APPENDIX I

HYDROLOGY AND WATER QUALITY

- PERCOLATION TEST RESULTS

- STORM DRAINAGE TECHNICAL REPORT

APPENDIX I
HYDROLOGY AND WATER QUALITY

I.1: Percolation Test Results

Project No.
9320.000.000

October 28, 2011

Mr. Hal Beral
Crossroads Business Center
% Golden State Developers, Inc.
18952 MacArthur Blvd., Suite 450
Irvine, CA 92612-1415

Subject: Cordes Ranch
Tracy, California

PERCOLATION TEST RESULTS

Dear Mr. Beral:

We are pleased to present this letter summarizing our percolation testing at the Cordes Ranch project in Tracy, California. This report summarizes the results of our percolation testing at various locations across the proposed Cordes Ranch site. The percolation testing was performed in general conformance with industry standards and the standard of care generally accepted at the time the testing was performed.

The site for the proposed development is located south of Highway 205, west of Mountain House Parkway to east of Hansen Road, and north of Schulte Road in Tracy, California, as shown in Figure 1. The site has historically been used for agricultural purposes and was in various stages of plowed fields and growing crops during our exploration. The Site Plan, Figure 1, shows the proposed project layout as well as our percolation testing locations.

The purpose of the percolation testing was to determine percolation rates in the areas of planned detention basins at the currently proposed depth of excavation for each basin location. We performed seven tests across the site.

TEST PREPARATION AND PROCEDURES

We performed percolation testing at the site in general conformance with the procedures adopted by local Environmental Health Department. Testing was performed at seven locations across the site as shown on Figure 1. The percolation test hole depths are listed in Table 1. A truck-mounted drill rig was used to drill an approximately 4-inch-diameter boring at each of the locations shown on the attached figure to the approximate depth shown on the table below. The soil cuttings were logged at each of the boring locations and are attached to this letter. Preparation of the percolation test holes began by placing an approximately two-inch-thick layer of drain rock in the bottom of the holes, then placing a 3-inch-diameter solid pipe in the test holes and additional drain rock surrounding the pipe up to the ground surface.

We presoaked the holes with clear drinking-quality water at least 12 hours prior to performing the percolation tests. It is our opinion that the percolation rate of drinking water should be similar to stormwater.

At the start of each test, we filled the holes with water to approximately 12 inches above the drain rock placed at the bottom of the hole. Measurements of the water level drop in each hole were collected every 1 to 30 minutes depending on the rate of percolation, until the percolation rate stabilized, approximately 1 to 4 hours.

The drain pipes were left in place at the completion of the percolation testing. The calculated percolation rates are presented in the table below.

TEST RESULTS

TABLE 1
Percolation Test Results

Test Hole	Depth (feet)	Percolation Rate (mins/inch)	Percolation Rate (gals/ ft^2/day)
P-1	13	3.39	265
P-2	8	2.03	441
P-3	10	0.51	1,767
P-4	11	1.69	530
P-5	9	25.40	35
P-6	8	1.27	706
P-7	12	0.30	3,003

These rates are based solely on the change in water-level elevations recorded in the stand pipes. We applied no conversion factors to arrive at the percolation rates. The design engineer should consider appropriate conversion factors or factors of safety for design. Based on the variability of the data collected and reviewed, the site geology, and our experience in the general site vicinity, the percolation rates should be adjusted accordingly based on location.

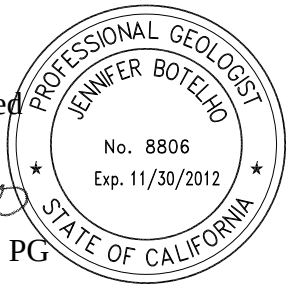
CLOSURE

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. This letter provides testing results and visual interpretation of the subsurface conditions at specific locations and variations in subsurface conditions can occur. In addition, the determination of percolation rates for natural soil is an approximation and appropriate contingencies should be included in the project design to account for variations in percolation rates. The locations of the subsurface explorations are approximate and were estimated by pacing from features shown on the site plan.

We are pleased to be of service to you on this project. If you have any questions or comments regarding this letter, please call and we will be glad to discuss them with you.

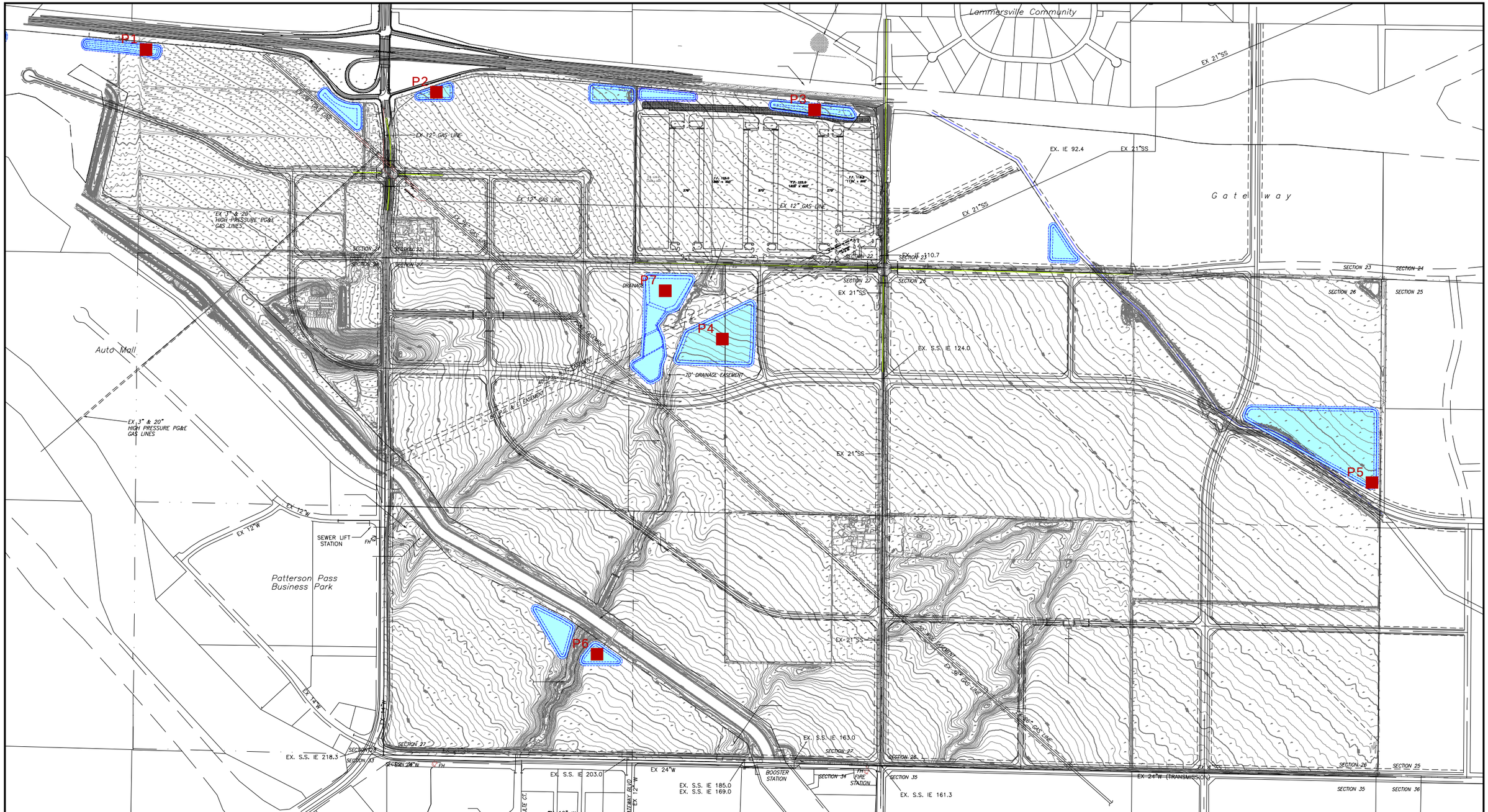
Sincerely,

ENGEO Incorporated



Jennifer R. Botelho, PG Josef J. Tootle, GE
jrb/jjt/jf:perc

Attachments: Figure 1 – Site Plan
Boring Logs



EXPLANATION

P7 ■ APPROXIMATE LOCATION OF PERCOLATION TEST

BASE MAP SOURCE: KIER & WRIGHT

ENGEO Expect Excellence

PERCOLATION TESTING LOCATIONS

CORDES RANCH

TRACY, CALIFORNIA

PROJECT NO.: 9320.000.000		FIGURE NO. 1
SCALE: AS SHOWN		
DRAWN BY: PC	CHECKED BY: JJT	

ORIGINAL FIGURE PRINTED IN COLOR

G:\Active Projects\9320\WP\9320000000-1-Final PercLoc.dwg Plot Date:10-28-11 spatters

LOG OF BORING P-1

ENGEO INCORPORATED

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 13 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 176 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND WITH CLAY (SM), yellowish brown, dry to moist, fine-grained sand										
	1												
5			as above, cleaner, few pebbles										
	2												
			SAND (SW), light yellowish brown, moist to dry, fine-to medium-grained sand, some coarse-grained sand, some silt										
10	3		very consistent drilling										
			as above, slightly moist										
			Bottom of boring at approximately 13 feet. No groundwater encountered.										

LOG - GEOTECHNICAL CORDES RANCH BORING LOGS.GPJ ENGEO INC.GDT 10/27/11

LOG OF BORING P-2

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 8 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 149 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY CLAY (CL), dark brown, dry, some fine-grained sand										
	1												
5			SILTY SAND (SM), yellowish brown, dry to moist, fine-to medium-grained sand, some coarse-grained sand, some carbonate nodules										
	2		easy drilling, very dry, water added										
			Bottom of boring at approximately 8 feet. No groundwater encountered.										

LOG OF BORING P-3

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 10 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 110 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY CLAY (CL), dark brown, dry										
	1		SANDY CLAY WITH SILT (CL), yellowish brown, dry to moist, fine-grained sand, few pebbles										
5	2												
10	3		Bottom of boring at approximately 10 feet. No groundwater encountered.										

