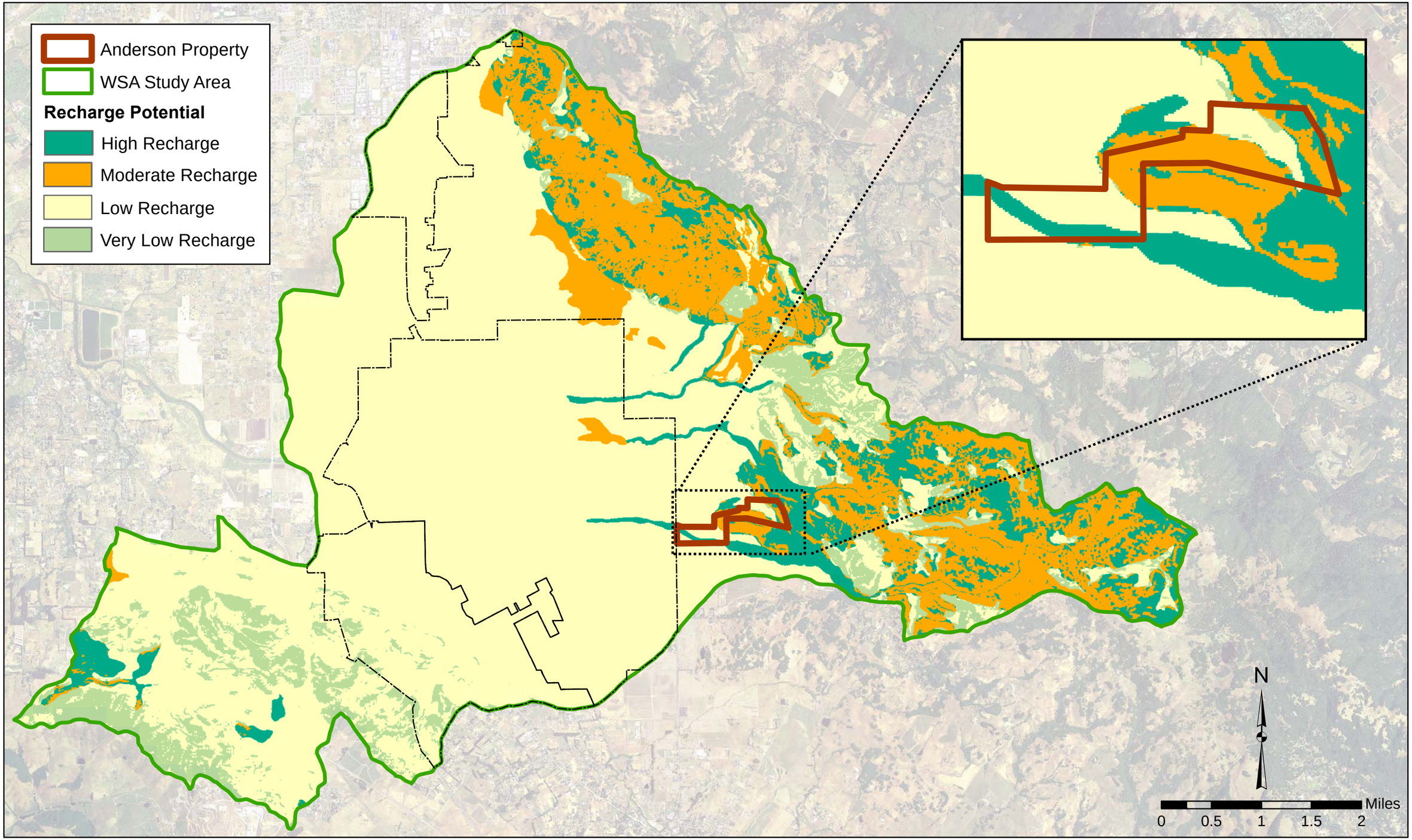
COPELAND CREEK STORMWATER DETENTION AND GROUNDWATER RECHARGE PROJECT



Winzler & Kelly, 2005, City of Rohnert Park Water Supply Assessment

CALIFORNIA GEOLOGICAL SURVEY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA- GRAY DAVIS, GOVERNOR
THE RESOURCES AGENCY- MARY NICHOLS, SECRETARY FOR RESOURCES
DEPARTMENT OF CONSERVATION- DARRYL YOUNG, DIRECTOR

Preliminary Geologic Map available from:
http://www.conservation.ca.gov/cgs/rghm/rgm/preliminary_geologic_maps.htm

