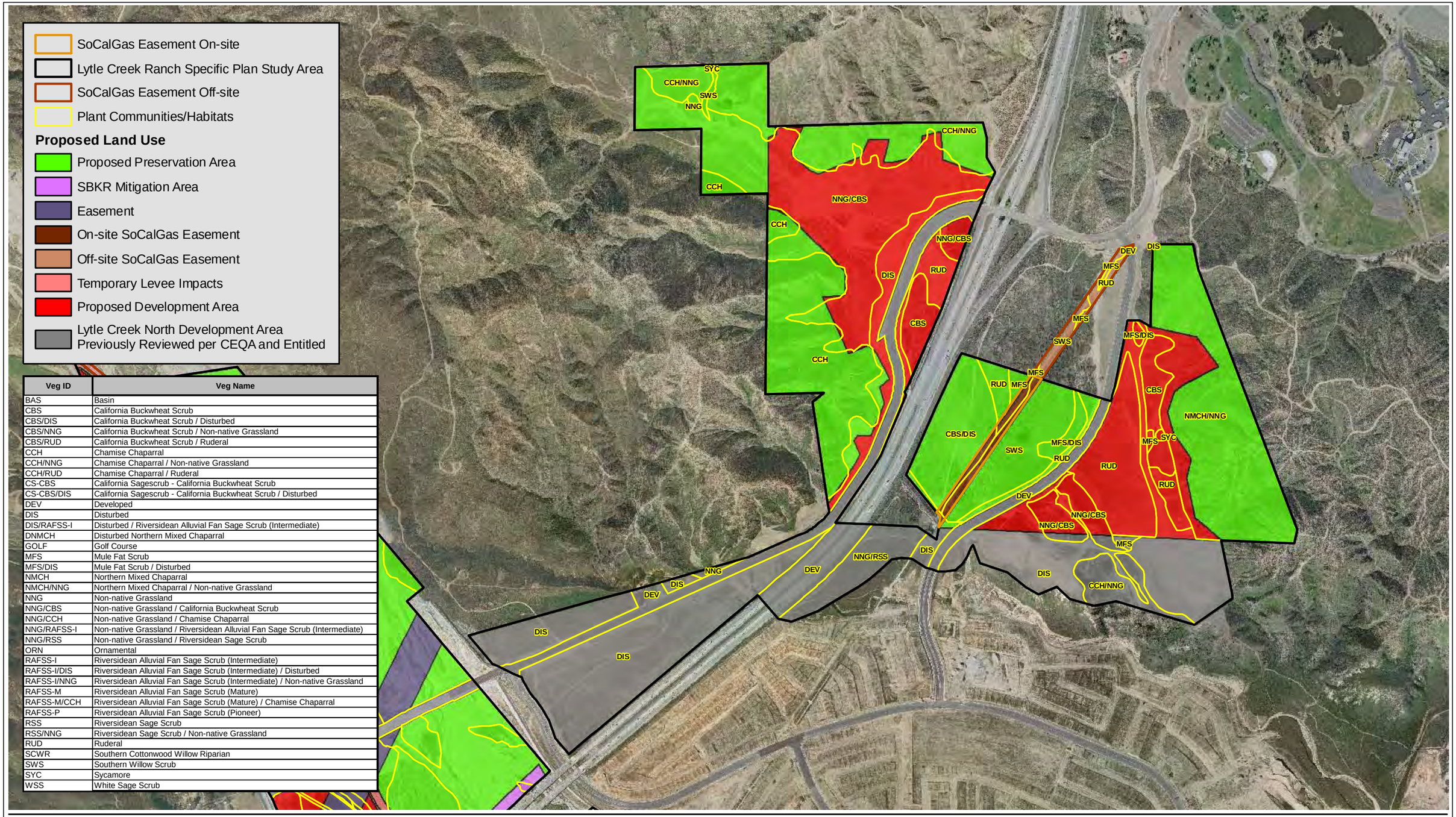


Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

N

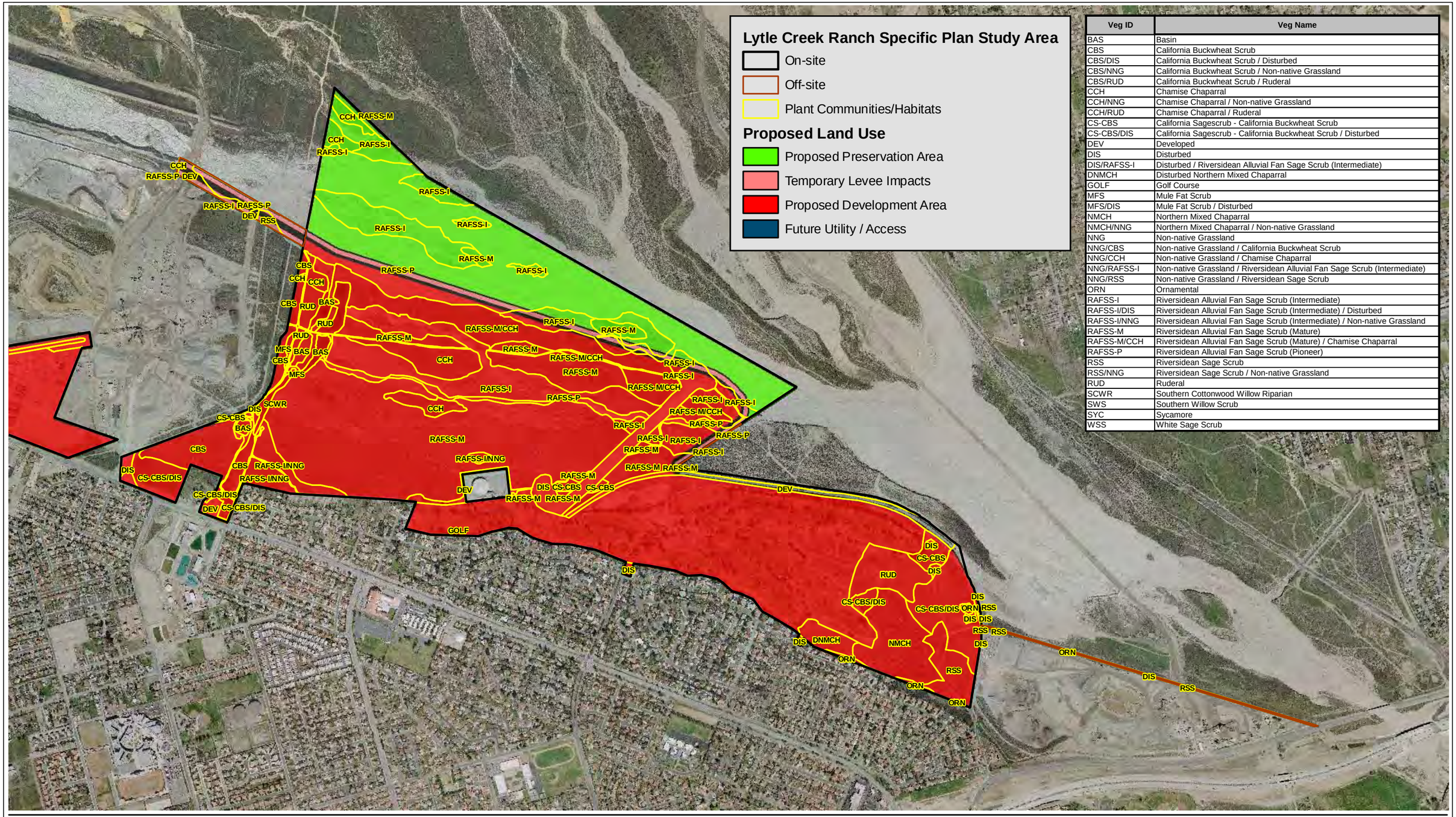
900 0 900 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 18

Lytle Creek Ranch Specific Plan

Impacts to Plant Communities/Habitats (Neighborhood I)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

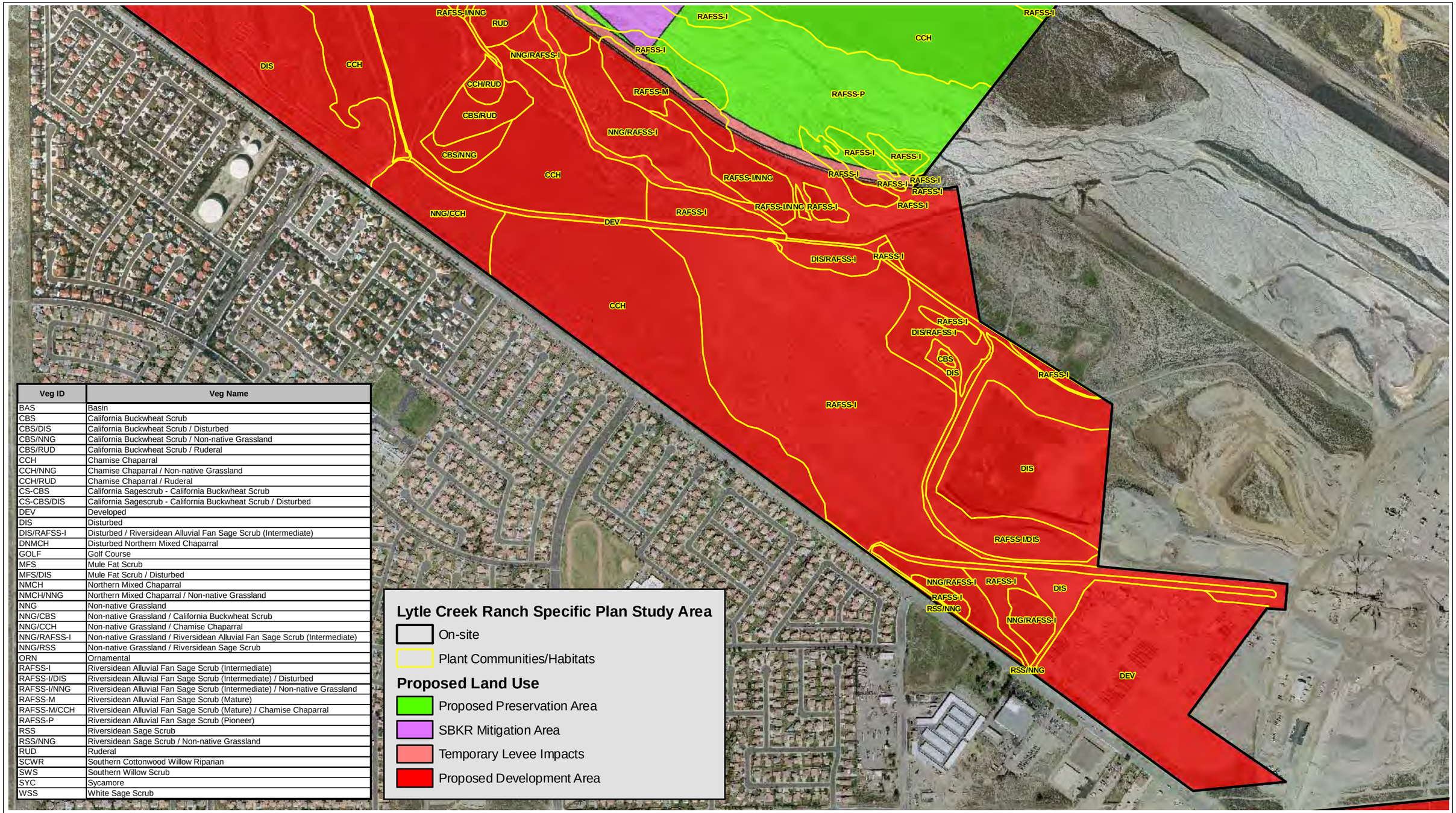
N

1,250 0 1,250 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 19

Lytle Creek Ranch Specific Plan
Impacts to Plant Communities/Habitats (Neighborhood II)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

N

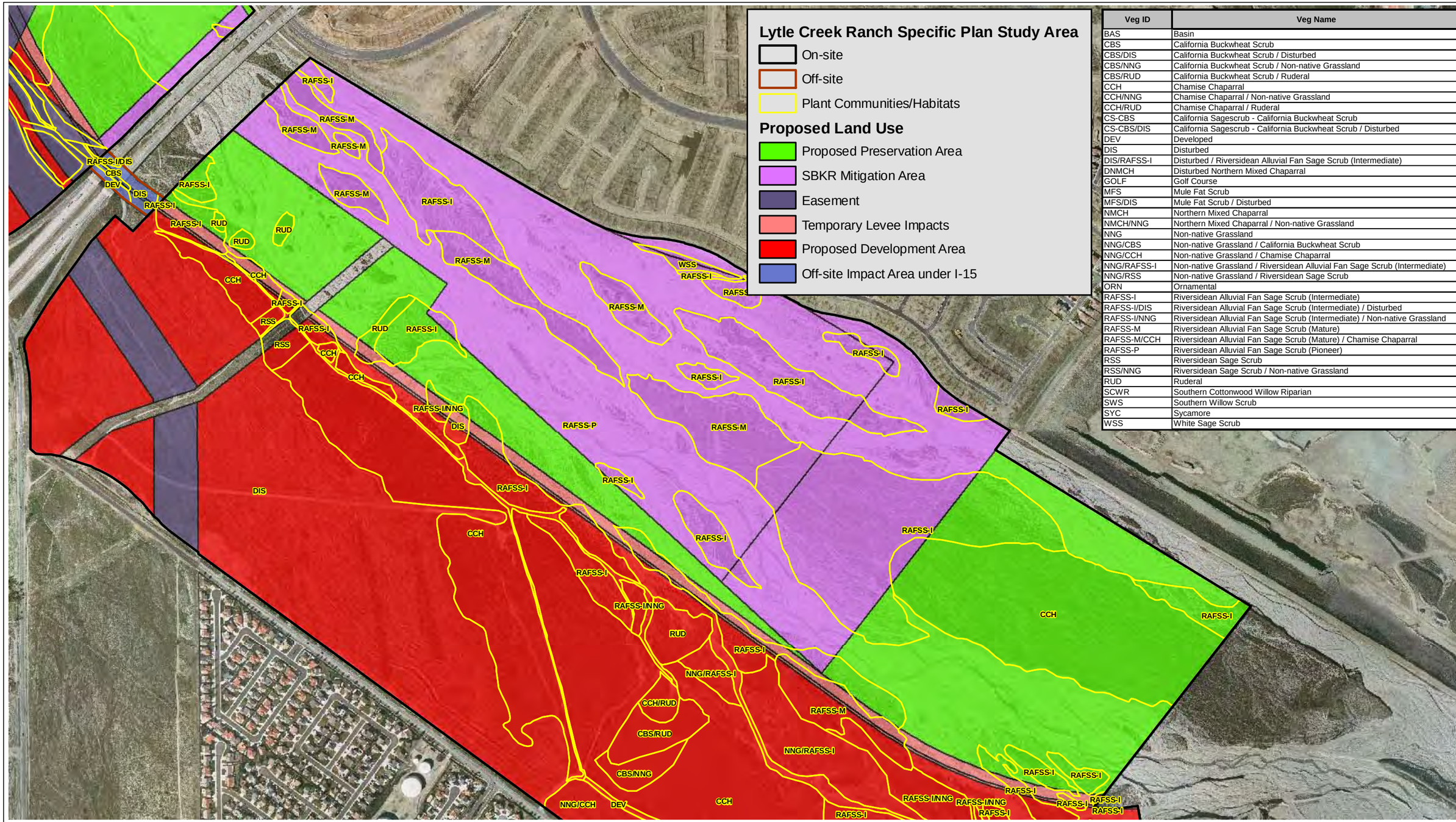
700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 20

Lytle Creek Ranch Specific Plan

Impacts to Plant Communities/Habitats (Neighborhood III East)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

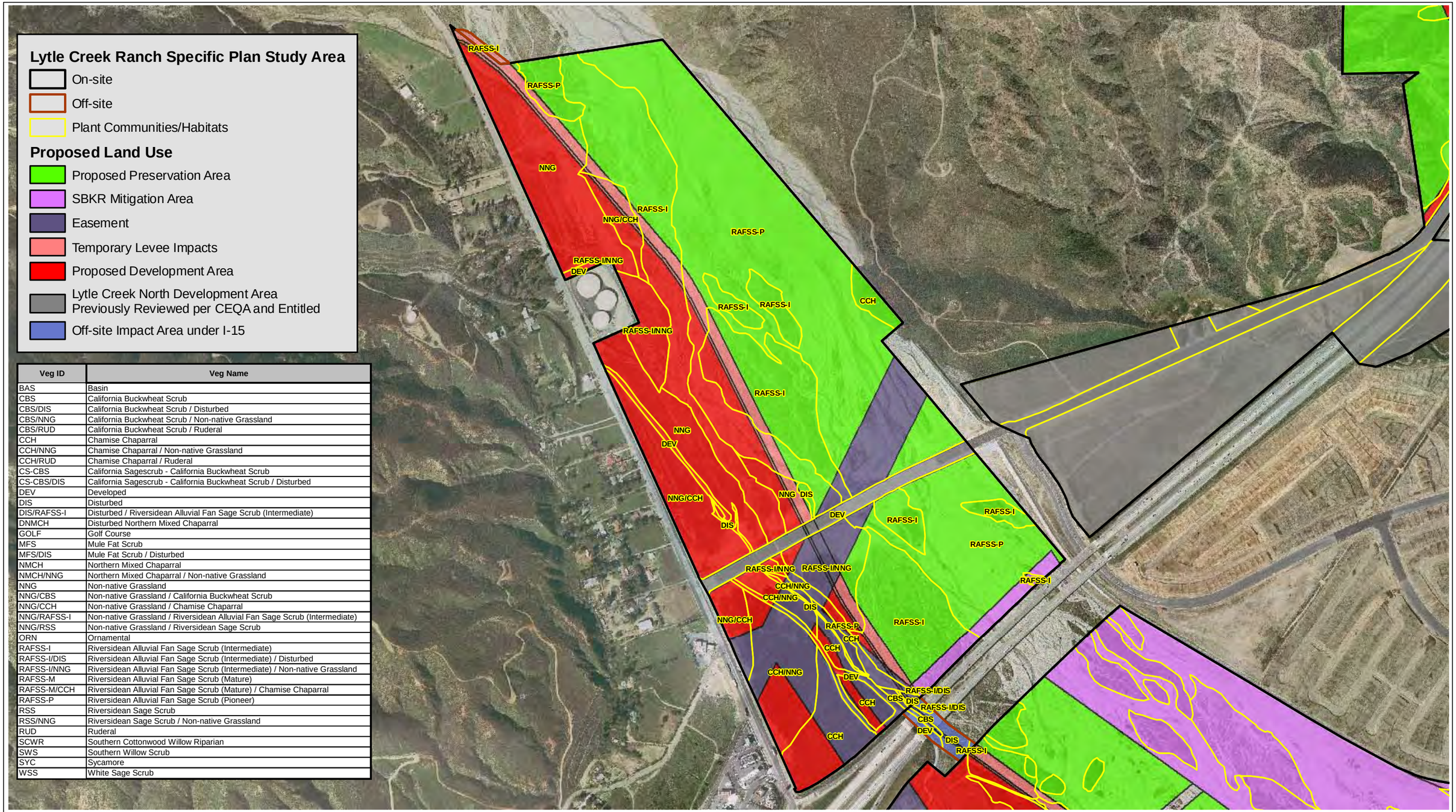
N

700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 21

Lytle Creek Ranch Specific Plan
Impacts to Plant Communities/Habitats (Neighborhood III West)



Veg ID	Veg Name
BAS	Basin
CBS	California Buckwheat Scrub
CBS/DIS	California Buckwheat Scrub / Disturbed
CBS/NNG	California Buckwheat Scrub / Non-native Grassland
CBS/RUD	California Buckwheat Scrub / Ruderal
CCH	Chamise Chaparral
CCH/NNG	Chamise Chaparral / Non-native Grassland
CCH/RUD	Chamise Chaparral / Ruderal
CS-CBS	California Sagescrub - California Buckwheat Scrub
CS-CBS/DIS	California Sagescrub - California Buckwheat Scrub / Disturbed
DEV	Developed
DIS	Disturbed
DIS/RAFSS-I	Disturbed / Riversidean Alluvial Fan Sage Scrub (Intermediate)
DNMCH	Disturbed Northern Mixed Chaparral
GOLF	Golf Course
MFS	Mule Fat Scrub
MFS/DIS	Mule Fat Scrub / Disturbed
NMCH	Northern Mixed Chaparral
NMCH/NNG	Northern Mixed Chaparral / Non-native Grassland
NNG	Non-native Grassland
NNG/CBS	Non-native Grassland / California Buckwheat Scrub
NNG/CCH	Non-native Grassland / Chamise Chaparral
NNG/RAFSS-I	Non-native Grassland / Riversidean Alluvial Fan Sage Scrub (Intermediate)
NNG/RSS	Non-native Grassland / Riversidean Sage Scrub
ORN	Ornamental
RAFSS-I	Riversidean Alluvial Fan Sage Scrub (Intermediate)
RAFSS-I/DIS	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Disturbed
RAFSS-I/NNG	Riversidean Alluvial Fan Sage Scrub (Intermediate) / Non-native Grassland
RAFSS-M	Riversidean Alluvial Fan Sage Scrub (Mature)
RAFSS-M/CCH	Riversidean Alluvial Fan Sage Scrub (Mature) / Chamise Chaparral
RAFSS-P	Riversidean Alluvial Fan Sage Scrub (Pioneer)
RSS	Riversidean Sage Scrub
RSS/NNG	Riversidean Sage Scrub / Non-native Grassland
RUD	Ruderal
SCWR	Southern Cottonwood Willow Riparian
SWS	Southern Willow Scrub
SYC	Sycamore
WSS	White Sage Scrub

PCR

N

700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 22

Lytle Creek Ranch Specific Plan
Impacts to Plant Communities/Habitats (Neighborhood IV)

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and mixed non-native grassland; (7) 9.9 acres on-site of permanent impacts to basin; (8) 47.8 acres on-site of permanent and 0.4 acre on-site of temporary impacts to ruderal; (9) 228.8 acres (225.7 acres on-site and 3.1 acres off-site as a result of construction the road under I-15 and the levee) of permanent and 1.5 acres (0.8 acre on-site as a result of constructing the levee and 0.7 acre off-site as a result of construction the road under the I-15) of temporary impacts to disturbed and mixed disturbed communities; (10) 158.6 acres on-site of permanent impacts to golf course; (11) 1.5 acres on-site of permanent impacts to ornamental; and (12) 49.7 acres (48.6 acres on-site and 1.1 acres off-site as a result of constructing the road under I-15 and the levee) of permanent and 1.6 acres off-site (as a result of constructing the levee) of temporary impacts to developed land.

Included in this total is the removal of 30.5 acres of habitat where elements of Riversidean alluvial fan sage scrub are present, but it is not the dominant community type due to high levels of disturbance such as trash dumping and off-road vehicle use or invasion by non-native grasses (including 9.5 acres of disturbed/intermediate Riversidean alluvial fan sage scrub and 21.0 acres of non-native grassland/intermediate Riversidean alluvial fan sage scrub). Further, a portion of these disturbed communities to be impacted are already hydrologically disconnected from the wash by existing levees. None of these plant communities represent sensitive plant communities and are not considered rare or warranting consideration by the CNDDB (CDFG 2003).

In a regional context, using data from Table 8, *Regional Inventory of General Habitat Types* and Table 10, *Impacts to Plant Communities*, these losses of non-sensitive plant communities as a result of the proposed project were calculated to represent: 0.4 percent of scrub communities in the region; 0.7 percent of chaparral communities in the region; 0.2 percent of riparian communities in the region (including the basins on-site); and 2.0 percent of grassland communities in the region. This calculation could not be made for disturbed or ruderal communities due to the difficulty in mapping these communities within the defined region. Any impacts to these non-sensitive communities do not exceed threshold 2 and are therefore considered less than significant.

4.5.2 Less than Significant Impacts to Common Plant Species

Project implementation would result in the direct removal of numerous common plant species on-site, both native and non-native. Common plant species present on-site occur in large numbers throughout the region and are therefore not expected to be significantly impacted. That is, it is reasonable to assume population losses for common plants will generally follow the losses of plant communities in which they occur in the region. As discussed above, losses to non-sensitive plant communities are not substantial. In addition, common plant species existing within disturbed areas on-site are typically disturbance-tolerant, and would be expected to be found off-site in abundance and in suitable habitat throughout the region. The loss of native and

non-native common plant species and ornamental plantings do not meet any of the significance thresholds related to species loss defined in Section 4.2 of this document; therefore, this impact is less than significant.

Indirect impacts to common plant species include the potential accumulation of dust on the surface of individual plants as a result of construction activities that disturb the surface soil. Excessive accumulation of dust on the surface of leaves or other plant parts may impair the respiratory functions of plants immediately adjacent to construction activities. However, indirect impacts from dust are not expected to be significant for the following reasons: 1) dust control requirements for air quality management will limit the extent to which fugitive dust may affect plants; 2) the area that may be affected would be limited to the vegetation immediately adjacent to soil disturbance areas; and 3) any effects are short term as dust is only generated during the grading period.

Another potential indirect impact is the invasion of non-native species from ornamental landscaping associated with the proposed development. If non-native plant species escape into adjacent native habitat, they may out-compete the natives and eventually convert native habitats to habitats dominated by non-natives. However, as non-sensitive plant species are common and abundant in the region, this impact is considered less than significant.

4.5.3 Less than Significant Impacts to Common Wildlife Species

Adverse impacts on wildlife are generally associated with the degree of habitat loss from the standpoint of physical character, quality, diversity, and abundance of vegetation. Project implementation in the short- and long-term would result in direct removal of wildlife habitat and the potential mortality of common wildlife species existing on-site. Here again, it is reasonable to assume population losses of common wildlife species will be correlated with the loss of the habitats they use. As discussed in Section 4.5.1 above, losses of non-sensitive habitats associated with the proposed project are not significant. Therefore, the potential direct loss of common wildlife does not meet any of the significance thresholds defined in Section 4.2 of this document and this impact is considered less than significant.

Short-term indirect effects would include temporary increased human activity, increased ambient noise, and higher nighttime light levels during construction. These short-term indirect impacts could result in the displacement of individual wildlife species near the development footprint. However, temporary increases in noise during construction are restricted to the development footprint's immediate vicinity due to the attenuation of noise with distance. Using 60 to 65 dBA as a conservative and generally accepted adverse threshold for wildlife, the majority of construction-related noise will attenuate to a 65 dBA level at a distance of about 200 feet.

Long-term, or permanent, indirect impacts include increased human-related disruption such as an increase in nighttime lighting, noise, road kills, and the presence of domestic pets which may result in mortality of native wildlife species. Operational noise impacts will be minimal when compared with existing noise generated by the I-15 Freeway and CEMEX mine. All major project roads will exist within the proposed development so that traffic noise will generally be attenuated within the surrounding development. Light impacts will be minimized with the implementation of design features aimed at shielding light away from natural open space areas. Road kills are not anticipated to be significant due to the small scale and low speeds projected for many access roads and the interior location of most new roads. Finally, unnatural predation by domestic pets on native species is anticipated to be minimal due to the presence of coyotes within the open space areas because coyotes are known to prey on domestic pets.

As non-sensitive wildlife species are common and abundant in the region, both temporary and permanent disruption of habitat for common wildlife species during and after construction would not represent a regionally significant impact. None of the defined significance thresholds would be exceeded, therefore, no significant impacts to common wildlife would result from project implementation on a direct or indirect basis.

4.5.4 Less than Significant Impacts to Nesting Birds

Project design features have been included to ensure the protection of active nests protected by the MBTA and nests and eggs protected by Fish and Game Code, Section 3503. As stated previously in the Project Design Features section, efforts will be made so that vegetation removal will occur outside of the nesting season. If vegetation removal activities must occur during the nesting season, provisions including biological monitoring and buffers around active nests will be incorporated into construction to ensure the protection of nesting birds. Therefore, impacts are considered less than significant.

4.5.5 Less than Significant Impacts to Wildlife Movement

On a local scale, wildlife movement through the Lytle Creek Wash is already constricted by the presence of the CEMEX mine off-site. Although wildlife movement through the LCRSP study area will be adversely affected by the proposed development due to the further constriction of this corridor, development of the upland terraces alone will not significantly affect movement through the open wash. However, the elimination of wildlife habitat in the adjacent terraces resulting from the project will reduce habitat used for cover, particularly by larger species such as mule deer. This may negatively affect wildlife movement patterns and may result in displacement to nearby open space areas.

The project site currently supports a wildlife movement corridor within Lytle Creek Wash that facilitates movement between the San Bernardino National Forest and open space areas near the confluence of Lytle and Cajon Creeks. This corridor that occurs on-site will be preserved as open space by the proposed project. From a regional perspective, significant regional movement throughout Lytle Creek Wash is already impeded by the presence of the I-15 Freeway, the recently completed improvement to Glen Helen Parkway, and downstream channelization and urbanization. Nevertheless, the functions of the on-site portion of this regional wildlife corridor, as a linkage between habitat patches to the northwest and east, will be ensured through preservation of the majority of the on-site wash. The wash also contains islands of habitat scattered throughout that provide cover for wildlife. In addition, existing mitigation areas for CEMEX, Calmat, and the County immediately north of Neighborhood II contribute to the area available for wildlife movement and refuge through Lytle Creek Wash (see Figure 9, *Areawide Proposed and Dedicated Open Space*). With these adjacent mitigation areas in place, the proposed conservation area within the wash is approximately 1,200 feet wide at its narrowest point at the I-15 Freeway underpass. Furthermore, the proposed levee is not anticipated to have a significant impact on existing habitat or current hydrogeomorphologic processes within the wash. As such, the project will not interfere substantially with wildlife movement, as defined in significance threshold 4 in Section 4.2. Therefore, direct impacts to wildlife movement as a result of the proposed project are considered less than significant.

Indirect impacts to wildlife movement associated with proximity to human habitat may result from the proposed project. However, edge effects such as increased lighting, noise, and domestic pets are not anticipated to substantially reduce the functions and values of the existing wildlife movement corridor through the wash. Due to the width of the proposed Habitat Mitigation Area, indirect effects associated with the development are likely to dissipate over this distance and may be limited to the edge of the open space shared with the development as discussed in Section 4.5.3. Therefore, indirect impacts to wildlife movement are considered less that significant.

4.5.6 Less than Significant Impacts to Sensitive Biological Resources

4.5.6.1 Sensitive Plant Communities

Within the study area, the proposed project will remove a total of 0.2 acre on-site of California sycamore alliance within the eastern portion of Neighborhood I. However, this small patch of sycamore trees is somewhat isolated and not part of a larger riparian community. Due to this vegetation association not functioning as a true riparian community, impacts to the California sycamore alliance mapped within the LCRSP study area will not result in a substantial adverse effect on a sensitive natural community, as defined in threshold 2. Therefore, impacts are considered less than significant.

Indirect impacts to sensitive plant communities are limited to Riversidean alluvial fan sage scrub vegetation as all other sensitive plant communities within the LCRSP study area would be either entirely removed by the proposed project or, any remaining habitat does not occur adjacent to proposed development. Indirect impacts to Riversidean alluvial fan sage scrub that is not removed as a result of the proposed project are similar to those that would occur to plant species and vegetation in general in the vicinity of the development and include the potential accumulation of dust on the surface of plants as a result of construction activities that disturb the surface soil. Excessive accumulation of dust on the surface of leaves or other plant parts may impair the respiratory functions of plants immediately adjacent to construction activities. However, indirect impacts from dust are not expected to be significant for the following reasons: 1) dust control requirements for air quality management will limit the extent to which fugitive dust may affect plants; 2) the area that may be affected would be limited to the vegetation immediately adjacent to soil disturbance areas; and 3) any effects are short term as dust is only generated during the grading period.

Another potential indirect impact is the invasion of non-native species from ornamental landscaping associated with the proposed development. If non-native plant species escape into adjacent native habitat, they may out-compete the natives and eventually convert native habitats to habitats dominated by non-natives. However, as landscape design features have been incorporated to restrict landscaping near open space areas to non-invasive plant species, this impact is considered less than significant.

4.5.6.2 Sensitive Plant Species

Slender-horned Spineflower

Although the slender-horned spineflower was observed within the study area in 1994, this species was not found in consecutive years of thorough survey efforts by PCR in 2004, 2005, 2006, and 2007. Recent survey years received varying amounts of rainfall that captured a range of precipitation conditions for this species and there is high confidence that it would have been observed, if present. Furthermore, the slender-horned spineflower was observed at a reference site in Redlands at the start of the 2005, 2006, and 2007 survey seasons. In addition, in the event that after the project is constructed the species recolonizes the wash, suitable habitat will be available as the majority of the wash will be preserved as part of the proposed project. Moreover, no hydro-geomorphic changes will occur to these areas as a result of the project that would preclude future recolonization. Therefore, this species is not believed to occur within the LCRSP study area at the present time and the proposed project will not have a substantial adverse effect on this species, as defined in threshold 1.

Woollystar

As discussed in Section 3.6.3, the results of PCR's analysis of corolla length (Appendix B), which was peer-reviewed by Dr. Mark Brunell, indicate that the LCRSP study area supports the non-sensitive *Eriastrum densifolium* ssp. *elongatum* (PCR 2007a). Further, under the proposed rule on hybridization (Department of Interior and Department of Commerce 1996), the population within the LCRSP study area would not be considered a listed taxon. Therefore, no impacts to the federally and state-listed endangered Santa Ana River woollystar (*Eriastrum densifolium* ssp. *sanctorum*) will occur as a result of the proposed project.