LOG OF BORING P-4

ENGEO INCORPORATED

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 11 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 140 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY CLAY (CL), dark brown, dry, some fine-grained sand										
	1												
5													
	2												
			SANDY CLAY WITH SILT (CL), dark yellowish brown, dry to moist, fine-to medium-grained sand										
10	3												
			Bottom of boring at approximately 11 feet. No groundwater encountered.										

LOG - GEOTECHNICAL CORDES RANCH BORING LOGS.GPJ ENGEO INC.GDT 10/27/11

LOG OF BORING P-5

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 9 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 100 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			CLAY WITH SILT (CL), dark olive brown, moist, some surface expansion cracks up to ~3/4" separation.										
	1												
5			SILTY CLAY (CL), light yellowish brown, moist, some fine-grained sand.										
	2												
			Bottom of boring at approximately 9 feet. No groundwater encountered.										

LOG OF BORING P-6

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 8 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 190 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SANDY, SILTY, CLAY (CL), brown, dry, surface expansion cracks up to ~3" sepatation										
	1												
5													
	2		CLAYEY SAND/SANDY CLAY (SC-CL), yellowish brown, dry to moist, fine-grained sand, water added during drilling										
			Bottom of boring at approximately 8 feet. No groundwater encountered.										

LOG OF BORING P-7

ENGEO INCORPORATED

Geotechnical Exploration
Cordes Ranch
Tracy, California
9320.000.000

DATE DRILLED: 10/3/2011
HOLE DEPTH: 12 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV: Approx. 145 ft.

LOGGED / REVIEWED BY: J. Botelho / JJT
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

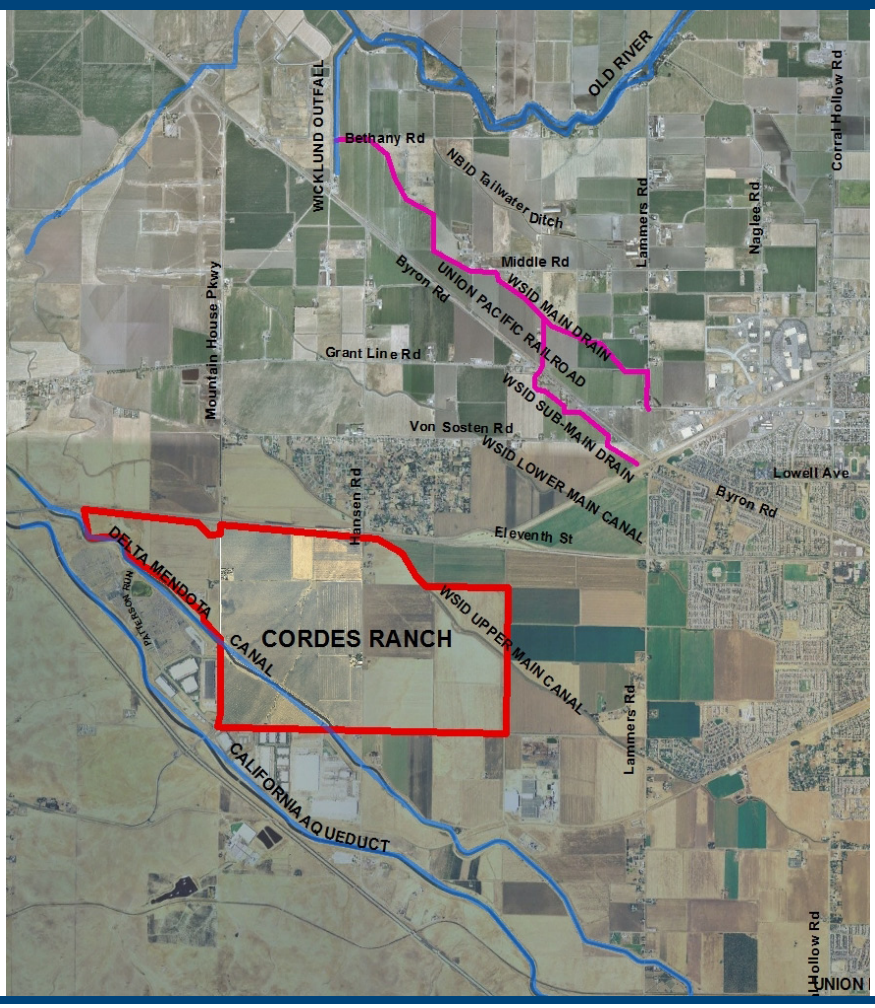
Depth in Feet	Depth in Meters	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY CLAY (CL), dark brown to dark yellowish brown, dry, some fine-grained sand										
	1		as above, lighter color, yellowish brown										
5			as above, slightly easier drilling										
	2												
			CLAYEY SAND WITH SILT (SC), light yellowish brown, dry to moist, fine-to medium-grained sand										
10	3		as above, more moist, slightly darker color, brown										
			Bottom of boring at approximately 12 feet. No groundwater encountered.										

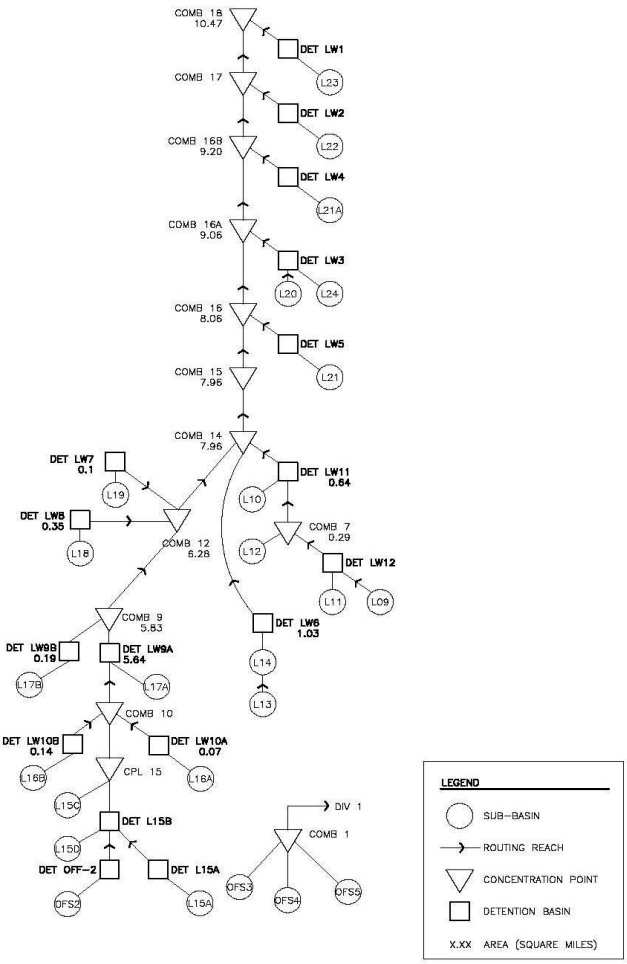
APPENDIX I
HYDROLOGY AND WATER QUALITY

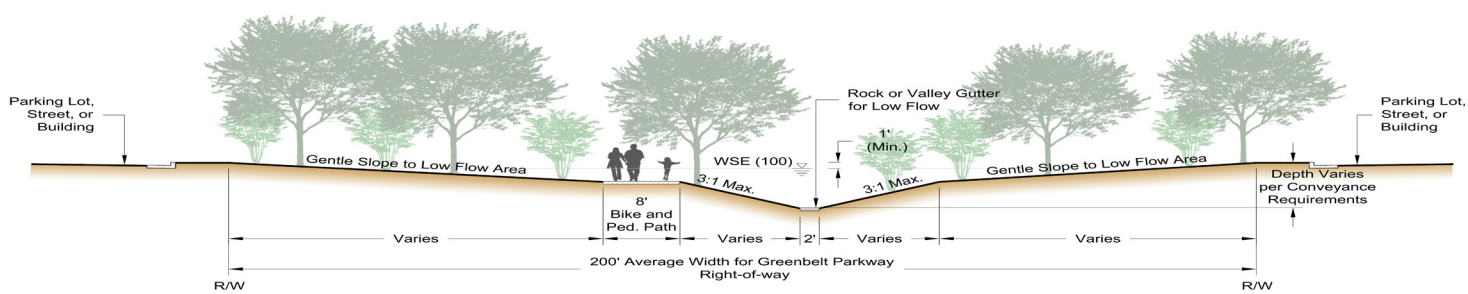
I.2: Storm Drainage Technical Report

Cordes Ranch Specific Plan

STORM DRAINAGE TECHNICAL REPORT







City of Tracy

December 2012

Storm Water Consulting Inc.

Stantec

Stantec

CORDES RANCH SPECIFIC PLAN STORM DRAINAGE TECHNICAL REPORT

December 2012

SWC Project No. 2011-76

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FIGURES (FOLLOWS THE PAGE)

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APPENDIX

1.0 Introduction

This report is a storm drainage technical report to support the Cordes Ranch Specific Plan currently being prepared by others. It provides technical documentation and requirements related to the future construction of storm drainage facilities that will serve the future development of Cordes Ranch, including shared storm drainage facilities with other future development projects where applicable.

The following information is included in this storm drainage technical report:

- A delineation of primary watersheds that include Cordes Ranch Specific Plan areas and sub-basins within these primary watersheds.
- Hydrologic analyses for the primary watersheds and sub-basins.
- Identification of storm drainage facility upgrades needed to serve the development of Cordes Ranch, including shared storm drainage facilities that will also serve other future development projects where applicable.
- Graphic representations of existing and proposed storm drainage infrastructure.
- Recommended invert elevations for key components of the proposed storm drainage infrastructure.
- Typical cross-sections of selected proposed storm drainage infrastructure components.
- Recommendations and requirements for the accommodation of offsite drainage flows through new development areas, as applicable.
- Identification of public storm drainage facilities and key storm drainage facilities that will be privately owned, constructed, operated and maintained.
- Preliminary alignments and sizes of onsite storm drains serving future streets, including an Opinion of Probable Cost for these onsite storm drains.
- References to drainage agreements between the City and other entities.
- Guidelines for the planning and design of joint-use detention basins.
- Drainage policies to be applied to new development, including the use of Low Impact Development (LID) practices.
- Project phasing requirements, including storm drainage facilities that will be required to serve proposed Phase 1 development areas within Cordes Ranch.