GEOLOGIC MAP OF THE COTATI 7.5' QUADRANGLE SONOMA COUNTY, CALIFORNIA: A DIGITAL DATABASE

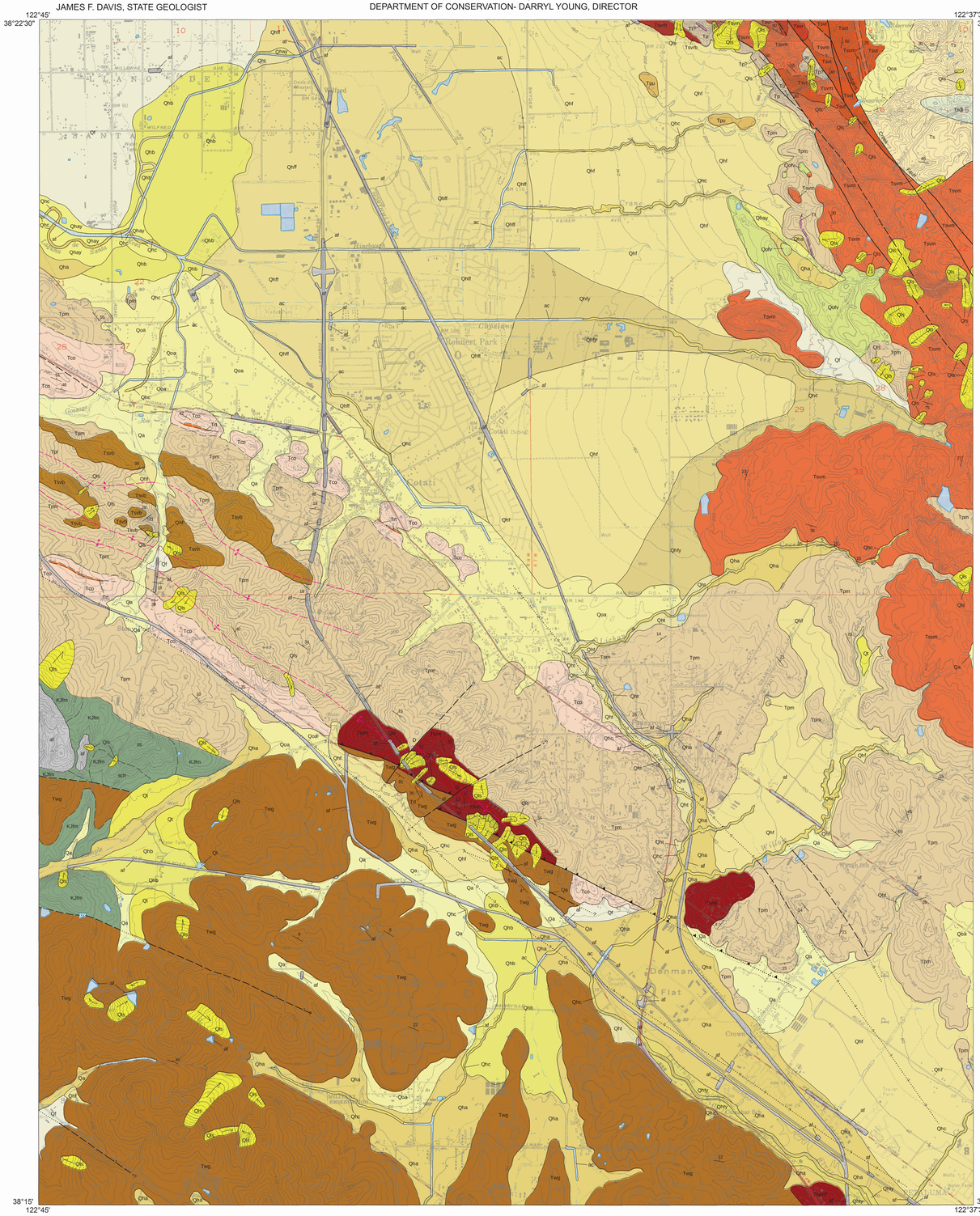
VERSION 1.0

By

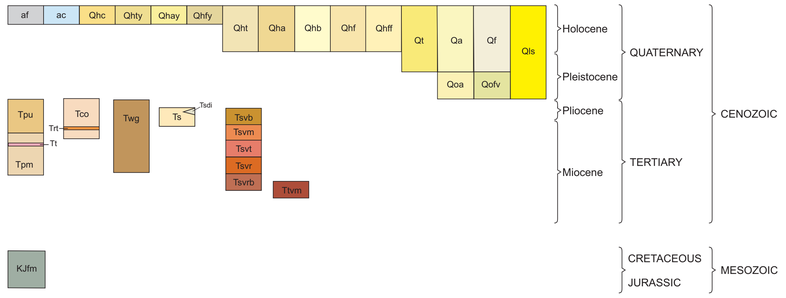
Kevin B. Clahan[1], Stephen P. Bezore[2], Richard D Koehler[3], and Robert C. Witter[3]

Digital Database
by:
Marina T. Mascorro[1] and Eric W. Ford[1]
2003

1. California Geological Survey, 185 Berry St., Ste. 210, San Francisco, CA 94107
2. California Geological Survey, 801 K st. MS 12-31, Sacramento, CA 95814
3. William Lettis & Associates, Inc., 1777 Botello Drive, Suite 262 Walnut Creek, CA 94596



Unit Correlation



Unit Explanation

(See Knudsen and others (2000), for more information on Quaternary units).