Plummer's Mariposa Lily

Based upon the 2005 survey results and 2006 verification, 88 out of a total of 127,295 individual Plummer's mariposa lilies are within the impact footprint and would be directly impacted by the proposed project (Figure 23, *Impacts to 2005 Plummer's Mariposa Lily Locations*, on page 120). These impacts are equivalent to approximately 0.07 percent of the total population mapped within the LCRSP study area in 2005. In addition, suitable habitat for this species exists in areas surrounding the LCRSP study area within the region. From a regional perspective, the proposed project will not have a substantial adverse effect on this species, as defined in threshold 1, and impacts are considered less than significant.

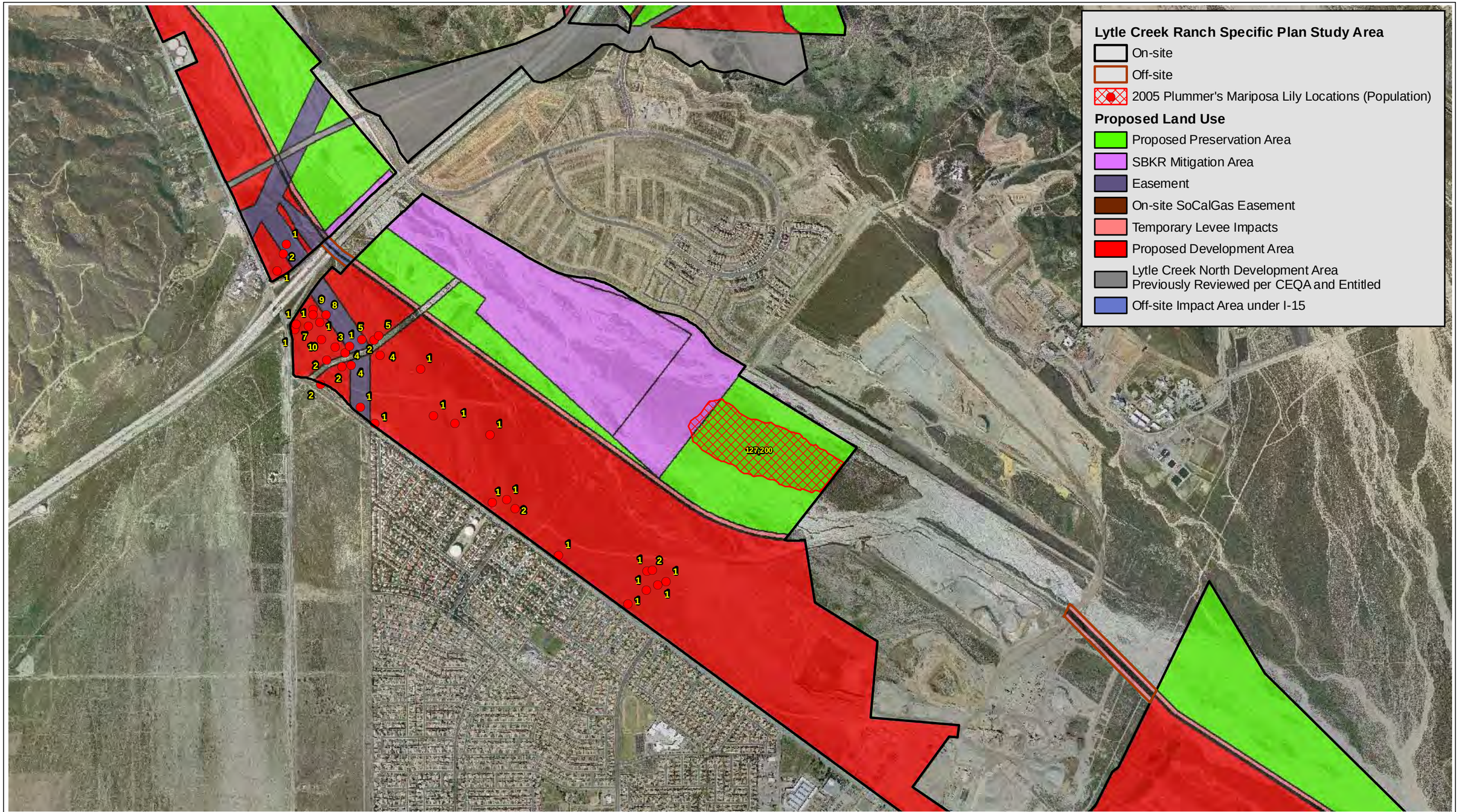
4.5.6.3 CNPS List 3 and 4 Plant Species

Southern California Black Walnut

One individual California black walnut tree was observed within the LCRSP study area and will be impacted by the proposed development. This species is not protected by federal or state listings as threatened or endangered and it is considered by the CNPS to be a List 4.2 species (of limited distribution, but whose existence does not appear to be susceptible to threat – Watch list). The loss of one individual would not threaten the regional population. Impacts to one California black walnut would not result in a substantial adverse effect on a sensitive species, as defined in threshold 1. Therefore, impacts to this species are considered less than significant.

Parry's Spineflower

In 1994, a total of 440,000 Parry's spineflower plants were documented as occurring in 13 populations covering 157 acres within the LCRSP study area. The major populations were confirmed during the 2005 and 2006 survey season, while additional populations (totaling 61,280 plants) were also documented throughout the LCRSP study area. In all, the LCRSP study area is estimated to support at least 501,280 plants. Of this total, approximately 35,280 individuals over approximately 7.2 acres will be permanently impacted by the proposed project (Figure 24, *Impacts to Parry's Spineflower Locations*, on page 121). This would result in the loss of



PCR

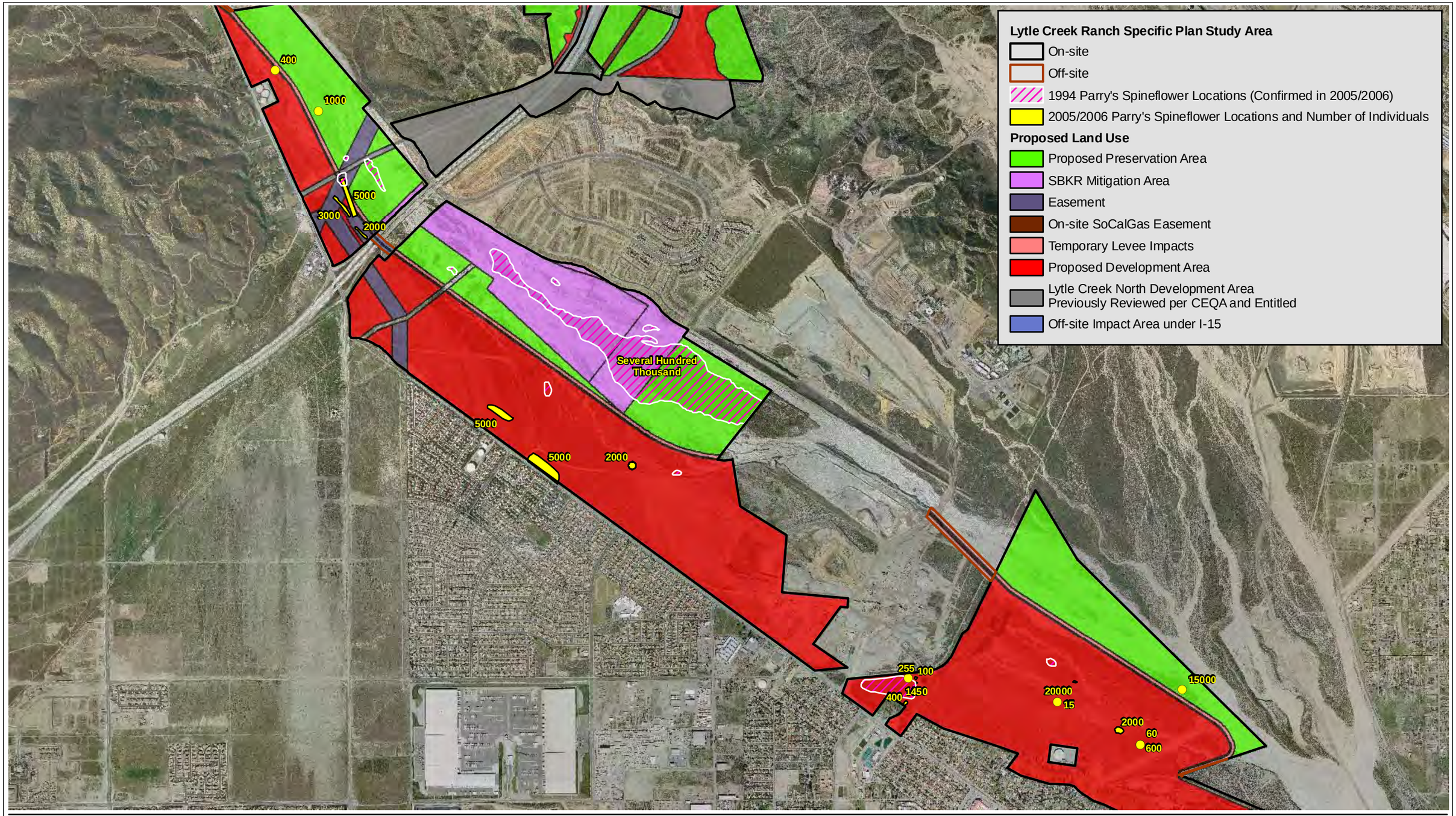
N

1,500 0 1,500 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 23

Lytle Creek Ranch Specific Plan
Impacts to 2005 Plummer's Mariposa Lily Locations



PCR

N

2,000 0 2,000 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 24

Lytle Creek Ranch Specific Plan
Impacts to Parry's Spineflower Locations

approximately seven percent (7%) of the population mapped within the LCRSP study area. However, the largest population mapped within the LCRSP study area is within the mitigation area and will be preserved in perpetuity. Further, Parry's spineflower is a CNPS List 3.2 species, which categorizes it as requiring more information before rarity can be determined (a review list). Therefore, the loss of seven percent (7%) of the Parry's spineflower within the LCRSP study area is not expected to cause the population to drop below self-perpetuating levels, and impacts are considered less than significant as they do not exceed threshold 1.

Indirect impacts to sensitive plant species are minimal. All sensitive plant species, with the exception of Parry's spineflower, do not occur within several hundred feet of the proposed levee line and therefore are not anticipated to incur indirect impacts. Potential indirect impacts to Parry's spineflower include dust from adjacent construction activities and invasion by non-native species. Dust is not anticipated to have a significant indirect impact for the following reasons: 1) dust control requirements for air quality management will limit the extent to which fugitive dust may affect plants; 2) the area that may be affected would be limited to any individual plants immediately adjacent to soil disturbance areas; and 3) any effects are short term as dust is only generated during the grading period. Invasion by non-native plant species is also considered a less than significant indirect impact since the project will restrict landscape palettes for common areas adjacent to open space to non-invasive species.

4.5.6.4 Sensitive Wildlife Species

Certain sensitive wildlife species mentioned in the Sensitive Wildlife Species section of this document may occur within the region but are not expected to occur within the LCRSP study area due to the lack of suitable habitat. Those species not expected to occur due to the lack of suitable habitat and, therefore, that will not be affected by the project, include Delhi sands flower-loving fly, arroyo chub, Santa Ana speckled dace, Santa Ana sucker, arroyo toad, mountain yellow-legged frog, southwestern pond turtle, two-striped garter snake, northern red-diamond rattlesnake, and American badger. The coastal California gnatcatcher and southwestern willow flycatcher are not expected due to the negative results of focused surveys. Several additional sensitive wildlife species (detailed by taxonomic group below) were either observed or have at least a moderate potential to occur within the LCRSP study area, as previously mentioned in Section 3.6.5, Sensitive Wildlife Species.

Potential indirect impacts to sensitive wildlife species include increased noise, lighting, road kills, and unnatural predation by domestic pets. However, as discussed in Section 4.5.3, these indirect impacts will be restricted to the development footprint's immediate vicinity due to the attenuation of such impacts over distance from the proposed development edge. On-going noise levels associated with the mixed land uses proposed will be minimal when compared with existing noise generated by the I-15 Freeway and CEMEX mining facility. In addition, all major roads will exist within the proposed development so as to attenuate traffic-generated noise within

the development itself. "Spill-over" light will be minimized with the implementation of design features aimed at shielding light features so as to prevent its intrusion into habitat areas. Road kills are not anticipated to increase significantly due to the relatively small scale, low speeds, and interior location proposed for the majority of new roads. Unnatural predation by domestic pets is anticipated to be minimal due to the on-going presence of coyotes, an effective meso-predator, within habitat areas to be preserved. Given these considerations, indirect impacts to sensitive wildlife are not expected to be different than those to wildlife in general, and are not expected to reach a level of significance.

Exceptions to this conclusion are potential indirect impacts to the least Bell's vireo and the San Bernardino kangaroo rat. The threatened population status and limited distribution of these two species dictates a greater concern for the short and long-term effects of indirect impacts. As discussed below in Section 4.6.2, potential indirect impacts to these species are considered to be potentially significant.

In order to determine the significance of direct impacts to observed or potentially occurring sensitive wildlife species as a result of the proposed project, an analysis was conducted to estimate the amount of potentially suitable habitat that currently occurs within the southwestern San Bernardino County region and the amount of habitat that will be lost as a result of the LCRSP project. The region was defined with two primary considerations in mind: the current range of these species within the extreme southwestern San Bernardino County area and the location of potentially suitable habitat. As described in Section 4.1.1, the resulting region used in this analysis is bordered by Haven Avenue on the west, the lower elevation slopes of the mountains leading into the Angeles and San Bernardino National Forests on the north, and south and east to, and including, the Jurupa Mountains and the Santa Ana River (Figure 17, *Regional Impact Analysis Study Area*).

The criteria used to determine the suitable habitat for the several sensitive wildlife species observed or potentially occurring within the study area included: 1) historic locations; 2) presence of habitat known to support the species using current locations and range; and 3) interpretation of vegetation types in aerial photographs to determine suitable habitat. Suitable habitat was divided into four general habitat types including scrub, chaparral, grassland, and riparian (Table 8, *Regional Inventory of General Habitat Types*).

The percent loss of habitat for sensitive wildlife species as a result of the proposed project was addressed through mapping of both historic and current occurrences and mapped areas of suitable habitat for these species on aerial photographs. The aerial photographs used were flown in 2005 or later and were at a scale of 1"=3,250'. The mapped areas of suitable habitat (i.e., scrub, chaparral, grassland, and riparian) were hand-drawn and then converted to GIS to determine acreage. Plant communities mapped within the study area were grouped into the four categories consistent with the regional analysis to determine impacts to suitable habitat

within the study area. Table 11, *Regional Analysis of Impacts to Suitable Habitat for Sensitive Wildlife Species Observed or Expected On-site*, on page 125, shows the breakdown of impacts from a regional perspective to individual species discussed below. The reader should note that the San Bernardino kangaroo rat and Los Angeles pocket mouse are not included in the table. Based upon trapping results, the actual area of occupied habitat within the study area has been mapped and this site-specific information was used in the assessments for these species.

Amphibians

Although no sensitive amphibian species were observed within the LCRSP study area, there is potential, albeit low, for the western spadefoot to utilize suitable habitat. However, suitable habitat for this species is limited in the LCRSP study area and only small populations would be expected, if any. From a regional perspective, the proposed project would impact four percent (4%) of potential habitat in the region, in the form of grasslands, for this species. However, it should be noted that the grasslands category includes other open habitat, many of which are disturbed, such as vineyards and other agriculture and ruderal areas. Further, this species does not occur uniformly throughout grasslands; rather, it would be restricted to microhabitats within grasslands such as near dirt road ditches and areas pooling within grassy terraces. As such, the potential for this species to occur within the LCRSP study area is low and would not be expected to occur throughout on-site grasslands as is reflected in the regional analysis. The western spadefoot is CSC species and is not listed as threatened or endangered and the loss of individuals would not threaten the regional population.

Therefore, as impacts to this species do not exceed Threshold 1, disruption of potentially suitable habitat represents a less than significant impact.

Reptiles

One sensitive reptile, the coast (San Diego) horned lizard, was observed within the study area. Sensitive reptile species with some potential to occur within the study area include orange-throated whiptail, silvery legless lizard, and coast patch-nosed snake. Within the regional context, the coast horned lizard prefers scrub habitats, the orange-throated whiptail can occur in scrub, chaparral, and grassland while the silvery legless lizard and coast patch-nosed snake are more restricted to chaparral. Based upon the availability of these habitat types within the defined region (Table 11, *Regional Analysis of Impacts to Suitable Habitat for Sensitive Wildlife Species Observed or Expected On-site*), the proposed project will impact approximately two percent (2%) of potential habitat for coast horned lizard and orange-throated whiptail and one percent (1%) of potential habitat for the silvery legless lizard and coast patch-nosed snake. These species are not listed by federal or state listings as threatened or endangered and loss of individuals due to these relative levels of habitat loss would not threaten the regional

Table 11

Regional Analysis of Impacts to Suitable Habitat for Sensitive Wildlife Species Observed or Expected On-site

Sensitive Wildlife Species (common name)	Existing Open Space within Region				Total Suitable Habitat within Defined Region (acres)	Impacts to Suitable Habitat within Study Area (acres)	Percent Impact of Study Area within Defined Regional (%)
	Scrub = 31,502 acres	Chaparral = 25,981 acres	Grassland = 5,766 acres [a]	Riparian = 1,237 acres			
Scrub Species: • Coast (San Diego) horned lizard • California leaf-nosed bat • Townsend's big-eared bat	X				31,502	688[b]	2 %
Chaparral Species: • Silvery legless lizard • Coast patch-nosed snake		X			25,981	216[c]	1 %
Grassland Species: • Western spadefoot toad • Burrowing owl			X		5,766	224[d]	4 %
Riparian Species: • Long-eared owl • Willow flycatcher • Least Bell's vireo • Yellow warbler • Tricolored blackbird • Yellow-breasted chat				X	1,237	4[e]	1 %
Scrub, Grassland, and Riparian Species (i.e., more open space species): • Raptors • Vaux's swift	X		X	X	38,505	804[f]	2 %
Scrub, Chaparral, and Grassland Species: • Orange-throated whiptail • Western mastiff bat • Northwestern San Diego pocket mouse • San Diego black-tailed jackrabbit • Pocketed free-tailed bat	X	X	X		63,249	984[g]	2 %
Scrub, Chaparral, and Riparian Species: • San Diego desert woodrat	X	X		X	58,720	918[h]	2 %

Table 11 (Continued)

Regional Analysis of Impacts to Suitable Habitat for Sensitive Wildlife Species Observed or Expected On-site

Sensitive Wildlife Species (common name)	Existing Open Space within Region				Total Suitable Habitat within Defined Region (acres)	Impacts to Suitable Habitat within Study Area (acres)	Percent Impact of Study Area within Defined Regional (%)
	Scrub = 31,502 acres	Chaparral = 25,981 acres	Grassland = 5,766 acres [a]	Riparian = 1,237 acres			
Scrub and Grassland Species: • Loggerhead shrike • Southern grasshopper mouse • Pallid bat	X		X		37,268	791[i]	2 %

[a] *Grassland includes open areas such as vineyards and agriculture.*

[b] *Impacts include: all scrub communities (567.7 acres of permanent and 42.3 acres of temporary), non-native grassland/intermediate Riversidean alluvial fan sage scrub (21.0 acres of permanent), non-native grassland/California buckwheat scrub (47.7 acres permanent), and disturbed/intermediate Riversidean alluvial fan sage scrub (9.5 acres permanent).*

[c] *Impacts include: all chaparral (187.2 acres permanent and 0.7 acre of temporary), non-native grassland/chamise chaparral (22.4 acres permanent and 0.7 acre of temporary), and disturbed/northern mixed chaparral (4.9 acres of permanent).*

[d] *Impacts include: Riversidean sage scrub/non-native grassland (0.9 acre permanent), intermediate Riversidean alluvial fan sage scrub/non-native grassland (25.4 acres permanent and 1.9 acre temporary), California buckwheat scrub/non-native grassland (2.7 acres permanent), California buckwheat scrub/ruderal (4.4 acres permanent), northern mixed chaparral/non-native grassland (8.4 acres permanent), chamise chaparral/non-native grassland (7.7 acres permanent), chamise chaparral/ruderal (1.7 acre permanent), all grassland communities (119.9 acres permanent and 3.2 acres temporary), and ruderal (47.8 acres permanent and 0.4 acre temporary).*

[e] *Impacts include: all riparian communities (3.6 acres permanent).*

[f] *Impacts include: all scrub communities (567.7 acres permanent and 42.3 acres temporary), all grassland communities (119.9 acres permanent and 3.2 acres temporary), all riparian communities (3.6 acres permanent), ruderal (47.8 acres permanent and 0.4 acre temporary), disturbed/intermediate Riversidean alluvial fan sage scrub (9.5 acres permanent) and basin (9.9 acres permanent).*

g *Impacts include: all scrub communities (567.7 acres permanent and 42.3 acres temporary), all grassland communities (119.9 acres permanent and 3.2 acres temporary),all chaparral (187.2 acres permanent and 0.7 acre of temporary), ruderal (47.8 acres permanent and 0.4 acre temporary), disturbed/intermediate Riversidean alluvial fan sage scrub (9.5 acres permanent),and disturbed/northern mixed chaparral (4.9 acres of permanent).*

h *Impacts include: all scrub communities (567.7 acres permanent and 42.3 acres temporary), all riparian communities (3.6 acres permanent), all chaparral communities (187.2 acres permanent and 0.7 acre of temporary), non-native grassland/intermediate Riversidean alluvial fan sage scrub (21.0 acres of permanent), non-native grassland/California buckwheat scrub (47.7 acres permanent), non-native grassland/chamise chaparral (22.4 acres permanent and 0.7 acre of temporary),basin (9.9 acres permanent), disturbed/intermediate Riversidean alluvial fan sage scrub (9.5 acres permanent), and disturbed/northern mixed chaparral (4.9 acres of permanent).*

i *Impacts include: all scrub communities (567.7 acres permanent and 42.3 acres temporary), all grassland communities (119.9 acres permanent and 3.2 acres temporary), ruderal (47.8 acres permanent and 0.4 acre temporary) and disturbed/intermediate Riversidean alluvial fan sage scrub (9.5 acres permanent).*

Source: PCR Services Corporation, 2009.

populations. Therefore, as impacts to these species do not exceed threshold 1, loss or disruption of potentially suitable habitat represents a less than significant impact to regional populations of these species.

Birds

Eleven sensitive bird species were observed within the LCRSP study area: golden eagle, northern harrier, American peregrine falcon, white-tailed kite, burrowing owl, loggerhead shrike, Vaux's swift, yellow warbler, yellow-breasted chat, least Bell's vireo, and willow flycatcher.[8] Two other sensitive avian species not observed within the LCRSP study area but with the potential to occur include long-eared owl and tricolored blackbird. All of these species, with the exception of the American peregrine falcon,[9] least Bell's vireo, and willow flycatcher, are not listed as threatened or endangered under the FESA or CESA.

American peregrine falcon and willow flycatcher are not expected to breed on-site due to the lack of suitable nesting habitat (i.e., cliffs and mature riparian habitat, respectively) and the presence of these species on-site is believed to be transitory and associated with seasonal migration. These bird species are highly mobile and impacts to these species do not exceed threshold 1; therefore, the loss or disruption of potentially suitable habitat for resident and migrant birds represents a less than significant impact to regional populations of these species.

The LCRSP study area does not support suitable habitat in the form of coniferous forest for the Vaux's swift, which is a migrant species in this area. Therefore, the LCRSP study area will not contribute to the loss of potentially suitable breeding habitat for this species and a regional analysis is not warranted. However, as a migrant that may utilize all habitat types, the project would impact two percent (2%) of the regional open space. As the project will not eliminate suitable breeding habitat and would only have a minor impact on regional migratory habitat for this species (as defined in threshold 1), impacts are less than significant.

The project would eliminate marginal breeding and foraging habitat for the loggerhead shrike. The loggerhead shrike is found in scrub and grassland. The proposed project would result in the loss of three percent (2%) of the regionally available habitat for this species. This impact would not be significant on a regional basis as it would not cause the regional population of this species to drop below self-sustaining levels.

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[8] *Full species of the willow flycatcher (Empidonax traillii) is state listed as endangered and the federally endangered subspecies does not occur within the study area.*

[9] *Federally delisted but state endangered.*

Impacts to the tricolored blackbird, yellow warbler, and yellow-breasted chat in the form of riparian habitat would result in the regional loss of one percent (1%) of this habitat type. The tricolored blackbird was not observed within the LCRSP study area and has a low potential to occur due to the lack of dense marsh habitat. As this impact would not cause the regional population of these species to drop below self-sustaining levels, impacts to these riparian bird species would not be considered significant.

Two willow flycatchers, of an undetermined subspecies, were observed within the LCRSP study area along the southern boundary of Neighborhood II in 2006. The observation was not made during a protocol southwestern willow flycatcher survey (such focused, protocol-level surveys were done for the southwestern willow flycatcher within potentially suitable habitat, but no individuals were detected), but rather during a coastal California gnatcatcher survey adjacent to scrub habitat. The birds were observed in an area dominated by ruderal and ornamental vegetation and were not seen on any prior or subsequent surveys. In 2007, one transient willow flycatcher was observed within Neighborhood I during the first survey period but not during subsequent surveys. Similarly, in 2008, focused surveys detected one individual in the Sycamore Flat riparian corridor in Neighborhood I. Based on willow flycatcher migration patterns and periods, all willow flycatchers are considered to have been transient birds likely moving through in search of suitable breeding habitat. However, no southwestern willow flycatchers have been found within the study area based upon three consecutive years of protocol surveys. Due to the lack of suitable breeding habitat in the vicinity of the sightings, impacts to the willow flycatcher are considered less than significant.

Over the past decade sightings of the federally-listed threatened coastal California gnatcatcher in this region of San Bernardino County have been limited to relatively few occurrences, mostly as individual birds on the Etiwanda Fan, within Glen Helen Park, and in the Jurupa Mountains. In 1990, one coastal California gnatcatcher was observed at the confluence of Lytle Creek and Cajon Creek approximately one-quarter mile north of the LCRSP study area (CDFG 2007a). In 1993, a single bird was observed in the LCNPD site on one occasion (pers. comm. with Steve Nelson, 2006; CDFG 2007a). There are no records of this species ever being seen or detected in the LCRSP study area.

Three separate survey efforts following the USFWS survey guidelines have been conducted in the LCRSP study area in 2005, 2006, and 2007. No coastal California gnatcatchers were observed or otherwise detected during any of the three survey efforts. Based on these findings, it is concluded that this species does not now nor is likely in the foreseeable future to disperse though, or reside as a breeder in, the LCRSP study area. Therefore, no impacts (direct or indirect) to the coastal California gnatcatcher are expected to result from the proposed project.

Raptors

The burrowing owl was observed in 2006, 2007, and 2009 along the southern bank of the 80-acre island that is part of the SBKR Conservation Area. This species has not been observed within the proposed development area during Phase I and II surveys performed in 2006 and 2007. However, due to the high mobility of this species, it could colonize nearby areas within the development footprint. Further, the breeding status of this species within the proposed natural open space portion of the LCRSP study area is unknown at this time. Nevertheless, the proposed project would impact four percent (4%) of grassland-type habitat (including agricultural fields and ruderal areas) in the region potentially suitable for this species. Prior to any construction-related impacts, a pre-construction survey will be conducted in accordance with the project design feature described in Section 4.4.2.1. This species is not listed by federal or state wildlife agencies as threatened or endangered, and loss of individuals would not threaten the regional populations. Therefore, any impacts to burrowing owl are considered less than significant as they do not exceed Threshold 1.

The open space of the Lytle Creek floodplain and the LCRSP study area provide a corridor of undeveloped land for migrating birds of prey. However, the LCRSP study area provides limited nesting sites, with the exception of the Sycamore Flat riparian corridor in Neighborhood I, and foraging habitat within the LCRSP study area is marginal for raptors due to the density of shrubs in vegetated areas. More suitable foraging habitat exists outside the LCRSP study area but within the vicinity of the project site. Specifically, the regional analysis identified a total of 38,505 acres of suitable raptor foraging habitat in the form of grasslands (including agriculture), scrub, riparian, and similar open habitats. The criteria used to determine the suitable raptor foraging habitat included: 1) the presence of raptors; 2) the presence of undeveloped open space (including vineyards and agricultural fields); 3) the size and degree of isolation (the potential foraging area must be at least 100 acres; if less than 100 acres, it must be within one-half mile of a larger potential foraging area or other open space area); 4) the presence of perches within, or in sight of, suitable foraging habitat in the form of trees, large shrubs, poles, or wires; 5) suitability for foraging (vegetative cover must be grasslands or, if scrub or vineyard, contain areas of bare ground or openings between shrubs; and, 6) evidence of a prey base (i.e., presence of burrows, reptiles, or small mammals).

For the purposes of this analysis, scrub, grassland, and riparian plant communities mapped within the LCRSP study area are considered potentially suitable for raptor foraging due to their relatively open nature. Therefore, impacts to raptor foraging habitat consist of 804 acres within the development footprint, excluding developed areas. This would result in the loss of approximately two percent (2%) of potentially suitable raptor foraging habitat within the region. The implementation of the project would cause incremental loss of raptor foraging habitat, which would be considered adverse but not regionally significant in terms of maintaining the population of raptor species in the region. In addition, the majority of these species are transient, or wintering birds. Further, raptors are highly mobile and would be able to forage and nest in

adjacent areas. Therefore, impacts to non-listed sensitive raptor species including golden eagle, white-tailed kite, long-eared owl, and northern harrier would not be considered significant.

In summary, with respect to the sensitive bird species discussed above, the proposed project would not have a substantial adverse effect on a sensitive species, as defined in Threshold 1. Therefore, impacts are considered less than significant. Impacts to the least Bell's vireo are discussed below in Section 4.6.2.

Mammals

Six sensitive mammal species were observed within the LCRSP study area, the San Diego black-tailed jackrabbit, western mastiff bat, pocketed free-tailed bat, northwestern San Diego pocket mouse, Los Angeles pocket mouse, and San Bernardino kangaroo rat. Several others potentially occurring within the LCRSP study area (but not observed) include California leaf-nosed bat, Townsend's big-eared bat, pallid bat, San Diego desert woodrat, and southern grasshopper mouse.

The southern grasshopper mouse is found in arid scrublands and grasslands and impacts from the proposed project represent two percent (2%) of the available suitable habitat in the region. The western mastiff bat, northwestern San Diego pocket mouse, and San Diego black-tailed jackrabbit may occur in scrub, chaparral, and grasslands. The proposed project would result in the loss of two percent (2%) of the suitable habitat for these species in the region. The San Diego desert woodrat can be found in scrub, chaparral, and riparian areas. The proposed project would impact two percent (2%) of the suitable habitat for this species in the region. Some of these species, such as the San Diego desert woodrat and San Diego black-tailed jackrabbit, are fairly common regionally. Further, these species are not listed by federal or state wildlife agencies as threatened or endangered, and loss of individuals would not threaten the regional populations; therefore, loss of potentially suitable habitat represents a less than significant impact to regional populations of these species.

Roosting habitat for the California leaf-nosed bat, Townsend's big-eared bat, and pallid bat does not occur on the LCRSP study area, although these species may forage over the site. The California leaf-nosed and Townsend's big-eared bat may forage over scrub habitats while the pallid bad may utilize scrub and grasslands to forage. The proposed project would impact two percent (2%) of the suitable foraging habitat for the former two species and two (2%) of suitable habitat for the latter species in the region. The loss of foraging habitat for these species would not be considered a significant impact due to the available foraging habitat in the San Gabriel Mountains.

The Los Angeles pocket mouse is a CSC species and is not federally or state-listed as threatened or endangered. For this species, site-specific information regarding areas of occupied

and unoccupied habitat within the LCRSP study area was obtained during focused trapping surveys. Therefore, impacts can be analyzed using this data rather than taking a regional habitat-based approach and assessing impacts to potentially suitable habitat. From a site-specific perspective, a total of 397.8 acres (76.5 acres within Neighborhood IV and 321.3 acres within the SBKR Conservation Areas and adjacent wash in Neighborhood III) of occupied Los Angeles pocket mouse habitat have been mapped within the LCRSP study area. Therefore, impacts to 33.8 acres (20.3 acres permanent and 13.5 acres temporary) of occupied habitat would represent a loss of eight and one half percent (8.5%) within the LCRSP study area (Figure 25, *Impacts to SBKR and LAPM Occupied Habitat*, on page 132) and a much smaller percentage of occupied habitat in the region. Impacts to Los Angeles pocket mouse occupied habitat will not significantly reduce population numbers of this species on-site. Roughly 160.6 acres of occupied habitat will be preserved within the study area in addition to the 216.8 acres already preserved within the SBKR Conservation Area. Thus, impacts to the Los Angeles pocket mouse are considered less than significant. The loss will not drop the population below self-sustaining levels and does not exceed Threshold 1.