Detention basin sizes represented in this storm drainage technical report account for the acreage required to accommodate the storage volumes needed for flood control only. Additional land will be required to incorporate provision for joint-use recreation facilities and differential grading, to the extent that such facilities are proposed.

Onsite storm drainage facilities serving individual future development projects or phases of future development projects shall be designed in consideration of storm drainage infrastructure recommended in this storm drainage technical report, but in conformance with the City's Design Standards.

2.0 Watersheds

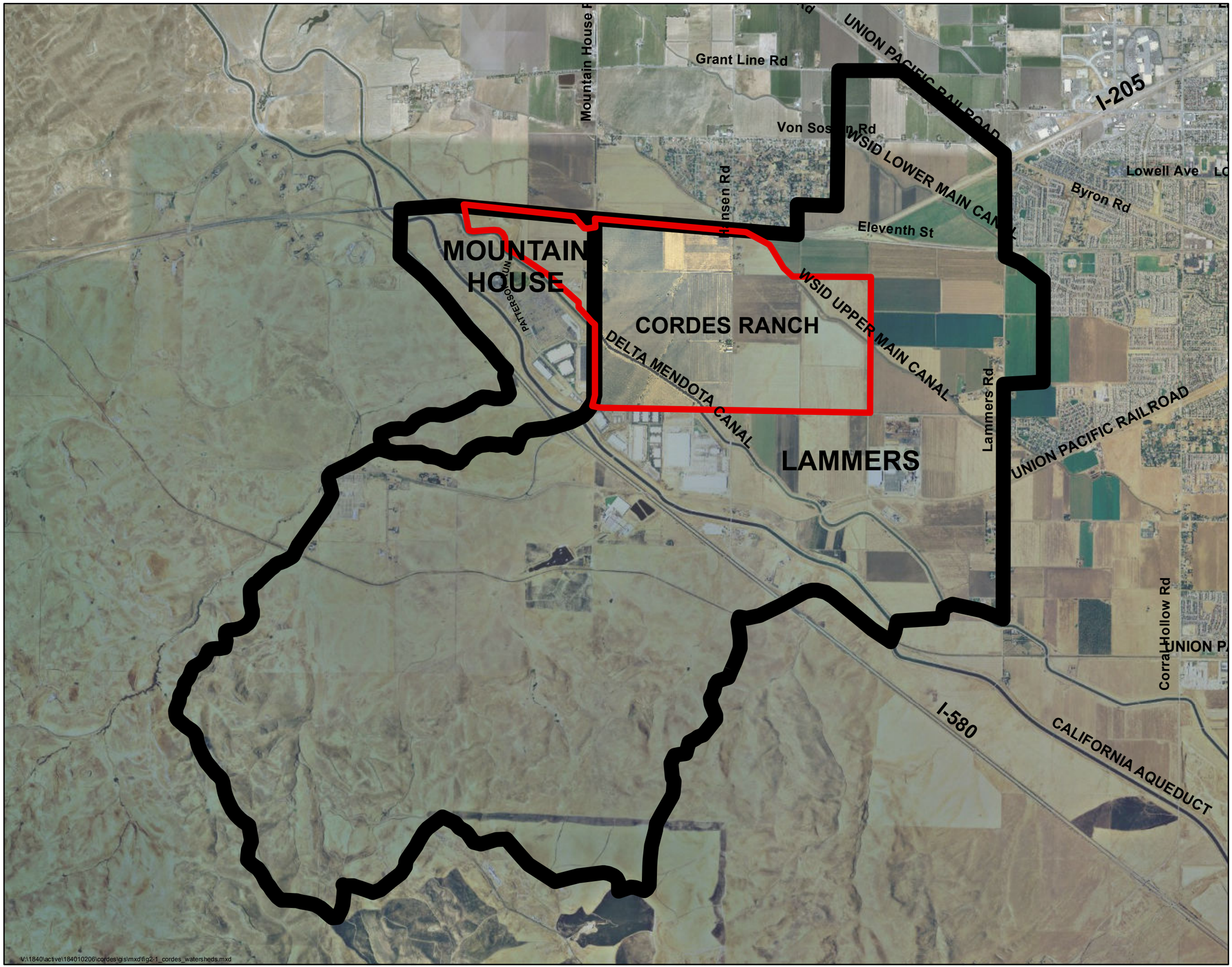
2.1 ORIENTATION OF CORDES RANCH SPECIFIC PLAN

The majority of the Cordes Ranch Specific Plan area resides to the east of Mountain House Parkway and is located in the Lammers Watershed as defined in the Citywide Storm Drainage Master Plan. The westernmost portion of the specific plan area resides to the west of Mountain House Parkway and is located in the Mountain House Watershed as defined in the Citywide Storm Drainage Master Plan. These watersheds were previously delineated based on topography, physical features, land use, and existing and proposed locations for future discharge of storm water. Both watersheds also receive storm runoff contributions originating from offsite watersheds extending upstream into the hills to the southwest. The orientation of Cordes Ranch within the Lammers and Mountain House Watersheds is depicted on Figure 2-1.

2.2 LAMMERS WATERSHED

The Lammers Watershed is a large area contiguous to the west of urbanized portions of the City of Tracy and is substantially undeveloped at present. It contains many of the City's larger service areas proposed for development in the future. Excluding the offsite watersheds that extend into the hills to the southwest and upstream of I-580, the Lammers Watershed consists of an area of about 8.6 square miles. The Lammers Watershed is roughly bounded by Mountain House Parkway on the west, I-580 on the south (plus offsite watersheds extending upstream to the southwest of I-580), Lammers Road on the east, and I-205 and Grant Line Road on the north. Existing development in the Lammers Watershed includes the east portions of Patterson Pass Business Park, the Safeway Distribution Center, and the OI Thermal Energy Development industrial site (all on the south side of Schulte Road between Mountain House Parkway and Lammers Road); Kimball High School on the east side of Lammers Road south of Eleventh Street; and large agricultural properties. Proposed development areas include the following City future service areas: Cordes Ranch, West Side Industrial, Gateway, the westernmost portions of Westside Residential, Bright, and the majority of Catellus.

Other existing drainage features within and downstream of the Lammers Watershed include agricultural ditches, tailwater ponds, and low capacity tailwater ditches that drain to West Side Irrigation District (WSID) tailwater conveyance facilities. WSID's Upper and Lower Main Canals also traverse across the watershed and intercept various upstream irrigation discharges and storm water flows. The WSID Sub-Main Drain tailwater ditch is located further downstream in the Lammers Watershed and extends northwesterly along the south side of Byron Road between I-205 (near Lammers Road) and the alignment of San Jose Road, and then turns north crossing Byron Road and the Union Pacific Railroad and joins the WSID Main Drain tailwater ditch to the north on the east side of San Jose Road. The WSID Main Drain continues northwesterly for another 2 miles and then discharges to the WSID intake facility at the intersection of Bethany Road and Wicklund Road. The WSID intake facility connects with Old River to the north.



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Legend

- Watershed Boundaries
- Cordes Ranch Boundary

Client/Project

CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 2-1

Title

Orientation of Cordes Ranch within Local Watersheds

December 2012
SWC File No. 2011-76

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Local sub-basins within the Lammers Watershed are defined by topography, future development considerations and the alignment of canals, ditches, streets and highways. Patterson Pass Business Park (east) and the Safeway Distribution Center include onsite detention basins that provide attenuation of onsite runoff during major storms but provide little attenuation during minor storms. These existing industrial developments discharge storm runoff to an existing channel (linear wetland) on the north side of Schulte Road within the Cordes Ranch Specific Plan area that eventually loses definition about 1 mile north of Schulte Road. The OI Thermal Energy Development industrial site drains to an onsite terminal retention pond.

The WSID Upper Main Canal drains in a southeasterly direction as it extends through the Cordes Ranch Specific Plan area and the Lammers Watershed, continues easterly as open canal and closed conduits and ultimately discharges to City of Tracy storm drainage facilities in the eastern urbanized portion of the City. The discharge to City storm drainage facilities is regulated by a drainage agreement between the City of Tracy and WSID. Cordes Ranch has a private drainage agreement with WSID that authorizes potential future discharge to the WSID Upper Main Canal for Sections 26 and 27 within the Cordes Ranch Specific Plan area (referred to as Crossroads in the agreement). The discharge location authorized in the private drainage agreement is within the northeast quadrant of Section 26, and discharge may be authorized on an interim basis by meeting specified requirements until a City owned and maintained outfall system that will serve future development within the Lammers Watershed is constructed.

There are two (2) offsite sub-basins that extend into the hills upstream to the southwest of I-580. These offsite sub-basins will occasionally generate significant rates and volumes of runoff that will enter the Cordes Ranch Specific Plan area during major storms. Generally, these offsite sub-basins will not contribute runoff during the more frequent, lower intensity storms of short duration. The offsite sub-basins are shown on Figure 2-2.