- **af** — Artificial fill; may be engineered and/or non-engineered.
- **ac** — Artificial stream channel
- **Qhc** — Modern (<150 years) stream channel deposits in active, natural stream channels. Consists of loose alluvial sand, gravel, and silt.
- **Qhty** — Latest Holocene (<1,000 years) stream terrace deposits. Stream terraces deposited as point bar and overbank deposits along Lichau Creek; composed of moderately sorted clayey sand and sandy clay with gravel.
- **Qhay** — Latest Holocene alluvial deposits. Fluvial sediment deposited on the modern flood plain of Laguna de Santa Rosa and along Crane Creek; composed of loose sand, gravel, silt, and clay.
- **Qhfy** — Latest Holocene fan deposits. Alluvial fan sediment deposited by streams emanating from Copeland Creek drainage; composed of moderately to poorly sorted and bedded sand, gravel, silt, and clay.
- **Qht** — Holocene (<10,000 years) stream terrace deposits. Stream terraces deposited as point bar and overbank deposits along Lichau Creek; composed of moderately to well-sorted and bedded sand, gravel, silt, and minor clay.
- **Qha** — Holocene alluvium, undivided. Alluvium deposited on fans, terraces, or in basins; composed of sand, gravel, silt, and clay that are poorly sorted.
- **Qhb** — Holocene basin deposits. Fine-grained alluvium with horizontal stratification. May contain peat and lenses of coarser alluvium.
- **Qhf** — Holocene alluvial fan deposits. Alluvial fan sediment deposited by streams emanating from mountain drainages onto alluvial valleys; composed of moderately to poorly sorted sand, gravel, silt and clay.
- **Qhff** — Holocene alluvial fan deposits, fine facies. Fine-grained alluvial fan and floodplain overbank deposits on very gently sloping portions of the valley floor; composed of predominantly clay with interbedded lenses of coarser alluvium.
- **Qt** — Latest Pleistocene to Holocene stream terrace deposits. Sand, gravel, silt and minor clay. Relatively flat, undissected stream terraces where absolute age is uncertain.
- **Qa** — Latest Pleistocene to Holocene alluvium, undivided. Flat, relatively undissected fan, terrace, and basin deposits.
- **Qf** — Latest Pleistocene (<~30,000 years) to Holocene alluvial fan deposits. Sand, gravel, silt and clay mapped on gently sloping, fan-shaped, relatively undissected alluvial surfaces.
- **Qoa** — Early to late Pleistocene alluvial deposits, undivided. Alluvial fan, stream terrace, basin, and channel deposits. Topography is gently rolling with little or no original alluvial surfaces preserved; moderately to deeply dissected.
- **Qofv** — Early to late Pleistocene alluvial fan deposits. Alluvial fan sediment composed of weakly cemented conglomerate and sandstone. Clasts are volcanic, subrounded, and range up to 8 inches in diameter. Topography is moderately rolling with little or no original alluvial surfaces preserved; deeply dissected.
- **Qls** — Holocene and Pleistocene landslide deposits. Includes debris flows and block slides.
- **Ts** (Tsdi) — Sand and gravel, tuff and diatomite. Rich in both Franciscan and Sonoma Volcanic detritus. Contains tuff dated at 4.8±0.03 Ma (J. Allen, Written communication). Tsdi - Predominantly diatomite.
- **Tpu** — Tpu- Upper Petaluma Formation (Late Miocene to Pliocene). A fluvial and marine transitional deposit comprised of massive well-sorted sandstone, siltstone and conglomerate. Conglomerate locally contains laminated siliceous shale (Monterey Formation) clasts. Tertiary volcanics and Franciscan clasts located throughout unit.
- **Tco** (Trt) — Tco- Sand and gravel of Cotati (Late Miocene to Pliocene) . A predominantly marine transitional horizon comprised of massive, well-sorted estuarine and aeolian sandstone and nearshore marine and fluvial conglomerate. Conglomerate is locally rich in subrounded laminated siliceous shale (Monterey Formattion) clasts, Tertiary volcanics, and Franciscan clasts. The Roblar Tuff (Trt), dated at 6.26 Ma (Robert Fleck, written communication) is interbedded near or at the base of unit.
- **Tpm** (Tt) — Tpm- Middle Petaluma Formation (Late Miocene). A predominantly lacustrine and fluvial deposit with estuarine and marine transitional horizons. Is comprised of siltstone and sandstone with interbedded conglomerate with minor silicified tuff, chert, lignite, and limestone. Clasts in conglomerate are mostly pebbles derived from the Franciscan, but clasts of Cretaceous and Tertiary sandstone as well as Tertiary volcanics are present. An undifferentiated tuff (Tt) of unknown age is interbedded near the top of the Middle Petaluma Formation.
- **Twg** — Wilson Grove Formation (Late Miocene). Light gray to light yellow-brown marine sandstone. The sandstone is fine-grained, well-sorted and massive to poorly bedded. Well-rounded pebbles of chert and quartz occur in thin lenses of pebbly sandstone. Locally contains thin lenses of pebble conglomerate.
- **Tsvb** — Sonoma Volcanics (Late Miocene to Pliocene) - Basalt flows, and breccias. Olivine basalt flows dated from 4.26 to 6.32 Ma on the Cotati Quadrangle (Fox and others, 1985).
- **Tsvm** — Sonoma Volcanics (Late Miocene to Pliocene) - Mafic flow and breccias with interbedded tuff breccia. Andesite and basaltic andesite. The age range on the Cotati Quadrangle is 4.78 to 6.32 Ma (Fox and others, 1985).
- **Tsvt** — Sonoma Volcanics (Late Miocene to Pliocene) - Silicic tuff and interbedded tuffaceous sediments. Few interbedded sandstone, siltstone, and diatomite lenses similar to the Middle Petaluma Fm. The age range on the Cotati Quadrangle is 5.99 to 7.32 Ma (Fox and others, 1985).
- **Tsvr** — Sonoma Volcanics (Late Miocene to Pliocene) - Dacitic flows.
- **Tsvrb** — Sonoma Volcanics (Late Miocene to Pliocene) - Silicic breccia. Blocks of silicic (rhyolite to dacite) flow rock in a tuffaceous, sandy-gravelly matrix. Blocks are mostly angular though some are rounded, some a meter or more across with color ranging from pink, white, to brown. Blocks and fragments of perlite are common. Fluvial and debris flow deposits are present. There are occasional interbeds of Franciscan derived gravel similar to the Petaluma Formation. Dates on the blocks range from 7.36 to 8.11 Ma (Youngman, 1989; Fox and others, 1985). However, chemistry of trace elements of the tuffaceous matrix suggest affinities to approximately 6 Ma tuffs of the Zammaroni Quarry area near Santa Rosa suggesting the tuff deposit formed a little over six million years ago (Andrei Sarna and Elmira Wan, personal communication, 2005).
- **Ttvm** — Tolay Volcanics. Mafic volcanics including mafic flows and breccia. Mostly basalt and basaltic andesite flows and breccia.
- **KJfm** — Franciscan Complex melange - Tectonic mixture of masses of resistant rock including sandstone, altered mafic rocks (greenstone), an exotic metamorphic rocks embedded in a sheared shaley matrix. Blocks within melange large enough to be shown at this scale are denoted as: ss=sandstone and sch=schist and semischist.