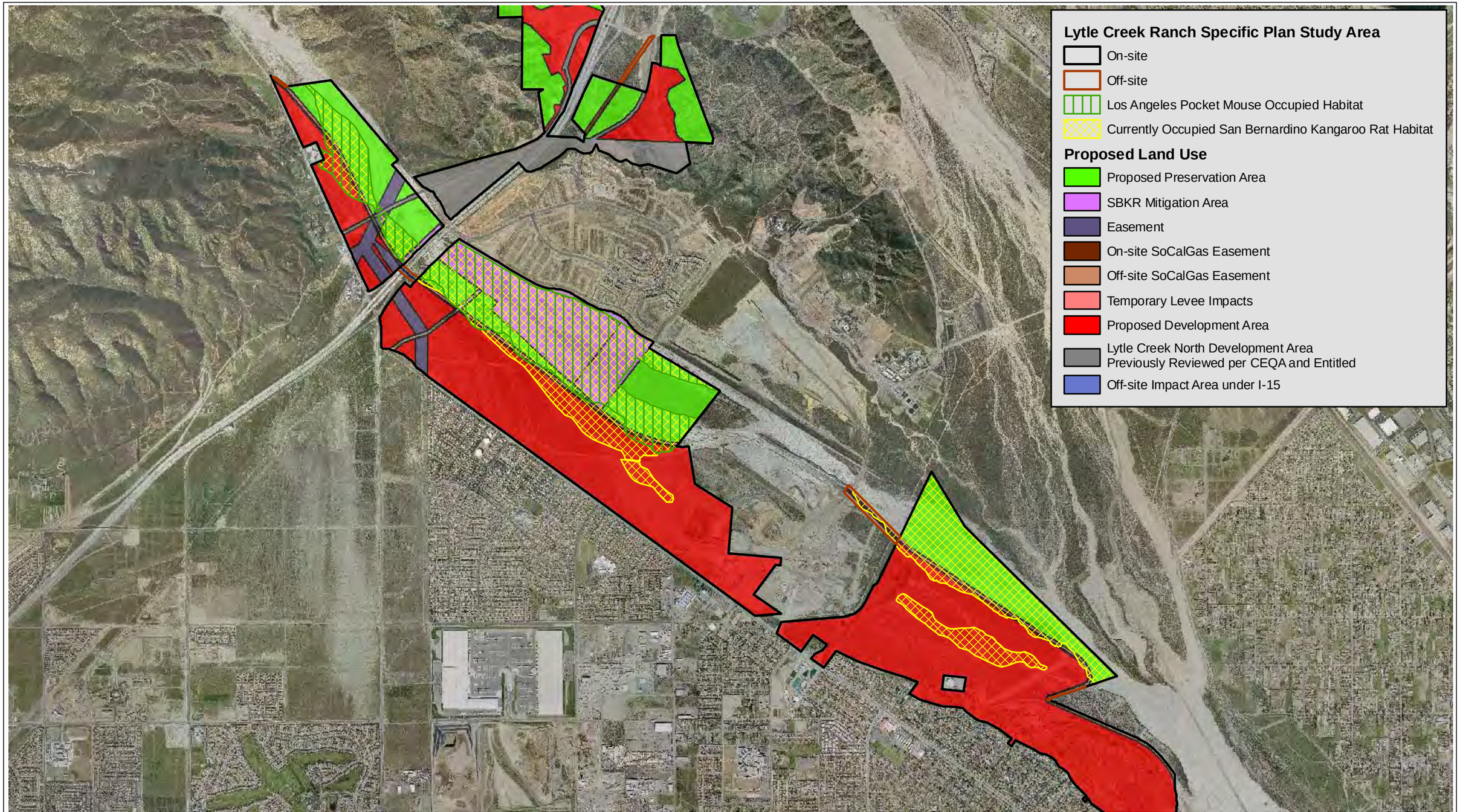
With respect to the sensitive mammal species discussed above, the proposed project would not have a substantial adverse effect on a sensitive species, as defined in Threshold 1. Therefore, impacts are considered less than significant. Impacts to the San Bernardino kangaroo rat are discussed below in Section 4.6.2.

4.6 IMPACTS FOUND TO BE POTENTIALLY SIGNIFICANT

The following is a discussion of impacts to biological resources which meet or exceed the thresholds of significance outlined above in Section 4.2 and, therefore, are considered to be potentially significant impacts. As described in Section 4.1.1, a regional analysis is utilized in some cases to substantiate significance determinations.

4.6.1 Potentially Significant Impacts to Sensitive Plant Communities

As shown in Table 10 , *Impacts to Plant Communities*, and Figure 18, *Impacts to Plant Communities (Neighborhood I)*, Figure 19, *Impacts to Plant Communities (Neighborhood II)*, Figure 20, *Impacts to Plant Communities (Neighborhood III-southeast)*, Figure 21, *Impacts to Plant Communities (Neighborhood III-northwest)*, and Figure 22, *Impacts to Plant Communities (Neighborhood IV)*, construction impacts will result in permanent impacts to 478.0 acres (476.2 acres on-site and 1.8 acres off-site) and 41.6 acres (35.7 acres on-site and 5.9 acres off-site) of temporary impacts to Riversidean alluvial fan sage scrub where Riversidean alluvial fan sage scrub is the only or primary community. Specifically, these permanent and temporary impacts include: (1) 56.2 acres (54.6 acres on-site and 1.6 acres off-site as a result of construction the levee) of permanent and 21.4 acres (17.2 acres on-site and 4.2 acres off-site as a result of constructing the levee) of temporary impacts to pioneer Riversidean alluvial fan sage scrub; (2)



PCR

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2,500 0 2,500 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 25

Lytle Creek Ranch Specific Plan
Impacts to SBKR and LAPM Occupied Habitat

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213.2 acres (213.0 acres on-site and 0.2 acre off-site as a result of construction the road under the I-15) of permanent and 18.1 acres (16.5 acres on-site and 1.6 acres off-site as a result of construction the levee and road under the I-15) of temporary impacts to intermediate Riversidean alluvial fan sage scrub; and (3) 208.6 acres on-site of permanent and 2.1 acres (2.0 acres on-site and 0.1 acre off-site as a result of construction the levee) of temporary to mature Riversidean alluvial fan sage scrub.

It should be noted that Table 10, *Impacts to Plant Communities*, calculates the total area of impacts to plant communities to be 1,368 acres on-site and 1,374.7 acres when the off-site areas that were included in the LCRSP study area were taken into consideration. This figure differs from the "Total Graded Acreage" of 1,539.3 acres that was identified in the project grading plans. The difference between the two acreage figures is 171.3 acres. The land that comprises the 171.3 acres is land that has been previously disturbed and therefore not included as "Total Area of Disturbance" which is defined to mean land which is in an undeveloped, "natural" state presently and which will be graded or its vegetation otherwise disturbed as part of the proposed Lytle Creek Ranch Development. All of the 171.3 acres omitted from the "Total Area of Disturbance" have already been graded or its vegetation disturbed or removed. Moreover, 137.8 acres of the 171.3 acres were previously analyzed, and its impacts addressed and mitigated for as part of the development and permitting of the LCNPD. Of the remaining areas, the rest were previously disturbed during construction of roads and the So Cal Gas easement work within Neighborhoods III and IV. Therefore, as these areas were already graded or its vegetation removed, these areas were not considered either "undeveloped" or in a "natural state" and were not included within the calculation of "Total Area of Disturbance" for purposes of this biological analysis. Nevertheless, because these areas will most likely require remedial grading, the acreage was included within the grading plan and considered part of the "Total Graded Acreage" of 1,539.3 acres. These 171.3 acres should also be distinguished from the other acreage included in Table 10, *Impacts to Plant Communities*, and designated as "Disturbed." Those acres consist of land that has been disturbed due to constant edge effects from human activities along Glen Helen Parkway; operations at CEMEX and Vulcan Materials; and areas that were previously burned along Riverside Avenue during the fires in 2006 and 2007, and were included in the Biological Resources Assessment's total of "Total Area of Disturbance," because none of these lands had been previously analyzed as part of another development project nor had impacts to these areas been previously permitted or mitigated.

As discussed above in Section 3.2.2, the terminology used in this assessment referring to pioneer, intermediate, and mature stages of alluvial fan sage scrub is reflective of the relative habitat diversities, values, and functions present within this natural community on-site today. Certainly, Smith (1996) and Barbour and Wirka (1997) describe more complex and widely distributed systems. In particular, Barbour and Wirka (1997) argued that the three-stage "paradigm" being used herein oversimplifies succession in alluvial scrub and may differ in successional dynamics depending on the specific drainage in question. As such, in their study

analyzing 106 samples of alluvial scrub in Los Angeles and San Bernardino counties, they differentiated seven "groups" of alluvial scrub with differences among these groups being most highly correlated with geographical location within coastal southern California. However, as a natural community composed of both plant and animal populations, there is considerable overlap of species among these different groups throughout this region that should be considered. Moreover, listed endangered, threatened or otherwise sensitive species of plants and animals that are endemic or restricted to only a few of the drainages supporting alluvial scrub in the region (for example, slender-horned spineflower and San Bernardino kangaroo rat) merit their own independent assessment as presented herein. Therefore, an assessment focused on habitat values, following a pioneer-intermediate-mature stage or "growth form" approach to the LCRSP study area, is considered to be the most practical, appropriate and meaningful means to satisfy CEQA.

It should also be noted that although the Riversidean alluvial fan sage scrub terminology has been consistently used to represent the subject plant community on-site, recent studies (Safford and Quinn 1998, Barbour and Wirka 1997) have commonly applied broader terminology (i.e., alluvial fan sage scrub) in southern California within which specific groups may be designated. The new *Terrestrial Vegetation of California* (Barbour et al. 2007) acknowledges the previous Riversidean alluvial fan sage scrub classification but describes the difficulty in assigning series (now termed alliances) to communities that experience successional transitions. Barbour et al. (2007) defines alluvial scrub as a specific type of interior sage scrub or Riversidean sage scrub that occurs on alluvial fans and floodplains. Therefore, in evaluating this community in the broader context outside the boundaries of the LCRSP study area and in the remainder of this analysis, it is appropriate to shift to the use of alluvial fan sage scrub with the understanding that Riversidean alluvial fan sage scrub is a subset or type of alluvial fan sage scrub.

In addition, the proposed project will remove 1.7 acres of southern cottonwood willow riparian on-site within Neighborhood II. The southern cottonwood willow riparian occurs within the narrow drainage fed by a pump station along the western portion of Neighborhood II. All 1.7 acres of southern cottonwood willow riparian mapped in this area will be impacted.

Due to the amount of acreage of these communities to be removed on-site relative to what exists on-site, their status as sensitive communities considered rare by the CNDDB (CDFG 2003), their riparian nature, and their capacity to support suitable habitat for sensitive species, the proposed project would result in a potentially significant impact on these sensitive natural communities (including Riversidean alluvial fan sage scrub and southern cottonwood willow riparian, as defined in threshold 2.

4.6.2 Potentially Significant Impacts to Sensitive Wildlife Species

Least Bell's Vireo

The federally and state-listed endangered least Bell's vireo was observed in the Sycamore Flat riparian corridor (Neighborhood I) as well as in a small mule fat-dominated riparian corridor near a pump station in the southwest portion of Neighborhood II (Figure 13, *Least Bell's Vireo Locations*, and Table 7, *2006 through 2008 Least Bell's Vireo Observations*). During protocol surveys in 2006, two breeding pairs were observed in Sycamore Flat. In the same year, at least one bird was heard and/or observed on several occasions within Neighborhood II; however, breeding was not confirmed at this location. Although one individual was also observed within Neighborhood III on one occasion as shown in Figure 13, *Least Bell's Vireo Locations*, there is no suitable riparian habitat in this area and the bird is believed to have been moving through the area. During protocol surveys in 2007, one pair of least Bell's vireo was observed on three consecutive survey dates just off-site within the County Parks parcel of the Sycamore Flat riparian corridor. However, during protocol surveys conducted in 2008, the least Bell's vireo was not observed within the LCRSP study area. As no project-related impacts will occur within the Sycamore Flat riparian corridor, no impacts in this area are anticipated. Potential impacts related to the off-site So Cal Gas easement are discussed in Section 4.3.1.

Therefore, as the small drainage in Neighborhood II is within the permanent impact footprint, direct impacts are considered potentially significant as defined in Threshold 1. In total, direct impacts to the least Bell's vireo include the loss of 2.9 acres of marginally suitable habitat that was utilized by at least one transient individual least Bell's vireo in 2006 (including 1.2 acres of mule fat scrub and 1.7 acres of southern cottonwood willow riparian within Neighborhood II).

Indirect impacts to the least Bell's vireo are also potentially significant and would be expected to occur within the Sycamore Flat area of Neighborhood I where proposed development is within several hundred feet of potentially suitable habitat for this species. Indirect impacts to least Bells' vireo would not be anticipated to affect any other areas of the LCRSP study area as the riparian habitat within Neighborhood II is entirely within the permanent impact footprint. Indirect impacts resulting from edge effects primarily include potential noise impacts from adjacent construction as well as potential predation by pets as a result of adjacent human habitation.

San Bernardino Kangaroo Rat

The federally-listed endangered San Bernardino kangaroo rat is known to occur in the study area (O'Farrell 2006b). Based on an intensive trapping program conducted in 2005, 2006, and 2007, a total of 702.7 acres (696.8 acres and 5.9 acres off-site) is currently occupied by this species within the study area. Consistent with the literature on the species, the distribution of

occupied habitat is primarily associated with the pioneer and intermediate stages of Riversidean alluvial fan sage scrub. In addition, these 702.7 acres (696.8 acres and 5.9 acres off-site) include the areas where the species was trapped in two isolated patches of intermediate and pioneer Riversidean alluvial fan sage scrub, totaling 51 acres, that are outside the 100-year floodplain and are the result of anthropogenic surface disturbance and a levee failure of the CEMEX mining operation. The distinctions between these circumstances of occupation are important to accurately understand the proposed project's impact on the preservation and eventual recovery of the species, as discussed below.

Of the total 702.7 acres (696.8 acres and 5.9 acres off-site) of occupied habitat that exists in the LCRSP study area, the proposed project will permanently impact approximately 140.6 acres (139.2 acres on-site and 1.4 acres off-site) and temporarily impact 41.0 acres (35.8 acres on-site and 5.2 acres off-site) of the 702.7 acres of SBKR-occupied habitat that exists in the LCRSP study area. This direct impact meets the criteria of threshold 1 and is considered potentially significant. Out of the 140.6 acres of permanent impacts, fifty-one (51) acres of these deserve further mention and analysis. These approximately 51 acres of San Bernardino kangaroo rat occupation are outside the 100-year floodplain and hydrologically disconnected due to past levee construction and past and on-going mining activities. While impacts to the San Bernardino kangaroo rat in these areas remain potentially significant because they represent a "take" under the FESA, the conservation of such areas is not likely to contribute meaningfully to the long-term sustainability of the species in Lytle Creek. This conclusion is based on three factors; 1) the vegetation in these areas is more than likely to re-establish itself and, consequently, form a vegetative cover too dense to be occupied by the species; 2) it is highly unlikely that an episodic (100-year) flood event will occur in the foreseeable future to maintain open habitat conditions suitable for long-term occupancy of the species and; 3) populations of this species occupying these isolated areas are isolated physically from founder populations elsewhere in the wash and, consequently, will be extirpated from these areas over time (Dr. Michael O'Farrell, pers. comm. with Steve Nelson, 2007a). Thus, the preservation of these 51 acres is not a viable long-term strategy for the recovery or long-term conservation of the species.

As proposed, the project contributes an additional 610.8 acres of natural open space to be preserved in perpetuity, of which 443.1 acres are immediately adjacent to and surrounding the existing 216.8-acre SBKR Conservation Area. This additional 443.1 acres will result in the expansion of the protected San Bernardino kangaroo rat area in Lytle Creek to 659.9 acres. Within these preservation areas, approximately 518.6 acres of occupied San Bernardino kangaroo rat habitat exist (Figure 25, *Impacts to SBKR and LAPM Occupied Habitat*). The proposed project's contribution to this area would be approximately 316.2 acres while the remaining acreage is entirely within the existing SBKR Conservation Area. Further, some areas within the 443.1 acres of additional proposed open space in and around Lyle Creek, such as the area currently supporting chamise chaparral adjacent and downstream of the SBKR Conservation Area in Neighborhood III, are good candidates for restoration to suitable San Bernardino

kangaroo rat habitat. Notwithstanding the potentially significant take of the species and occupied habitat, these preserved areas can and will serve as the core of a conservation program aimed at sustaining the species in Lytle Creek in perpetuity. However, in the absence of mitigation measures to prevent adverse indirect impacts from affecting the population in the wash, spill-over effects are considered to be potentially significant. As mentioned throughout this assessment, such impacts include the harmful effects of unrestricted access and habitat degradation, loss of habitat functions and values due to the establishment of invasive plant species, unnatural predation by domestic pets, and night-lighting.

In recognition of the Lytle Creek population and occupied habitat, along with other populations and occupied habitat within the range of the San Bernardino kangaroo rat, the USFWS revised the critical habitat designation for the species in 2008 (50 FR 61936) (USFWS 2008a). However, the designation of critical habitat was based on a landscape approach whereby broad areas where possible habitat could exist were delineated. The extensive trapping program, upon which this assessment is based, represents a refinement of the designation and is, therefore, viewed as a much more accurate assessment of occupied and suitable habitat for the species. As mentioned above, pioneer, intermediate, and mature alluvial fan sage scrub inside the 100-year flood limits are identified as true habitat elements because only these habitat areas and the hydro-geomorphic processes they are subject to, are capable of sustaining this species in the long-term. The extensive trapping results within the LCRSP study area over multiple years bear this out. The reader should note that under the USFWS revised 2008 critical habitat designated for the San Bernardino kangaroo rat, impacts to actually demonstrated habitat elements will be the same.

5.0 CUMULATIVE IMPACTS

Cumulative impacts are defined as the direct and indirect effects of a proposed project which, when considered alone, would not be deemed a significant impact, but when considered in addition to the impacts of related projects in the area, would be considered "cumulatively considerable" and significant. "Related projects" refers to past, present, and probable future projects, which would have impacts similar to those of the proposed project, which are identified either through a list of projects prepared by the lead agency within and outside of its jurisdiction, and/or are based upon a summary of projections contained in an adopted general plan or related planning document or a prior-certified EIR which describes or evaluates regional or area-wide conditions contributing to the cumulative impact. [14 California Code of Regulations Section 15130(b)(1)(B)].

For the purpose of analyzing cumulative impacts of the proposed LCRSP project, several criteria were used to establish the scope of the assessment. First, for impacts related to sensitive plant communities, sensitive wildlife species, and wildlife movement corridors, the geographic extent was established to encompass the open space within southwestern San Bernardino County. This area contains a regional complex of relevant habitats, species' populations, and biological systems bounded on the north by higher mountain elevations, on the south by extensive urban development within Riverside and San Bernardino counties, on the east by the desert environs of the Banning Pass, and on the west by substantial urban development within incorporated foothill cities. This area is thought to provide a meaningful, regional ecological and biological unit upon which to base the cumulative impact analysis. It should be noted that for the analysis of alluvial fan sage scrub, two additional expanded geographic regions relevant to the distribution of this community in coastal southern California are also evaluated (and are discussed in more detail in Section 5.2.1).

Second, the assessment considered past, present, and reasonably foreseeable projects within the next ten to fifteen years, including federal, non-federal, and private actions to the extent that information was available and deemed to be reliable and accurate. In order to accomplish this, specific and general plans for the County and cities within the relevant geographic region were reviewed, interviews were conducted with appropriate city and County planning department staff, and information collected during previous project public review processes was compiled. Information on relevant projects within the LCNPD Environmental Assessment (ACOE 2003) was also utilized.

Third, potentially affected resources were categorized and addressed in accordance with their sensitivity (i.e., scarcity), significance (i.e., importance to habitat functions and values), and

role in ecosystem sustainability (i.e., contribution to biological diversity). In this manner, all resources potentially affected are considered; however, focus is placed on those resources upon which cumulative impacts potentially have the greatest cause-and-effect implications.

Fourth and finally, the analysis considers cumulative impacts to be additive as well as potentially synergistic in their effects. Thus, the concept of thresholds for impacts, beyond which resource functions and values are lost despite the persistence of resources in limited amounts, is taken into consideration.

Relevant Projects

Digital data were collected from the following jurisdictions within the defined region: City of Rialto, City of Rancho Cucamonga, City of Fontana, City of Redlands, City of Highland, City of San Bernardino, County of San Bernardino, and County of Riverside. Data was extracted from general plan and specific plan maps. In areas where open space areas overlapped with proposed developments, it should be noted that the proposed development was chosen to represent the area. Also, City data took precedence over data from the County where overlap occurred. The list of projects below is only a partial listing of what is used in this analysis and includes those large projects that could be identified.

- Lytle North PDP, County of San Bernardino (677 acres)
- Arboretum Specific Plan, City of Fontana (458 acres)
- Glen Helen Specific Plan, County of San Bernardino (3,400 acres)
- Agua Mansa Industrial Corridor Specific Plan, County of San Bernardino and Cities of Colton and Rialto (4,285 acres)
- Rialto Airport Redevelopment Plan or Renaissance Rialto, City of Rialto (1,500 acres)
- Rio Vista Specific Plan, County of Riverside (918 acres)
- So Cal Gas Easement through Neighborhood I of LCRSP and into County Parks property (7.5 acres)

5.1 CUMULATIVE IMAPCTS FOUND TO BE LESS THAN SIGNIFICANT

5.1.1 Less than Significant Cumulative Impacts to Riversidean Sage Scrub

A total of 13.9 acres (13.5 acres on-site and 0.4 acre off-site resulting from construction of the levee) of permanent and 0.7 acre off-site of temporary impacts to monotypic and mixed Riversidean sage scrub will occur as a result of the proposed project. Within the defined region, a total of 31,502 acres of scrub habitat were mapped. Although not all scrub habitat exists as Riversidean sage scrub, this number is useful in determining a rough estimate of cumulative impacts since the faunal and floristic characteristics of various scrub habitats overlap to a high degree. The amount of scrub habitat within approved and pending projects, including the proposed LCRSP project, is approximately 3,591 acres or 11 percent (11%) of the total existing in the relevant region (Table 12, *Cumulative Impacts to Sensitive Wildlife Species Suitable Habitat*, on page 141, and Figure 26, *Regional Cumulative Impacts to Habitat Types*, on page 142). This level of loss, while not incremental, cannot be shown to reduce common and general plant and animal populations to a level that threatens their sustainability. In other words, cumulative impacts to this plant community would not exceed the threshold beyond which resource functions and values are lost despite the persistence of resources in limited amounts. Therefore, although the project will contribute to the cumulative loss of Riversidean sage scrub habitat in the region, cumulative impacts are less than significant. The reader should note that cumulative losses to plant and animal scrub species of concern are addressed independently in this assessment.

5.1.2 Less than Significant Cumulative Impacts to Wildlife Movement

Although the proposed project preserves the majority of Lytle Creek Wash as a wildlife corridor within the LCRSP study area, development along the southern edge limits the area of available habitat that could be utilized for movement. In combination with the levee that has been built along the northern bank of LCNPD, the proposed project will reduce the width of the corridor used by wildlife in this area and would contribute to the cumulative impact on wildlife movement corridors in the region. The width of the existing Lytle Creek Wash corridor varies from a minimum of about 1,200 feet at the I-15 freeway underpass to a maximum of about 2,500 feet in Neighborhood III across the SBKR Conservation Area. The recently completed improvement to Glen Helen Parkway upstream of the I-15 incorporates several large culverts for wildlife that do not make surface crossings moving along the wash in this area. Including off-site areas, a maximum corridor width of several miles occurs in the vicinity of Neighborhood II due to the adjacent open space conservation areas northeast of the wash.

Table 12

Cumulative Impacts to Sensitive Wildlife Species Suitable Habitat

General Habitat Type	(A) Available/Existing Acreage within Defined Region	(B) Acreage of Potential Cumulative Impacts, including Study Area (Percentage of Column A)	(C) Lytle Creek Ranch Impact Acreage (Percent Contribution to Column B)	(D) Acreage Subject to Long-term Preservation (Percentage of Column A) [a]
Scrub (including Riversidean alluvial fan sage scrub)	31,502	3,591 (11%)	608 (17%)	9,990 (32%)
Chaparral	25,981	4,747 (18%)	188 (4%)	1,922 (7%)
Grassland (including other open areas such as vineyards and agriculture)	5,766	2,193 (38%)	330 (15%)	93 (2%)
Riparian	1,237	6 (0.5%)	4(67%)	503 (41%)
TOTAL	**64,486**	**10,537**	**1,130**	**12,508**

[a] *Open space preservation includes project-proposed open space areas.*

Source: PCR Services Corporation 2009.

With implementation of the proposed project, the minimum corridor width along Lytle Creek Wash would remain at 1,200 feet at the I-15 undercrossing as developed areas are generally clustered near existing development. The corridor would be somewhat constrained in Neighborhood III due to the presence of development on either side of the wash. However, in Neighborhoods II and IV, adjacent open space areas including the confluence of Cajon Creek and the foothills north of the wash within the San Bernardino National Forest, respectively, help buffer the effects of narrowing the corridor width. According to the scientific literature, a minimum corridor width necessary to maintain connectivity and use by large mammals is difficult to determine. However, Beier (1995) as cited in Corridor Ecology by Hilty et. al (2006), recommended that mountain lions moving though a corridor greater than 1 km (0.62 miles) in length would need a width of at least 400 meters (1,312 feet). The proposed corridor would generally follow this recommendation.

Therefore, areas to be preserved along Lytle Creek Wash will provide for a continuous corridor along the wash that connects several biological mitigation open space sites and conservation banks near the Cajon Creek/Lytle Creek confluence with the alluvial fan habitats and National Forest lands to the north and northwest of the study area. Further, mitigation for indirect impacts to the San Bernardino kangaroo rat will also minimize edge effects to the Lytle Creek Wash corridor. Therefore, as no other future projects are proposed in the vicinity of Lytle Creek Wash that would further constrict or impact this wildlife corridor, cumulative impacts to wildlife movement are not considered significant.

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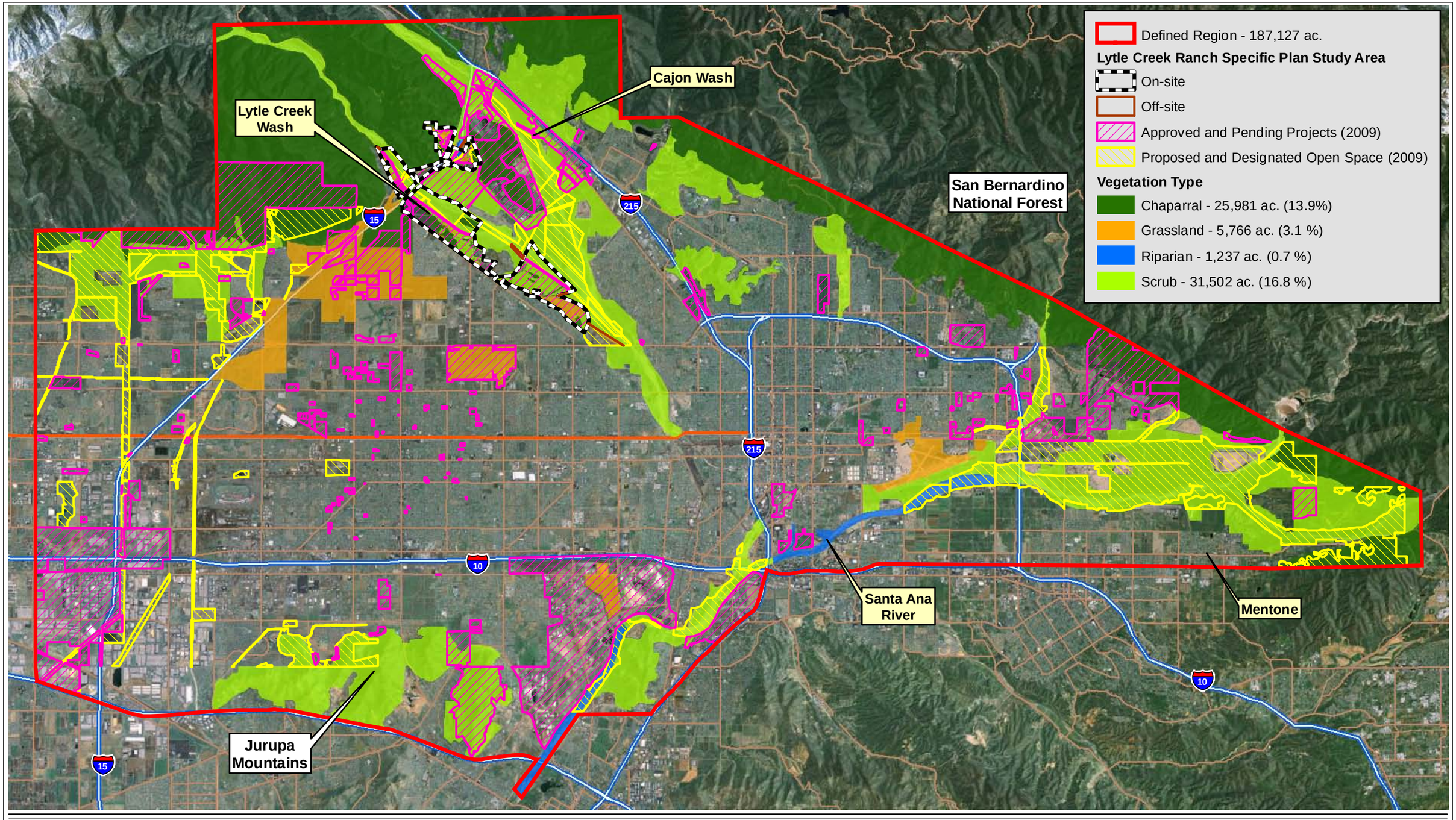

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Source: Aerial Express, 2007; PCR Services Corporation, 2009.

Figure 26

Lytle Creek Ranch Specific Plan
Regional Cumulative Impacts to Habitat Types

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5.1.3 Less than Significant Cumulative Impacts to Grassland-Dependent Sensitive Wildlife Species

The regional analysis of impacts to grassland-dependent sensitive wildlife species (i.e., western spadefoot and burrowing owl) as a result of the proposed project identified direct impacts to four percent (4%) of potentially suitable habitat. This is considered less than significant as described in Section 4.5.6.3. However, the analysis of cumulative impacts to sensitive wildlife species identified a total of 2,193 acres (38 percent) of grassland habitat within the region that occurs within approved or pending projects (Table 12, *Cumulative Impacts to Sensitive Wildlife Species Suitable Habitat*). Potentially suitable habitat in the form of grasslands includes other open areas such as vineyards, other agriculture, and ruderal areas. These communities are not considered sensitive and are generally the result of disturbance. Due to the coarse-scale nature of the mapping for this analysis, the grassland designation should not be interpreted to signify native grasslands.

The two species that are more or less solely dependent upon grassland-type habitats include the western spadefoot and burrowing owl. The western spadefoot occurs within open grassland areas or near quiet streams with loose soil for burrowing and where temporary pools are available for reproduction. However, this species is generally restricted to grassland areas near seasonal ponds or calm streamsides utilized for breeding. Therefore, this species does not occur uniformly throughout grassland habitat and is likely sparsely distributed throughout the defined region. According to the CNDDB database, no occurrences of this species have been recorded within the defined region (CNDDB 2008a). Moreover, this species has not been detected within the LCRSP study area, including the area proposed to be impacted.

With respect to the burrowing owl, this species prefers berms, ditches, and grasslands adjacent to rivers, agricultural, and scrub areas. Although burrowing owls have been observed within the SBKR Conservation Area, this species has not been detected during any of the surveys within the impact area of the proposed project. According to the distribution throughout the defined region, based upon CNDDB occurrences, the nearest occurrence is approximately 1.5 miles south of the study area (CNDDB 2008a). Therefore, cumulative impacts to the western spadefoot toad and burrowing owl are likely much less than the 38 percent of cumulative grassland habitat anticipated to be lost in the region. As these species have not been detected within the impact footprint of the proposed project, the contribution of the project to cumulative impacts would be less than significant. Further, any cumulative impacts to the western spadefoot and burrowing owl as a result of this potential cumulative loss of habitat are considered less than significant.

Two additional categories of species that are also highly dependent upon grasslands but may also utilized other habitat types, raptors (for foraging) and Los Angeles pocket mouse, are discussed below.

5.1.4 Less than Significant Cumulative Impacts to Scrub, Chaparral, and Riparian-Dependent Sensitive Wildlife Species

The analysis of cumulative impacts to sensitive wildlife species identified a total of 11 percent, 18 percent, and one half percent (0.5%) of scrub, chaparral, and riparian habitats, respectively, within the region that occur within approved or pending projects (Table 12, *Cumulative Impacts to Sensitive Wildlife Species Suitable Habitat*). With the exception of the least Bell's vireo and San Bernardino kangaroo rat, which are discussed in more detail below, sensitive wildlife species dependent upon these habitat types are not listed by federal or state listings as threatened or endangered and loss of individuals due to these relative levels of habitat loss would not threaten the regional populations. Therefore, as impacts to these species do not exceed threshold 1, the potential cumulative loss or disruption of potentially suitable habitat represents a less than significant impact to regional populations of these species.

5.1.5 Less than Significant Cumulative Impacts to Least Bell's Vireo

The analysis of cumulative impacts to the least Bell's vireo are based upon the coarse-scale mapping of riparian habitat within the defined region and the amount of this potentially suitable habitat that falls within currently approved or pending projects. Approved and pending projects (including but not limited to single-family residences, commercial, and mining) total six acres of potentially suitable riparian habitat for the least Bell's vireo (Table 12, *Cumulative Impacts to Sensitive Wildlife Species Suitable Habitat*). These projects, including the LCRSP study area, represent a loss of approximately one half percent (0.5%) of the potential least Bell's vireo habitat within the region. In addition, several proposed and designated preserves were identified and mapped totaling 503 acres, or approximately 41 percent of the suitable least Bell's vireo habitat within the region. Therefore, the proposed Lytle Creek Ranch project will add incrementally to the cumulative impacts to least Bell's vireo habitat within the region, but the impacts from the project would not be considered cumulatively significant in light of the amount of habitat or this species that remains available and protected.