The westernmost offsite sub-basin (OFF2) is roughly 4.5 square miles in area upstream of I-580 and storm runoff enters the existing east portion of the Patterson Pass Business Park via a 72” RCP culvert crossing of the California Aqueduct. Storm runoff is routed through a small detention basin and discharged to an existing channel (linear wetland) within the Cordes Ranch Specific Plan area on the north side of Schulte Road. The existing channel extends to the Delta Mendota Canal and flow is regulated by an existing 3.5’ x 3.5’ CBC that crosses underneath the canal, limiting the 100-year discharge rate to about 244 cfs downstream of the canal. The existing channel continues on the north side of the canal, but loses definition at a location about 1 mile north of Schulte Road near the proposed alignment of future Capital Parks Drive. Continued drainage to the north is provided for low flow in existing small irrigation ditches and as sheet flow across agricultural fields when the capacity of the small irrigation ditches is exceeded. The excess flows collect at an existing 2-cell 6’ x 3’ CBC that crosses I-205 just west of Hansen Road and is intercepted by the WSID Upper Main Canal north of I-205. Facilities north of I-205 have little capacity compared to the rates and volumes that this offsite sub-basin is capable of generating during major, albeit rare, storm events and downstream flooding of

CORDES RANCH

OFF2

OFF3

OFF4

OFF5

Eleventh St

I-580

N

Legend

OFF2 Subbasins

Watershed Boundaries

Client/Project

CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 2-2

Title

Offsite Sub-basins Contributing to Lammers Watershed

December 2012
SWC File No. 2011-76

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Stantec

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streets, properties, and facilities within County areas to the north of I-205 is likely to occur until shortly after a major storm event subsides.

The second offsite sub-basin (OFF3) is roughly 5.7 square miles in area extending into the hills upstream of I-580, and during a major storm event storm runoff enters a manmade open channel on the south side of the Safeway Distribution Center via a 10' x 8' overchute crossing of the California Aqueduct and a 45' bridge crossing of the Union Pacific Railroad. Flows generated from this offsite sub-basin are then conveyed eastward in this manmade open channel and cross underneath Hansen Road via 4 - 6' x 3' CBCs. Runoff will then spill northeasterly as sheet flow and cross over the Delta Mendota Canal via a 10' x 4' overchute that limits the 100-year outflow discharge to downstream properties to about 420 cfs. There is no defined provision for collection and conveyance of this runoff below the Delta Mendota Canal and sheet flow flooding will occur to the northeast across the West Side Industrial future service area and the southeast corner of the Cordes Ranch Specific Plan area before exiting the City's Sphere of Influence during a major storm event. The flow rate for the portion of the sheet flow area that will pass through the southeast corner of the Cordes Ranch Specific Plan area is estimated to be about 100 cfs during a 100-year 24-hour storm. Downstream and outside of the Sphere of Influence, excess offsite runoff is intercepted by the WSID Upper Main Canal.

2.3 MOUNTAIN HOUSE WATERSHED

The Mountain House Watershed includes areas within the City's Sphere of Influence that are located west of Mountain House Parkway, including the westernmost portion of the Cordes Ranch Specific Plan area. It is traversed by a generally well-defined channel/corridor known as Patterson Run that conveys runoff generated by an upstream offsite watershed extending upstream into the hills to the southwest of I-580. The offsite watershed for Patterson Run is shown on Figure 2-3 and has a contributing watershed area of 6.8 square miles measured upstream of I-580. Excluding the upstream offsite watershed for Patterson Run, the Mountain House Watershed is about 1.7 square miles in area and is bounded by I-580 on the southwest (with an additional small offsite sub-basin, OFF1, extending upstream to the southwest), I-205 on the north, and Mountain House Parkway on the east. The central portion of this watershed lies between the California Aqueduct and the Delta Mendota Canal and has been developed as the western portion of Patterson Pass Business Park and the Golden Gate Auto Auction. A detention basin having a storage volume of 68 acre-feet has been constructed off-line from the Patterson Run channel within the Golden Gate Auto Auction development and collects runoff from existing developed areas to the south and from offsite Sub-basin OFF1, discharging an attenuated peak rate of 7 cfs to Patterson Run. Patterson Run enters the Golden Gate Auto Auction via a 93" RCP culvert crossing of the California Aqueduct, exits the auto auction via 2-5' x 5' CBCs that cross underneath the Delta Mendota Canal, extends through the Cordes Ranch Specific Plan area and exits the Cordes Ranch Specific Plan area and the City's Sphere of Influence via 2-10' x 10' CBCs that cross underneath I-205. Under existing conditions the overall watershed for Patterson Run, including the Mountain House Watershed, generates a 100-year discharge of 546 cfs at the culvert crossing of I-205. North of I-205, Patterson Run lacks definition and discharges to existing agricultural properties and pastures and existing and

PR3

OFF1

PR2

PR1

CORDES RANCH

DELTA MENDOTA CANAL

PATTERSON RUN

Hans

W

Legend

PR3 Subbasins

Watershed Boundaries

N

V:\1840\active\184

s\gis\mxd\fig2-3_cordes_offsite_patterson.mxd

Client/Project

CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 2-3

Title

Offsite Sub-basin (Patterson Run) Contributing to Mountain House Watershed

December 2012
SWC File No. 2011-76

Storm Water Consulting Inc.

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future facilities operated by the Mountain House CSD further downstream.

As Patterson Run extends through the Cordes Ranch Specific Plan area, it exists as a defined channel within right-of-way owned by the San Luis and Delta Mendota Water Authority (north of the Delta Mendota Canal) but loses definition and creates a wide shallow flooding area as it approaches the 2-10' x 10' CBCs at I-205. Under existing conditions, Patterson Run and about the westernmost 25% of the portion of the Cordes Ranch Specific Plan area residing within the Mountain House Watershed drain to the 2-10' x 10' CBCs at I-205. The remaining 75% of this portion of the Cordes Ranch Specific Plan area presently drains to the northeast towards I-205 and Mountain House Parkway and is discharged to the north across I-205 via an existing 29" x 18" CMPA culvert and a 30" RCP culvert located on the west side of Mountain House Parkway.

2.4 MAJOR DRAINAGE FEATURES

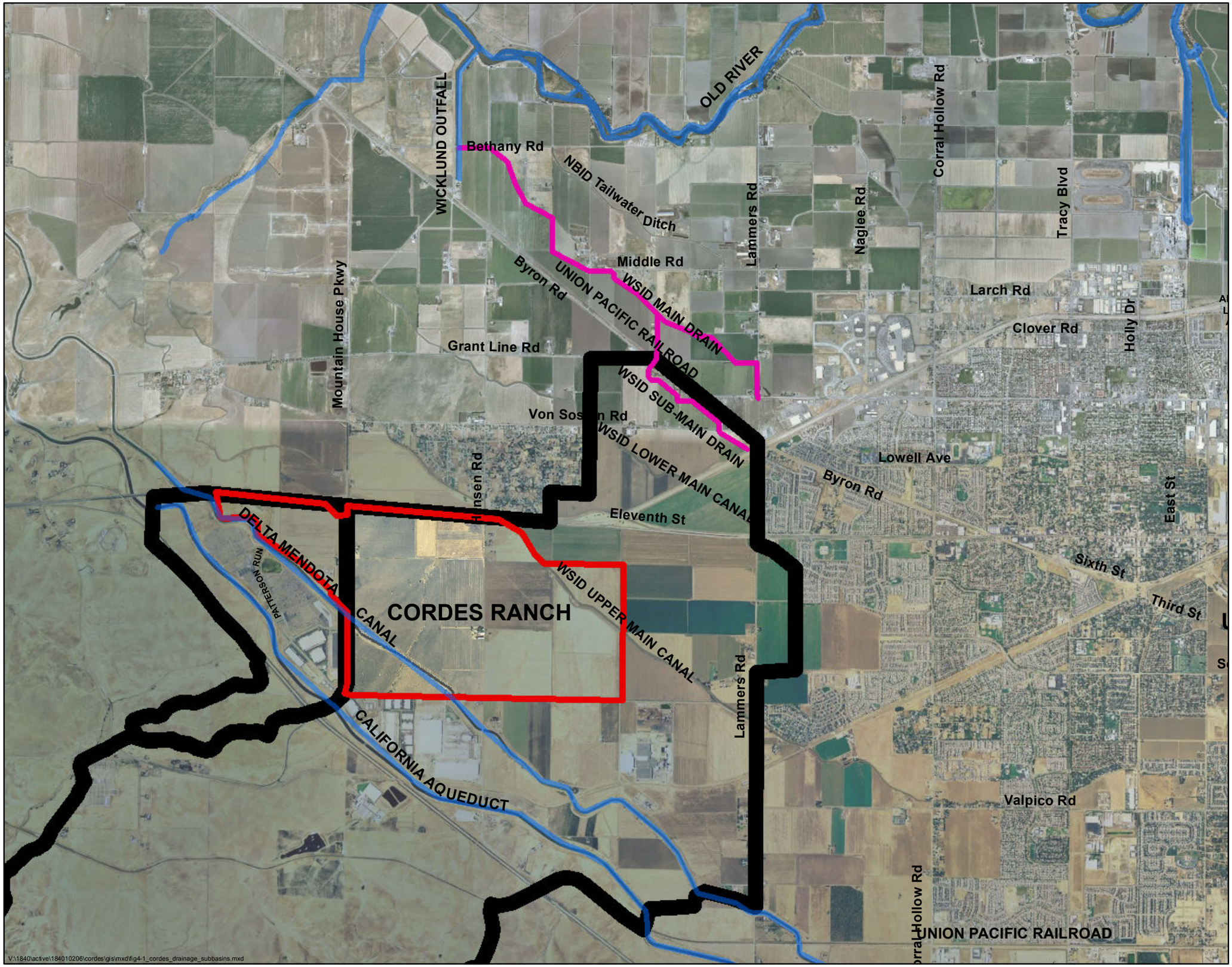
There are a number of major drainage features within or contiguous to the Lammers and Mountain House Watersheds that have an impact or influence on storm drainage solutions proposed for the Cordes Ranch Specific Plan area. These major drainage features are shown on Figure 2-4 and are described below:

- *California Aqueduct* – The California Aqueduct aligns parallel to and north of I-580 and perpendicular to the direction of drainage flow dictated by topography. It crosses over several major and minor drainages that are generally flowing in a northeasterly direction during runoff producing storm events. Storm runoff is collected on the upstream side of the aqueduct and is delivered to overchutes that cross over the aqueduct and culverts that pass underneath the aqueduct. The California Aqueduct tends to consolidate runoff to fewer locations and often limits the flow rates discharged to lands below the aqueduct.