Symbol Explanation

- Contact between map units - solid where accurately located, dashed where approximately located; short dash where inferred; dotted where concealed.
- Contact between similar map units of different relative age - generally approximately located.
- Fault - solid where accurately located, dashed where approximately located; dotted where concealed; queried where uncertain. U = Upthrown block; D = Downthrown block.
- Thrust fault - barbs on upper plate; solid where accurately located, dashed where approximately located; dotted where concealed; queried where uncertain.
- Syncline - Dashed where approximately located; dotted where concealed; queried where questionable.
- Anticline - Dashed where approximately located; dotted where concealed; queried where questionable.
- 25 — Strike and dip of bedding plane.
- Landslide - hachures indicate headscarp (source area); arrows indicate principal direction of movement. Queried where questionable.

References

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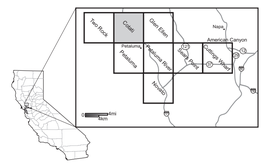


Topographic base from the U.S. Geological Survey UTM Projection

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Scale 1:24,000

Contour Interval 20 feet

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, Statemap Award no. 02HQAG0018

Revised: 03/13/2006

Subsequent Phases of Copeland Creek Watershed Storm Water Detention/Groundwater Recharge, Habitat Restoration, and Steelhead Refugia Project