5.1.6 Less than Significant Cumulative Impacts to Los Angeles Pocket Mouse Habitat

In order to complete an analysis of cumulative impacts to Los Angeles pocket mouse habitat within the previously defined region, PCR performed an assessment of the amount of suitable habitat within currently approved or pending projects. Approved and pending projects (including but not limited to single-family residences, commercial, and mining) total 5,784 acres of suitable Los Angeles pocket mouse habitat [i.e., scrub (3,591 acres) and grassland (2,193 acres)] (Table 12, *Cumulative Impacts to Sensitive Wildlife Species Suitable Habitat*). These projects, including the LCRSP study area, represent a loss of approximately 16 percent of the potential Los Angeles pocket mouse habitat within the region. In addition, several proposed and designated preserves were identified and mapped totaling 10,083 acres, or approximately 27

percent of the suitable Los Angeles pocket mouse habitat within the region. Based on this analysis, the proposed LCRSP project will add incrementally to the cumulative impacts to Los Angeles pocket mouse habitat within the region, but the impacts from the project would not be considered cumulatively significant in light of the amount of habitat that remains available for this species in the region analyzed.

5.1.7 Less than Significant Cumulative Impacts to Raptor Foraging Habitat

In order to complete an analysis of cumulative impacts to raptor foraging habitat within the previously defined region, PCR performed an assessment of the amount of suitable foraging habitat within currently approved or pending projects. Approved and pending projects (including but not limited to single-family residences, commercial, and mining) total 5,790 acres of suitable raptor foraging habitat (i.e., scrub, grassland, and riparian). These projects represent a cumulative loss of approximately 15 percent of the available raptor foraging habitat, within the region. In addition, several proposed and designated preserves were identified and mapped totaling 10,586 acres, or approximately 27 percent of the existing raptor foraging habitat, within the region. Here again, the proposed LCRSP project will add incrementally to the cumulative impacts to raptor foraging habitat within the region, but the impacts from the project would not be considered cumulatively significant in light of the amount of habitat that remains available for this species in the region analyzed.

5.2 CUMULATIVE IMPACTS FOUND TO BE POTENTIALLY SIGNIFICANT

5.2.1 Potentially Significant Cumulative Impacts to Riversidean Alluvial Fan Sage Scrub

As mentioned in Section 5.0, an analysis was conducted to determine the amount of development that has and will occur in the region. This cumulative impact analysis entailed the gathering of data from city and county jurisdictions regarding proposed or approved projects and open space areas. EIRs, General Plans, and large Specific Plans were analyzed and the relevant information was extracted. Where available, GIS data for projects and open space within the specified area were utilized for the Riversidean alluvial fan sage scrub cumulative impact analysis. These digital data were then overlain on the comprehensive mapping of existing Riversidean alluvial fan sage scrub completed by PCR in 2008 in order to calculate acreages of habitat to be impacted in the specified region.

Based upon the results of the regional analysis of remaining Riversidean alluvial fan sage scrub, on the order of 10,638 acres of Riversidean alluvial fan sage scrub remains within the previously defined region (Figure 27, *Regional Cumulative Impacts to RAFSS*, on page 146). Of

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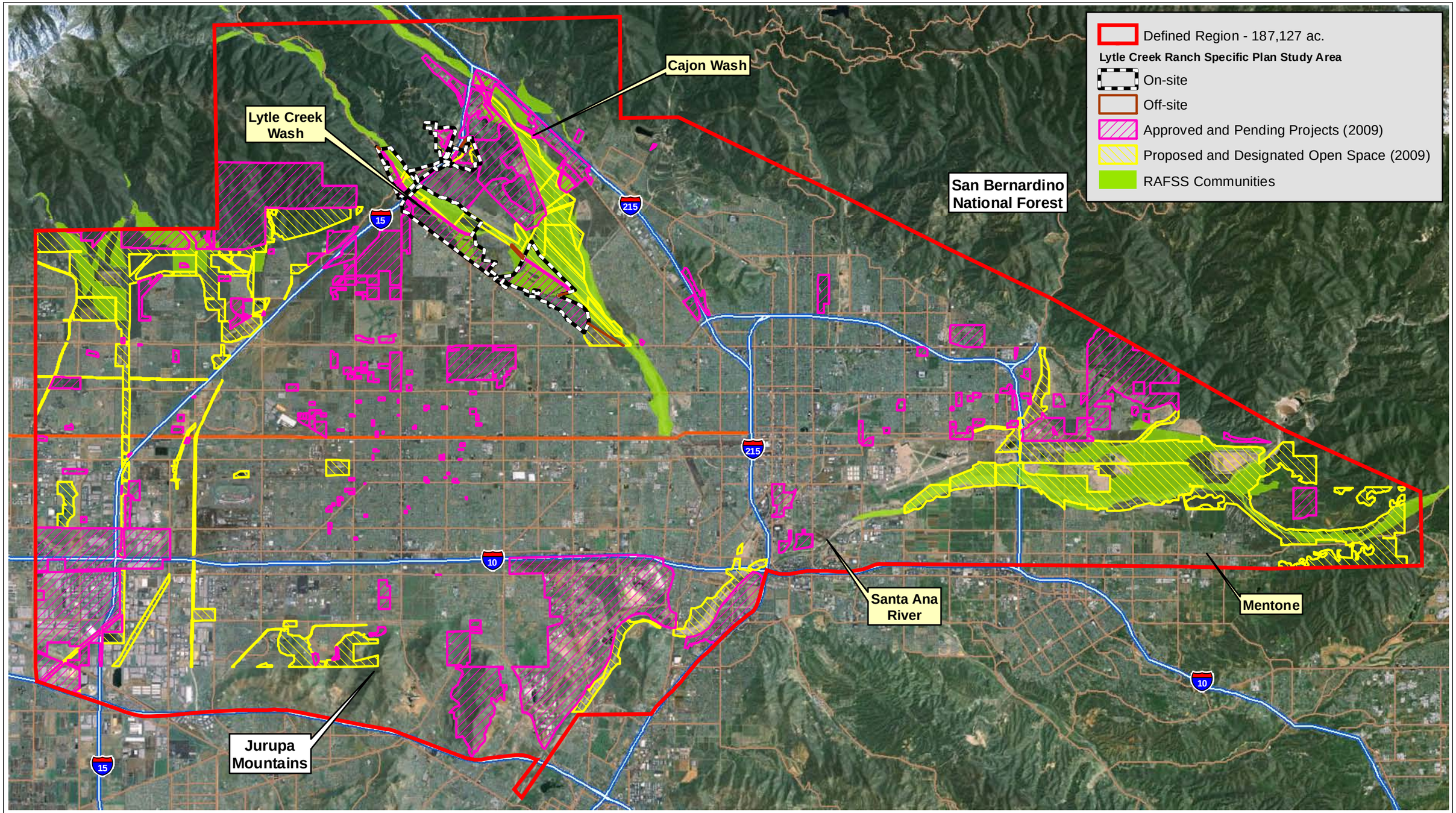

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Source: Aerial Express, 2007; PCR Services Corporation, 2009.

Figure 27

Lytle Creek Ranch Specific Plan
Regional Cumulative Impacts to RAFSS

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this, approximately 1,098 acres (10 percent) are within the borders of approved, planned, or foreseeable projects, including 519.6 acres within the LCRSP area. Table 13, *Cumulative Impacts to Riversidean Alluvial Fan Sage Scrub*, on page 148, summarizes relevant regional projects and impacts to Riversidean alluvial fan sage scrub.

It is also meaningful to document cumulative impacts on a broader regional area in the event relative cumulative impacts to this regionally limited habitat type were greater outside the area defined for cumulative impacts for the purpose of this assessment. For this reason, an inventory of the remaining habitat historically classified as Riversidean alluvial fan sage scrub (Smith 1980; Hanes, et al. 1988) within all of Los Angeles, San Bernardino, and Riverside counties was performed; and, an even broader inventory of the recently classified alluvial fan sage scrub within the entire cismontane Southern California floristic province was completed in recognition of more recent habitat classification research. This research, particularly by Barbour and Wirka (1997), does not view Riversidean alluvial fan sage scrub as materially different from subcategories, or groups, of alluvial fan sage scrub identified by Barbour and Wirka, which are primarily distinguished by geography. As with the cumulative study area analysis mentioned above, both of the expanded regional analyses entailed contacts with city and county planning agencies to ascertain projects that were either approved, planned, or reasonably foreseeable that would impact alluvial fan sage scrub habitat.[10] In the case of habitats constituting the historically defined Riversidean alluvial fan sage scrub, there remains 14,674 acres of habitat, of which 1,178 acres (8 percent) is projected to be impacted by projects, including the LCRSP buildout. Within the greater cismontane Southern California floristic province, some 16,770 acres of alluvial fan sage scrub habitat remains today, of which approximately 1,181 acres (7 percent) are projected to be impacted based upon our analysis. However, while, impacts to alluvial fan sage scrub habitats in these broader regional areas are useful as background and context to understanding the cumulative effects of the proposed project, the most prudent and conservative analysis would be to examine the cumulative effects within the relevant geographic area previously defined for the cumulative impacts analysis in Section 5.0.

Considering the general plant and animal species' populations that are supported by Riversidean alluvial fan sage scrub, and recognizing that highly localized endemics such as San Bernardino kangaroo rat are addressed separately in this Biological Resources Assessment, it is expected that a ten (10) percent cumulative loss of habitat would not result in declines of numbers below self-sustaining levels for any particular species and would not result in the remaining Riversidean alluvial fan sage scrub in the region falling below self-sustaining levels as a community . That is, Riversidean alluvial fan sage scrub is the habitat for a wide variety and

[10] *It should be noted that there are a few jurisdictions for which we were unable to gather data due to either the lack of data in GIS format, the lack of response from representatives (i.e., planners) following multiple contact attempts, unknown uses within tribal or military lands, or difficulty in interpreting data such as zoning and general plan maps to determine whether impacts are foreseeable.*

Table 13

Cumulative Impacts to Riversidean Alluvial Fan Sage Scrub

Community Name	Total within Defined Region (acres)	Proposed and Existing Open Space (study area alone) (acres) *	Proposed and Recently Approved Projects (study area alone) (acres) *	Percent Cumulative Impact to Resource (study area alone) *
Riversidean Alluvial Fan Sage Scrub	10,638	7,064 (391)	1,098 (520)	10% (5%)

* *Acreage in parentheses represents acreage or % of the LCRSP study area and contribution of the LCRSP study area to total in that column.*

Source: PCR Services Corporation, 2009.

number of plant and animal species; and, with the exception of the San Bernardino kangaroo rat, these species are expected to occur throughout this habitat within the entire cumulative impact study area.

Nonetheless, Riversidean alluvial fan sage scrub is a plant community with an assemblage of plant and animal species that is unique and restricted in distribution within the cumulative impacts analysis study area. In addition, this community is found along linear wash features that have relatively high perimeter to area ratios which make them more susceptible to adverse edge effects, and more easily fragmented by development along their lengths (such as from bridge crossings, flood control improvements, and groundwater recharge facilities). Therefore, without mitigation, cumulative impacts to Riversidean alluvial fan sage scrub, like project-related impacts, are considered to be potentially significant.

5.2.2 Potentially Significant Cumulative Impacts to San Bernardino Kangaroo Rat

In order to complete an analysis of cumulative impacts to San Bernardino kangaroo rat habitat within the previously defined region, the assessment of cumulative impacts to Riversidean alluvial fan sage scrub habitat within the region was utilized. A total of ten (10) percent or 1,098 acres out of 10,638 acres of Riversidean alluvial fan sage scrub will be cumulatively impacted within the geographically-relevant region. However, not all of this is necessarily considered suitable habitat for the San Bernardino kangaroo rat. For the purposes of this assessment, it is meaningful as an approach to identifying potentially suitable habitat for the San Bernardino kangaroo rat to consider only alluvial scrub that is both within active hydrological regimes and viable in the long-term as suitable habitat (including pioneer Riversidean alluvial fan sage scrub). These categories total 7,530 acres within the defined region. Of these, 769 acres or ten percent will be cumulatively impacted by approved, planned, or foreseeable projects. Therefore, on a regional basis, the level of potential cumulative loss is considered to be significant. This determination is based on the endangered status of the species and the degree to which a ten percent cumulative loss, in the absence of mitigation, could accentuate the fragmentation and isolation of existing populations.

6.0 MITIGATION MEASURES

6.1 APPROACH

Mitigation measures for impacts to biological resources considered to be potentially "significant" were developed in an effort to reduce such impacts to a level of "insignificance", while at the same time allowing the project proponent an opportunity to realize the project's goals and objectives. As stated in CEQA Section 15370 mitigation includes:

a. Avoiding the impact altogether by not taking a certain action or parts of an action.

b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

c. Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.

d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

e. Compensating for the impact by replacing or providing substitute resources or environments.

6.2 MITIGATION MEASURES FOR POTENTIALLY SIGNIFICANT IMPACTS

The following mitigation measures address potentially significant impacts associated with implementation of the proposed project.

6.2.1 Measures to Mitigate Potentially Significant Impacts to Sensitive Plant Communities

6.2.1.1 Riversidean Alluvial Fan Sage Scrub

In formulating effective mitigation measures for potentially significant impacts to alluvial fan sage scrub, two alternative approaches have been identified. The first is based on appropriately-scaled and previously accepted "mitigation ratios" of acres to be preserved to acres to be impacted, both on and off site, for comparable projects. The second is based on "Habitat

Equivalency Analysis (HEA)" which incorporates the measurement and comparative analysis of common ecological metrics (or indicators) between impacted sites and mitigation sites such that their functions and values can be demonstrated to be equivalent despite differences in their areas. It should be noted that in presenting two alternative approaches for mitigating impacts to alluvial fan sage scrub, this assessment is not suggesting that one approach is necessarily superior to the other, and this assessment concludes that either would reduce the project's impacts to below a level of significance.

6.2.1.1.1 Mitigation Based on Scaled Appropriately and Previously Accepted Ratios

Mitigation for project-related impacts to Riversidean alluvial fan sage scrub (where Riversidean alluvial fan sage scrub is the only or primary community) will combine on-site preservation and off-site acquisition and preservation. A total of 275.0 acres of pioneer, 112.0 acres of intermediate, and 8.4 acres of mature Riversidean alluvial fan sage scrub, for a total of 395.4 acres, will be preserved within the LCRSP study area. This would result in the following on-site mitigation ratios (acres preserved: acres impacted): 3.5:1 for pioneer, 0.5:1 for intermediate, and 0.04:1 for mature Riversidean alluvial fan sage scrub. The average on-site preservation ratio for all phases of Riversidean alluvial fan sage scrub combined is 0.8:1 (Table 14, *Riversidean Alluvial Fan Sage Scrub Mitigation Ratios*, on page 151).

To evaluate the adequacy of on-site preservation of Riversidean alluvial fan sage scrub as a means to mitigate impacts to this plant community, several factors may be considered. These include, but are not necessarily limited to: the diversity and abundance of alluvial fan sage scrub vegetation to be affected, with the loss of mature phase representing an inherently greater loss in diversity and biomass; the value to wildlife in general, with the loss of mature phase vegetation, again, representing an inherently greater loss in habitat diversity and structure, and therefore, a greater loss in wildlife habitat values; and, the value to listed species, with the loss of pioneer and intermediate phases representing a greater loss to the San Bernardino kangaroo rat and slender-horned spineflower (which is not believed to currently exist within the LCRSP study area, but could colonize preserved wash areas in the future). Despite these valid considerations, however, such an approach to evaluating the adequacy of on-site preservation as mitigation only reflects conditions today, or a single point in time within the continuum of constant change due to the on-going hydro-geomorphological processes that define alluvial wash environments. Therefore, the only meaningful way to evaluate adequacy with a long-term perspective is to focus on the mitigation provided on-site for the overall alluvial fan sage scrub system including all phases.

In formulating an appropriate mitigation ratio for impacts to Riversidean alluvial fan sage scrub considerations were made that reflect recent thinking in the mitigation of impacts to

Table 14

Riversidean Alluvial Fan Sage Scrub Mitigation Ratios

Riversidean Alluvial Fan Sage Scrub Communities [a]	Existing Acres within Study Area	Impacts	Preservation[b]	Mitigation Ratio
Pioneer Riversidean Alluvial Fan Sage Scrub	490.0	77.6	275.0	3.5:1
Intermediate Riversidean Alluvial Fan Sage Scrub	406.4	231.3	112.0	0.5:1
Mature Riversidean Alluvial Fan Sage Scrub	247.3	210.7	8.4	0.04:1
Total Riversidean Alluvial Fan Sage Scrub	**1,144.7**	**519.6**	**395.4**	**0.8:1**

[a] *Riversidean alluvial fan sage scrub acreages include all plant communities in which this is the only or primary component.*

[b] *Acreage of Riversidean alluvial fan sage scrub preservation does not include areas within the SBKR Conservation Area.*

Source: PCR Services Corporation. 2009.

alluvial fan sage scrub in the region.[11] For plant communities and habitats that have historically been diminished in the region (e.g., riparian and wetlands) mitigation ratios are typically increased to a minimum of 2:1 due to the elevated importance these restricted resources represent in maintaining biological diversity and sustaining stable biological systems. Such has been the case for the Riversidean alluvial fan sage scrub similar to that to be impacted by the proposed LCRSP project.

As part of this mitigation analysis, a review of available environmental documents that address mitigation for impacts to alluvial fan sage scrub was conducted. In particular, nine documents provided information important to establishing the context for this assessment. This information is summarized below in Table 15, *Alluvial Fan Sage Scrub Mitigation Ratio Research*, on page 152.

In general, mitigation ratios were lowest in the cases where the documents were prepared 10 or more years ago (project/document numbers 1 and 2), or in the case where impacts were relatively minor in comparison to alluvial fan sage scrub avoided (project/document numbers 5 and 6). As shown, the resulting ratios found to be adequate to mitigate impacts to a level less than significant ranged from 1:1 to 1.76:1. In one case, a recently proposed project with relatively minor impacts to alluvial fan sage scrub suggests mitigation is not necessary due to the small size of impacts, the isolated nature of the habitat, and the lack of hydrology affecting this remnant stand of mature alluvial fan sage scrub. In the case of projects/documents where the

[11] *As will be discussed in more detail below, the term alluvial fan sage scrub will be used in this discussion to describe the habitat type being mitigated for. Although we have used the terminology Riversidean alluvial fan sage scrub to refer to the site-specific plant community, it is clear from the scientific literature that alluvial fan sage scrub is a more general term that is appropriate for use to describe the subject plant community throughout coastal southern California.*

Table 15

Alluvial Fan Sage Scrub Mitigation Ratio Research

#	Project/Document Title	Author	Year	Alluvial Fan Sage Scrub Impact (ac.)	Alluvial Fan Sage Scrub Mitigation (ac.)	Mitigation Ratio	Significance Finding
1	FEIR for Glen Helen Regional Park Master Plan Amend. & Sheriff's Training Facility Site Approval, SCH# 88032102	Tom Dodson & Assoc.	1988	85 acres	150 acres	1.76:1	Less than Significant with Mitigation
2	CalMat San Bernardino & Cajon Creek properties Consultation Reinitiating and BO (1-6-94-F 51R1)	USFWS	1998	432 within 100-yr floodplain, 575 RAFSS-M outside floodplain, 119 dist. RAFSS outside floodplain = 1126 ac.	768-ac conservation area, 610-ac Cons. Bank, & 197-ac leased land managed for alluvial fan sage scrub = 1575 ac.	1.4:1	no jeopardy
3	State Route 210 (formerly 30) Improvements Biological Opinion for Cal Trans	USFWS	2004	29.2 acres (18.6 acres permanent; San Bernardino kangaroo rat occupied alluvial fan sage scrub)	112 acres in Cajon Creek Cons Bank	3.8:1 plus 3:1 for any unanticipated impacts beyond 29.2 acres	no jeopardy
4	Glen Helen S. P. and EIR Resource Management Plan	MBA	2005	Not quantifiable; need site-specific data.	2,340 acres	min 2:1	
5	DEIR for San Antonio Spreading Grounds Conjunctive Use Project, SCH# 2005021134	EIP Assoc.	2005	3.7 acres		min 1:1 & approved by CDFG	Less than Significant with Mitigation
6	Tentative Tract Map SUB TT 17651, Planning Commission Resolution No. 06-75, MND approved and Mitigation Monitoring Plan	City of Rancho Cucamonga	2006		2.6 acres	1:1	Less than Significant with Mitigation
7	EIS/EIR for the Proposed BNSF Cajon Third Main Track Summit to Keenbrook	URS	2007	11.1 acres	26.1 acres of compensatory mitigation for scrub, drainages, etc.	2.35:1	
8	Proposed BNSF Cajon Third Main Track Summit to Keenbrook Mitigation, Monitoring, & Reporting Plan (Appendix E of FEIR)	URS	2007			3:1 according to HMMP	
9	DEIR for Baseline Road Master Plan, SCH# 2006011124	Lilburn Corp	2007	10 acres of mature RAFSS	None, less than significant impact due to small size, isolation, and lack of hydrology	N/A	Less than Significant without Mitigation

Source: PCR Services, 2009.

acreages of impacted alluvial fan sage scrub were somewhat larger (project/document numbers 4 and 7), ratios of a minimum of 2:1 to 2.35:1 were established. In the single case known to impact 100 percent of the alluvial fan sage scrub on the project site that was also occupied by the San Bernardino kangaroo rat (project/document number 3), the ratio was established at 3.8:1, with a ratio of 3:1 established for any unanticipated impacts. The circumstances around project/document number 8 were not available; however, a ratio of 3:1 was established in this case.

In terms of project scale, the most comparable project to the LCRSP is number 2. It proposed to impact 1,126 acres of alluvial fan sage scrub, as compared to the 519.6 acres proposed to be impacted by the LCRSP project. Moreover, due to its location in Cajon Creek, it likely impacted alluvial fan sage scrub habitats and associated plant and wildlife populations literally identical to those proposed to be impacted by the LCRSP project. Thus, in the context of past approved mitigation ratios for similarly scaled projects, a minimum ratio of 1.4:1 appears to be an appropriate starting point for discussion. In addition to project scale, however, the age of project/document number 2 (prepared 11 years ago) and more recent thinking reflected in higher mitigation ratios of 2.35:1 and 3:1 for project/document numbers 7 and 8, respectively (both not more than one year old), should be acknowledged.

On the other hand, the configuration of the alluvial fan sage scrub habitat to be preserved on-site will be such that mitigation land is adjacent to areas of this habitat already under public ownership and/or set aside for conservation in perpetuity. Again, following current conservation planning principles, the addition of mitigation lands from the LCRSP project to already established conservation areas adjacent to, and in the immediate vicinity of, the project's proposed mitigation lands would enhance habitat functions and values to the benefit of the species they support to a greater degree than these lands could provide alone (i.e., if they were not connected biologically to other preserved areas containing similar habitat).

Further, the draft *Economic Analysis of Critical Habitat Designation for San Bernardino Kangaroo Rat* (Berkeley Economic Analysis 2008) includes numerous references to a 2:1 mitigation ratio as the USFWS-recommended compensation for development impacts to San Bernardino kangaroo rat lowland habitat. Lowland habitat is defined as areas occupied year-round with high densities of individuals but can be considered synonymous with occupied alluvial fan sage scrub within the floodplain).

Therefore, a 2:1 mitigation ratio is considered adequate to conserve the contribution Riversidean alluvial fan sage scrub makes to the biological diversity found in the regional study area and reduce the project's impacts to Riversidean alluvial fan sage scrub below a level of significance.

As indicated above, Riversidean alluvial fan sage scrub can be mitigated on-site at a ratio of 0.8 acre of habitat preserved for each acre of this vegetation impacted. Although this preservation is an important and beneficial feature of the proposed project, it represents only partial mitigation and would not reduce impacts to a less than significant level. In order to attempt to fully mitigate impacts to Riversidean alluvial fan sage scrub, off-site opportunities were examined through a regional inventory of such habitats, their ownerships, and acres of potential off-site acquisition and preservation by the applicant.

As discussed above in Sections 3.2.2, the new *Terrestrial Vegetation of California* (Barbour et al. 2007) defines alluvial scrub as a specific type of interior sage scrub or Riversidean sage scrub that occurs on alluvial fans and floodplains. This includes the drainages on the coastal side of the Transverse and Peninsular Ranges and correlates with Holland's California floristic province (southwestern California). Although more specific terminology (i.e., Riversidean alluvial fan sage scrub) has been used in prior scientific literature and is used when referring to the plant community mapped within the LCRSP study area, alluvial fan sage scrub will be used in this discussion of off-site mitigation opportunities. In their study analyzing 106 samples of alluvial scrub in Los Angeles and San Bernardino counties, Barbour and Wirka (1997) differentiated seven "groups" of alluvial scrub with differences among these groups being most highly correlated with geographical location within coastal southern California. However, as a natural community composed of both plant and animal populations, there is considerable overlap of species among these different groups throughout the region [i.e., Holland's California floristic province (southwestern California)] that should be considered.

In addition, the terminology used in this assessment referring to pioneer, intermediate, and mature stages of alluvial fan sage scrub is reflective of the relative habitat diversities, values, and functions present within this natural community on-site today. Although Barbour and Wirka (1997) argued that the three-stage "paradigm" being used herein oversimplifies succession in alluvial scrub and may differ in successional dynamics depending on the specific drainage in question, this assessment takes these phases into consideration due to the different habitat values lost based on impacts to the various phases within the LCRSP study area.

The region-wide inventory was completed in February 2008. The study methodology consisted of initially obtaining current color aerial photographs and mapping vegetation types at the major stands remaining today, including 26 major drainages within the region, as defined by Holland's California floristic province for southern California. These drainages were initially identified using the body of scientific literature on alluvial fan sage scrub including Barbour and Wirka (1997), Smith (1996), Stafford and Quinn (1998), as well as earlier work by Hanes et al. (1989). After preliminary mapping on the aerial photographs, a reconnaissance-level verification of the mapping was performed in the field for all of the drainages under study. At the same time, the alluvial fan sage scrub vegetation at each of the drainages was broadly characterized and

dominant species were recorded. As indicated in Table 16, *Alluvial Fan Sage Scrub in Southern California - 2008*, on page 156, and Figure 28, *Alluvial Fan Sage Scrub Regional Analysis*, on page 157, the total remaining alluvial scrub at the 26 major drainages containing alluvial fan sage scrub in the region encompasses approximately 16,770 acres. This total consists of: 7,569 acres of mature and intermediate alluvial fan sage scrub that is still within an active hydrologic regime; 2,009 acres of alluvial fan sage scrub that is cut off from a hydrologic regime; 1,881 acres of disturbed alluvial fan sage scrub; and 5,311 acres of pioneer stage alluvial fan sage scrub.

It should also be noted that the dominant species found by PCR in the 26 drainages examined showed considerable overlap. In particular, scale-broom was a co-dominant species in 24 (96.2 percent) of the drainages; California buckwheat was co-dominant in 22 (84.6 percent) of the drainages; and *Opuntia* spp. was co-dominant in 13 (50 percent) of the drainages. The overlap in habitat structure (that is, the physical form) and plant species is also indicative of the expected overlap in all but a relatively few wildlife species. Thus, the opportunity to meaningfully mitigate for project-related impacts to habitat and general plant and wildlife species, in kind on a regional basis, reasonably exists in any one of these 26 drainages.

When considering the feasibility of off-site mitigation through the acquisition, preservation, enhancement, and/or restoration of this habitat, it is important as a conservation approach to consider all opportunities, such as: alluvial scrub that is viable in the long-term both outside and within active hydrological regimes based on the findings of Barbour and Wirka (1997); disturbed alluvial scrub that presumably could be enhanced or restored; and pioneer-stage alluvial fan sage scrub. More importantly, an analysis of ownership data identified a total of 1,624 acres (excluding the LCRSP project site) of alluvial fan sage scrub land, within 412 separate private ownerships, out of the total of 16,770 acres mapped in the region.[12] This accounts for only approximately 10 percent of the total remaining alluvial fan sage scrub in the region. The remaining 15,146 acres, approximately 90 percent of the total, are publicly owned and, presumably, not available for acquisition. Even so, at a recommended mitigation ratio of 2:1, 1,039.2 acres of alluvial fan sage scrub would be required to be conserved in order to compensate for the project-related loss of 519.6 acres of this habitat. Approximately 395.4 acres are to be preserved on-site, leaving the need to preserve an additional approximately 643.8 acres off-site. Based on the regional inventory of opportunities potentially available, this would be accomplished through a combination of approaches, including: 1) acquisition of lands now supporting alluvial fan sage scrub that are privately owned and potentially could be purchased; 2) purchase of conservation/mitigation bank credits, and, possibly; 3) restoration or enhancement of habitat on publicly-owned or privately-owned lands. It is also recommended that a minimum of

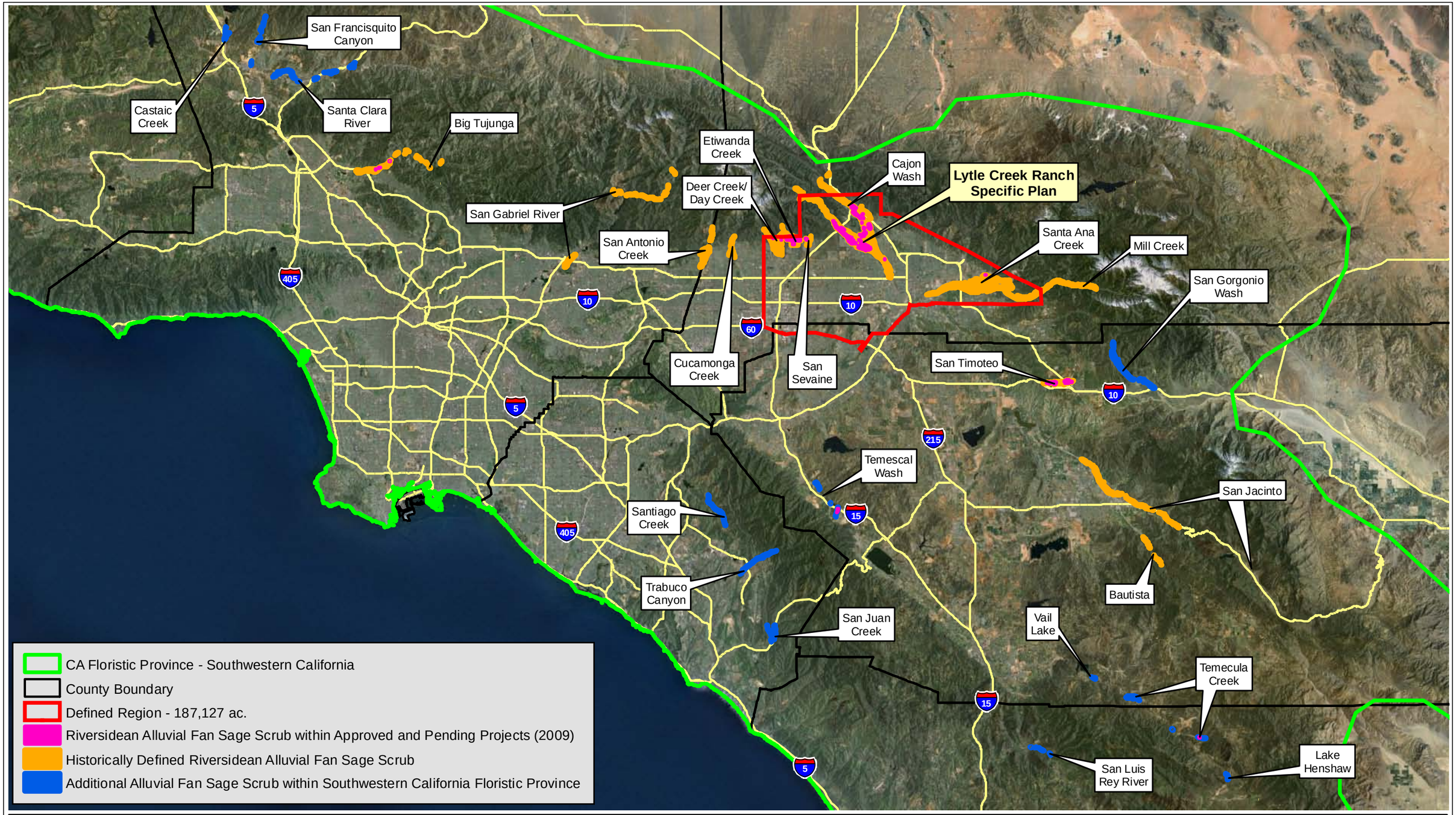
[12] *For the calculation of acreage within private and public ownership, data on alluvial fan sage scrub acreage per parcel was obtained for all but the three Orange County drainages, which represent three percent of all alluvial fan sage scrub acreage mapped. For Orange County, an extrapolation was used based on the ratio of private ownership within all parcels containing some unknown amount of alluvial fan sage scrub.*

Table 16

Alluvial Fan Sage Scrub in Southern California - 2008

Watershed Name	Mature and Intermediate Alluvial Scrub (Active Hydro. Regimes)	Alluvial Scrub (Outside Active Hydro. Regimes)	Disturbed Alluvial Scrub	Barren Wash (i.e., Pioneer Alluvial Scrub)	TOTAL
Santa Ana River Wash	1,854	-	1,005	725	3,611
Cajon Wash	1,434	-	199	733	2,367
San Jacinto River	415	3	-	494	912
Bautista Creek/Wash	48	16	8	3	74
Big Tujunga Wash	207	104	-	234	545
Deer Creek/Day Creek	38	842	-	12	892
San Antonio Creek	694	-	10	18	722
San Gabriel River	250		-	162	411
East Etiwanda Creek	13	675	7	10	705
Cucamonga Creek	10	100	62	49	221
Mill Creek	325	-	154	489	968
Lytle Creek (including study area)	1,088	-	397	1,490	2,975
San Timoteo Wash	58	-	-	108	167
San Sevaine	25	-	-	80	105
Castaic Creek	7	32	2	-	41
Lake Henshaw	-	-	-	38	38
San Francisquito Canyon	84	-	17	-	101
San Gorgonio Wash	423	196	-	155	774
San Juan Creek	62	-	-	100	162
San Luis Rey River	33	-	-	-	33
Santa Clara River	205	-	12	159	377
Santiago Creek	29	-	-	67	96
Temecula Creek	171	-	-	32	203
Temescal Wash	27	41	-	-	68
Trabuco Canyon	57	-	-	126	182
Vail Lake	12	-	8	-	20
TOTAL ACRES	7,569	2,009	1,881	5,311	**16,770**

Source: PCR Services Corporation, 2008.