- *Delta Mendota Canal* – The Delta Mendota Canal runs generally parallel to and just downslope from the California Aqueduct. It further reduces the number of locations where storm runoff is concentrated. Storm runoff passes over or under the canal via overchutes and culverts that further limit the rates discharged to lands below the canal. The Delta Mendota Canal also contains a significant number of locations where local drainage flow that is collected on the upstream side of the canal simply enters the canal directly via drain inlets and is not released to downstream lands.

- *Union Pacific Railroad* – The Union Pacific Railroad also traverses along the area where the canals reside. The railroad bed is generally elevated and runoff is collected on the upstream side of railroad beds and is delivered to a limited number of bridge and culvert crossings of the railroad tracks.

- *West Side Irrigation District (WSID) Upper Main Canal* – The WSID Upper Main Canal aligns downstream of the Delta Mendota Canal. Similar to the California Aqueduct and the Delta Mendota Canal, though considerably smaller in size and capacity, the WSID Upper Main Canal extends along an alignment that is perpendicular to the direction of drainage flow dictated by topography. Local drainage flows are intercepted by the WSID



Legend

- Watershed Boundaries
- Cordes Ranch Boundary
- Rivers and Major Canals
- Irrigation Tailwater Ditch

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CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 2-4

Title

Major Drainage Features

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Upper Main Canal and existing tailwater ponds discharge to the canal at several locations.

- *WSID Tailwater Ditches* – WSID retains several tailwater ditches that collect irrigation tailwater and urban runoff from designated portions of the City and convey it to their intake area connecting to Old River at Wicklund Road. The main tailwater ditch is the WSID Main Drain and a secondary ditch, the WSID Sub-Main Drain, is a significant tributary to the WSID Main Drain. These primary tailwater ditches are located downstream to the north of Cordes Ranch.

- *Old River* – Old River is located to the north of the Lammers and Mountain House Watersheds and is a part of the San Joaquin River system of interconnected waterways that discharge to the Delta area. Old River is contained by levees, and in the event of a levee failure there are areas, mostly north of I-205, that would be subjected to flooding according to Flood Insurance Rate Maps published by FEMA. These flood hazard areas do not impact the Cordes Ranch Specific Plan area. With regard to water quality, Old River is included on the Section 303(d) list of water quality limited segments requiring Total Maximum Daily Loads (TMDLs) published by the State Water Resources Control Board. The listed “pollutant/stressor” is *low dissolved oxygen* and the proposed TMDL completion year is 2019.

3.0 Design Standards for Storm Drainage Facilities

3.1 MASTER PLAN FACILITIES

For the development of the Cordes Ranch Specific Plan area, new master plan level (major) storm drainage facilities that are being recommended have been sized based on the following criteria:

- Detention basins: 100-year 24-hour storm.
- Detention basin pump stations (when needed): provide the desired function and attenuation during the 100-year 24-hour storm.
- Greenbelt parkways: 100-year 24-hour storm.
- Underground storm drains: 100-year 24-hour storm for storm drain outfalls draining detention basins in new development areas.

These levels of service are consistent with the Citywide Storm Drainage Master Plan.

In addition, cross-drainage structures serving streets that will cross the existing linear wetland that conveys flow from upstream Sub-basin OFF2 will be sized to convey the 100-year 24-hour storm discharge generated by Sub-basin OFF2, the existing Safeway Distribution Center, the east portion of the Patterson Pass Business Park, and contributing onsite runoff.

3.2 ONSITE FACILITIES

In 2008, the City of Tracy adopted an updated set of Engineering Design & Construction Standards (City Standards) to be applied to design projects. These standards address requirements for the design of storm drainage facilities that serve new development projects and shall be followed with respect to onsite storm drainage facilities that are not a part of the master plan (major) storm drainage infrastructure presented in this technical report.

3.3 STORMWATER QUALITY CONTROL PROVISIONS

The City adopted a Manual of Stormwater Quality Control Standards for New Development and Redevelopment (SWQC Manual) in August 2008. The SWQC Manual has the following goals and attributes:

- Assist new development in reducing urban runoff pollution to prevent or minimize water quality impacts.
- Provide standards for developers, design engineers, agency engineers, and planners to use in the selection, design, and implementation of General Site Design Control

Measures for Low Impact Development (LID) and appropriate site-specific source and treatment control measures.

- Provide maintenance procedures to ensure that the selected control measures will be maintained to provide effective, long-term pollution control.

LID is an approach to managing stormwater runoff that mimics the natural pre-development hydrology of a development site by using design techniques that infiltrate, filter, store, treat, evaporate, and detain stormwater runoff close to the source. Almost all areas of site design can incorporate LID measures, including residential landscaping, open space, streetscapes, parking lots, sidewalks, and medians. LID can be used in combination with traditional storm drain systems to infiltrate the smaller, more frequent storms, while allowing the larger storms to flow to pipes and basins for flood control (possibly with lower off-site costs than traditional non-LID systems). LID techniques offer great benefits to stormwater quality, especially for the smaller return interval storm events. LID will help reduce the amount of runoff entering the City's system and will aid in recharging ground water.

The infrastructure identified in this storm drainage technical report assumes that LID practices will be implemented with new development and redevelopment in conformance with the SWQC Manual and that the rates and volumes of runoff will be reduced when compared against developed condition runoff production in the absence of said measures. The methodology for incorporating the runoff reduction into hydrologic modeling is described in Section 4.0.

3.4 TEMPORARY RETENTION FACILITIES

When new development projects are not located near existing or proposed detention basins or conveyance facilities leading to detention basins or other outfalls, the City often considers allowing the use of temporary retention basins as an interim drainage solution, subject to appropriate engineering substantiation regarding feasibility. When temporary retention basins are approved by the City, the project developer is required to maintain them until the storm drainage system for the development project is connected to the City's permanent storm drainage system and the temporary storm drainage basin is either filled and decommissioned or integrated into the overall permanent system. In the event that temporary retention basins are approved by the City for individual or groups of development projects, said approvals will only be provided with the understanding or anticipation that a permanent solution that will allow for the decommissioning of applicable temporary retention basins within a reasonable time frame is imminent. The City may require that the developer deposit enough funds in advance with the City to pay for the future decommissioning of a temporary storm retention basin.

Temporary retention basins are proposed to be utilized as an interim measure to control storm runoff for new development areas within the Cordes Ranch Specific Plan area until such time as sufficient downstream facilities are constructed to accommodate the desired flows. These temporary retention basins will be required to have a capacity equivalent to the runoff volume generated from 2 times a 10-year 48-hour storm in conformance with City Standards. Since

temporary retention facilities have no outfall, the City Standards do not allow the required storage volume to be reduced by the rate of percolation.

4.0 Hydrologic Modeling

4.1 HEC-HMS MODEL

The U.S. Army Corps of Engineers' HEC-HMS computer program was used to develop a rainfall/runoff computer simulation for the Lammers and Mountain House Watersheds. The Soil Conservation Service (SCS) dimensionless unit hydrograph method was used for the analysis. The HEC-HMS computer model develops a runoff hydrograph for individual sub-basins through the input of numerical representations of their physical and hydrological characteristics. The computed hydrographs are then routed and/or combined with hydrographs from other sub-basins to yield a dynamic numerical analysis of peak discharges (design flows) that may be expected to occur at key locations. The model was run for the 10-year 24-hour and 100-year 24-hour storm events. The 100-year 24-hour design flows and volumes were subsequently used for applicable storm drain and detention basin sizing.

The input parameters utilized for sub-basins and watersheds in the HEC-HMS analysis are described in the following paragraphs.

4.2 SUB-BASIN DELINEATION

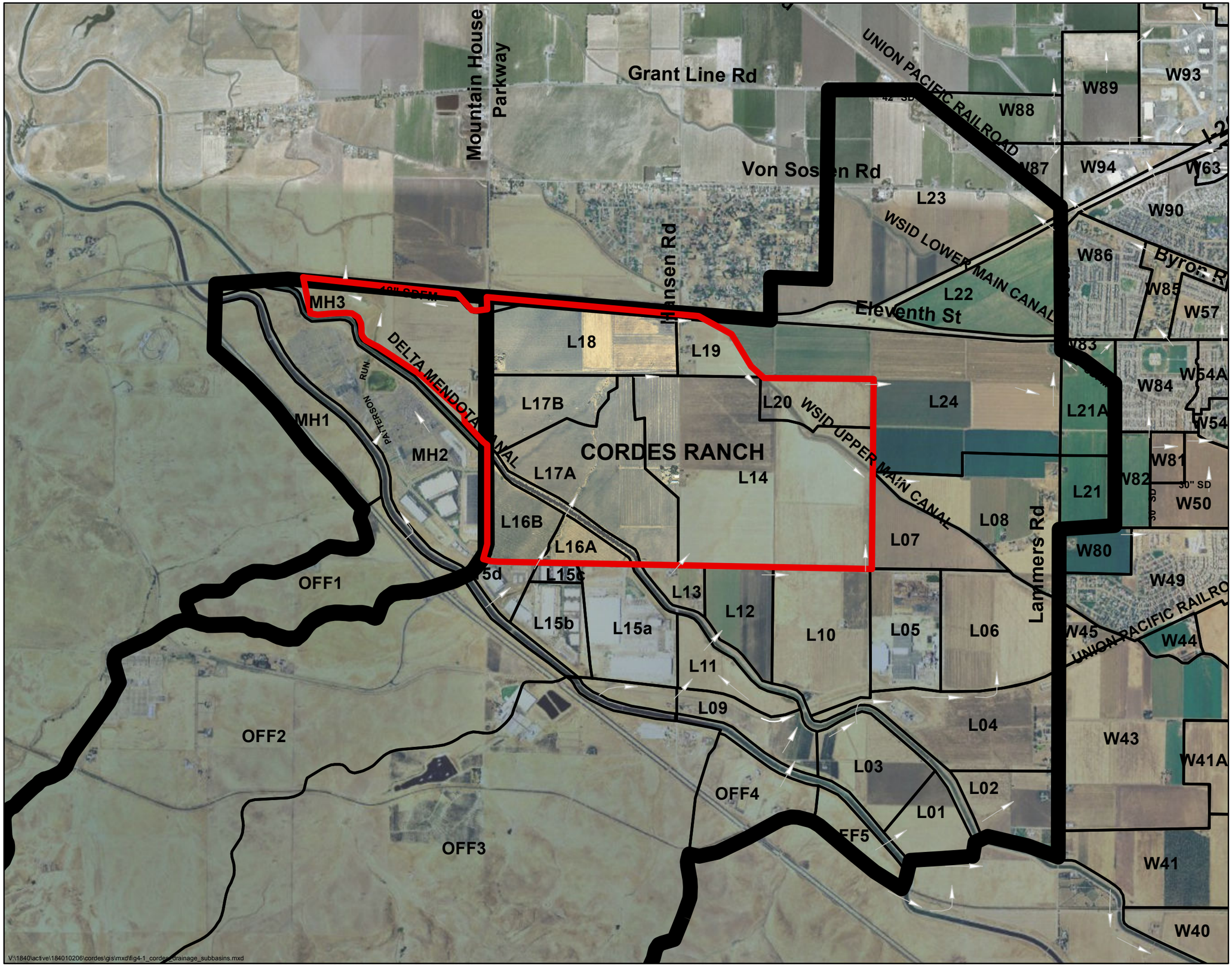
The boundaries for each sub-basin were determined based on field investigations, U.S. Geological Survey 7.5 minute quadrangle maps, prior studies and reports, aerial photographs, proposed development conditions for the Cordes Ranch Specific Plan area, proposed development conditions for other development areas, and other available maps and plans. The location of various physical features such as roadways, irrigation canals, the Delta Mendota Canal, the California Aqueduct, storm drainage facilities, railroad tracks and other physical features, as well as future service area boundaries, were also factors in establishing the sub-basins boundaries (see Figure 4-1).