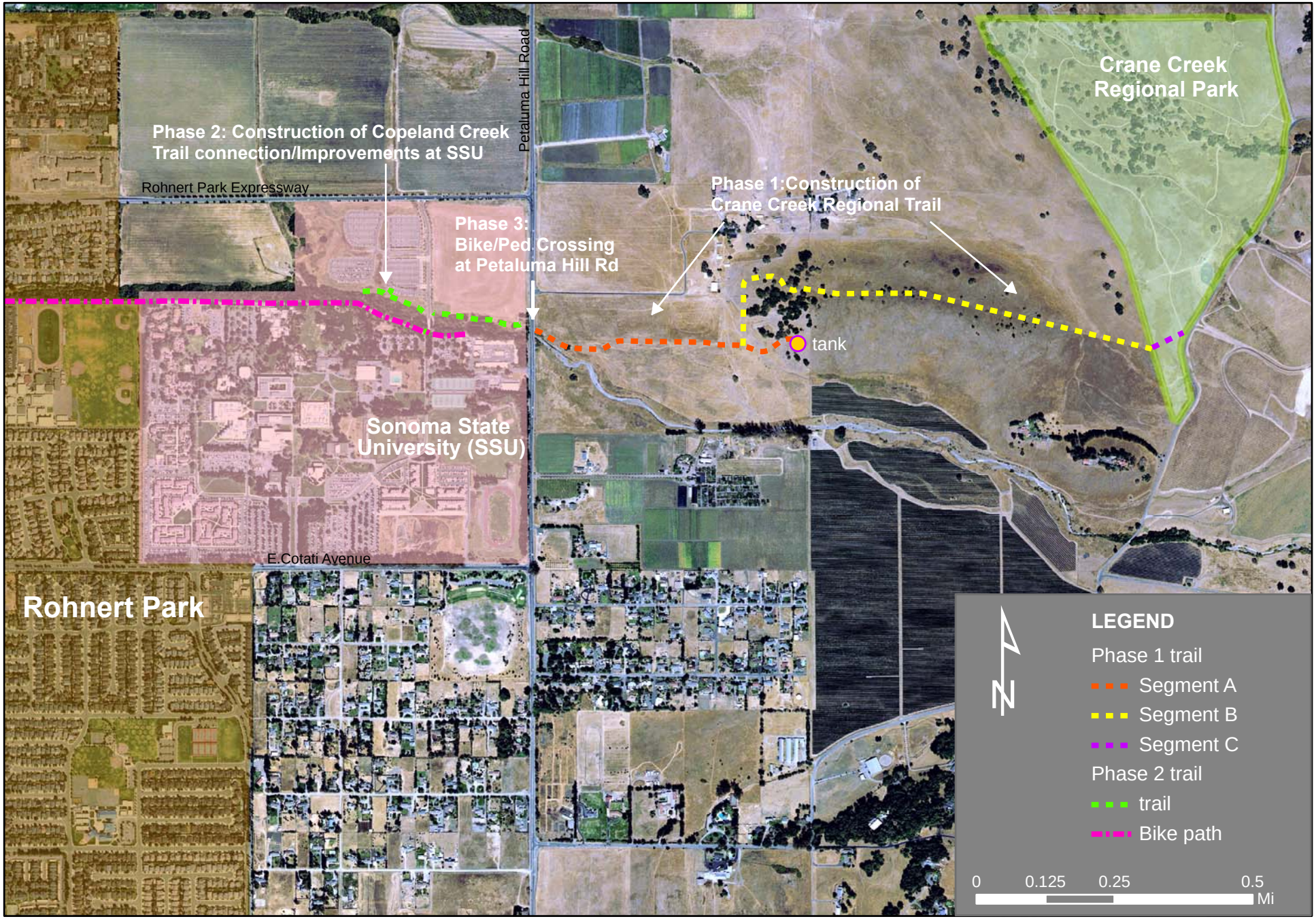


Figure 2: Proposed Crane Creek Regional Trail

Subsequent Phases of Copeland Creek Watershed Storm Water Detention/Groundwater Recharge, Habitat Restoration, and Steelhead Refugia Project