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Source: Aerial Express, 2007; PCR Services Corporation, 2009.

Figure 28
Lytle Creek Ranch Specific Plan
Alluvial Fan Sage Scrub
Regional Analysis

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322 acres of mature and/or intermediate stage alluvial fan sage scrub be a part of the off-site acquisition and preservation or restoration/enhancement mitigation in order to offset the loss of these stages from the LCRSP study area and the elevated functions and values they provide as wildlife habitat.

With the preservation of 395.4 acres of existing alluvial fan sage scrub on-site and the additional preservation of 643.8 acres of existing, enhanced, or restored alluvial fan sage scrub (on private lands, public lands, or some combination of the two) in the manner described above, potentially significant impacts to alluvial fan sage scrub can be mitigated to a level less than significant.

It should be noted that an additional 34.5 acres of chamise chaparral on-site within Neighborhood III will be restored to Riversidean alluvial fan sage scrub as mitigation for impacts to the San Bernardino kangaroo rat. In addition, the project proposes to restore and manage in perpetuity another 40 acres of upland areas to Riversidean alluvial fan sage scrub within publicly or privately owned conservation areas in close proximity to the LCRSP study area for San Bernardino kangaroo rat refugia (described in detail in Section 6.2.2.1 below). These combined nearly 75 acres of proposed restoration and management of Riversidean alluvial fan sage scrub habitat for the benefit of the San Bernardino kangaroo rat would apply toward the recommended 643.8 acres of alluvial fan sage scrub mitigation and could be properly categorized as providing intermediate-phase alluvial fan sage scrub.

The mitigation measures described above will also be effective in reducing potential cumulative impacts to a level below significant, given the project's intended mitigation and conservation strategy oriented toward the assemblage of large blocks of continuous preserved habitat. For example, the western Riverside County Multiple Species Habitat Conservation Plan (WRC-MSHCP), adopted in 2003 allowed for the potential take of 34 percent (2,710 acres) of Riversidean alluvial fan sage scrub out of a total of 7,940 acres within the WRC-MSHCP study area (Dudek 2003). The WRC-MSHCP concluded that although 66 percent of this habitat would be included as Conserved Habitat, substantial impacts to Riversidean alluvial fan sage scrub would remain due to the patchy distribution of this vegetation community in the plan area and the loss of 34 percent of this sensitive habitat. However, features incorporated into the WRC-MSHCP, including the configuration of conserved lands, as well as adaptive management and monitoring, were determined to reduce this 34 percent loss to a less than significant level.

In comparison, the cumulative impact analysis study area for this project includes 10,638 acres of Riversidean alluvial fan sage scrub, of which only ten percent (1,098 acres) are within the borders of approved, planned, or foreseeable projects, and at least 8,761 acres are within public ownership. In addition to the substantially reduced take potential associated with the project's cumulative impacts, there is also a comparable approach in mitigation and conservation strategy. There are approximately 2,352 acres of habitat abutting the LCRSP study

area that are within five separate conservation areas. These are: the CEMEX Mitigation Area totaling 154 acres; the San Bernardino County Sheriff's Facility Woollystar Preserve totaling 128 acres; the San Bernardino County Flood Control Conservation Area totaling 475 acres; the Vulcan Conservation Bank totaling 1,378 acres; and the SBKR Conservation Area totaling 216.8 acres. To this, the proposed LCRSP project will add approximately 395.4 acres of open space within Lytle Creek Wash, for a total dedicated habitat conservation area of 2,747 acres, the vast majority of which is Riversidean alluvial fan sage scrub. Further, after the project's 395.4-acre contribution to dedicated habitat conservation is made, a total of 7,064 acres, or 66 percent of the remaining Riversidean alluvial fan sage scrub habitat within the cumulative impact analysis study area will be placed under permanent conservation. This is highly comparable to the 66 percent of Riversidean alluvial fan sage scrub targeted as Conserved Habitat in the WRC-MSHCP, without factoring in any future dedications for other projects in the region. Through this preservation, it is expected that the contribution of Riversidean alluvial fan sage scrub to regional biological diversity will be maintained along with its important habitat functions and values within regional biological systems.

In conclusion, a cumulative ten percent loss of Riversidean alluvial fan sage scrub will be a less than significant cumulative impact considering the project's mitigation requiring two acres to be acquired, enhanced, restored and/or preserved for every acre impacted.

It is recognized that a project of the size proposed may be developed, or the project site graded, in phases over time. Thus, it is not necessary for the project applicant to secure all of the alluvial fan sage scrub mitigation at the beginning of the project development, provided that the project applicant maintains at all times a conservation level of alluvial fan sage scrub at a 2:1 mitigation ratio, relative to the alluvial fan sage scrub which is removed from the project site. In other words, the mitigation of alluvial fan sage scrub habitat can be phased to follow, in proportion, the phasing of the project's impacts to alluvial fan sage scrub habitat. Thus, the acquisition of off-site alluvial fan sage scrub mitigation habitat, or the right to enhance, restore or create protected alluvial fan sage scrub habitat on public lands (together with secured funding to achieve the necessary enhancement, restoration or creation), should be secured by the project applicant at a minimum mitigation ratio of 2:1 at all times during project construction prior to removing alluvial fan sage scrub habitat for project construction. Prior to issuance of any grading permit that would result in the removal of alluvial fan sage scrub habitat, the lead agency should verify that the project applicant has secured sufficient alluvial fan sage scrub habitat (through one or more of the means described above) to maintain this 2:1 mitigation ratio, as compared with the amount of alluvial fan sage scrub that could be removed under the then-issued grading permits for the project.

6.2.1.1.2 Mitigation Based on Habitat Equivalency Analysis

HEA is being proposed as an alternative means to provide mitigation for impacts to alluvial fan sage scrub that will result from the proposed LCRSP project as it is built-out over time. Recognizing that alluvial fan sage scrub is a habitat of concern that possesses value to a unique assemblage of plant and animal species, HEA provides a consistent basis to expand opportunities to mitigate impacts in a manner that promotes the conservation of alluvial fan sage scrub habitats and the associated biological diversity in a sustainable manner. Such benefits include: larger contiguous conservation areas/habitat reserves; enhanced connectivity between fragmented habitats; improved and more diverse habitat conditions; and long-term stewardship through on-going management and maintenance activities. HEA will also facilitate the realization of benefits within the Lytle/Cajon wash complex where such benefits will be most effective in compensating for project-related impacts and maintaining diversity in local biological systems. As discussed below, HEA is a methodology shown to be effective and applicable in a wide variety of circumstances and settings where appropriately-scaled mitigation is being sought for biological impacts.

Background and Overview of Approach

As a tool for quantifying impacts and appropriately-scaled mitigation, HEA was developed in the early 1990s and became the recommended approach to the replacement of damaged natural resources in the Oil Pollution Act of 1990 regulations promulgated by the United States Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) in 1996. Since that time it has been widely used in other contexts. HEA, also know as the "service-to-service" approach to scaling, is supported by several federal agencies (DOI, 1997; NOAA, 1997; EPA, 2007) and by federal court decisions (e.g., USA vs. M. Fisher et. al. 1997) as a valid approach for determining compensation for habitat impacts and for measuring environmental improvement.

Most relevant to this assessment, HEA has been used as an "*ex ante*" (before the event; i.e., before the impact) evaluation tool in the contexts of CEQA and the National Environmental Policy Act (NEPA), as well as in regulatory permit processing under the federal Clean Water Act. In California, the State Lands Commission was the lead agency for an Environmental Impact Report (EIR) that included HEA for the disposition of debris mounds created by the removal of four oil drilling platforms off the coast (CSLC, 2007). HEA was the approach to scaling mitigation recommended by the U.S. Environmental Protection Agency (EPA) to the U.S. Army Corps of Engineers (ACOE) in a letter of comment to a Draft Environmental Impact Statement (EIS) for the master plan for a deep-draft wharf in Guam (EPA, 2007). In North Carolina, it has been used to scale comprehensive watershed restoration programs to meet mitigation needs as part of ACOE permitting processes (Kealy et. al., in preparation). Finally, the Oregon Department of Transportation (ODOT) in concert with the USFWS, EPA, ACOE,

Federal Highways Administration and others have implemented a very similar approach and methodology for determining compensatory mitigation debit/credit calculations for its projects (Warncke, 2005).

The HEA approach has been used in multiple states across the United States. As examples: in the Town of Windsor, California, HEA is being used to estimate the value of preserving oak woodland and establish mitigation for a proposed 168-acre recycled water storage project (Rockel et. al., 2008); in Washington, HEA was used to establish a new set of wind power guidelines that are being used by the Washington Department of Fish and Wildlife in a five-year pilot program to assess mitigation requirements across the state (Ling and Linehan, 2003); in Idaho, HEA was used to scale mitigation and restoration for negative impacts to fish assemblages arising from operations at a mine site (Chapman et. al, 1998); in Louisiana, HEA was used to determine restoration requirements for a salt marsh damaged by failure of an oil line at Lake Barre (Penn and Tomasi, 2002); and in Florida, HEA was used to determine the appropriate amount of restoration of seagrass beds damaged by downward-directed prop wash (Fonseca et. al., 2000).

The merits of this approach have also been discussed in several peer-reviewed journal articles and federal government reports (King, 1997; Unsworth and Bishop, 1994; NOAA, 2006; Fonseca et. al., 2000; 2001; Penn and Tomasi, 2002; Roach and Wade, 2006). In particular Ray (2008), in a ACOE Engineering Research and Development Center report discussing HEA as a tool for estimating environmental benefits, stated: “Because it is a generic method it can be applied to a variety of situations, including evaluations of both habitats and individual species”. In their discussion of an HEA derived approach to more effectively address endangered species’ recovery, Bruggeman et. al. (2005), through the Department of Fisheries and Wildlife at Michigan State University, reached a similar conclusion.

In order to apply HEA, a system of “ecological currency”, with which to quantify and scale mitigation is required. Such a system of ecological currency whereby trade-offs are quantified can be described as a tool of net environmental benefit analysis, which is derived from the same theoretical foundation as economic cost-benefit analysis (Findlay and Kealy, 2003). An important distinction, however, is that in applying an ecological currency system, only the ecological effects of an action are considered. Fundamental to this approach is the recognition that the value of biological resources (e.g., wildlife carrying capacity, habitat diversity, suitability to support threatened and endangered species) is defined by the quality and quantity of the services provided by the resource. Enhancement, stewardship, and/or long-term protection of a habitat such as alluvial fan sage scrub, then, can be defined in terms of the increase in quality and/or quantity of ecological services that it provides. Applying a systematic valuation framework to assess ecological costs and benefits is a necessary step in this process. The ecological currency approach accomplishes this objective.

Applicability to the Proposed Project

The principle concept underlying the HEA approach, as it applies to this assessment, is that adequate compensation for losses of habitat services can be achieved by providing net gains in habitat services (at mitigation sites) of the same type according to combinations of habitat quantity and quality (the term "service" hereinafter being referred to as "value"). In other words, HEA assumes a one–to-one trade-off between a unit of value at the impact site and a unit of value at the mitigation site. Replacement can occur in a variety of ways and in combinations of ways that, cumulatively, generate mitigation synergisms. That is, HEA does not necessarily assume a one-to-one trade-off in resources (that is, acres of habitat), but instead in the values they possess and the functions they provide.

The HEA approach recommended for consideration here does diverge from that generally applied in one notable way, and that is how temporary and permanent losses from impacts and immediate and long-term gains from mitigation are compared. NOAA (1999) recommends using a three (3) percent discount rate when scaling compensatory mitigation for discounting interim losses of resource functions at impact sites and long-term gains of resource functions at mitigation sites. For example, if a compensation project continues to provide resource functions for a long period of time (say, 300 years) and the interim loss of value at an impact site is a relatively short period of time (say, 5 years), then the area required for compensation of the lost values will be smaller than the original impacted area, because the services accrue over time. Likewise, full realization of mitigation efforts may occur some time after impact and, consequently, mitigation may be worth less in present-value terms than mitigation that occurs and is fully realized at the time of impact. Under the approach recommended for consideration herein, this element of HEA is simplified by requiring mitigation (in terms of the land set aside or dedication element of the mitigation measure) prior to or at the time of impact. Thus, delays between the time of impact and the time mitigation takes place will be eliminated and there is no need to discount values. Note in the discussion of net improvements below, however, the metrics for enhancement and restoration have been scaled over time to account for temporary losses of habitat. On the other hand, if mitigation is anticipated and net improvement activities are initiated in advance of impacts, discounting is not appropriate and full metric values are to be realized. That is, full vegetation metrics are valid to apply to a site where the appropriate amount of restoration was implemented prior to impacts and the restoration success criteria have been met.

As mentioned earlier, HEA is a tool with which to apply a system of ecological currency. The currency is based on biological metrics or indicators common to the habitats at both the impact and mitigation sites. Further, when choosing a system of metrics to evaluate the quantity and quality of values provided per unit of habitat, it is important to examine the existing and potential values of habitats for comparative purposes. It is also important that the metrics reflect CEQA concerns, including providing for mitigation of significant impacts to habitats and species

of concern. Therefore, in the context of mitigation for impacts to biological resources, intermediate alluvial fan sage scrub within active hydrological regimes and occupied by San Bernardino kangaroo rat was considered to be the most appropriate basis, or benchmark, for establishing metrics. This type of habitat was chosen with the input of Natural Resource Consultants (NRC), the City-hired third party reviewer for the EIR assessment, and Dr. Tom McGill of PBS&J, who is currently working under contract with the County of San Bernardino to resolve similar issues for its public improvement projects. There was general consensus among these experts that impacts to this habitat type was considered to warrant careful examination and mitigation to address the CEQA goals of reducing impacts to less than significant levels. By consensus, appropriate metrics were determined to be attributes of: 1) vegetation and species of plants and wildlife of concern as affecting the capacity of a site to provide existing values; 2) vegetation and species of plants and wildlife of concern as affecting the opportunity to provide enhanced or restored values; and 3) landscape context as affecting the ability of a site to sustain existing, enhanced or restored values over the long-term. Thus, vegetation structure and diversity, presence or potential presence of species of plants and wildlife of concern, and landscape context of habitats are the bases for establishing the common metrics for HEA application under this alternative mitigation approach.

Due to the scale of the proposed LCRSP project, the project's build-out will be phased over time and, likely, will involve more than one builder. Therefore, it is necessary that the methodology for applying the metrics is readily applicable. The HEA process described herein was designed to meet the requirements that it: 1) employ time-efficient and cost-effective ambient monitoring and assessment methodologies; 2) can be performed on varying scales, ranging from less than an acre to tens or even hundreds of acres; and 3) provide an objective assessment of habitat quality that is both reliable and repeatable by different investigators. As an appropriate method to follow in these regards, the HEA data gathering process described in this assessment parallels the California Rapid Assessment Method for Wetlands User's Manual (Collins et. al. 2007). The California Rapid Assessment Method (CRAM) was one of several products formulated by a consortium of local, State, and federal authorities in the development of new tools to increase the State's capacity to assess and monitor its wetland resources, as mandated by California Assembly Bill 2286. Moreover, in the summer of 2005 the CRAM method was ground-truthed by comparing CRAM results from 54 randomly chosen study sites to a more intensive and quantitative Index of Biotic Integrity (IBI) of benthic macro-invertebrates. Results revealed a significant correlation between overall CRAM results and IBI scores. The close association between CRAM results and the more in-depth IBI assessment suggests that CRAM is a viable tool for assessing ecological integrity, despite the rapid and somewhat qualitative nature of the method (Clark 2007). It also suggests the validity of using a similar method for the assessment of alluvial fan sage scrub as part of the alternative HEA approach.

For alluvial fan sage scrub biodiversity conservation, the HEA approach here has also been designed to assess habitat quality at both impact and mitigation sites in terms of their

potential contribution to a cumulative and coordinated region-wide conservation strategy. These are identified as part of the discussion of metrics for vegetation, species of concern, landscape context, and net improvement below. It was also necessary to note the relative importance of the various metrics in characterizing intermediate alluvial fan sage scrub occupied by San Bernardino kangaroo rat. Some are more "necessary" to be present than others. Consequently, the metrics have been weighted according to their degree of being a defining character of benchmark conditions. Here, again, NRC and Dr. McGill were consulted and a consensus about weighting was employed.

Metrics for Vegetation Analysis

A range of methods for assessing vegetation quality and integrity have surfaced over the past three decades in the United States. As examples: Wilhelm (1977) and Swink and Wilhelm (1979, 1994) introduced and developed the Floristic Quality Assessment (FQA) as a method that uses a floristic quality index (FQI) to assess quality. Andreas and Lichvar (1995) developed the Floristic Quality Assessment System as a tool to provide a numerical value (Floristic Quality Assessment Index) for natural area evaluation in northern Ohio based on plant species present; and, Brooks et. al. (1998) applied an index of biological integrity to forested riparian systems. However, FQI approaches were not considered for the metrics here for two primary reasons. First, the methodologies used to apply floristic indices are not consistent with the rapid assessment methodology to be used. Second, they do not address the life forms and structures making up habitats that are important to assessing their value to wildlife.

Instead, the method for assessing vegetation metrics designed here follows that of the "habitat hectares" approach introduced by Parkes et. al. (2003). This approach was developed in Australia and is based upon an approach initially developed for determining offset scenarios for environmental impacts. The approach was elaborated in the Draft Victorian Native Vegetation Management Framework (Natural Resources and Environment, 2000) as one of several improvements in identifying priorities for the protection of native habitats on private land, and was subsequently endorsed by the Victorian Government (Natural Resources and Environment, 2002).

In summary, the habitat hectares approach is a straightforward, quantitative method for assessing the quality of vegetation by totaling scores that are assigned to various habitat attributes. As stated by McCarthy et. al. (2004) in their independent review and critique of the habitat hectares approach, "This approach aims to be rapid, objective, reliable and repeatable." It is to be used to assess the potential for improvement of sites with low quality vegetation, compare the quality of different types, and provide a single metric that combines the area of vegetation with its quality. The habitat hectares approach also aims to measure the net outcomes of management decisions and the relative importance of different components of native vegetation. Based on a critical review of the habitat hectares approach, it appears to be well

suited for use in the application of the HEA approach to mitigation in that it can be applied rapidly by different investigators with consistent results. However, some adjustments to the metrics to be used to accommodate assessments of alluvial fan sage scrub and the addition of a sensitive species component were necessary. It should also be noted that the habitat hectares approach is congruent with floristic quality assessments developed and used in North America in terms of its considerations of species diversity and presence of non-native, invasive species with comparable effects on overall vegetation quality. That is, under both the habitat hectares approach and many floristic quality assessments, the presence of higher native species diversity leads to higher quality values and the presence of non-native invasive species leads to suppressed values.

Habitat hectare (hereinafter referred to as habitat acre for purposes of conversion to U.S. units) assessments rely on a comparison of vegetation/habitats at both impacted and mitigation sites to a "benchmark" for the same vegetation type existing in a condition and context of high value. As such, the benchmark for alluvial fan sage scrub will reflect relatively undisturbed, intermediate-structured alluvial fan sage scrub that is occupied by the San Bernardino kangaroo rat within Lytle Creek wash and is within the 100-year floodplain. To establish benchmark values the average values of the metrics taken from 11 one-acre plots within intermediate-structured alluvial fan sage scrub that are occupied by San Bernardino kangaroo rat were calculated. These metrics, the methods of data collection, the rationale for their inclusion, and weightings (i.e., maximum attribute value/percentage of total score) are summarized below:

- The canopy cover of native trees and large shrubs over six (6) feet in height, as measured along five 100-foot line transects within one-acre study plots using a systematic point sampling methodology. Although these plant life forms add a distinct dimension to habitat diversity, they are not reflective of intermediate alluvial fan sage scrub and often are a sign of senescent vegetation that does not represent suitable habitat for San Bernardino kangaroo rat. Therefore, values are inversely correlated with the percent canopy cover of trees scaled over broad intervals (Table 17, *Canopy Cover of Trees and Large Shrubs Taller Than 6 Feet,* on page 166). Maximum value – 5%.

- The percent canopy cover of native trees and shrubs less than six (6) feet in height, as measured along the five 100-foot line transects within one-acre study plots. As an important indicator of a habitat's suitability to support San Bernardino kangaroo rat, scores approximating benchmark values will be highest. Values will be reduced for habitats exhibiting substantially higher and lower values. Values are based on intervals of percent cover with percent cover approaching and overlapping those of pioneer alluvial fan sage scrub and mature alluvial fan sage scrub at the lower and higher ends of the scale, respectively (Table 18, *Canopy Cover of Native Shrubs Shorter Than 6 Feet,* on page 166). Maximum value – 15%.

Table 17

Canopy Cover of Trees and Large Shrubs Taller Than 6 Feet

Canopy Cover of Trees and Shrubs >6 Ft.	Value
None	5
0-20%	2
>/= 21%	0

* *For comparative purposes, benchmark attribute is 0 percent cover.*

Source: PCR Services Corporation, 2008

Table 18

Canopy Cover of Native Shrubs Shorter Than 6 Feet

Canopy Cover of Shrubs Shorter Than 6 Feet	Value
20-30%	15
15-19% or 31-35%	10
10-14% or 36-40%	5
<10% or >40%	0

* *For comparative purposes, benchmark attribute is 25 percent cover.*

Source: PCR Services Corporation, 2008

- The number of native, indicator shrub species for the benchmark intermediate alluvial fan sage scrub, derived by actual counts of individual species encountered anywhere along the 100-foot line transects. This will serve as an indicator of dominant and common plant diversity as compared to the benchmark habitat. Values are based on the number of species encountered in comparison to benchmark values (Table 19, *Number of Indicator Shrub Species Present,* on page 167). Maximum value – 10%.

- The percent of ground cover by non-native plants, as measured along the five 100-foot line transects. This will serve as an indicator of disturbance and suitability to support San Bernardino kangaroo rat (e.g., this species avoids sites where a dense cover of non-native grasses is found). Values are based on percent cover intervals with values scaled down as cover by non-native species increases. (Table 20, *Percent Ground Cover by Non-Native Plant Species,* on page 167). Maximum value – 10%.

- The percent of ground cover by organic litter, as measured along the five 100-foot line transects. If relatively high, the cover of organic litter in alluvial fan sage scrub is usually associated with conditions not consistent with intermediate stands. Moreover, if relatively high, litter cover is a deterrent to occupation by San Bernardino kangaroo rat for the same reasons a dense cover with non-native species is. Values are based on intervals of lower and higher percent cover of organic litter as

Table 19

Number of Indicator Shrub Species Present

Number of Indicator Species	Value
None	0
1 Species	2
2 Species	4
3 Species	6
4 Species	8
5 Species	10

* *Benchmark indicator species are Eriogonum fasciculatum, Yucca whipplei, Lepidospartum squamatum, Artemisia californica and Lotus scoparius.*

Source: PCR Services Corporation, 2008.

Table 20

Percent Ground Cover by Non-Native Plant Species

Cover of Non-Native Plant Species	Value
>25%	0
20-25%	2
15-19%	4
10-14%	6
6-9%	8
=/<5%	10

* *For comparative purposes, benchmark attribute is 5% cover.*

Source: PCR Services Corporation, 2008.

compared to the benchmark reflecting conditions of pioneer alluvial fan sage scrub and mature alluvial fan sage scrub, respectively (Table 21, *Percent Ground Cover by Organic Litter,* on page 168). Maximum value – 5%.

Metrics for Landscape Context Analysis

Whereas the vegetation quality assessments will be made from an appraisal of the five different attributes outlined above, the quality and long-term sustainability of vegetation will be dependent on external factors potentially influencing a particular site. For the purpose of the HEA analysis these factors are habitat patch size and surrounding habitats (i.e., the degree of connectivity the patch possesses), both of which relate to the Species Area Relationship (SAR), and, the presence of an active hydrologic regime which will provide for long-term sustainability.

At one time in the early 1980s there existed an argument among conservation biologists over the relative merits of a single large or several small reserves. After several years, the results

Table 21

Percent Ground Cover by Organic Litter

% Cover of Organic Litter	Value
<8% or >24%	0
8-12% or 20-24%	3
13-19%	5

** For comparative purposes, benchmark attribute is 16% cover.*

Source: PCR Services Corporation, 2008.

of research concluded that all else being equal, reserves of larger area will support more species than reserves of smaller area (Murphy 1989). Research on the subject of SAR or its converse, the effects of habitat fragmentation, is extensive. Several studies cited here are: Ney-Nifle and Mangel (2000); Holt et. al. (1999); Palmer and White (1994); Harrison and Bruna (1999); Soule et. al. (1988); Murphy and Wilcox (1986); and Crooks et. al. (2001). It should also be pointed out that the reserve designs provided for in the Natural Community Conservation Planning (NCCP) programs for Orange County and Western Riverside County, both of which have been adopted and are now being implemented, follow SAR principles. As such, the components of landscape context have been assigned substantial roles in the overall HEA process.

The importance of an active hydrologic regime (i.e., 100-year flood plain) can not be overstated regarding the benchmark and how sites compare to it. By definition, alluvial fan sage scrub is a vegetation-type dependent on hydro-morphological processes for its long-term sustainability, and in the absence of these processes, the vegetation will become senescent and show a transitional trend toward chamise chaparral in its composition and structure. Senescent stands of alluvial fan sage scrub are not suitable for San Bernardino kangaroo rat.

The metrics for landscape context, the methods of data collection, the rationale for their inclusion, and weightings (i.e., maximum attribute value/percentage of total score) are as follows:

- Patch size, based on GIS analysis with increments of size ranging from <2 acres to >20 acres is used to "valuate" sites under investigation and compare them with benchmark values (Table 22, *Patch Size*, on page 169). Maximum value – 10%.

- Surrounding habitats, which reflects the degree of connectivity between patches of vegetation/habitats, as measured as the proportion (percent) of the area within a defined radius covered by native vegetation. Three radii - 100 yards, one-quarter mile, and one-half mile - are to be examined using GIS. A sliding scale of percent native cover within each radii reflect scaled values with emphasis on smaller radii.

Table 22

Patch Size

Patch Size (Acres)	Value
<2 acres	0
>/=2, but <5 acres	2
>/=5, but <10 acres	4
>/=10, but <15 acres	6
>/=15, but <20 acres	8
>20 acres	10

** For comparative purposes, benchmark attribute is >20 acres.*

Source: PCR Services Corporation, 2008.

Scores are based on benchmark values (Table 23, *Surrounding Habitats,* on page 170). Maximum value (of all three radii) – 10%.

- The presence of an active hydrologic regime as determined using a current delineation of the 100-year flood plain as prepared by a qualified engineer. Scores will either be "0" where no hydrologic regime exists or "15" where one does exist. Where no precise data exists, a qualified engineer will be consulted to review existing data in the vicinity and/or will be asked to render a delineation by "approximate method" as suggested by FEMA guidelines. Scores will be based on the benchmark value that a hydrologic regime exists (Table 24, *Hydrologic Regime,* on page 170). Maximum value – 15%.

The San Bernardino kangaroo rat, along with its intermediate alluvial fan sage scrub habitat and affinity to alluvial fan sage scrub habitats within the 100-year flood plain, has become one of the most important defining criteria for resource conservation planning in the San Bernardino Valley region. Yet, not all areas of alluvial fan sage scrub habitat within the 100-year flood plain are occupied. Based on an extensive trapping effort of potential habitat within the study area, areas of occupation were identified and delineated using GIS. Using the GIS database compiled for this species, a relatively high weighting will be used to valuate habitats based on the presence or absence of San Bernardino kangaroo rat in the HEA approach to mitigation, as follows:

- The presence of San Bernardino kangaroo rat as established by the extensive trapping conducted in the study area (Table 25, *San Bernardino Kangaroo Rat,* on page 170). Maximum value (for presence only) – 20%.

Table 23

Surrounding Habitats

Radius	Percent Native Vegetation		Weighting		Value
100 yards		X	0.04	=	
¼ mile		X	0.04	=	
½ mile		X	0.02	=	
			TOTAL	**=**	

* *For comparative purposes, benchmark attribute is 100% native cover within all radii.*

Source: PCR Services Corporation, 2008.

Table 24

Hydrologic Regime

Relationship to 100-year flood plain	Value
Within 100-year flood plain	15
Outside 100-year flood plain	0

* *For comparative purposes, benchmark attribute is within 100-year flood plain.*

Source: PCR Services Corporation, 2008.

Table 25

San Bernardino Kangaroo Rat

Presence/Absence	Value
Species present	20
Species absent	0

* *For comparative purposes, benchmark is species present.*

Source: PCR Services Corporation, 2008.

Metrics for Net Gains and Improvements

Up to this point in the analysis, the potential maximum metric value is 1.00, or 100 percent of one habitat acre, as established by the benchmark. This is due to the metrics above being those essential to defining the benchmark as intermediate alluvial fan sage scrub that is within the 100-year flood plain and occupied by San Bernardino kangaroo rat.

Although not considered a part of benchmark conditions, key species of concern other than the San Bernardino kangaroo rat are incorporated into the HEA approach for two primary reasons. First, they make an important contribution to biological diversity and mitigation efforts should recognize and receive value for their conservation. Second, incentives to pursue

mitigation efforts that recognize more than a single species should be provided for if a comprehensive alluvial fan sage scrub conservation program is to be achieved. That is, inherent to the conservation of biological diversity, and important to achieving adequate mitigation for project-related impacts, should be species of concern attributes.

Key species of concern are defined here as species that meet one or more of the following criteria: listed as endangered or threatened under the FESA of 1973 proposed for listing under FESA; candidate for listing under FESA; listed as endangered or threatened under the CESA; candidate for listing under CESA; listed as a CSC by CDFG; designated as a List 1B, List 2, or List 4 species by the CNPS (for an expanded discussion of species of concern, the reader is referred to Section 3.6 of this assessment). The metrics for species of concern attributes, the methods of data collection, the rationale for their inclusion, and their weightings (i.e., maximum attribute value/percentage of total score) are summarized below:

- The presence of key species of concern. Presence will be determined based on either the documented presence of certain species within the habitat polygon within the prior five years, focused surveys, or other means of detection by an accredited, qualified biologist. Scores are based on a range of values to be given species along a gradient of "rarity" and, therefore, conservation priority in the region (Table 26, *Key Species of Concern*, on page 172).

In the simplest of terms, net improvement (or net gain) means achieving a net benefit. If a net improvement is measured in ecological terms, ecological functions and values need to be considered. As discussed above under Metrics for Landscape Context Analysis, habitat values would be increased under scenarios where habitats used for mitigation are relatively large and/or contiguous with adjacent habitats (SAR). On the other hand, values would be decreased for fragmented and/or relatively isolated habitat areas. In other words, by mitigating impacts to a fragmented and/or relatively isolated habitat patch in such a way that habitats become connected, contiguous or configured in a large block, a net improvement in the sustainability of preserved habitats would result.

It is also possible to achieve net improvements in habitat values through habitat acquisition/dedication for preservation, enhancement or restoration and long-term maintenance and management. Examples are: the restoration of alluvial fan sage scrub in disturbed areas that lie between relatively undisturbed habitat areas, thereby effectively increasing the habitat size or providing greater connectivity; seeding or planting container plants in florally homogeneous areas to add plant species diversity thereby creating more diverse habitats for wildlife; conducting periodic weed control activities in a habitat area to forestall non-natives from overtaking native plant species; and fencing preserved habitat areas to prevent unauthorized off-road vehicle use which could otherwise damage the habitat. Such investments in mitigation habitats should be accommodated in the HEA process and are provided for here. The metrics for

Table 26

Key Species of Concern

Species Presence*	Value
Santa Ana woollystar	20
Slender-horned spine flower	15
Southwestern flycatcher	15
Least Bell's vireo	15
Burrowing owl	10
California gnatcatcher	10
Arroyo toad	10
Other species of concern	5 each**

* *Presence of key species of concern to be established by focused surveys or other direct means of detection.*

** *Other species of concern are Los Angeles pocket mouse, San Diego pocket mouse, San Diego horned lizard, Plummer's mariposa lily, and Parry's spineflower.*

Source: PCR Services Corporation, 2008.

net improvement, the methods of data collection, the rationale for their inclusion, and their weightings (i.e., maximum attribute value/percentage of total score) are summarized below:

- Off-site acquisition of habitat for preservation purposes will accrue attribute values consistent with the benefit of removing habitat from "unprotected" public or private ownership and placing it under an easement or deed restriction for conservation in perpetuity. Absent a protected conservation status, such land may be lost to development or other uses and without such conservation status there is a substantially greater likelihood that unauthorized activities (such as ORV use, trash dumping, etc.) will reduce or eliminate the habitat value provided by such lands. In such cases, a value of 50% of the baseline habitat acre value will be assigned for land acquired off-site and dedicated to preservation using a conservation instrument (e.g., deed restriction, conservation easement, etc.). Any other improvement activities will be added to this (Table 27, *Net Improvements,* on page 173).