4.3 SOIL GROUP CLASSIFICATIONS

Watershed soil groups were determined using soil maps contained in a report entitled *Soil Survey for San Joaquin County, California* issued December 2007 by the Natural Resources Conservation Service (NRCS) - formerly the US Department of Agriculture Soil Conservation Service. Soil groups are classified as A, B, C or D with Group A having the highest rate of infiltration (lowest runoff production) and Group D having the lowest rate of infiltration (highest runoff production). Soil groups with watershed boundaries superimposed upon them are depicted in Figure 4-2.

4.4 RAINFALL LOSS AND SCS CURVE NUMBERS

Rainfall loss is that portion of the precipitation depth that is lost due to evaporation, interception by vegetation, infiltration into soil and surface depression storage. Rainfall excess is that portion of the precipitation depth that appears as surface or collected stormwater runoff during and after a storm event. Rainfall losses consists of both initial and constant losses and were determined



N

Legend

- L14 Subbasins
- Watershed Boundaries
- Cordes Ranch Boundary

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CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 4-1

Title

Drainage Sub-basins

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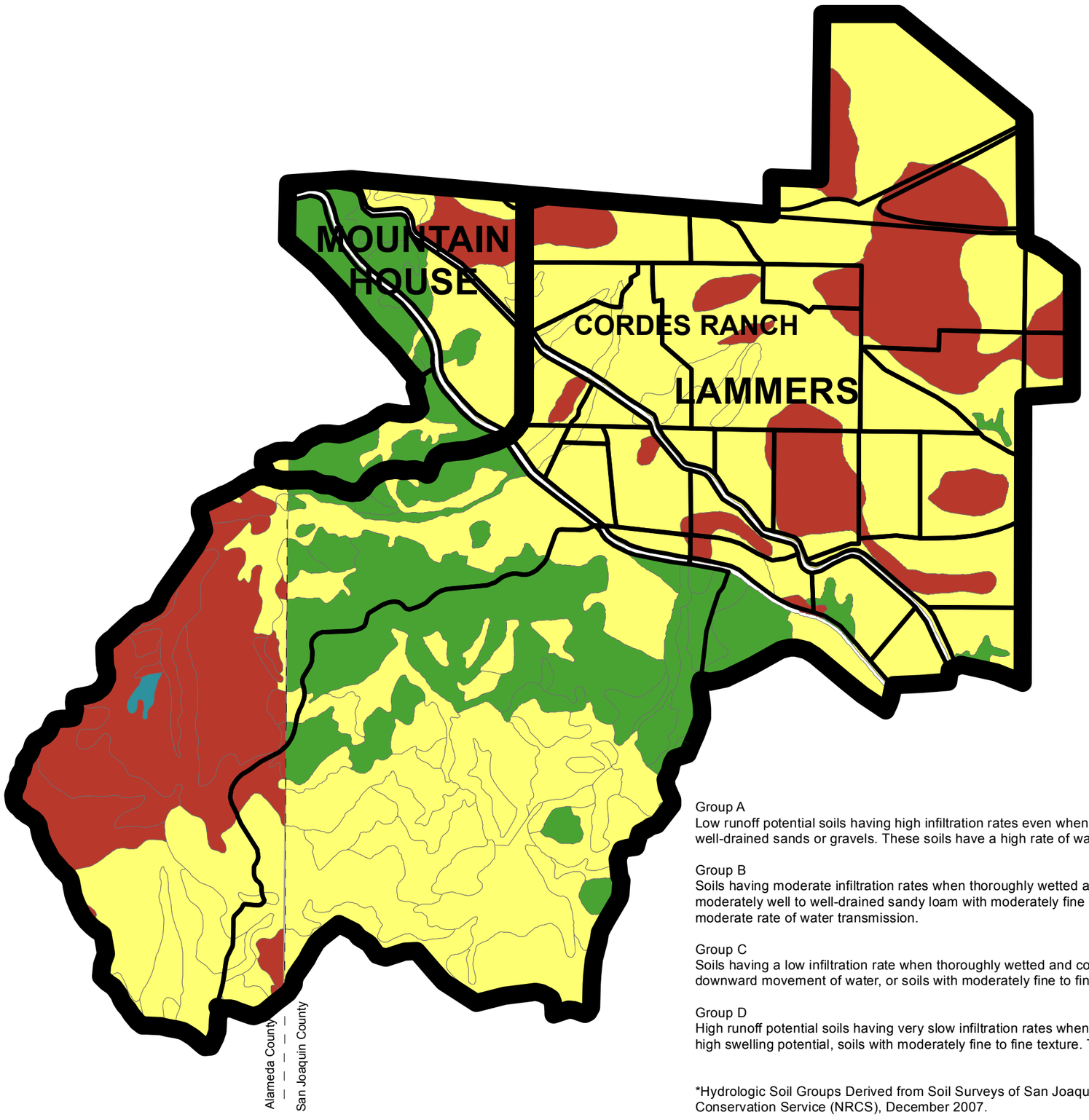

Group A
Low runoff potential soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-drained sands or gravels. These soils have a high rate of water transmission.

Group B
Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained sandy loam with moderately fine to moderately course textures. These soils have a moderate rate of water transmission.

Group C
Soils having a low infiltration rate when thoroughly wetted and consisting chiefly of silt-loam soils layer that impedes downward movement of water, or soils with moderately fine to fine texture. The soils have a slow rate of water transmission.

Group D
High runoff potential soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with moderately fine to fine texture. The soils have a slow rate of water transmission.

*Hydrologic Soil Groups Derived from Soil Surveys of San Joaquin and Alameda County prepared by the Natural Resources Conservation Service (NRCS), December 2007.

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N

Legend

- Subbasins
- Watershed Boundaries

Hydrologic Soil Group*

- A
- B
- C
- D

Client/Project
CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 4-2

Title
Soil Groups (Lammers and Mountain House Watersheds)

December 2012
SWC File No. 2011-76

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using the NRCS Curve Number (CN) Method that uses a soil cover complex for estimating watershed losses. The CN is related to the underlying hydrologic soil group (A, B, C or D), land use, cover density, and soil moisture conditions. In addition to soil classification, the Curve Numbers are based on the vegetative cover. For the Lammers and Mountain House Watersheds, a vegetative cover classified as "good" with grass cover on at least 75% of the area was assumed.

The four hydrologic soil groups are described in greater detail as follows:

- *Group A:* Low runoff potential soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well-drained sands or gravels. These soils have a high rate of water transmission. *A CN of 39 was used for Group A Soils.*

- *Group B:* Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained sandy-loam with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission. *A CN of 61 was used for Group B Soils.*