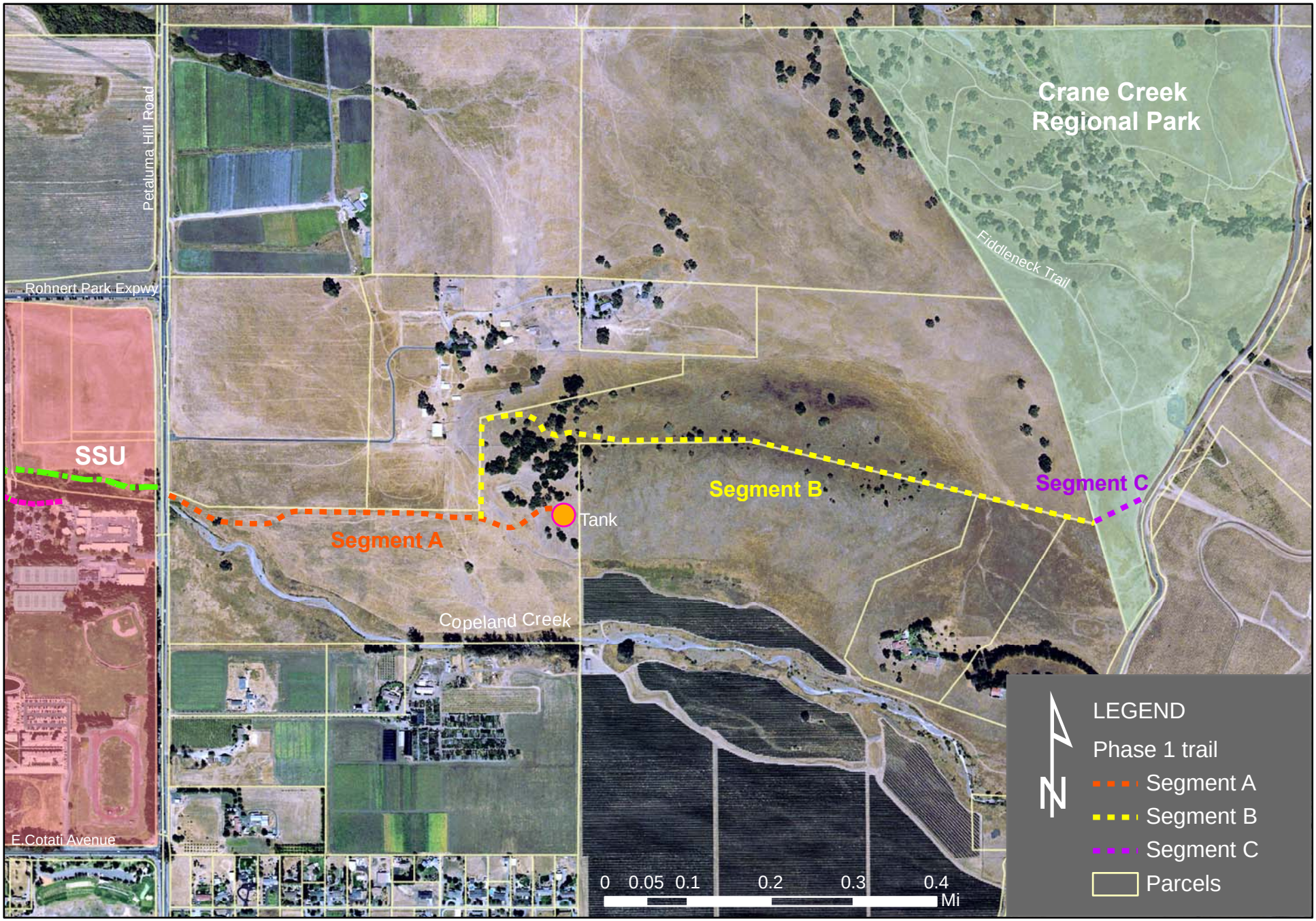
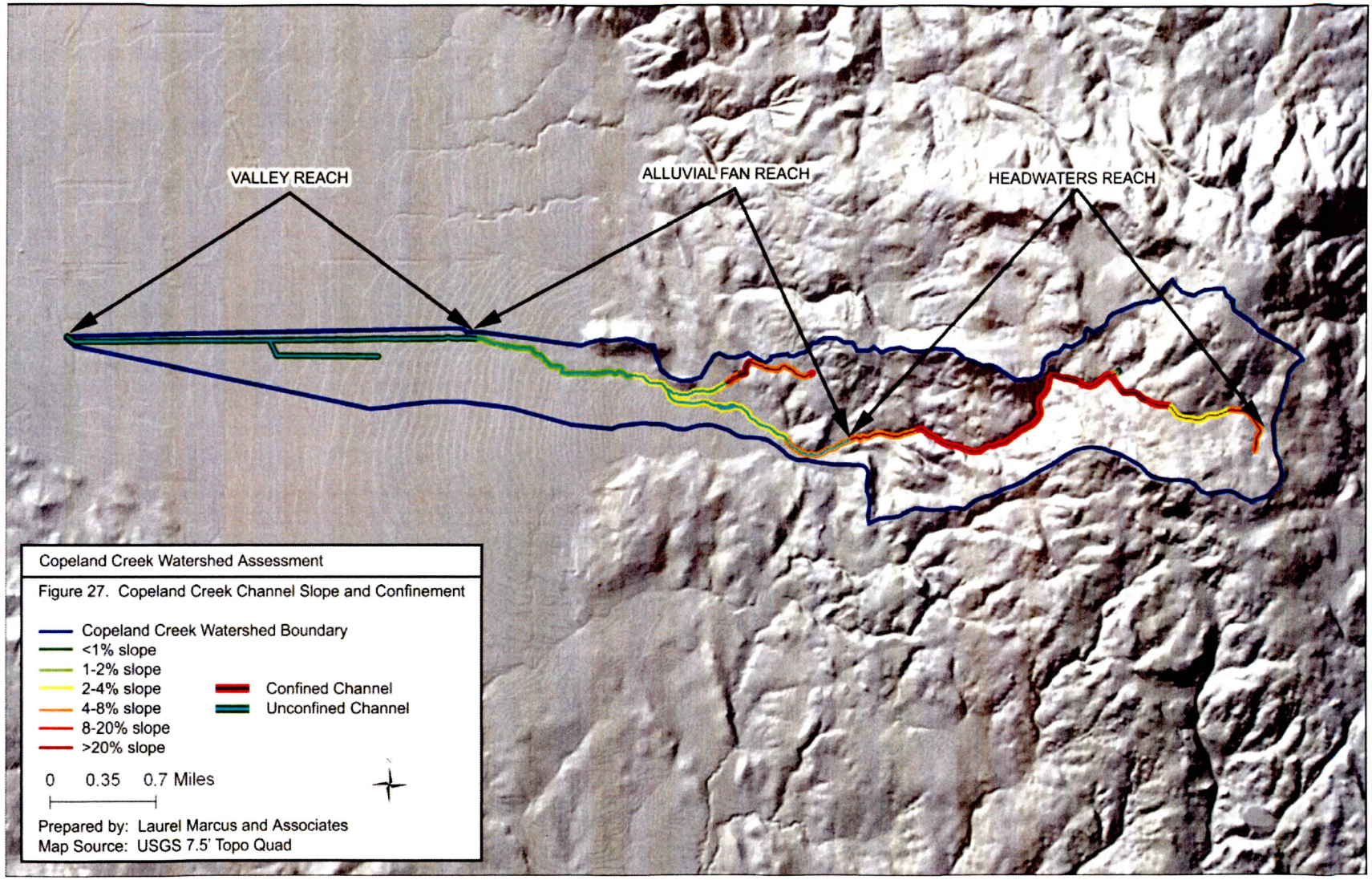