- On-site preservation of habitat will accrue attribute values consistent with the benefit of removing habitat from unprotected status and placing it under a protected conservation status. In such cases, a value of 50% of the baseline habitat acre value will be assigned for land dedicated on-site using a conservation instrument (e.g., deed restriction, conservation easement, etc.). Any other improvement activities will be added to this (Table 27, *Net Improvements*)

Table 27

Net Improvements

Activity	Value
Off-site acquisition for preservation	50% of baseline habitat value
On-site preservation	50% of baseline habitat value
Fencing/barriers/signage	10
Weed control	10
Biological monitoring	10
Management for SBKR	20
Enhancement/Restoration	20 per year

* *Off-site acquisition for preservation and on-site preservation must include an instrument for conservation in perpetuity (e.g., deed restriction, conservation easement, etc.)*

** *Enhancement/restoration values will begin to accrue at implementation dependent upon either an endowment to fund in perpetuity or a five-year monitoring program with associated criteria.*

Source: PCR Services Corporation, 2008.

- Enhancement and restoration efforts accrue attribute values equal to the difference between baseline habitat values and enhanced or restored habitat values, according to the metrics for vegetation analysis (see Tables 17 through 21). For example, by seeding or planting three indicator shrub species (6% net gain in value), reducing non-native plant cover from more than 25% to less than five percent (10% net gain in value), and reducing organic litter cover from greater than 24% to 15% (5% net gain value), a total net gain of 21% in value will be realized and available for mitigation. Maximum value – total of net gains for all vegetation attributes enhanced or restored.

- Habitat modifications to create habitat suitable for federal and/or State-listed species accrue attribute values that are adjusted from values as if those species existed on site at the time of the initial valuation (Table 27, *Net Improvements*). For example, the removal of dense chamise chaparral from areas where soils are suitable to support San Bernardino kangaroo rat and are adjacent to habitat occupied by the species will receive increased value scores. Maximum value – full metric value upon documentation of presence. That is, if chamise chaparral removal from a site results in occupancy by San Bernardino kangaroo rat after one year, the full 20% value for the presence of this species will be realized at that time.

- Long-term maintenance and management activities or the provision of funds to support such activities is viewed as vitally important to the sustainability of conserved habitats into the future. These activities accrue values according to the number of activities being provided for, limited to fencing or other barriers to unauthorized access/signage, on-going weed control, and biological monitoring (Table 27, *Net Improvements*). Maximum value – 10% per activity (maximum of 30%).

HEA Procedure

The basic steps for implementation of the HEA approach are as follows.

Step 1 – Determine the Extent of Potential Impact: Based on the impact assessment provided above in Section _4.0, *Project Related Impacts*, impacts to alluvial fan sage scrub include 210.7 acres of mature, 231.3 acres of intermediate, and 77.6 acres of pioneer structure vegetation generally occurring in a mosaic pattern in the LCRSP study area. In addition, 702.7 acres (696.8 acres and 5.9 acres off-site) of habitat is occupied by San Bernardino kangaroo rat. Using the vegetation maps provided in Figures 4 through 8, *Plant Communities*, the map of occupied San Bernardino kangaroo rat habitat provided in Figure 14, *SBKR and LAPM Occupied Habitat*, and maps showing the 100-year flood plain in the LCRSP study area, composite polygons will be delineated which reflect common characteristics of disturbed and relatively undisturbed mature, intermediate, and pioneer structure, the presence or absence of San Bernardino kangaroo rat, and location within or outside the 100-year flood plain within the development foot print. Within each polygon, randomly selected study plots of one acre will be identified at the rate of one plot per 10 acres of polygon size, rounded up to the nearest whole number of plots. For example, a habitat polygon of 15 acres would require two study plots for analysis (15÷10=1.5, rounded up to two). Within each one-acre study plot five parallel 100-foot line transects will be established at intervals of 15 feet, all of which are contained entirely within the study plot boundaries.

Employing systematic point sampling at one foot intervals along the 100-foot transects, the raw attributes of the plot for percent canopy of trees and shrubs greater than six feet in height, percent canopy of all shrubs less than six feet in height, number of native shrub species, percent of ground cover by non-native species, and percent ground cover by organic litter will be recorded. Data reflecting attributes sampled using the line transects will be averaged from data taken from all five transects.

Landscape context will be assessed using GIS whereby patch size and percent native habitat cover within radii of 100 yards, one quarter mile and one half mile. The presence or absence of San Bernardino kangaroo rat and location within or outside the 100-year flood plain will have already been incorporated as these attributes are used to define polygons for study. Metrics for Net Improvement do not apply to areas to be impacted.

Using the data collected, the various attributes will be scored according to the metrics reflecting a comparison to benchmark provided in Tables 17 through 21. All attribute scores will then be totaled to represent the habitat acre value each acre in the polygon possesses, as compared to the benchmark. The resulting habitat acre score will then be multiplied by the size of the polygon (acres) to derive the total habitat acres value that will be lost from that polygon due to project-related impacts. After completing the scoring process for all polygons within the

development foot print, and summing their individual habitat acre values, a grand total of habitat acres to be impacted will be derived. This total will be used to identify the habitat acres value to be replaced through mitigation.

Step 2 – Determine Value of Candidate Mitigation Site(s): For candidate mitigation lands that will be preserved as conserved lands for mitigation purposes, the evaluation process outlined in Step 1 will be repeated to determine baseline habitat acre values. Following the determination of baseline habitat acre values the remaining Net Improvement metrics will be applied. As stated above, for lands placed in a conservation status that previously were not in such status Net Improvement values will be added to adjusted baseline values. For lands already subject to some form of conservation instrument, Net Improvement values will accrue by themselves.

Step 3 – Determine Required Mitigation: After determining the extent of impacts, expressed in habitat acres, and the value of candidate mitigation lands, also expressed in habitat acres, the amount of mitigation will be calculated. Using the HEA approach, adequate mitigation will be achieved when the value of all mitigation activities equals the total habitat acres value of impacts.

The City of Rialto, as the Lead Agency under CEQA, will be the responsible party for reviewing and approving project mitigation proposals as they are formulated using the HEA process. As the project will be built-out in phases, the City should expect the need for multiple reviews over time. That is, mitigation need only be supplied for the impacts associated with each phase, as such impacts occur. The City's review should also anticipate the hiring of a qualified monitoring biologist to provide technical input and third-party review of the HEA analyses as they occur. This review, and City approval, should occur prior to the granting of grading permits which should be conditioned with the details of mitigation to be implemented.

6.2.1.2 Other Sensitive Riparian Communities

Mitigation for impacts to 1.7 acres of southern cottonwood willow riparian will include preservation, enhancement, and restoration of a combined 3.4 acres within the existing and available mule fat scrub, southern willow scrub, and southern cottonwood willow riparian habitat within the Sycamore Flat riparian corridor (totaling 18.9 acres); this mitigation represents a 2:1 mitigation ratio (this mitigation will also benefit the least Bell's vireo; see mitigation measure in Section 6.2.2.2, Least Bell's Vireo). Therefore, potentially significant direct impacts to southern cottonwood willow riparian will be mitigated to a level less than significant.

6.2.2 Measures to Mitigate Potentially Significant Impacts to Sensitive Wildlife Species

6.2.2.1 San Bernardino Kangaroo Rat

In order to effectively mitigate the project-related impacts to the San Bernardino kangaroo rat, several considerations must be made including: 1) avoidance, preservation, and creation of habitat on-site; 2) preservation, creation, and connectivity of habitat off-site; 3) avoidance and minimization of direct individual San Bernardino kangaroo rat mortality during construction; 4) minimization of indirect individual San Bernardino kangaroo rat mortality through edge effects; and, 5) management programs to assure the ability to sustain on- and off-site San Bernardino kangaroo rat populations in the long-term.

The on- and off-site preservation and creation of habitat will be accomplished with two key factors in mind. First, the mitigation will provide a large enough area of pioneer and intermediate Riversidean alluvial fan sage scrub habitat to accommodate numbers of animals equal to or greater than those lost from the area to be permanently impacted. This amount of acreage need not be based on a strict "no net loss" of occupied habitat approach; however, it needs to be an area that will ensure, to the best of the body of knowledge on the species, that the San Bernardino kangaroo rat population in Lytle Creek/Cajon Washes is sustained in the long-term. Second, the mitigation will provide for areas of refuge above the 100-year flood event limits to assure the repopulation of populations in the lower wash areas in the event of an episodic flood event.

On-site Avoidance and Preservation

As proposed, on-site avoidance and preservation of occupied habitat will contribute a total of approximately 316.2 acres to the existing 216.8-acre SBKR Conservation Area. The acreage to be contributed in this manner is essentially all Riversidean alluvial fan sage scrub such that it supports 302.7 acres of pioneer and intermediate Riversidean alluvial fan sage scrub where San Bernardino kangaroo rat populations are reported to reach their highest numbers and densities, and several acres of mature Riversidean alluvial fan sage scrub which are theorized to serve as refugia and sources for recolonization and repopulation following episodic flooding in active wash areas. This represents a mitigation ratio of 0.8 acres avoided and preserved on-site for every one acre of occupied habitat to be lost, which only partially mitigates the potentially significant adverse impacts.

Additional on-site mitigation will include restoration, creation, and preservation of refugia habitat which will support and harbor a number of San Bernardino kangaroo rats sufficient to repopulate the adjacent wash following catastrophic flooding events. As a successful case study to follow, the amount of upland and wash habitat set aside for the LCNPD was based upon trapping conducted on an isolated population of San Bernardino kangaroo rat in

the southern portion of Lytle Creek Wash off-site. This trapping demonstrated that a 46.9-acre upland area supported 72 individuals and was sufficient to repopulate the adjacent 100 acres of wash which received continual disturbance due to the removal of alluvial deposits for sand and gravel mining. Following this model, mitigation for the species under the LCNPD included upland habitat creation and restoration on 40 acres in order to create a founder population within the 216.8-acre SBKR Conservation Area.

The 216.8-acre SBKR Conservation Area sustains 62.5 acres of habitat above the 100-year flood limits. It is important to note, however, that of these 62.5 acres, only 16.8 acres were occupied by the species at densities comparable to the adjacent wash areas at the time the SBKR Conservation Area was established (O'Farrell, 2002; 2003). An additional 16 acres on the large upland habitat island partly within the SBKR Conservation Area were determined to be below natural carrying capacity levels due to the heavy ground cover of non-native grasses; and, another 24 acres were entirely unoccupied due to a dense cover of chamise chaparral. Accordingly, the management plan for the SBKR Conservation Area included the removal of chamise from, and restoration of, scrub habitat on 24 acres and reduction of non-native grasses from the 16-acre area. Early monitoring efforts indicated rapid recolonization of both areas by San Bernardino kangaroo rat to serve as both a stable population in the SBKR Conservation Area and founder stock for recolonization of adjacent wash areas following flood events.

In similar fashion, the on-site preservation area within Neighborhood III supports approximately 34.5 acres of chamise chaparral above the 100-year floodplain that is immediately downstream of, and contiguous with, the SBKR Conservation Area that was created for the species as a result of the LCNPD. The LCRSP project proposes to remove the chamise and other species detrimental to the San Bernardino kangaroo rat (such as non-native grasses) and manage these approximately 34.5 acres to supplement the already established founder population (that utilizes the habitat in the SBKR Conservation Area) within the wash upstream of the CEMEX quarry operation, and, to remove chamise and manage an appropriate number of acres within off-site areas downstream of the CEMEX quarry operation to assure a stable population in the downstream wash area (off-site areas are described in more detail below). It should be noted that individuals within the impact footprint will be salvaged and translocated to unoccupied rehabilitated habitat within the mitigation area.

The results of the proposed on-site upland habitat manipulation in Neighborhood III is expected to effectively double the protected population size existing on the large (75 plus-acre) mitigation island upstream of the CEMEX quarry (Michael O'Farrell, Ph.D., pers comm. with Steve Nelson, 2007b). This will more than ensure the long-term survival of the species in this founder population area and throughout this portion of the wash. Furthermore, trapping efforts by Dr. O'Farrell throughout this portion of Lytle Creek Wash have shown that individual San Bernardino kangaroo rats do move relatively long distances through scoured wash areas. Therefore, the increase in numbers of individuals on this large island will increase the movement

of surplus individuals downstream through the "pinch point" created by the CEMEX quarry. It is the opinion of PCR and O'Farrell Biological Consulting that the proposed on-site mitigation upstream of the CEMEX quarry and pinch point will more than compensate for the loss of occupied San Bernardino kangaroo rat habitat below the proposed levee and limits of grading (i.e., within the development area) in Neighborhood III, a portion of which is already isolated from the wash and not considered viable in the long-term.

Off-site Preservation and Connectivity

In examining the feasibility of employing a similar approach to areas within Neighborhood II downstream of the CEMEX quarry pinch point, it is important to note that the Lytle/Cajon Washes population is in its entirety a single gene pool with exchange between animals upstream and downstream of the CEMEX mining operation occurring by way of the active wash that flows through the center of the mining facility. As such, there are 2,694 acres of occupied and/or potentially suitable habitat currently preserved in the vicinity of the proposed project which can support this species (Figure 9, *Areawide Proposed and Dedicated Open Space*). To this, the project proposes to add 316.2 acres of currently occupied and potentially suitable habitat (a 12 percent increase).

The LCRSP study area abuts or is in close proximity to four separate conservation areas that may provide off-site opportunities for creating refugia following habitat manipulation: the CEMEX Mitigation Area totaling 154 acres; the San Bernardino County Sheriff's Facility Woollystar Preserve totaling 128 acres; the San Bernardino County Flood Control Conservation Area totaling 475 acres; and the Vulcan Conservation Bank totaling 1,378 acres. Based on an examination of current aerial photography by Dr. O'Farrell, there are at least 158.7 acres of land above the 100-year floodplain that support dense chamise chaparral, do not currently support the San Bernardino kangaroo rat, and are adjacent to or proximate to the habitat areas to be preserved on the LCRSP site (Figure 29, *Off-site San Bernardino Kangaroo Rat Mitigation Opportunities*, on page 179).

In order to achieve adequate mitigation for impacts to occupied habitat downstream of the CEMEX quarry, a total of 40 acres of upland refugia habitat will be restored for the species and managed in perpetuity within one or more of the conservation areas detailed above. It should be noted that the majority of the occupied habitat to be lost within Neighborhood II downstream of the CEMEX mining operation is isolated from the main wash and not sustainable in the long-term. Therefore, the key to the proposed mitigation is to set aside, through preservation of existing occupied and suitable habitat as well as creation and restoration, adequate wash and upland refugia in a biologically and geographically meaningful configuration necessary to sustain the species in the long-term rather than trying to achieve a set mitigation ratio.

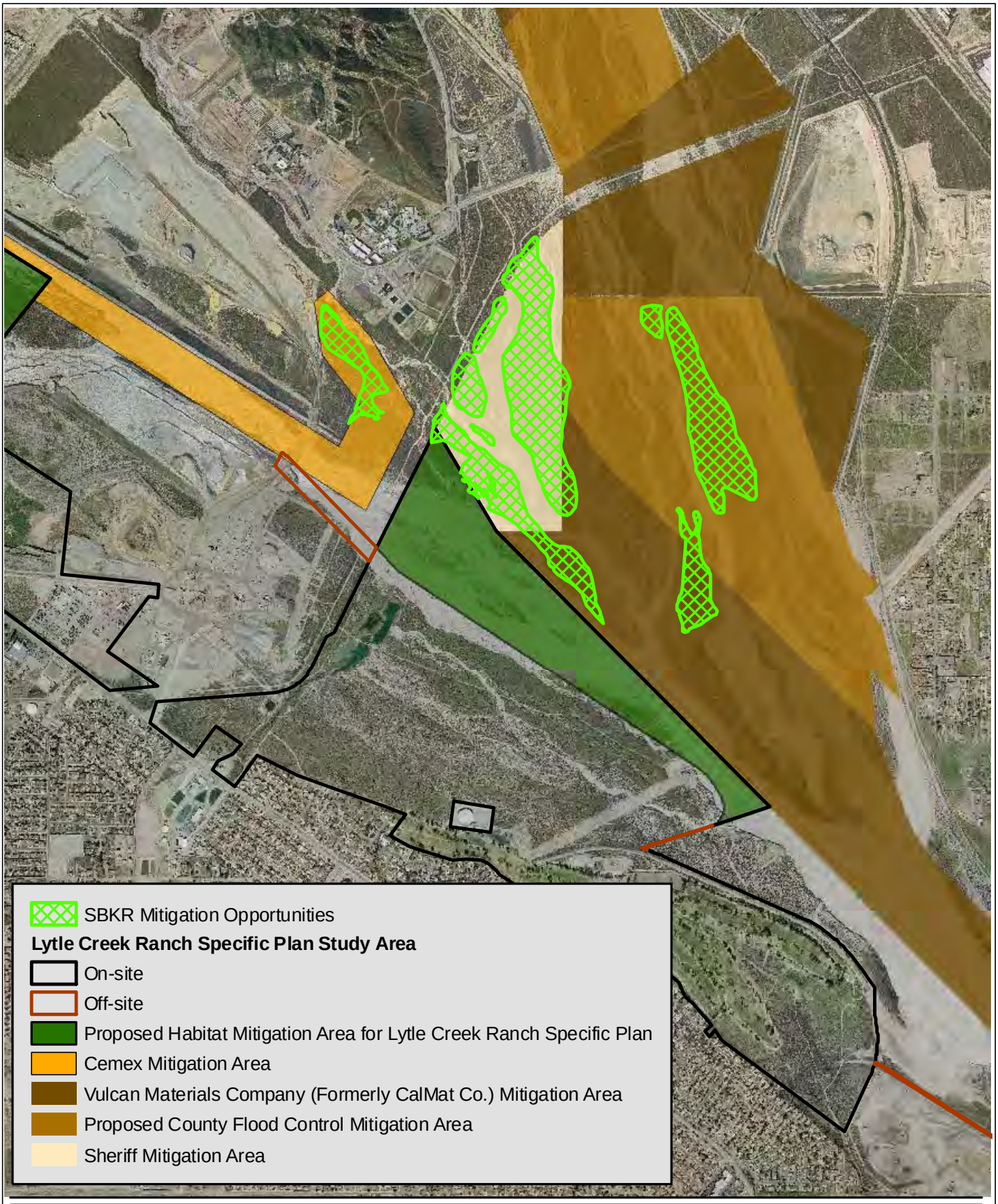
These off-site lands will be made available through acquisition or agreements with land owners. However, in order to ensure success of the proposed plan, PCR biologists and Dr. O'Farrell have developed the following species-specific criteria for acquisition: 1) upland refugia must be adjacent to active wash areas, 2) the minimum size of any single upland island/patch is 5 acres (this is based upon occupation of a five-acre island within the SBKR Conservation Area), and 3) upland refugia must have 80 to 90 percent of its interface between the active wash and upland (common perimeter) that is topographically passable by the species (i.e. not supporting steep escarpments). This will ensure individuals have access to the wash. As is proposed for the on-site mitigation, individuals will be translocated from the impact areas to newly acquired and restored areas to assist with initial colonization.

In conclusion, the proposed off-site mitigation will ensure recolonization of the wash by the species following catastrophic flood events downstream of the quarry pinch point and will provide additional genetic exchange up- and downstream of the CEMEX operation. In short, this proposed off-site mitigation (downstream of CEMEX) in combination with on-site mitigation (upstream of CEMEX) will accomplish long-term sustainability of the Lytle/Cajon Wash population of San Bernardino kangaroo rat through the creation of a system-wide conservation area for the species. The proposed mitigation will also satisfy threshold 1 as impacts after mitigation will not have a substantial adverse effect on the San Bernardino kangaroo rat. As defined in Section 4.2, the proposed project and associated mitigation measures will not significantly reduce population numbers of the species. While a large portion of the proposed impacts are within occupied areas not sustainable in the long-term, the Lytle/Cajon Wash population is expected to increase substantially and be sustainable in the long-term as a result of the proposed mitigation.

Refinement of Mitigation Program through Consultation with USFWS

Due to the proposed project's potential impacts to the federally-endangered San Bernardino kangaroo rat and the required federal regulatory permits for the proposed project that will need to be processed and approved by the ACOE, the USFWS will be consulted as required by Section 7 of the FESA. This statute imposes the obligation on federal agencies to ensure that their actions (such as issuing federal Clean Water Act permits for this project) are not likely to jeopardize the continued existence of a species or destroy or adversely modify its critical habitat. This obligation is enforced through the procedural requirement that agencies, such as the ACOE, consult with USFWS on any actions that may affect a threatened or endangered species.

During the "formal" FESA Section 7 consultation anticipated for this project, USFWS will gather all relevant information concerning the proposed project and the potential project-related impacts on the San Bernardino kangaroo rat and designated critical habitat, prepare its opinion with respect to whether the project is likely to jeopardize the continued existence of the species, and formulate alternatives and mitigation/conservation measures where appropriate.



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Source: Otte-Berkeley, September 16, 2008 (Aerial);
PCR Services Corporation, 2009.

Figure 29
Lytle Creek Ranch Specific Plan Off-Site San Bernardino Kangaroo Rat Mitigation Opportunities

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Among those measures to be considered by USFWS are those conservation measures for the San Bernardino kangaroo rat described above relating to on-site habitat creation, enhancement and/or restoration and off-site San Bernardino kangaroo rat habitat creation, enhancement, restoration and/or management. It should be noted that during its review and consideration, USFWS may refine, expand, and/or substitute some of these measures – or parts of these measures - based on its analysis and determination that such modifications are required to comply with federal law. Accordingly, as long as any such modified, different or substituted on- or off-site habitat creation, restoration, enhancement and/or management measures are found by the USFWS to result in a San Bernardino kangaroo rat conservation program that is at least as effective in mitigating the impacts to San Bernardino kangaroo rat as proposed herein (as evidenced by a determination by USFWS that the proposed project will not jeopardize the continued existence of the San Bernardino kangaroo rat or result in the adverse modification of its designated critical habitat), such measures may be substituted for the on- and off-site habitat creation, restoration, enhancement and/or management measures identified herein.

Avoidance and Minimization of Direct Mortality of Individuals

Construction-related mortality to individual San Bernardino kangaroo rats will be avoided through the design and implementation of a pre-construction trapping and relocation program. Key elements of this program will include:

- Initial establishment of one or more receiver sites where suitable habitat is known to be unoccupied, is significantly below carrying capacity levels, and/or where scrub vegetation has been restored and colonization by the species has not occurred.
- Installation of exclusionary fencing at the limits of construction within suitable habitat areas.
- Live-trapping of suitable habitat within construction areas and the relocation of trapped individuals to one or more biologically appropriate receiver sites.

In this manner, potentially significant impacts related to the direct mortality of the species will be mitigated to a level of less than significant.

Minimization of Indirect Mortality of Individuals

Edge effects, or mortality due to the “spillover” effects of development near and adjacent to areas preserved for the benefit of the species will be minimized through design elements intended to buffer and avoid human-wildlife conflicts. Key elements include:

- Installation of a cat-proof fence at the perimeter of development where it abuts preservation areas, and the location of all pedestrian and vehicular routes and trails

outside the fence (except any routes necessary solely for conservation activities within the preserved habitat areas or associated with any pre-existing easements).

- Prohibition of night lighting along the perimeter of preserved areas.
- Direction of all night lighting within development areas away from preserved areas.
- Installation of signage to direct human activity away from preserved habitat areas.
- Prohibition of unleashed dogs within preserved habitat areas.
- Implementation of a homeowner's awareness program to educate residents about the conservation values associated with preserved habitat areas.

Through the incorporation of these elements, potentially significant indirect mortality to the species will be mitigated to a level less than significant.

Long-term Management of Preserved Habitat Areas

All areas to be preserved within the LCRSP study area, as well as all areas to be restored both on-and off-site, will be monitored biologically for five years and managed in perpetuity by an appropriate management entity. That is, monitoring of San Bernardino kangaroo rat populations within the areas to be preserved will take place over a five-year period to ensure the success of the mitigation efforts such that they provide suitable habitat for this species. On-going maintenance (e.g., fence and sign repair) and management (e.g., periodic vegetation thinning) will also be a part of the long-term management plan. This plan will be funded through a combination of up-front capital costs and revenue-generating, non-wasting endowment funded by the Applicant. If additional work is determined to be necessary after the five years of monitoring, the funds provided by the applicant will be such that they cover adaptive management necessary to meet the success criteria.

In summary, the incorporation of the mitigation programs outlined above will reduce potentially significant direct and indirect impacts to the San Bernardino kangaroo rat (both as a result of the proposed project and cumulatively) to a level less than significant. The proposed preservation of 316.2 acres of occupied habitat on-site and the creation of 75 additional acres of habitat for the species (approximately 34.5 acres upstream of CEMEX and 40 acres downstream), that together will allow connectivity up- and down-stream, will outweigh proposed losses since much of the occupied habitat to be lost is not suitable in the long-term. Of the approximately 140.6 acres (139.2 acres on-site and 1.4 acres off-site) of permanent impacts and 41.0 acres (35.8 acres on-site and 5.2 acres off-site)of temporary impacts of occupied habitat proposed to be lost, 51 acres currently exists in a hydrologically disconnected state and are not sustainable in the long-term. That leaves approximately 130.6 acres of occupied habitat viable in

the long term to be impacted by the proposed project. For these reasons, mitigation will reduce potential impacts to a level less than significant under CEQA.

6.2.2.2 Least Bell's Vireo

Mitigation for direct impacts to 2.9 acres of least Bell's vireo habitat and any other sensitive riparian birds (including the loss of 1.2 acre of mule fat scrub and 1.7 acres of southern cottonwood willow riparian within Neighborhood II) will include on-site preservation, restoration, and enhancement of southern willow scrub and adjacent mule fat scrub habitat at a minimum 2:1 ratio. This will be accomplished through the enhancement and/or restoration, and preservation of lands within the Sycamore Flat East riparian corridor (Figure 30, *Sycamore Flat Riparian Mitigation Area*, on page 184). The northernmost portion of the riparian corridor (just north of the study area) is owned and managed by the County of San Bernardino and is therefore not included in the proposed mitigation area. Similarly, the off-site So Cal Gas easement that runs through Neighborhood I is excluded from consideration for available mitigation area. Mitigation will likely include a combination of enhancement and restoration of approximately 5.8 acres out of an available 18.9 acres within the existing Sycamore Flat riparian corridor and adjacent floodplain to improve the quality of habitat for this species.

Currently, this corridor exists in a degraded condition and consists of a mosaic of stands of under-developed willows (that are still recovering from their complete burning during a catastrophic wildfire in late 2003), mule fat, and exotic "weeds". As such, the carrying capacity of the habitat to be impacted is believed to be substantially suppressed for least Bell's vireo. The recommended mitigation efforts are intended to improve and expand habitat quality (through carrying capacity for the least Bell's vireo) in the near term. The reader should note that the proposed project avoids those portions of this habitat where up to two pairs of least Bell's vireo are believed to have nested during the past two years. Through mitigation, additional pairs will be accommodated.

Potential indirect impacts to least Bell's vireos should be mitigated in several ways, as follows. Of the following measures, (a), (b), and (f) are to be done if they are feasible or practicable for the applicant to implement based upon the construction schedule and equipment availability. All others would be required to mitigate potential indirect impacts. Measures to be taken for all construction activities within 300 feet of potential least Bell's vireo habitat:

a. Construction limits in and around least Bell's vireo potential habitat should be delineated with flags and fencing prior to the initiation of any grading or construction activities.

b. Prior to grading and construction a training program should be developed and implemented to inform all workers on the project about listed species, sensitive

habitats, and the importance of complying with avoidance and minimization measures.

c. All construction work should occur during the daylight hours.

d. Noise from construction activities should be limited to the extent possible through the maximum use of technology available to reduce construction equipment noise.

e. Two brown-headed cowbird traps should be installed and maintained within the general vicinity of the habitat for five years.

Additional measures to be taken for all construction activities within 300 feet of potential least Bell's vireo habitat during the breeding season (March 15 to September 15):

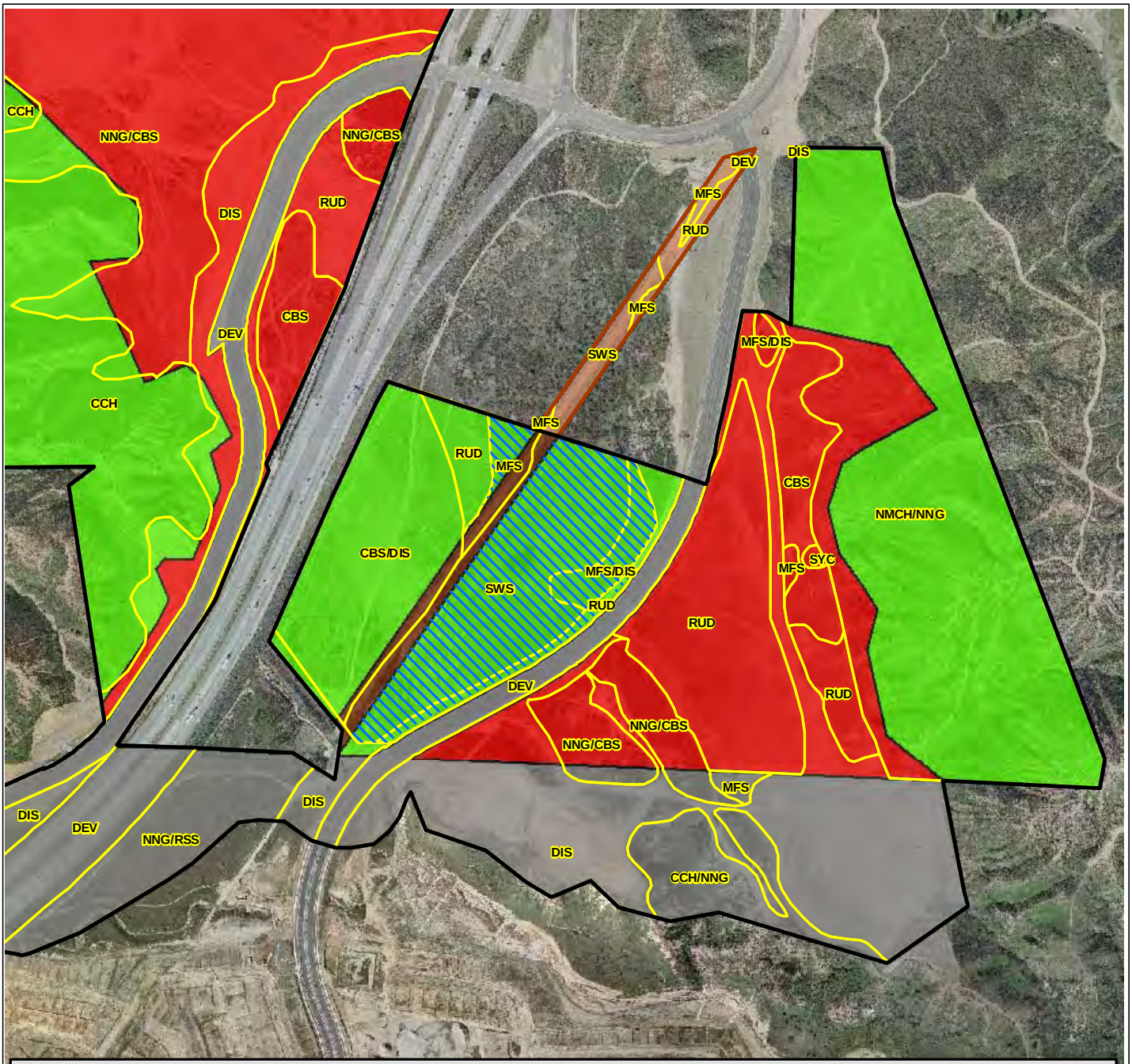
a. Pre-construction surveys should be conducted within one week prior to initiation of construction activities and all results forwarded to the USFWS and CDFG. Focused surveys should be conducted for least Bell's vireo during construction activities.

b. If at any time least Bell's vireo are found to occur within 300 feet of construction areas, the monitoring biologist should inform the appropriate construction supervisor to cease such work and should consult with the USFWS and CDFG to determine if work shall commence or proceed during the breeding season; and, if work may proceed, what specific measures should be taken to ensure least Bell's vireos are not affected.

c. Monitoring by a qualified acoustician should be conducted as needed to verify noise levels are below 60 dBA required within identified, occupied least Bell's vireo territories. If the 60 dBA requirement is exceeded, the acoustician should make operational changes and/or install a barrier to alleviate noise levels during the breeding season.

d. Installation of any noise barriers and any other corrective actions taken to mitigate noise during the construction period should be communicated to the USFWS and CDFG.

If the above avoidance, minimization, and restoration measures are incorporated into the project and its construction, potentially significant impacts to least Bell's vireo can be reduced to a level less than significant.



Lytle Creek Ranch Specific Plan Study Area

- On-site
- Off-site
- Sycamore East Riparian Mitigation Area
- Plant Communities/Habitats

Proposed Land Use

- Proposed Preservation Area
- On-site SoCalGas Easement
- Off-site SoCalGas Easement
- Proposed Development Area
- Lytle Creek North Development Area Previously Reviewed per CEQA and Entitled

PCR

N

700 0 700 Feet

Source: Otte-Berkeley, September 16, 2008 (Aerial); PCR Services Corporation, 2009.