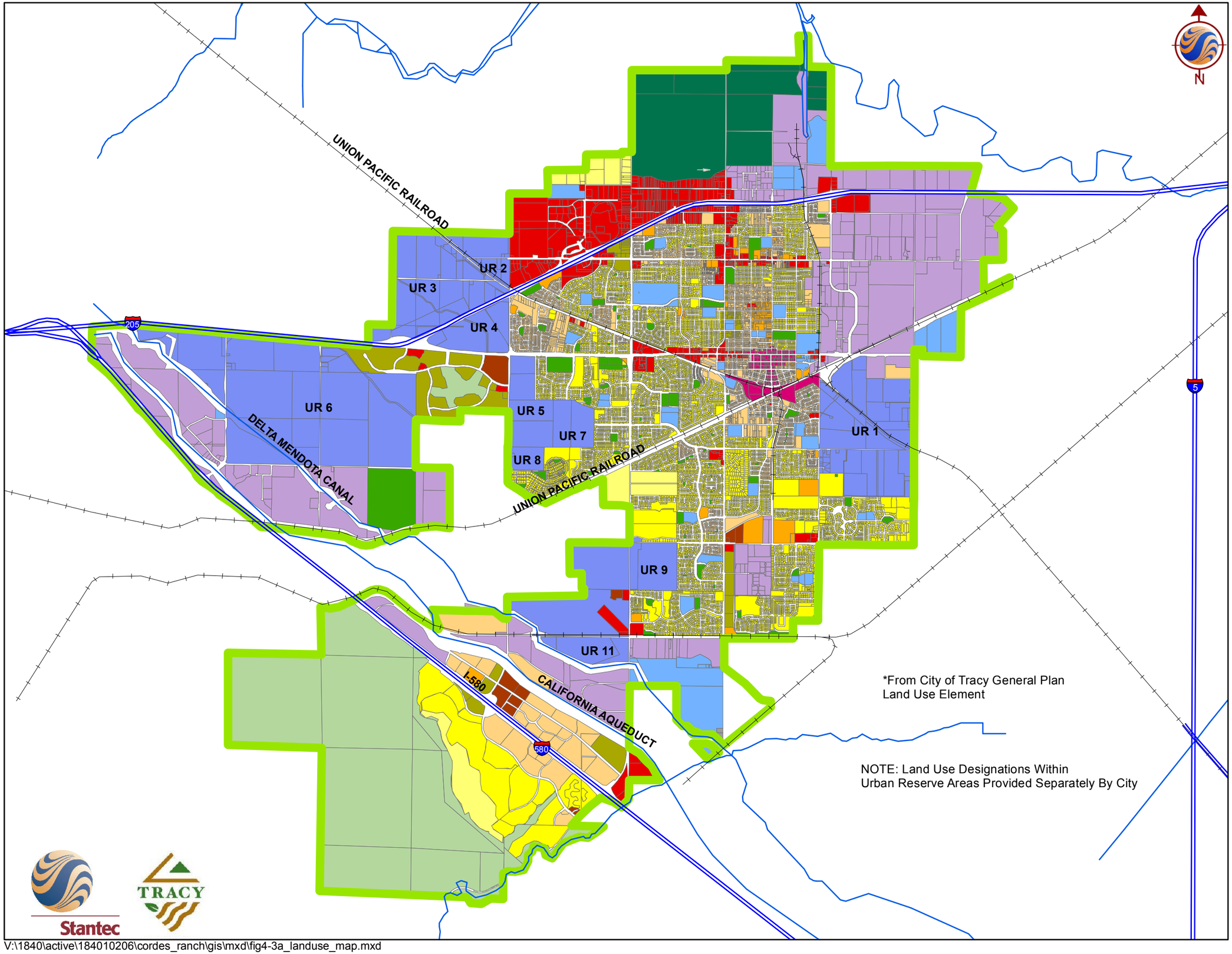
- *Group C:* Soils having a low infiltration rate when thoroughly wetted and consisting chiefly of silt-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission. *A CN of 74 was used for Group C soils.*

- *Group D:* High runoff potential soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have slow rate of water transmission. *A CN of 80 was used for Group D soils.*

4.5 LAND USE ASSUMPTIONS AND PERCENT IMPERVIOUS

Land uses assumed in the HEC-HMS modeling were taken from the City's General Plan Amendment (see Figure 4-3a), with supplemental input and direction from City staff, including proposed land uses for the Cordes Ranch Specific Plan area. The supplemental input and direction from City staff, including land uses applicable to the Cordes Ranch Specific Plan area, are shown on Figure 4-3b.

The percent of impervious area for each sub-basin was based on a weighted average of the amount and type of the different land uses within the sub-basins, as estimated by direct measurements of the various land uses shown in the General Plan Amendment (as supplemented by City staff). This is an important input parameter in the HEC-HMS program because the model relates the amount of impervious area to the total area of a given sub-basin to estimate the amount of runoff losses attributed to pervious areas. For the purposes of hydrologic modeling, design flow determination, and the planning of storm drainage facilities in the watersheds, future build-out of the City's Sphere of Influence was assumed.



Legend

- Watershed Boundaries
- Sphere of Influence
- Highways
- Canals and Creeks
- Railroad

Land Use Designations

- Residential Very Low
- Residential Low
- Residential Medium
- Residential High
- Commercial
- Office
- Industrial
- Downtown
- Village Center
- Public Facilities
- Park
- Open Space
- Agriculture
- Aggregate
- Urban Reserve

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CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 4-3a

Title

Land Use Map*

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TRACY

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City of Tracy Infrastructure Master Plans DRAFT Land Use Assumptions

Density Breakdown

IMMPA Map ID Number	General Plan Planning Area/Common Name	Approximate Total Acres	Overall Density (Units per Gross Acre)	Very Low Density (1.5 DU per acre)		Low Density (4.35 DU per acre)		Medium Density (9 DU per acre)		High Density (18.75 DU per acre)		Industrial/ Business Park Industrial Acres (0.5 FAR)	Office/ Business Park Acres (0.45 FAR)	Retail/ Commercial Acres (0.30 FAR)	Public Facilities and Open Space
				units	acres	units	acres	units	acres	units	acres				
1	Westside Residential (URs 5, 7, 8, 9)														
1	UR 5 (Bright)	170	9.7			174	40	360	40	375	20			10	60
1	UR 7 (Bright)	107	6.8			174	40	432	48						19
1	UR 8 (Fahmy)	60	8.9			96	22	252	28	188	10				
1	UR 9 (Keenan)	130	7.7			305	70	387	43	319	17				
2	UR1 (Alvarez + others)	780	3.6	570	380	1305	300	585	65	469	25			10	
3	UR10 (Ellis)	320	7			531	122	837	93	581	31			35	39
4	UR11 (South Linne)	120										120			
5	Tracy Hills	2604		83	82	1591	539	3286	557	531	35	383		206	802
6	Gateway	550											491	59	
7	UR6 (Cordes Ranch)	1731										1437.7	152.2	56.3	84.4
8	UR4 (Bright Triangle)	185	18.75							750	40		50	95	
9	UR3 (Catellus)	700		60	40							535	40	45	40
10	UR2 (Filios)	43											7	36	
11	I-205 Expansion	172												172	
12	West Side Industrial	485										485			
13	East Side Industrial	368										368			
14	Larch Clover	498												498	
15	Chrisman Road	113											100	13	
16	Rocha	91	7.9			296	68			431	23				
17	Berg/Byron	54	9					450	50					4	
18	Kagehiro	47	5.85			250	47								
	PARKS - See note 15														
	SCHOOLS - See note 16														
	Totals	**9328**		**713**	**502**	**4721**	**1248**	**6589**	**924**	**3644**	**201**	**3329**	**840**	**1239**	**1044**
	Total Units														
	Total Acres														
	Population Estimate			2353		15578		17790		8016					43737

Explanations:

1. UR is "Urban Reserve", as defined in the General Plan
2. All acreages are approximate gross acres (not adjusted gross), based on the General Plan
3. Public Facilities in UR 5 (Westside Residential) is Kimball High School - 60 acres.
4. Industrial may accommodate flex office. Industrial max FAR is 0.5 per the General Plan
5. Commercial may accommodate residential high (12.1-25du/acre)
6. Residential Very Low =0.1 - 2 du/acre (1.5 DU per acre assumed)
7. Residential Low= 2.0 - 5.8 du/acre (4.35 du per acre assumed)
8. Residential Medium =5.9 - 12.0 du/acre (9 DU per acre assumed)
9. Residential High =12.1 - 25.0 du/acre (18.75 DU per acre assummed)
10. UR 7 includes the currently planned approx 19-acre storm detention pond (existing Srorm Drainage Master Plan)
11. UR 10 (Ellis) assumes 39 acres of public facilities per approved Specific Plan
12. Tracy Hills acres identified as Public Facilities are per the approved Specific Plan
13. Tracy Hills Density Calcs are per the Tracy Hills Specific Plan, not the GP
14. UR 3 identifies 40 acres for the I-205/Lammers Interchange
15. Park areas will be provided by MIG, Park & Rec. Master Plan consultant, at a future date. At 5 acres per 1000 people, the estimate of new parks is 220 acres.
16. School sites will be provided by City staff at a future date.

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CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 4-3b

Title

Supplemental Land Use Assumptions

December 2012
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Based on the City's SWQC Manual requirements (see Section 3.3), different land use percent impervious values were used for existing development and for future development. An analysis of the impact of the use of sustainable infrastructure principles on storm runoff generation rates and volumes during a 100-year 24-hour storm performed with the Citywide Storm Drainage Master Plan resulted in a general reduction of runoff by roughly a 2-year return period storm peak runoff rate and total runoff volume by implementing practices required per the SWQC Manual with new development. Table 4-1 below shows the impervious cover percentages of the different land uses that have been utilized in the HEC-HMS model.

Table 4-1: Land Use Impervious Cover Values

Land Use Designation	% Impervious *(Existing and Infill Development)**	% Impervious *(New Development)***
Residential - Very Low Density	10	6
Residential - Low Density	25	16
Residential - Medium Density	35	22
Residential - High Density	65	41
Commercial/Retail	90	57
Office & Business Park	90	57
Industrial & Business Park Industrial	90	57
Downtown	90	57
Village Center	90	57
Public Facilities	60	38
Park	10	6
Open Space	3	2

* Provisions from City's *Manual of Stormwater Quality Control Standards for New Development and Redevelopment* **NOT applied**

** Provisions from City's *Manual of Stormwater Quality Control Standards for New Development and Redevelopment* **applied**

The values on the table that are proposed to be applied to existing development areas within the watersheds assume that SWQC Manual provisions have not been applied and are essentially the same values that have been adopted and utilized by the City for several years. The values on the table that are proposed to be applied to new development areas have been reduced by a uniform percentage reduction factor of 37% as a hydrologic modeling approach to account for the application of SWQC Manual practices. The 37% reduction factor is not an actual impervious cover reduction that will occur with the design of new development projects but simulates the reduction in runoff rates and volumes that are projected to occur with the implementation of practices described in the SWQC Manual.

Please note that the hydrologic modeling procedures utilized in this storm drainage technical report, and particularly the reduction in % impervious values to model the effects of implementing SWQC Manual practices, are being applied to master plan level (major) storm drainage facilities, only, and are limited in application to the development of the storm drainage infrastructure master plan for the watersheds evaluated. The design of onsite storm drainage facilities shall continue to utilize the procedures set forth per City Standards.

4.6 RAINFALL

The depths of precipitation that were used in the hydrologic modeling are shown on Table 4-2 below. The SCS 24-hour Type I Rainfall Distribution was used in hydrologic modeling.