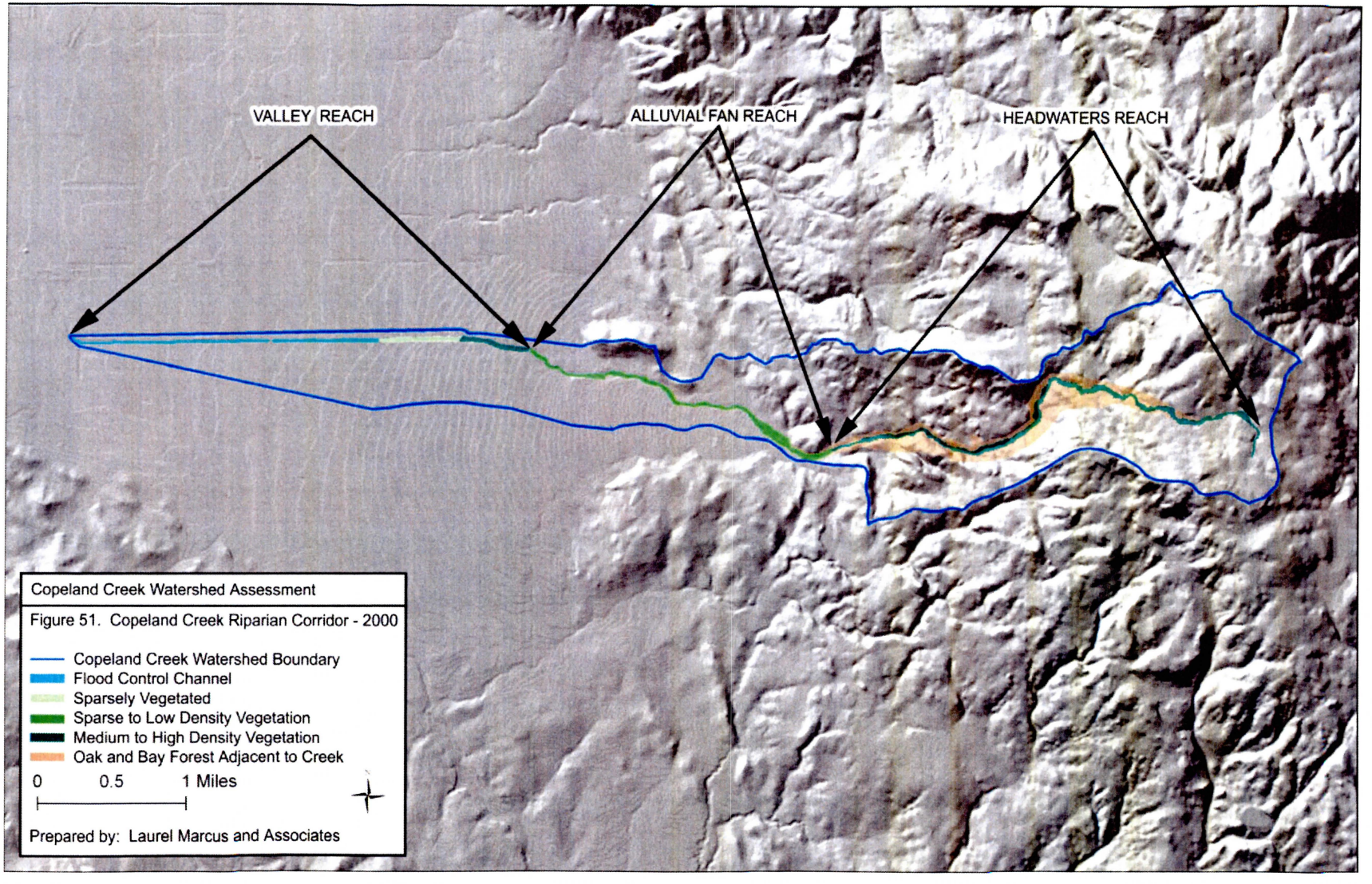
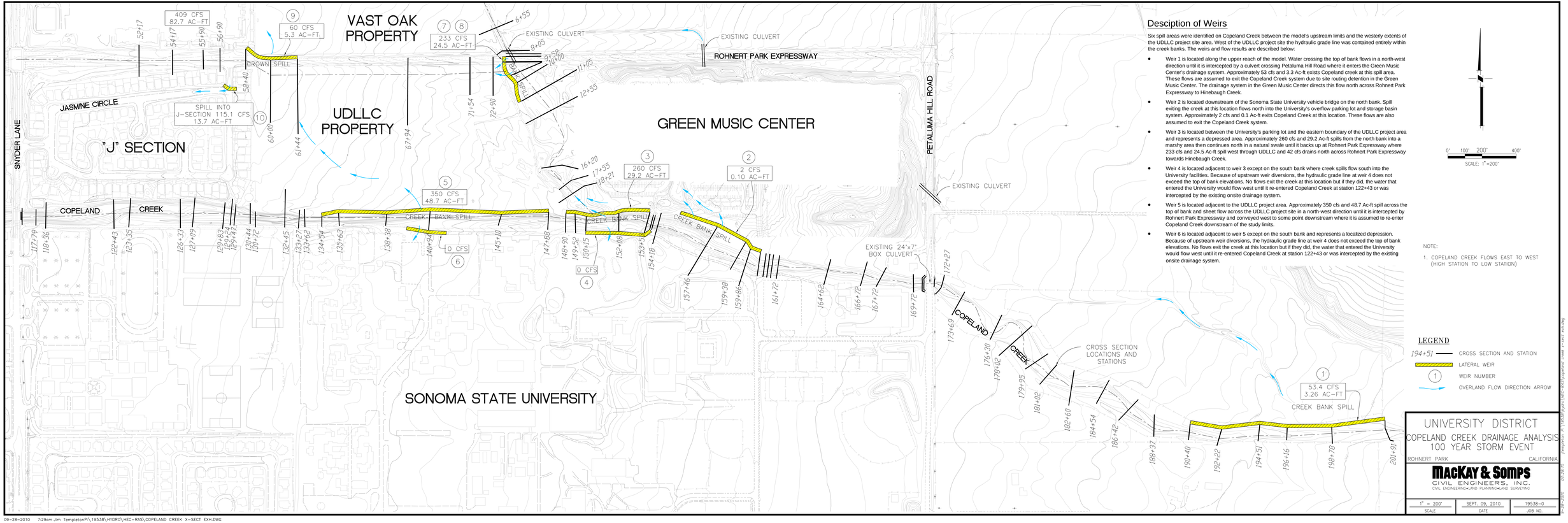