Figure 30
Lytle Creek Ranch Specific Plan
Sycamore Flats
Riparian Mitigation Area

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6.3 FEDERAL AGENCY REVIEW AND CONSULTATION

In order to address and acknowledge the potential for species listed under the FESA to occur within the LCRSP study area or be impacted by the proposed project, this assessment acknowledges potential future actions by federal agencies in addition to the analyses necessary and requirements under CEQA. Potentially affected species considered for this analysis include the Santa Ana River woollystar, slender-horned spineflower, coastal California gnatcatcher, least Bell's vireo, and San Bernardino kangaroo rat. However, three of these species, the Santa Ana River woollystar, slender-horned spineflower, and coastal California gnatcatcher, are not believed to currently occur within the LCRSP study area and have a low probability of occupying the study area in the future. The federally-endangered Santa Ana River woolly star (subspecies sanctorum) occurs several miles downstream of the LCRSP study area in the Santa Ana River and the on-site woollystar population most closely resembles the non-listed subspecies elongatum, based upon a study of corolla lengths peer reviewed by Dr. Mark Brunell (PCR 2007a). The slender-horned spineflower, although observed on-site in 1994, was not detected on-site during focused surveys in 2004, 2005, 2006, and 2007. Similarly, focused protocol surveys for the coastal California gnatcatcher were conducted in 2005, 2006, and 2007 with negative findings and, in 2007, the USFWS completely eliminated the former critical habitat designation from the study area, partly in recognition of the very few pairs known to exist in the region that includes the LCRSP study area.

The remaining two species, least Bell's vireo and San Bernardino kangaroo rat, have been recently identified in the LCRSP study area and may be impacted by the proposed project. The least Bell's vireo was observed within Neighborhoods I and II during 2006 protocol surveys and in Neighborhood I only in 2007. Proposed mitigation for this species includes on-site preservation, enhancement, and restoration of riparian habitat at a minimum 2:1 ratio. Based on trapping studies performed by Dr. Michael O'Farrell in 2005, 2006, and 2007, the San Bernardino kangaroo rat occurs within Neighborhoods I, II and III in suitable habitat areas associated with Lytle Creek Wash. Mitigation for this species includes a combination of on- and off-site restoration and preservation of suitable habitat (including upland refugia and movement habitat) within the Lytle/Cajon Creek system.

The presence, or likely presence, of these two species, combined with the need for federal regulatory permits (i.e., Clean Water Act Section 404 permit) that will be processed and would be issued by the ACOE, will require that the USFWS be consulted as provided for by Section 7 of the FESA. This statute imposes the obligation on federal agencies to ensure that their actions (such as issuing federal Clean Water Act permits for this project) are not likely to jeopardize the continued existence of a listed species or destroy or adversely modify its designated critical habitat. This obligation is enforced through the procedural requirement that agencies, such as the ACOE, consult with USFWS on any actions that may affect a threatened or endangered species.

During the "formal" FESA Section 7 consultation anticipated for this project, USFWS will gather all relevant information concerning the proposed project and the potential project-related impacts on the least Bell's vireo and San Bernardino kangaroo rat and designated critical habitat, prepare its opinion with respect to whether the project is likely to jeopardize the continued existence of the species, and recommend mitigation/conservation measures where appropriate.

7.0 IMPACTS AFTER MITIGATION

7.1 UNAVOIDABLE SIGNIFICANT IMPACTS

Under the proposed project development program, Project Design Features and mitigation available within the context of the proposed project design will mitigate all potentially significant adverse impacts to a level less than significant.

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APPENDIX A: FLORAL AND FAUNAL COMPENDIA

GYMNOSPERMS

SCIENTIFIC NAME	COMMON NAME
Cupressaceae	**Cypress Family**
Juniperus californica	California juniper
Pinaceae	**Pine Family**
Pinus sp.	pine

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FERNS AND FERN ALLIES

SCIENTIFIC NAME	COMMON NAME
Pteridaceae	**Brake Family**
Pellaea mucronata	bird's-foot fern
Selaginellaceae	**Spike-Moss Family**
Selaginella bigelovii	Bigelow's spike-moss

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ANGIOSPERMS (DICOTYLEDONS)

	SCIENTIFIC NAME	COMMON NAME
	Anacardiaceae	**Sumac or Cashew Family**
	Rhus trilobata	skunkbrush (squawbush)
	Toxicodendron diversilobum	poison oak
	Asteraceae	**Sunflower Family**
	Acourtia sp.	sacapellote
	Ambrosia psilostachya	western ragweed (sandbur)
	Anaphalis margaritacea	pearly everlasting
	Artemisia californica	California sagebrush
	Artemisia douglasiana	mugwort
	Baccharis salicifolia	mule fat
	Brickellia californica	California brickellbush
*	*Centaurea melitensis*	tocalote
	Chaenactis glabriuscula	yellow pincushion
*	*Chamomilla suaveolens*	pineapple weed
	Cirsium occidentale	cobweb thistle
	Conyza canadensis	horseweed
	Encelia californica	California bush sunflower
	Encelia farinosa	brittlebush
	Ericameria pinifolia	pinebush
	Erigeron foliosus	fleabane daisy
	Eriophyllum confertiflorum	golden yarrow
	Filago californica	California fluffweed
	Filago gallica	narrow-leaved filago
	Gnaphalium californicum	California everlasting
	Gnaphalium canescens ssp *.microcephalum*	felty everlasting
	Gnaphalium palustre	lowland cudweed
	Gnaphalium purpureum	Purple everlasting
	Gutierrezia californica	California matchweed
	Hazardia squarrosa	saw-toothed goldenbush
	Helianthus annuus	common sunflower
	Heterotheca grandiflora	telegraph weed
	Heterotheca sessiliflora	hairy golden-aster
*	*Hypochaeris glabra*	smooth cat's-ear

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ANGIOSPERMS (DICOTYLEDONS)

	SCIENTIFIC NAME	COMMON NAME
	Hypochaeris radicata	hairy cat's ear
*	*Lactuca serriola*	prickly lettuce
	Layia platyglossa	tidy-tips
	Lepidospartum squamatum	scale-broom
	Lessingia filaginifolia	California aster
	Porophyllym gracile	odora
	Senecio flaccidus	shrubby butterweed
	Senecio flaccidus var. *douglasii*	shrubby butterweed
*	*Sonchus asper*	prickly sow thistle
*	*Sonchus oleraceus*	common sow thistle
	Stephanomeria sp.	stephanomeria
	Stephanomeria pauciflora	wire-lettuce
	Stephanomeria virgata	twiggy wreathplant
	Stylocline gnaphaloides	everlasting neststraw
	Uropappus [Microseris] lindleyi	silver puffs
Boraginaceae		**Borage Family**
	Amsinckia menziesii	common fiddleneck
	Cryptantha intermedia	common forget-me-not
	Cryptantha maritima	Guadalupe cryptantha
	Cryptantha microstachys	Tejon cryptantha
	Cryptantha muricata	prickly cryptantha
	Plagiobothrys sp.	popcorn flower
Brassicaceae		**Mustard Family**
*	*Brassica nigra*	black mustard
*	*Hirshfeldia incana*	short-podded mustard
	Lepidium lasiocarpum	shaggy fruit
*	*Sisymbrium irio*	London rocket
*	*Sisymbrium officinale*	hedge mustard
*	*Sisymbrium orientale*	Oriental mustard
Cactaceae		**Cactus Family**
	Opuntia basilaris	short-joint beavertail
	Opuntia littoralis	coastal prickly pear
	Opuntia parryi	valley cholla

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ANGIOSPERMS (DICOTYLEDONS)

SCIENTIFIC NAME	COMMON NAME
Caprifoliaceae	**Honeysuckle Family**
Sambucus mexicana	Mexican elderberry
Caryophyllaceae	**Pink Family**
Loeflingia squarrosa	California loeflingia
* *Polycarpon tetraphyllum*	four-leaved allseed
Chenopodiaceae	**Goosefoot Family**
* *Chenopodium album*	lamb's quarters
* *Salsola tragus*	Russian thistle
Cistaceae	**Rock-Rose Family**
Cistus sp.	rock rose
Helianthemum scoparium	peak rush-rose
Convolvulaceae	**Morning-Glory Family**
Calystegia macrostegia	western bindweed
Crassulaceae	**Stonecrop Family**
Crassula connata	pygmy-weed
Dudleya lanceolata	lance-leaved dudleya
Cucurbitaceae	**Gourd Family**
Marah macrocarpus	wild cucumber
Cuscutaceae	**Dodder Family**
Cuscuta californica	California dodder
Ericaceae	**Heath Family**
Arctostaphylos glauca	bigberry manzanita
Euphorbiaceae	**Spurge Family**
Croton californicus	California croton
Eremocarpus setigerus	dove weed
Euphorbia sp.	spurge
* *Ricinus communis*	castor bean
Fabaceae	**Legume Family**
Lotus scoparius	deerweed
Lotus strigosus	strigose lotus
Lotus subpinnatus	calf lotus
Lupinus bicolor	miniature lupine
Lupinus hirsutissimus	stinging lupine

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ANGIOSPERMS (DICOTYLEDONS)

SCIENTIFIC NAME	COMMON NAME
Lupinus sparsiflorus	Coulter's lupine
* *Melilotus indica*	sourclover
Pickeringia montana	chaparral pea
Trifolium ciliolatum	tree clover
* *Trifolium hirtum*	rose clover
Trifolium microcephalum	small-headed clover
* *Vicia benghalensis*	purple vetch
Fagaceae	**Oak Family**
Quercus chrysolepis	canyon live oak
Quercus berberidifolia	scrub oak
Geraniaceae	**Geranium Family**
* *Erodium botrys*	broad-lobed filaree
* *Erodium cicutarium*	red-stemmed filaree
Hydrophyllaceae	**Waterleaf Family**
Emmenanthe penduliflora	whispering bells
Eriodictyon trichocalyx	hairy yerba santa
Eriodictyon trichocalyx ssp. *trichocalyx*	hairy yerba santa
Eucrypta chrysanthemifolia	common eucrypta
Phacelia cicutaria	caterpillar phacelia
Phacelia distans	fern-leaf phacelia
Phacelia curvipes	dwarf phacelia
Phacelia minor	wild canterbury-bell
Juglandaceae	**Walnut Family**
Juglans californica var. *californica*	southern California black walnut
Lamiaceae	**Mint Family**
* *Marrubium vulgare*	horehound
Salvia apiana	white sage
Salvia columbariae	chia
Salvia mellifera	black sage
Loasaceae	**Loasa Family**
Mentzelia laevicaulis	blazing star
Mentzelia micrantha	small-flowered stick-leaf
Malvaceae	**Mallow Family**
Malacothamnus fasciculatus	mesa bushmallow

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ANGIOSPERMS (DICOTYLEDONS)

SCIENTIFIC NAME	COMMON NAME
Onagraceae	**Evening Primrose Family**
Camissonia bistorta	California sun cup
Camissonia californica	California evening primrose
Camissonia micrantha	small primrose
Clarkia purpurea ssp. *quadrivulnera*	four-spot clarkia
Orobanchaceae	**Broom-rape Family**
Orobanche fasciculata	clustered broom-rape
Paeoniaceae	**Peony Family**
Paeonia californica	California peony
Papaveraceae	**Poppy Family**
Dicentra sp.	bleeding heart
Dicentra chrysantha	golden ear drops
Eschscholzia californica	California poppy
Plantaginaceae	**Plantain Family**
Plantago erecta	western plantain
Platanaceae	**Sycamore Family**
Platanus racemosa	western sycamore
Polemoniaceae	**Phlox Family**
Allophyllum divaricatum	purple false gilyflower
Eriastrum densifolium spp. *elongatum*	woollystar
Eriastrum sapphirinum	sapphire eriastrum
Gilia angelensis	angel gilia
Gilia capitata	blue field gilia
Gilia splendens	splendid gilia
Navarretia atractyloides	holly-leaved navarretia
Navarretia hamata	hooked navarretia
Polygonaceae	**Buckwheat Family**
Chorizanthe parryi var. *parryi*	Parry's spineflower
Chorizanthe staticoides	turkish rugging
Eriogonum fasciculatum	California buckwheat
Eriogonum thurberi	Thurber's buckwheat
Eriogonum gracile	slender woolly buckwheat
Lastarriaea coriacea	lastarriaea
Pterostegia drymarioides	California thread-stem

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ANGIOSPERMS (DICOTYLEDONS)

SCIENTIFIC NAME	COMMON NAME
* *Rumex crispus*	curly dock
Portulacaceae	**Purslane Family**
Calandrinia ciliata	red maids
Calyptridium monandrum	common calyptridium
Primulaceae	**Primrose Family**
* *Anagallis arvensis*	scarlet pimpernel
Ranunculaceae	**Buttercup Family**
Delphinium cardinale	scarlet larkspur
Delphinium sp.	larkspur
Rhamnaceae	**Buckthorn Family**
Ceanothus crassifolius	hoary leaf ceanothus
Ceanothus leucodermis	chaparral whitethorn
Rhamnus crocea	spiny redberry
Rhamnus ilicifolia	holly-leaf redberry
Rosaceae	**Rose Family**
Adenostoma fasciculatum	chamise
Cercocarpus betuloides	birch-leaf mountain-mahogany
Prunus ilicifolia	holly-leaved cherry
Rubiaceae	**Madder Family**
Galium angustifolium	narrow-leaved bedstraw
Salicaceae	**Willow Family**
Populus fremontii ssp. *fremontii*	Fremont's cottonwood
Salix laevigata	red willow
Salix lasiolepis	arroyo willow
Salix goodingii	Gooding's black willow
Scrophulariaceae	**Figwort Family**
Keckiella cordifolia	heart-leaved penstemon
Linaria canadensis	blue toadflax
Mimulus aurantiacus	orange bush monkey-flower
Mimulus brevipes	wide-throated monkey-flower
Mimulus guttatus	common monkey-flower
Penstemon spectabilis var. *subviscosus*	royal penstemon
Solanaceae	**Nightshade Family**
Datura wrightii	jimson weed

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ANGIOSPERMS (DICOTYLEDONS)

SCIENTIFIC NAME	COMMON NAME
* *Nicotiana glauca*	tree tobacco
Nicotiana quadrivalvis	Wallace's tobacco
Solanum xanti	chaparral nightshade
Tamaricaceae	**Tamarisk Family**
* *Tamarix* sp.	tamarisk

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ANGIOSPERMS (MONOCOTYLEDONS)

SCIENTIFIC NAME	COMMON NAME
Arecaceae	**Date Palm Family**
* *Phoenix* sp.	date palm
Liliaceae	**Lily Family**
Bloomeria crocea	common goldenstar
Calochortus plummerae	Plummer's mariposa lily
Dichelostemma capitatum	blue dicks
Yucca whipplei	Our Lord's candle
Poaceae	**Grass Family**
Achnatherum speciosum	desert needlegrass
Agrostis viridis	water bent
* *Avena barbata*	slender wild oat
* *Bromus diandrus*	ripgut grass
* *Bromus hordeaceus*	soft chess
* *Bromus madritensis* ssp. *rubens*	foxtail chess
* *Bromus madritensis* ssp. *madritensis*	foxtail chess
* *Bromus tectorum*	cheat grass
* *Lamarckia aurea*	goldentop
Melica imperfecta	coast range melic
* *Poa annua*	annual bluegrass
* *Schismus barbatus*	Mediterranean schismus
* *Vulpia myuros*	fescue

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AMPHIBIANS

SCIENTIFIC NAME	COMMON NAME
Plethodontidae	**Lungless Salamanders**
? *Batrachoseps nigriventris*	black-bellied slender salamander
? *Batrachoseps pacificus*	Pacific slender salamander
? *Ensatina eschscholtzi crocreater*	yellow-blotched salamander
Pelobatidae	**Spadefoot Toads**
? *Spea hammondii*	western spadefoot
Bufonidae	**True Toads**
Bufo boreas	western toad
Hylidae	**Tree Frogs**
? *Hyla cadaverina*	California treefrog
Hyla regilla	Pacific treefrog
Ranidae	**True Frogs**
?* *Rana catesbeiana*	bullfrog

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REPTILES

SCIENTIFIC NAME	COMMON NAME
Gekkonidae	**Geckos**
? *Coleonyx variegatus abbotti*	San Diego banded gecko
Scincidae	**Skinks**
? *Eumeces gilberti rubricaudatus*	western red-tailed skink
? *Eumeces skiltonianus skiltonianus*	Skilton skink
Teiidae	**Whiptail Lizards**
? *Cnemidophorus hyperythrus beldingi*	Beldings orange-throated whiptail
Cnemidophorus tigris stejnegeri	coastal whiptail
Anguidae	**Alligator Lizards**
? *Elgaria multicarinatus webbi*	San Diego alligator lizard
Anniellidae	**California Legless Lizards**
? *Anniella pulchra pulchra*	silvery legless lizard
Boidae	**Boas**
? *Charina trivirgata roseofusca*	coastal rosy boa
Colubridae	**Colubrid Snakes**
Arizona elegans eburnata	desert glossy snake
? *Lampropeltis getulus californiae*	California kingsnake
Masticophis flagellum piceus	red racer
Pituophis melanoleucus annectens	San Diego gopher snake
? *Salvadora hexalepis virgultea*	coast patch-nosed snake
Viperidae	**Vipers**
Crotalus viridis helleri	southern pacific rattlesnake
Phrynosomatidae	**Zebra-tailed, Earless, Fringe-toed, Spiny, Tree,**
Callisaurus draconoides draconoides	common zebra-tailed lizard
Sceloporus orcutti	spiny granite lizard
Sceloporus occidentalis	western fence lizard
Uta stansburiana	side-blotched lizard
Phrynosoma coronatum (blainvillei)	coast (San Diego) horned lizard

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BIRDS

	SCIENTIFIC NAME	COMMON NAME
	Podicipedidae	**Grebes**
?	*Podilymbus podiceps*	pied-billed grebe
	Ardeidae	**Herons**
	Ardea alba	great egret
	Ardea herodias	great blue heron
?	*Nycticorax nycticorax*	black-crowned night-heron
	Butorides virescens	green heron
	Egretta thula	snowy egret
	Anatidae	**Waterfowl**
	Branta canadensis	Canada goose
?	*Anas strepera*	gadwall
?	*Anas crecca*	green-winged teal
	Anas platyrhynchos	mallard
?	*Anas americana*	American wigeon
?	*Anas acuta*	northern pintail
?	*Anas clypeata*	northern shoveler
?	*Anas discors*	blue-winged teal
	Anas cyanoptera	cinnamon teal
	Oxyura jamaicensis	ruddy duck
	Cathartidae	**New World Vultures**
	Cathartes aura	turkey vulture
	Accipitridae	**Hawks**
?	*Elanus leucurus*	white-tailed kite
	Pandion haliaetus	osprey
	Circus cyaneus	northern harrier
?	*Accipiter striatus*	sharp-shinned hawk
	Accipiter cooperii	Cooper's hawk
	Buteo lineatus	red-shouldered hawk
	Buteo jamaicensis	red-tailed hawk
?	*Buteo regalis*	ferruginous hawk
	Aquila chrysaetos	golden eagle
	Falconidae	**Falcons**
	Falco sparverius	American kestrel
?	*Falco mexicanus*	prairie falcon

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BIRDS

SCIENTIFIC NAME	COMMON NAME
Falco peregrinus anatum	Americal peregrine falcon
Odotophoriade	**Quails**
Callipepla californica	California quail
Oreortyx pictus	mountain quail
Rallidae	**Rails and Gallinules**
? *Gallinula chloropus*	common moorhen
Fulica americana	American coot
Charadriidae	**Plovers**
Charadrius vociferus	killdeer
Recurvirostridae	**Stilts and Avocets**
Himantopus mexicanus	black-necked stilt
? *Recurvirostra americana*	American avocet
Scolopacidae	**Sandpipers**
Tringa melanoleuca	greater yellowlegs
? *Actitis macularia*	spotted sandpiper
? *Calidris minutilla*	least sandpiper
? *Gallinago gallinago*	common snipe
Laridae	**Gulls and Terns**
? *Larus delawarensis*	ring-billed gull
? *Larus californicus*	California gull
Columbidae	**Pigeons and Doves**
* *Columba livia*	rock dove
? *Columba fasciata*	band-tailed pigeon
Zenaida macroura	mourning dove
Cuculidae	**Cuckoos and Roadrunners**
+ *Geococcyx californianus*	greater roadrunner
Tytonidae	**Barn Owls**
+ *Tyto alba*	barn owl
Strigidae	**True Owls**
Bubo virginianus	great horned owl
? *Asio otus*	long-eared owl
Caprimulgidae	**Goatsuckers**
Chordeiles acutipennis	lesser nighthawk
Phalaenoptilus nuttallii	common poorwill

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BIRDS

SCIENTIFIC NAME	COMMON NAME
Apodidae	**Swifts**
Chaetura vauxi	Vaux's swift
Aeronautes saxatalis	white-throated swift
Trochilidae	**Hummingbirds**
Archilochus alexandri	black-chinned hummingbird
Calypte anna	Anna's hummingbird
Calypte costae	Costa's hummingbird
Selasphorus rufus	rufous hummingbird
? *Selasphorus sasin*	Allen's hummingbird
Picidae	**Woodpeckers**
Picoides nuttallii	Nuttall's woodpecker
Colaptes auratus	northern flicker
Tyrannidae	**Tyrant Flycatchers**
Contopus cooperi	olive-sided flycatcher
Contopus sordidulus	western wood-pewee
? *Empidonax difficilis*	Pacific-slope flycatcher
Empidonax traillii	willow flycatcher
Sayornis nigricans	black phoebe
Sayornis saya	Say's phoebe
Myiarchus cinerascens	ash-throated flycatcher
Tyrannus vociferans	Cassin's kingbird
Tyrannus verticalis	western kingbird
Alaudidae	**Larks**
+ *Eremophila alpestris actia*	California horned lark
Hirundinidae	**Swallows**
Tachycineta thalassina	violet-green swallow
Stelgidopteryx serripennis	northern rough-winged swallow
Petrochelidon pyrrhonota	cliff swallow
Hirundo rustica	barn swallow
Corvidae	**Jays and Crows**
Aphelocoma californica	western scrub-jay
Corvus brachyrhynchos	American cow
Corvus corax	common raven

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BIRDS

SCIENTIFIC NAME	COMMON NAME
Troglodytidae	**Wrens**
Campylorhynchus brunneicapillus	cactus wren
Salpinctes obsoletus	rock wren
Thryomanes bewickii	Bewick's wren
Troglodytes aedon	house wren
Regulidae	**Kinglets**
Regulus calendula	ruby-crowned kinglet
Sylviidae	**Old World Warblers, Gnatcatchers**
+ *Polioptila californica californica*	coastal California gnatcatcher
Polioptila caerulea	blue-gray gnatcatcher
Turdidae	**Thrushes**
? *Sialia mexicana*	western bluebird
? *Sialia currucoides*	mountain bluebird
Catharus guttatus	hermit thrush
? *Turdus migratorius*	American robin
Muscicapidae	**Wrentits**
Chamaea fasciata	wrentit
Aegithalidae	**Bushtis**
Psaltripanus minimus	bushtit
Mimidae	**Thrashers**
Mimus polyglottos	northern mockingbird
Toxostoma redivivum	California thrasher
Motacillidae	**Pipits**
? *Anthus rubescens*	American pipit
Bombycillidae	**Waxwings**
? *Bombycilla cedrorum*	cedar waxing
Ptilogonatidae	**Silky Flycatchers**
Phainopepla nitens	phainopepla
Vireonidae	**Vireos**
Vireo bellii pusillus	least Bell's vireo
Vireo huttoni	Hutton's vireo
Vireo gilvus	warbling vireo
Laniidae	**Shrikes**
Lanius ludovicianus	loggerhead shrike

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BIRDS

	SCIENTIFIC NAME	COMMON NAME
	Sturnidae	**Starlings**
*	*Sturnus vulgaris*	European starling
	Parulidae	**Wood Warblers**
	Vermivora celata	orange-crowned warbler
	Dendroica coronata	yellow-rumped warbler
	Dendroica nigrescens	black-throated gray warbler
?	*Dendroica townsendi*	Townsend's warbler
	Dendroica petechia brewsteri	yellow warbler
?	*Oporornis tolmiei*	MacGillivray's warbler
	Geothlypois trichas	common yellowthroat
?	*Wilsonia pusilla*	Wilson's warbler
	Icteria virens	yellow-breasterd chat
	Cardinalidae	**Cardinals**
	Pheucticus melanocephalus	black-headed grosbeak
	Guiraca caerulea	blue grosbeak
	Passerina amoena	lazuli bunting
	Thraupidae	**Tanagers**
	Piranga ludoviciana	western tanager
	Emberizidae	**Emberizids**
	Pipilo chlorurus	green-tailed towhee
	Pipilo crissalis	California towhee
	Pipilo maculatus	spotted towhee
	Aimophila ruficeps canescens	southern California rufous-crowned sparrow
	Spizella atrogularis	black-chinned sparrow
	Chondestes grammacus	lark sparrow
	Amphispiza belli belli	Bell's sage sparrow
?	*Passerella iliaca*	fox sparrow
	Passerculus sandwichensis	savannah sparrow
	Melospiza melodia	song sparrow
	Melospiza lincolnii	Lincoln's sparrow
	Zonotrichia atricoplilla	golden-crowned sparrow
	Zonotrichia leucophrys	white-crowned sparrow
?	*Junco hyemalis*	dark-eyed junco

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BIRDS

SCIENTIFIC NAME	COMMON NAME
Icteridae	**Blackbirds**
Agelaius phoeniceus	red-winged blackbird
? *Agelaius tricolor*	tricolored blackbird
Sturnella neglecta	western meadowlark
Euphagus cyanocephalus	Brewer's blackbird
Quiscalus mexicanus	great-tailed grackle
Molothrus ater	brown-headed cowbird
Icterus bullockii	Bullock's oriole
Icterus cucullatus	hooded oriole
Fringillidae	**Finches**
Carpodacus mixicanus	house finch
Carduelis psaltria	lesser goldfinch
Carduelis lwrencei	Lawrence's goldfinch
Carduelis tristis	American goldfinch
Passeridae	**Old World Sparrows**
* *Passer domesticus*	house sparrow

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MAMMALS

	SCIENTIFIC NAME	COMMON NAME
	Didelphidae	**New World Opossums**
?*	*Didelphis virginiana*	Virginia opossum
	Soricidae	**Shrews**
?	*Sorex ornatus*	ornate shrew
?	*Notiosorex crawfordi*	desert shrew
	Vespertilionidae	**Evening Bats**
?	*Antrozous pallidus*	pallid bat
?	*Antrozous pallidus*	pallid bat
?	*Corynorhinus (=Plecotus) townsendii pallescens*	pale big-eared bat
	Myotis californicus	California myotis
	Myotis ciliolabrum	western small-footed myotis
?	*Myotis evotis*	long-eared myotis
?	*Myotis leibii*	small-footed myotis
?	*Myotis thysanodes*	fringed myotis
?	*Myotis volans*	long-legged myotis
	Myotis yumanensis	Yuma myotis (AKA San Joaquin myotis)
?	*Lasiurus blossevillii*	western red bat
?	*Lasiurus cinereus*	hoary bat
	Lasiurus xanthinus	western yellow bat
	Pipistrellus hesperus	western pipistrelle
	Eptesicus fuscus	big brown bat
	Molossidae	**Free-Tailed Bats**
	Tadarida brasiliensis	Brazilian free-tailed bat
	Eumops perotis	western mastiff bat
	Nyctinomops femorosaccus	pocketed free-tailed bat
	Leporidae	**Hares and Rabbits**
	Lepus californicus bennettii	San Diego black-tailed jackrabbit
	Sylvilagus auduboniisanctidiegi	Audubon's cottontail
?	*Sylvilagus bachmani*	brush rabbit
	Sciuridae	**Squirrels**
	Spermophilus beecheyi nesioticus	California ground squirrel
	Geomyidae	**Pocket Gophers**
+	*Thomomys bottae*	Botta's pocket gopher

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MAMMALS

	SCIENTIFIC NAME	COMMON NAME
	Heteromyidae	**Pocket Mice and Kangaroo Rats**
	Perognathus longimembris brevinasus	Los Angeles pocket mouse
?	*Chaetodipus californicus*	California pocket mouse
	Chaetodipus fallax	San Diego pocket mouse
	Chaetodipus fallax fallax	northwest San Diego pocket mouse
+	*Dipodomys agilis*	Pacific kangaroo rat
	Dipodomys merriami parvus	San Bernardino Merriam's kangaroo rat
	Dipodomys simulans	Dulzura kangaroo rat
	Muridae	**Mice, Rats, and Voles**
?	*Peromyscus boylii*	brush mouse
	Peromyscus californicus insignis	California parasitic mouse
	Reithrodontomys megalotis	western harvest mouse
	Peromyscus eremicus	cactus mouse
	Peromyscus maniculatus	deer mouse
?	*Onychomys torridus ramona*	southern grasshopper mouse
?	*Neotoma fuscipes*	dusky-footed woodrat
	Neotoma lepida	desert woodrat
?	*Neotoma lepida intermedia*	San Diego desert woodrat
?*	*Mus musculus*	house mouse
?	*Microtus californicus*	California vole
	Canidae	**Wolves and Foxes**
	Canis latrans	coyote
+*	*Canis familiaris*	domestic dog
	Urocyon cinereoargenteus	gray fox
	Procyonidae	**Raccoons**
?	*Bassariscus astutus*	ringtail
?	*Procyon lotor*	raccoon
	Mustelidae	**Weasels, Skunks, and Otters**
+	*Mustela frenata*	long-tailed weasel
?	*Spilogale gracilis*	western spotted skunk
+	*Mephitis mephitis*	striped skunk
	Felidae	**Cats**
?*	*Felis catus*	domestic cat
?	*Puma concolor*	mountain lion

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MAMMALS

SCIENTIFIC NAME	COMMON NAME
Lynx rufus	bobcat
Cervidae	**Deer**
Odocoileus hemionus	mule deer
Bovidae	**Bison, Goats, and Sheep**
+* *Ovis sp.*	domestic sheep

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APPENDIX B: SUBSPECIES IDENTIFICATION OF THE WOOLLY-STAR AT THE LYTLE CREEK RANCH SPECIFIC PLAN PROJECT SITE, SAN BERNARDINO COUNTY, CALIFORNIA

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SUBSPECIES IDENTIFICATION OF THE WOOLLY-STAR AT THE LYTLE CREEK RANCH SPECIFIC PLAN PROJECT SITE, SAN BERNARDINO COUNTY, CALIFORNIA

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ABSTRACT

Controversy over subspecies delimitation for *Eriastrum densifolium* has left the taxonomic status of some populations unresolved. Based on a review of literature, corolla length is the best diagnostic tool for distinguishing the federally endangered *sanctorum* subspecies from the non-endangered subspecies. A field study was conducted to assess the corolla length of a population at the Lytle Creek Ranch Specific Plan project site relative to the 18 mm threshold value for the *sanctorum* subspecies. The mean corolla length at the site was 12.9 mm. Confidence intervals and population percentiles indicate that there is no overlap between the Lytle Creek Ranch Specific Plan population and the Santa Ana River population (i.e. subspecies *sanctorum).* Field data indicates that the population at the Lytle Creek Ranch Specific Plan site keys to the *elongatum* subspecies rather than *sanctorum* subspecies.

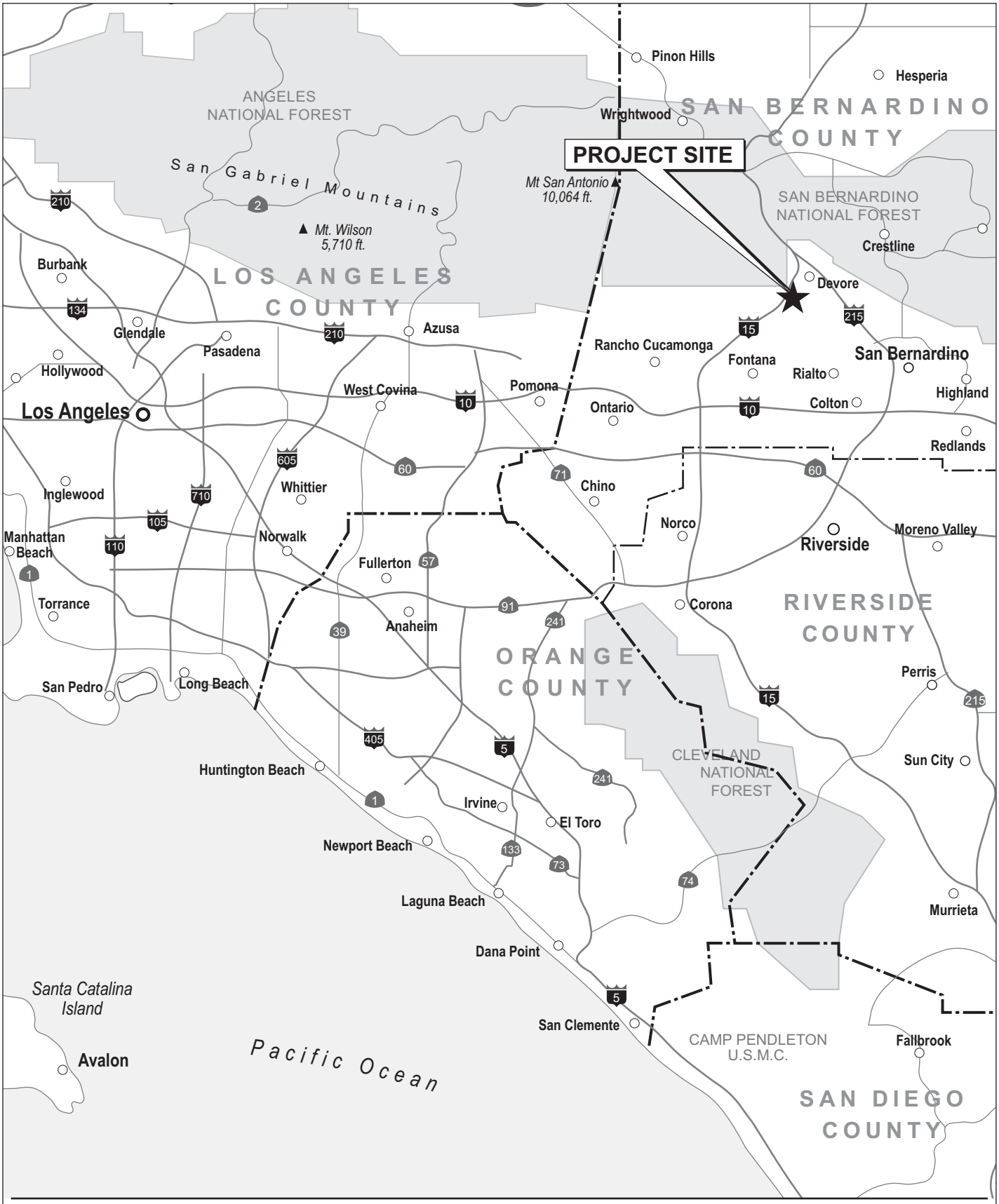
INTRODUCTION

The Santa Ana River woolly-star (*Eriastrum densifolium* subspecies *sanctorum*) is a federally and state-listed endangered species. It is also a California Native Plant Society (CNPS) List 1B species, which is defined as rare or endangered in California and elsewhere.