Table 4-2: Precipitation

Return Period Storm	24-hour Depth of Precipitation
10-year return period storm	1.85 inches
100-year return period storm	2.69 inches

4.7 UNIT HYDROGRAPH

For runoff computations from each sub-basin, the NRCS Dimensionless Unit Hydrograph option was utilized in the HEC-HMS computer model.

4.8 LAG TIME

The temporal distribution of the unit hydrograph is a function of the basin lag time. The lag time is defined as a time required for 50 percent of the volume of runoff to reach the basin outlet and was estimated utilizing the NRCS method. The equation is as follows:

$$Lag = (L)^{0.8}(S+1)^{0.7}/1900(Y)^{0.5}$$

L = hydraulic length of watershed in feet

S = potential maximum surface retention = (1000/CN) -10

CN = hydrologic curve number

Y = average watershed land slope in percent

Parameters used for each sub-basin in lag time calculations and the resultant lag times are represented in the Appendix.

4.9 ROUTING

Routing of runoff between sub-basins was performed utilizing the Muskingum Cunge method.

4.10 DETENTION BASINS

Detention basins are proposed to be an integral part of the drainage plan for the watersheds and will store and attenuate stormwater runoff. The detention basins were modeled by applying stage-storage and elevation-discharge curves to their inflow hydrographs. The Modified Puls Reservoir Routing method was used to route flow through the proposed detention basins.

4.11 RESULTS

The HEC-HMS output files and schematic flow diagrams are included in the Appendix. The flows at various concentration points were used for storm drainage infrastructure sizing.

5.0 Proposed Drainage Plan

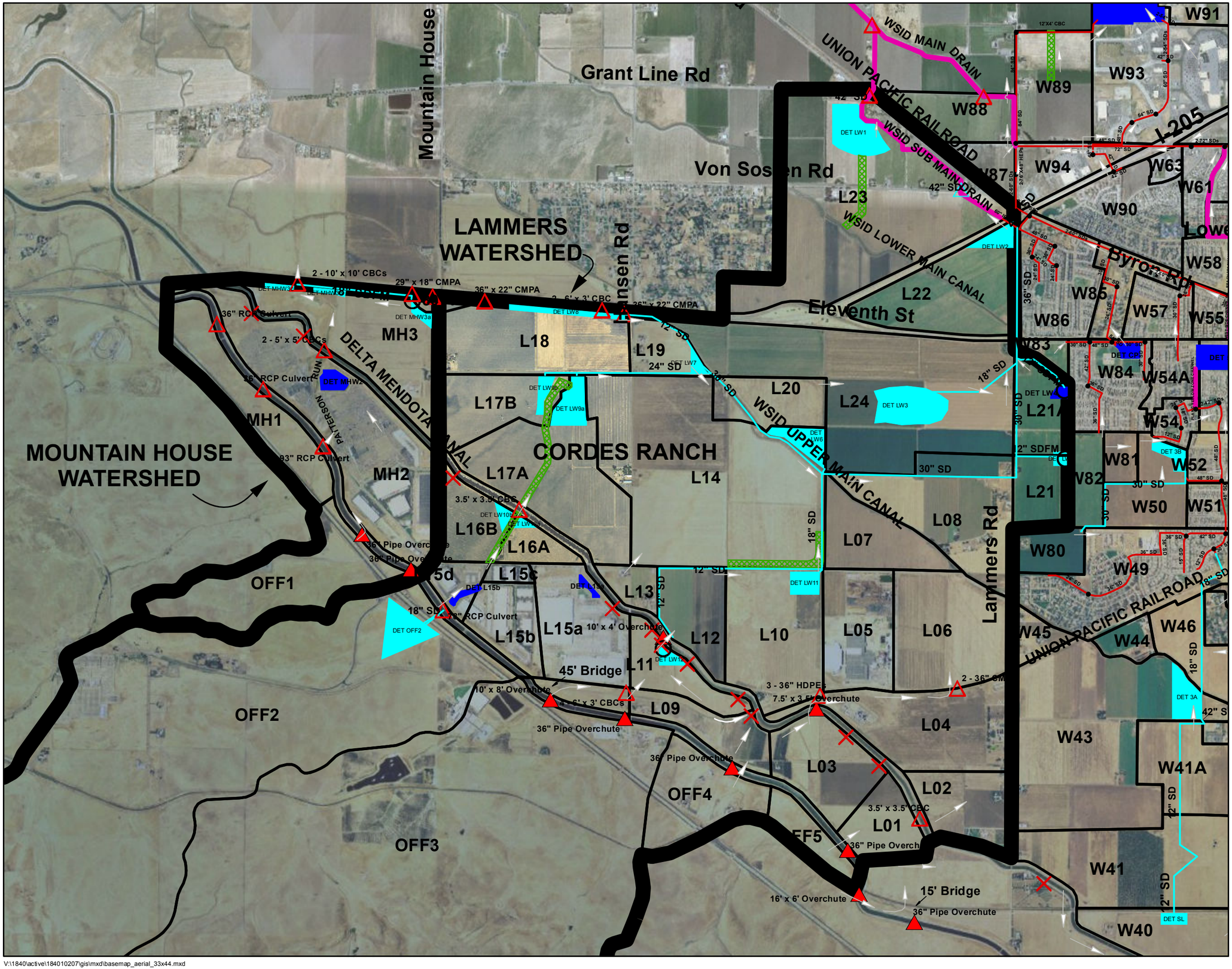
5.1 INFRASTRUCTURE COMPONENTS AND SIZING

The proposed storm drainage infrastructure plan for the Lammers and Mountain House Watersheds recommended in this technical report includes a combination of the following components (see Figure 5-1):

- Detention basins
- Greenbelt parkways
- Underground storm drains
- Pumping facilities (serving applicable detention basins)
- Percolation facilities, where feasible
- Interflow crossovers between systems
- Irrigation tailwater ditches
- Temporary retention facilities

In general, new development projects within these watersheds will be required to provide site-specific or project-specific storm drainage solutions that are consistent with the overall infrastructure approach presented in the Citywide Storm Drainage Master Plan. The City may allow for a reasonable degree of flexibility to be incorporated into specific design approaches as a part of achieving effective solutions, including adjustments to alignments of linear storm drainage conveyance facilities and adjustments to configurations of detention facilities.

For the majority of the Cordes Ranch Specific Plan area, the project's proposed drainage plan is integrated to function with the broader drainage plan for storm drainage facilities that will serve new development in the overall Lammers Watershed. However, that portion of the Cordes Ranch Specific Plan area that is within the Mountain House Watershed will have its own storm drainage facilities that will discharge to a different outfall than the areas east of Mountain House Parkway. In general, there will be significant storage, attenuation and storm water quality treatment provided by proposed detention basins, greenbelt parkways and by low impact development (LID) measures that conform to the City's SWQC Manual. A schematic representation of the proposed storm drainage facilities for the Cordes Ranch Specific Plan area is shown on Figure 5-1 (which includes the broader watershed areas) and on Figure 5-2, which is specific to Cordes Ranch.



Legend

- Existing Storm Drain
- Proposed Storm Drain
- Existing Detention Basin
- Proposed Detention Basin
- Existing Channel or IrrigationTailwater Ditch
- L14 Subbasins
- Watershed Boundaries
- Proposed Greenbelt Parkway
- Pipe Change
- Existing Overchutes
- Existing Culverts
- Proposed Culverts
- Existing Drain Inlet to Delta Mendota Canal
- Proposed Pump Stations

N

Client/Project

CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 5-1

Title

Proposed Storm Drainage Infrastructure for Lammers and Mountain House Watersheds

December 2012
SWC File No. 2011-76

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N

Legend

- Public Drainage Facilities
- Private Drainage Facilities

EX. 2 ~ 10'x10' CULVERT
2.03 CFS INV. 152±
1.78 CFS INV. 165±
MHW3C
MHW3B
18" F.M.S.D.
PUMP STATION 2.03 CFS INV. 152±
MHW3A
0.38 CFS INV. 120±
0.28 CFS INV. 114±
EX. 2 ~ 6'x3' CULVERT
0.47 CFS INV. 103±
LW4A
LW4
LW3B
0.37 CFS INV. 130±
PUMP STATION 1.50 CFS INV. 102±
Lammersville Community
INTERSTATE ROUTE 205
12" S.D.
W.S.I.D.
Gateway
0.50 CFS INV. 93±
INTERIM PUMP STATION TO W.S.I.D. CHANNEL (20 CFS max.) (7 CFS ~ FIRST PHASE) INV. 91±
LW7
GRAVITY
ROAD A
ROAD B
ROAD C
ROAD D
ROAD E
ROAD F
ROAD G
ROAD H
ROAD P1 (CAPITAL PARK)
OVERLAND OFFSITE FLOW 244± CFS (EX. T00YR)
1.00 CFS INV. 127±
2-60" RCP's
INV. 124±
LW9B 8 AC 18 AF
LW9A 10 AC 13' DEEP 93 AF
10.0 CFS INV. 126±
24" S.D.
7.80 CFS INV. 118±
90" S.D.
ROAD P2 (NEW SCHULTE RD)
ROAD P3 (HANSEN ROAD)
ROAD G (PAVILLION PKWY)
LW6
17.5 AC 9' DEEP 101 AF
4.0 CFS INV. 90±
30" S.D.
FAIRWAY DRIVE
8" S.D.
Auto Mall
DELTA MENDOTA CANAL
CALIFORNIA AQUEDUCT
INTERSTATE ROUTE 580
W. SCHULTE ROAD
Patterson Pass Business Park
2-60" RCP's
0.67 CFS INV. 183±
0.33 CFS INV. 186±
LW 10B
LW 10A
MOUNTAIN HOUSE PARKWAY
OLD SCHULTE ROAD
BOOSTER STATION
FIRE STATION
DET LW1
EX. 72" RCP
EX. PATTERSON PASS DETENTION BASIN
OFF2
18"SD

Client/Project

CORDES RANCH SPECIFIC PLAN
STORM DRAINAGE TECHNICAL REPORT

Figure 5-2

Title

Public and Private Storm Drainage Facilities Serving Cordes Ranch

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Storm Water Consulting Inc.

Stantec