The endangered Santa Ana River woolly-star *sanctorum* subspecies is believed to be restricted to a short stretch of the Santa Ana River Wash, approximately 8 miles southeast of the Lytle Creek Ranch Specific Plan project site (Figure 1, *Regional Map*, on page 2 and Figure 2, *Vicinity Map*, on page 3.). Known sites of *Eriastrum densifolium* subspecies *sanctorum* can be found within the U.S. Geological Survey (USGS) 7.5-minute Yucaipa and Redlands topographic quadrangle maps.

This report reviews literature on the Santa Ana River Woolly-star in order to determine an appropriate basis for distinguishing this subspecies from the non-endangered subspecies. This report also presents and analyzes field data on a woolly-star population located at the Lytle Creek Ranch Specific Plan project site ("Site") within a portion of Lytle Creek Wash. This is part of a larger effort to assess the biological resources of the Site and to determine the impacts from proposed development.

Eriastrum densifolium (Benth.) H. Mason is a member of the phlox family (Polemoniaceae) and one of thirteen species of the genus *Eriastrum* in California. The range of this perennial species extends from the central coast of California east to the Sierra Nevada range and Mojave Desert and south to Baja California, Mexico. *E. densifolium* occupies a wide range of habitats such as dunes, dry riverbeds, and open slopes (Patterson, 1993).



Source: PCR Services Corporation, 2006.

Figure 1
Lytle Creek Ranch Regional Map

Taxonomic manuals have used such features as leaf canescence, leaf lobing, stem height, habitat type, corolla length, and corolla color to distinguish subspecies. Munz and Keck (1959) recognized four subspecies of Eriastrum densifolium (*austromontanum, mohavense, elongatum,* and *sanctorum*) while Patterson (1993) recognized five subspecies, including *densifolium.*

Later research by Brunell and Rieseberg (1993) examined genetic evidence from 15 subpopulations of the subspecies *sanctorum*, two *elongatum* populations, two *austromontanum* populations, and two Lytle Creek subpopulations and concluded that no clear genetic discontinuities exist between the populations. Likewise, random amplified polymorphic DNA (RAPD) marker variation indicated that the "currently recognized subspecies are not natural groups" (Brunell and Whitkus, 1997). Brunell and Whitkus (1999b) examined the floral and vegetative morphology and concluded that only one clear discontinuity exists: "the only character that exhibits discontinuous variation among populations is corolla tube length for population SANCT". SANCT refers to the endangered Santa Ana River population. Therefore, they assert that *E. densifolium* comprises only two subspecies: the relatively short corolla length subspecies *densifolium* and the longer corolla length subspecies *sanctorum*.

These papers also addressed the taxonomic status of a woolly-star population occurring along Lytle Creek Wash, approximately 4 miles southeast of the Lytle Creek Ranch Specific Plan project site and 4 miles northwest of the previously defined range of the *sanctorum* subspecies. Geographic proximity and certain morphological similarities between these plants and those of the endangered subspecies *sanctorum* population were apparently the basis for speculating that the Lytle Creek population represented a "range extension" of the *sanctorum* population. Brunell and Rieseberg (1993) found that genetic evidence could not be used to assign the Lytle Creek population to a definite subspecies and that "conventional taxonomic methods may provide more insight."

Brunell and Whitkus (1997) found that genetic variation within the species does not occur in "genetically cohesive groups" but rather is distributed on a continuum correlated with geographic distance. As such, the Lytle Creek population, investigated by Brunell and Whitkus, is one of several populations closely related to the SANCT population. However, based on principle component analysis (PCA), Brunell and Whitkus (1999b) determined that the LYTLE population bears a close affinity to the SANCT population only in terms of vegetative morphology, but a distant affinity in terms of floral morphology.

Eriastrum densifolium subspecies *sanctorum* may be in the process of diverging sympatrically into a new species and could thus be considered an example of a neoendemic (CNPS, 2001). According to Brunell and Whitkus (1999a), no genetic barriers yet exist to prevent cross-pollination between populations of different subspecies and thus "hybridization" could feasibly occur between adjacent populations. However, findings by Brunell and Whitkus (1999b) indicate that there is no gradient in terms of corolla length between the SANCT population and nearby *E. densifolium* populations. It appears that the distance between these populations is sufficient to confer reproductive isolation.

SITE DESCRIPTION

The Lytle Creek Ranch Specific Plan project site is located along Lytle Creek Wash, partly within the City of Rialto and partly within unincorporated San Bernardino County, California. It can be found within the U.S. Geological Survey (USGS) 7.5-minute Devore

topographic quadrangle map. The Site is generally located within the floodplain terraces of Lytle Creek Wash, and consists of four main parcels or subareas referred to as Neighborhoods I through IV) including adjacent open space parcels along the northern portion of the wash. The woolly-star population in question is located in the eastern portion of Neighborhood II, along the edge of the terrace adjacent to Lytle Creek Wash.

The habitat in which these plants occur is mapped as Riversidean Alluvial Fan Sage Scrub (RAFSS). RAFSS is a plant community that occupies coarse alluvial deposits associated with streams that experience infrequent episodes of severe overbank flooding. This vegetation dominates major outwash fans at the mouths of canyons along the coastal side of the San Gabriel and San Bernardino mountains and other floodplain areas of Southern California. RAFSS is composed of an assortment of drought-deciduous subshrubs and large evergreen woody shrubs adapted to porous, low-fertility substrates and to survival of episodes of intense, periodic flooding and erosion.

METHODS

PCR biologists Robert Freese and Susan Erickson visited the Site on June 28, 2006 during the blooming period for the woolly-star. The field analysis they conducted was two-fold. First, certain vegetative morphology characteristics traditionally used in distinguishing the *sanctorum* subspecies were noted, including leaf canescence and plant height. This provided a source of information needed in using the Munz (1974) and Patterson (1993) dichotomous keys.

Second, they followed a procedure developed in consultation with Dr. Mark Brunell that involved measuring the lengths of three corolla tubes on each of 60 individual *E. densifolium* plants for a total of 180 measurements (Figure 3, *Woolly-star Photographs*, on page 6). Corollas were removed from the plant and measured to the nearest millimeter. The corolla tube was considered to extend from the base of the flower to the sinuses between the lobes of the individual petals.

The three corolla measurements per plant were averaged to produce a single estimate for each plant. These estimates were then averaged to produce a mean estimate for the population.

The standard error, 95% and 99% confidence intervals for the mean were calculated using standard procedures (Rao, 1998). Population percentiles (10th, 25th, 50th, 75th, and 90th percentiles) were expressed in the form of a Tukey's box plot describing variation in corolla tube length for the 60 samples.

The mean and the confidence interval ranges were compared to a threshold value for corolla length that must be met or exceeded in order for the population to qualify as subspecies *sanctorum*. Although Patterson (1993) defines this threshold as 25 mm, Dr. Mark Brunell recommends a more conservative threshold value of 18 mm (personal communication, June 15, 2006).

GPS points were collected at the locations of most sampled plants. The distribution of sample points is shown in Figure 4, *Woolly-star Sample Locations*, on page 7. This figure verifies that the samples were generally taken from the mapped range of the species as determined during focused sensitive plant surveys (PCR, 2006). An additional four plants were sampled from an area just south of the project boundary. This data was included in the analysis because the plants are part of this same population.

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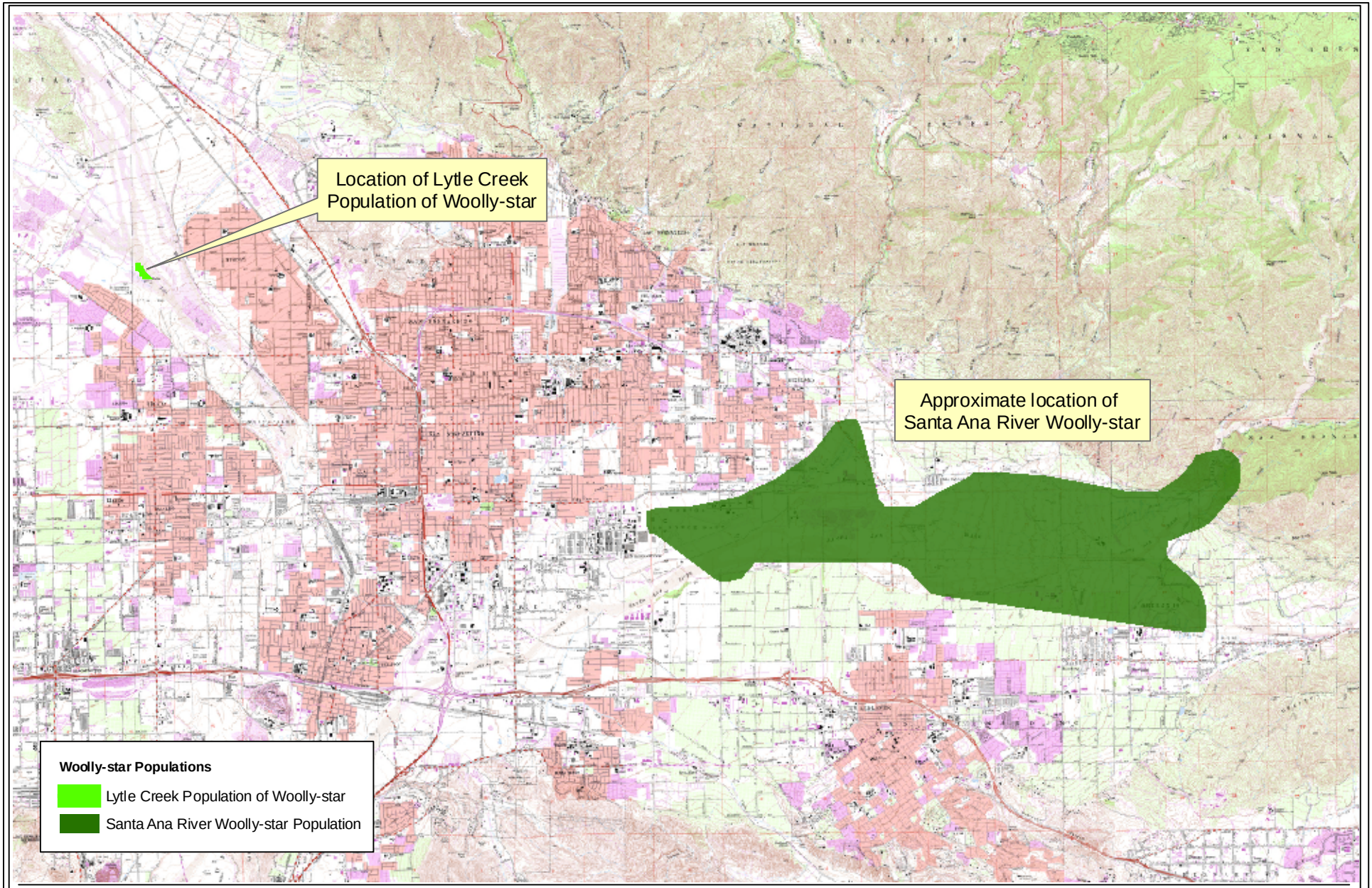

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N

2 0 2 Miles

Source: Brunell, M.S. and LH Rieseberg (1993); PCR Services Corporation, 2006.

Figure 2
Lytle Creek Ranch
Vicinity Map

Photograph 1: *Eriastrum densifolium elongatum* plants and surrounding habitat at Lytle Creek Ranch project site within Lytle Creek.

Photograph 2: Close-up view of *Eriastrum densifolium elongatum* plants, Lytle Creek Ranch project site.

Photograph 3: Biologist measuring corolla lengths at edge of wash, Lytle Creek Ranch project site.

Photograph 4: Close-up view of individual flowers of *Eriastrum densifolium sanctorum*. (CalPhoto-Nina Jimerson, 2003)

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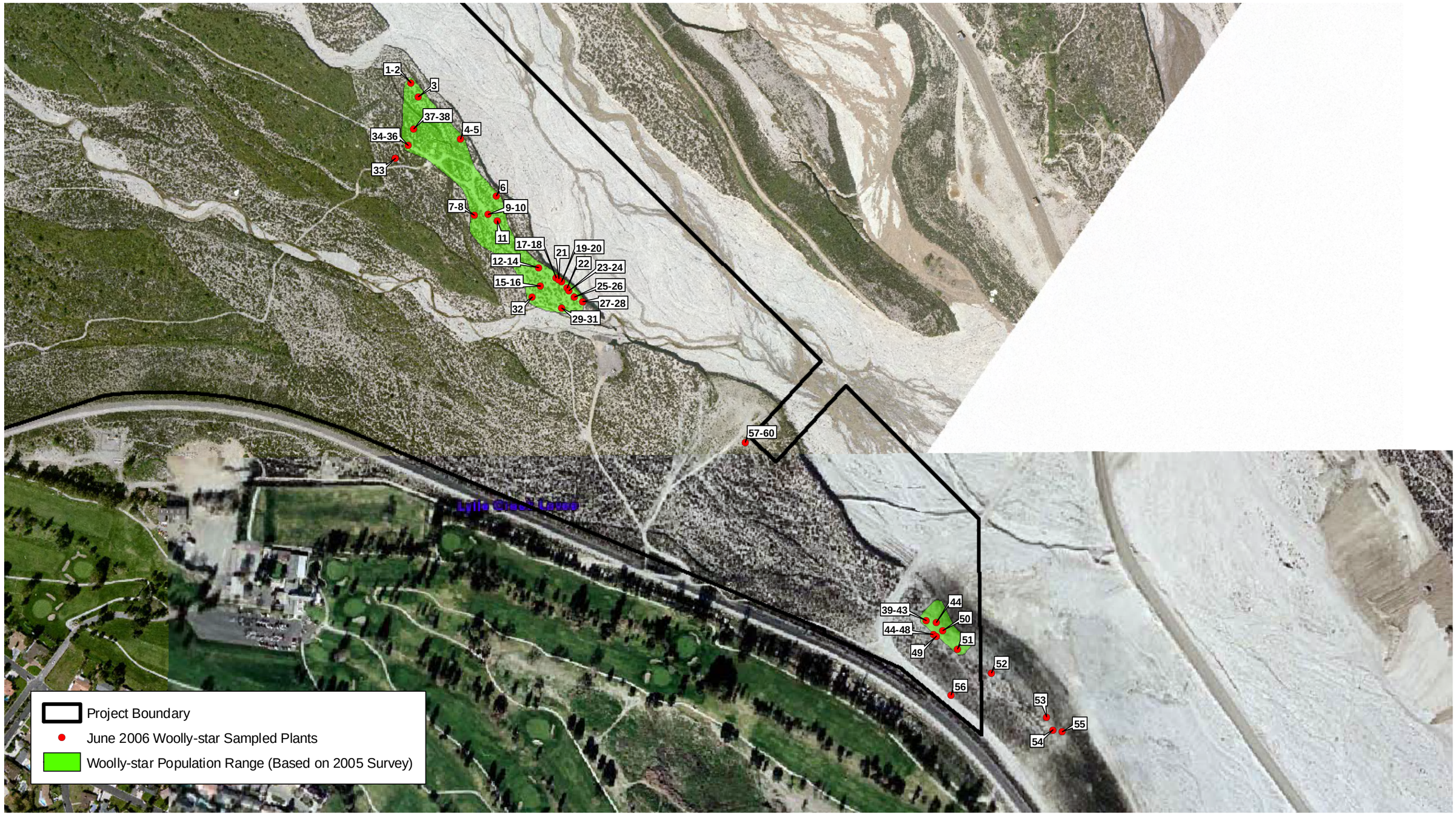
Figure 3
Lytle Creek Ranch
Woolly-star Photographs

Source: PCR Services Corporation, 2006.



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400 0 400 Feet

Source: PCR Services Corporation, 2006.

Figure 4
Lytle Creek Ranch
Woolly-star Sample Locations

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RESULTS

The field data are shown in the Appendix, *Corolla Length and Plant Height Measurements*.

Vegetative Morphology

The average plant height was 46.6 cm. Individual plants ranged widely from 19.0 cm to 80.0 cm. Leaf and stem canescence consistently ranked as either 1 or 2 on a scale of 0 to 3 (0=glabrous, 1=slight canescence, 2=clearly evident canescence, 3=densely white-woolly canescence). However, the bracted inflorescences generally ranked 3 on this scale. Photograph 2 of Figure 3 shows this pattern.

Floral Morphology

The distribution of corolla measurements is shown in Figure 5, *Corolla Length Distribution*, on page 9. The bar graph suggests that the population is normally distributed. The population is slightly right-skewed but does not suggest multiple populations on-site with respect to corolla length.

The longest corolla measured was 16 mm while the shortest was 10 mm. There was little variation in corolla length among flowers from the same plant and most flowers were within 1 mm of each other. Only 1 plant had flowers that varied by more than 2 mm.

The mean corolla length was 12.9 mm and averaged values for individual plants ranged from 11.0 mm to 15.7 mm. The 95% confidence interval for the mean is between 12.6 and 13.2 mm while the 99% confidence interval is between 12.5 and 13.3 mm. This indicates that the true mean for the population of corolla lengths is well below the 18 mm threshold for the *sanctorum* subspecies. These calculation are based on a standard error of 0.15 and critical t-distribution values for $\alpha/2=0.05$ and 0.01.

The population percentiles for corolla lengths at the Site are presented in the lowermost portion of Figure 6, *Box-Plot Population Percentiles*, on page 10. The median corolla length is 13.0 mm and 80% of the population is distributed between 11.3 (the 10th percentile) mm and 14.7 mm (the 90th percentile). The upper portion of this figure presents data from 23 woolly-star populations including the endangered SANCT population. That portion is reprinted with permission from Brunell and Whitkus (1999). A comparison of percentiles from the Site population with those of other populations indicates that the distribution of corolla lengths matches those of the non-sensitive populations. A clear discontinuity exists between the Site population and the SANCT population.

DISCUSSION

Despite the previously discussed problems with subspecies delimitation, the woolly-star plants at the Site can be keyed using field data and photographs. The following couplets are from the dichotomous key for *Eriastrum densifolium* in the Jepson manual. Following each couplet is the choice, shown in bold, that we made in keying the plants at the Site.

2. "Lvs few-lobed or entire, gen glabrous; coastal dunes" (= subspecies *densifolium*).

2'. "Lvs variously lobed, densely hairy, gen away from the immediate coast" (= continue to couplet 3).

The plants on-site are variously lobed, somewhat hairy and are located away from the immediate coast (Selection 2').

3. "Lvs strongly recurved, blade wider at base than at tip, lobes spine-tipped – DMoj" (=subspecies *mohavense*).

3'. "Lvs not recurved, blades gen equally wide at base, tip, lobes not spine tipped" (=continue to couplet 4).

The plants on-site have leaves that are not recurved, equally wide at the base and not spine tipped (Selection 3').

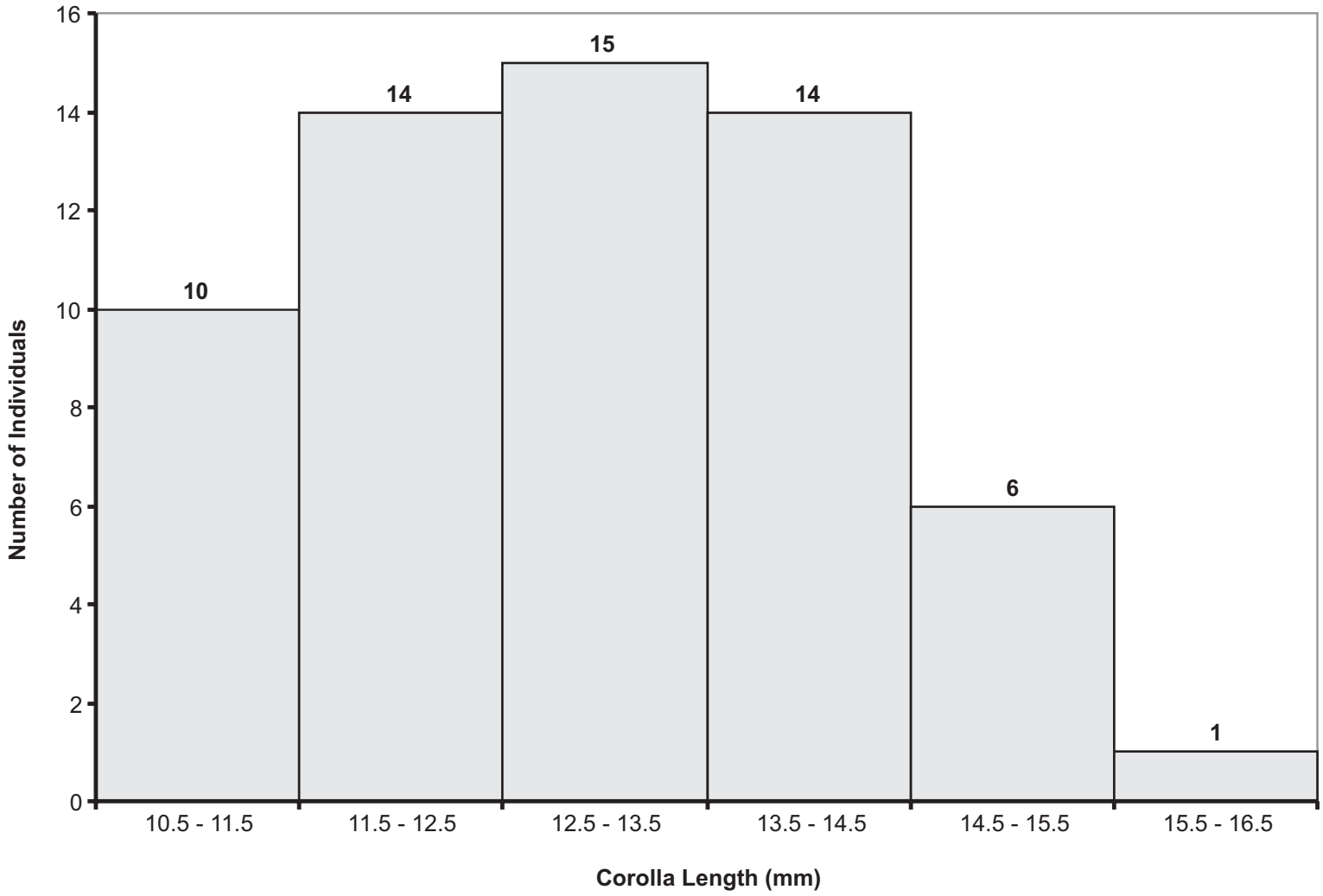

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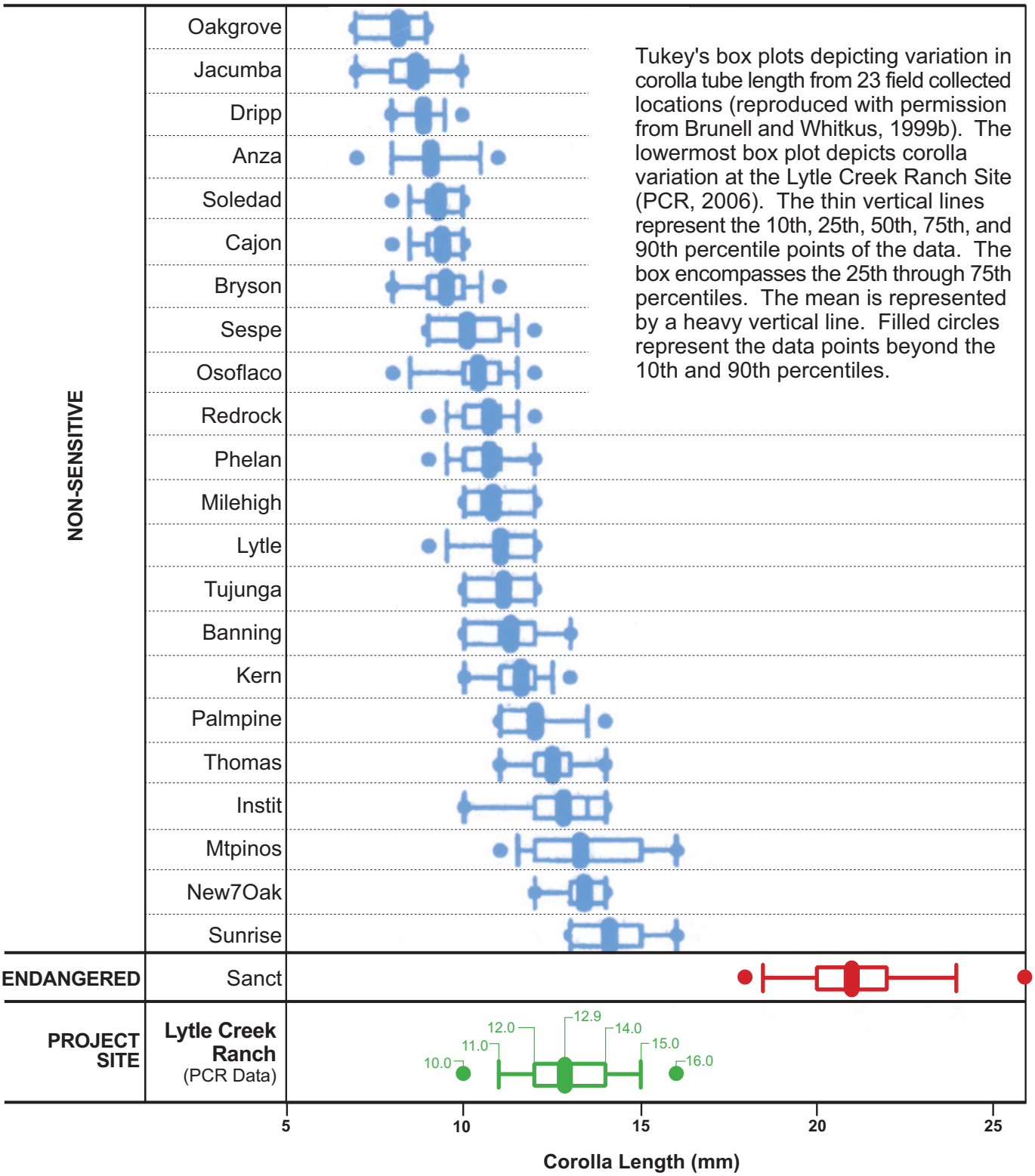
Figure 5
Lytle Creek Ranch
Corolla Length Distribution

Source: PCR Services Corporation, 2006.



Tukey's box plots depicting variation in corolla tube length from 23 field collected locations (reproduced with permission from Brunell and Whitkus, 1999b). The lowermost box plot depicts corolla variation at the Lytle Creek Ranch Site (PCR, 2006). The thin vertical lines represent the 10th, 25th, 50th, 75th, and 90th percentile points of the data. The box encompasses the 25th through 75th percentiles. The mean is represented by a heavy vertical line. Filled circles represent the data points beyond the 10th and 90th percentiles.

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Source: Brunell and Whitkus, 1999b;
PCR Services Corporation, 2006.

Figure 6
Lytle Creek Ranch
Box-Plot Population Percentiles

4. "Corolla 25-32 mm; pls densely woolly – e SCo (Santa Ana River)" (=subspecies *sanctorum*).

4'. "Corolla < 20 mm; pls gen hairy but not densely white woolly" (= continue to couplet 5).

The plants on-site have corolla lengths much less than 20 mm and are only slightly to moderately hairy (Selection 4').

5. "Bracts gen 5-9 lobed; fls gen 15-20" (=subspecies *austromontanum*).

5'. "Bracts gen 1-5 lobed; fls gen < 15" (=subspecies *elongatum*).

The plants on-site have inflorescences with generally fewer than 15 flowers and therefore key to *Eriastrum densifolium* subspecies *elongatum*.

The description of the *sanctorum* subspecies in A Flora of Southern California (Munz, 1974) indicates that subspecies *sanctorum* attains greater stature (25-75 cm) than the other subspecies. The plants of the Lytle Creek population are relatively tall and thus fit that concept. However, the plants on-site are extremely variable and stature was discarded as a distinguishing feature in the more recent Jepson Manual. It appears that vegetative morphology is not a reliable basis for distinguishing the *sanctorum* subspecies.

The current scientific literature shows that corolla length is the best diagnostic tool for distinguishing the endangered *sanctorum* subspecies from the non-endangered subspecies. The mean corolla length for the population at the Site was 12.9 mm, considerably short of the 18 mm threshold that characterizes the endangered subspecies. None of the 180 flowers sampled attained the threshold length of 18 mm. The population percentiles show no overlap between the Santa Ana River population (i.e. subspecies *sanctorum)* and the Site population with respect to corolla length. We therefore conclude that the evidence does not support classifying the woolly-star population at the Lytle Creek Ranch Specific Plan project site as the endangered *sanctorum* subspecies.

To address the issue of possible hybridization between individuals of listed and non-listed taxon, the USFWS and National Oceanographic Atmospheric Administration published a proposed rule in the Federal Register focusing on the treatment of intercrosses and intercross progeny (i.e. hybridization) (Department of Interior and Department of Commerce, 1996). The proposed policy would extend protection of intercross progeny if "(1) the progeny share the traits that characterize the taxon of the listed parent, and (2) the progeny more closely resemble the listed parent's taxon than an entity intermediate between it and the other known or suspected non-listed parental stock."

Based upon the information presented in this paper regarding corolla length, individuals sampled within the population of woolly-star occurring at the Lytle Creek Ranch Specific Plan project site more closely resemble the non-listed subspecies *elongatum*, which has a corolla tube length of 14 – 18 mm according to the Jepson Manual, rather than the federally and state-listed endangered subspecies *sanctorum*. Under the proposed rule on hybridization, the Lytle Creek Ranch Specific Plan population would not be considered a listed taxon.

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APPENDIX A: COROLLA LENGTH AND PLANT HEIGHT MEASUREMENTS

Plant no.	Corolla length (mm)			Ave. length (mm)	Height (cm)
1	15	15	15	15.00	52
2	14	14	13	13.67	41
3	12	13	12	12.33	44
4	14	14	14	14.00	78
5	13	13	13	13.00	32
6	16	16	15	15.67	40
7	14	12	14	13.33	55
8	11	12	12	11.67	65
9	10	14	12	12.00	50
10	15	14	14	14.33	40
11	12	13	13	12.67	43
12	12	12	12	12.00	45
13	14	13	13	13.33	57
14	14	13	14	13.67	30
15	13	13	13	13.00	40
16	14	14	14	14.00	38
17	11	12	11	11.33	79
18	12	13	13	12.67	46
19	12	11	11	11.33	45
20	14	14	15	14.33	39
21	13	12	13	12.67	29
22	12	12	11	11.67	57
23	13	13	14	13.33	39
24	14	14	13	13.67	60
25	12	12	13	12.33	50
26	13	12	12	12.33	34
27	12	12	12	12.00	58
28	11	11	12	11.33	35
29	13	13	14	13.33	39
30	14	13	14	13.67	24
31	13	13	12	12.67	38
32	11	11	12	11.33	80
33	13	12	12	12.33	69
34	12	12	11	11.67	23
35	14	14	15	14.33	24
36	11	12	10	11.00	48
37	11	11	12	11.33	74
38	11	11	12	11.33	52
39	11	12	11	11.33	49
40	12	13	11	12.00	32

Plant no.	Corolla length (mm)			Ave. length (mm)	Height (cm)
41	14	15	15	14.67	62
42	14	14	14	14.00	47
43	12	12	11	11.67	47
44	14	15	15	14.67	33
45	15	15	14	14.67	48
46	14	14	13	13.67	27
47	13	13	15	13.67	53
48	13	13	13	13.00	58
49	15	15	15	15.00	24
50	13	13	13	13.00	49
51	13	13	13	13.00	66
52	12	13	13	12.67	53
53	13	12	12	12.33	46
54	11	12	11	11.33	60
55	12	12	12	12.00	19
56	11	12	11	11.33	53
57	13	13	13	13.00	40
58	14	14	14	14.00	35
59	14	14	14	14.00	57
60	14	15	15	14.67	46
Averages				**12.92**	**46.60**

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