Figure 3: Phase 1 Crane Creek Regional Trail


VALLEY REACH
ALLUVIAL FAN REACH
HEADWATERS REACH
Copeland Creek Watershed Assessment
Figure 27. Copeland Creek Channel Slope and Confinement
Copeland Creek Watershed Boundary
<1% slope
1-2% slope
2-4% slope
4-8% slope
8-20% slope
>20% slope
Confined Channel
Unconfined Channel
0 0.35 0.7 Miles
Prepared by: Laurel Marcus and Associates
Map Source: USGS 7.5' Topo Quad


VALLEY REACH
ALLUVIAL FAN REACH
HEADWATERS REACH
Copeland Creek Watershed Assessment
Figure 51. Copeland Creek Riparian Corridor - 2000
Copeland Creek Watershed Boundary
Flood Control Channel
Sparsely Vegetated
Sparse to Low Density Vegetation
Medium to High Density Vegetation
Oak and Bay Forest Adjacent to Creek
0 0.5 1 Miles
Prepared by: Laurel Marcus and Associates



Desciption of Weirs

Six spill areas were identified on Copeland Creek between the model's upstream limits and the westerly extents of the UDLLC project site area. West of the UDLLC project site the hydraulic grade line was contained entirely within the creek banks. The weirs and flow results are described below:

- Weir 1 is located along the upper reach of the model. Water crossing the top of bank flows in a north-west direction until it is intercepted by a culvert crossing Petaluma Hill Road where it enters the Green Music Center's drainage system. Approximately 53 cfs and 3.3 Ac-ft exists Copeland creek at this spill area. These flows are assumed to exit the Copeland Creek system due to site routing detention in the Green Music Center. The drainage system in the Green Music Center directs this flow north across Rohnert Park Expressway to Hinebaugh Creek.
- Weir 2 is located downstream of the Sonoma State University vehicle bridge on the north bank. Spill exiting the creek at this location flows north into the University's overflow parking lot and storage basin system. Approximately 2 cfs and 0.1 Ac-ft exits Copeland Creek at this location. These flows are also assumed to exit the Copeland Creek system.
- Weir 3 is located between the University's parking lot and the eastern boundary of the UDLLC project area and represents a depressed area. Approximately 260 cfs and 29.2 Ac-ft spills from the north bank into a marshy area then continues north in a natural swale until it backs up at Rohnert Park Expressway where 233 cfs and 24.5 Ac-ft spill west through UDLLC and 42 cfs drains north across Rohnert Park Expressway towards Hinebaugh Creek.
- Weir 4 is located adjacent to weir 3 except on the south bank where creek spills flow south into the University facilities. Because of upstream weir diversions, the hydraulic grade line at weir 4 does not exceed the top of bank elevations. No flows exit the creek at this location but if they did, the water that entered the University would flow west until it re-entered Copeland Creek at station 122+43 or was intercepted by the existing onsite drainage system.
- Weir 5 is located adjacent to the UDLLC project area. Approximately 350 cfs and 48.7 Ac-ft spill across the top of bank and sheet flow across the UDLLC project site in a north-west direction until it is intercepted by Rohnert Park Expressway and conveyed west to some point downstream where it is assumed to re-enter Copeland Creek downstream of the study limits.
- Weir 6 is located adjacent to weir 5 except on the south bank and represents a localized depression. Because of upstream weir diversions, the hydraulic grade line at weir 4 does not exceed the top of bank elevations. No flows exit the creek at this location but if they did, the water that entered the University would flow west until it re-entered Copeland Creek at station 122+43 or was intercepted by the existing onsite drainage system.

0' 100' 200' 400'

SCALE: 1"=200'

NOTE:

1. COPELAND CREEK FLOWS EAST TO WEST (HIGH STATION TO LOW STATION)

LEGEND

- 194+51 — CROSS SECTION AND STATION
- LATERAL WEIR
- (1) WEIR NUMBER
- OVERLAND FLOW DIRECTION ARROW

UNIVERSITY DISTRICT
COPELAND CREEK DRAINAGE ANALYSIS
100 YEAR STORM EVENT

ROHNERT PARK CALIFORNIA

MacKAY & SOMPS
CIVIL ENGINEERS, INC.
CIVIL ENGINEERING • LAND PLANNING • LAND SURVEYING

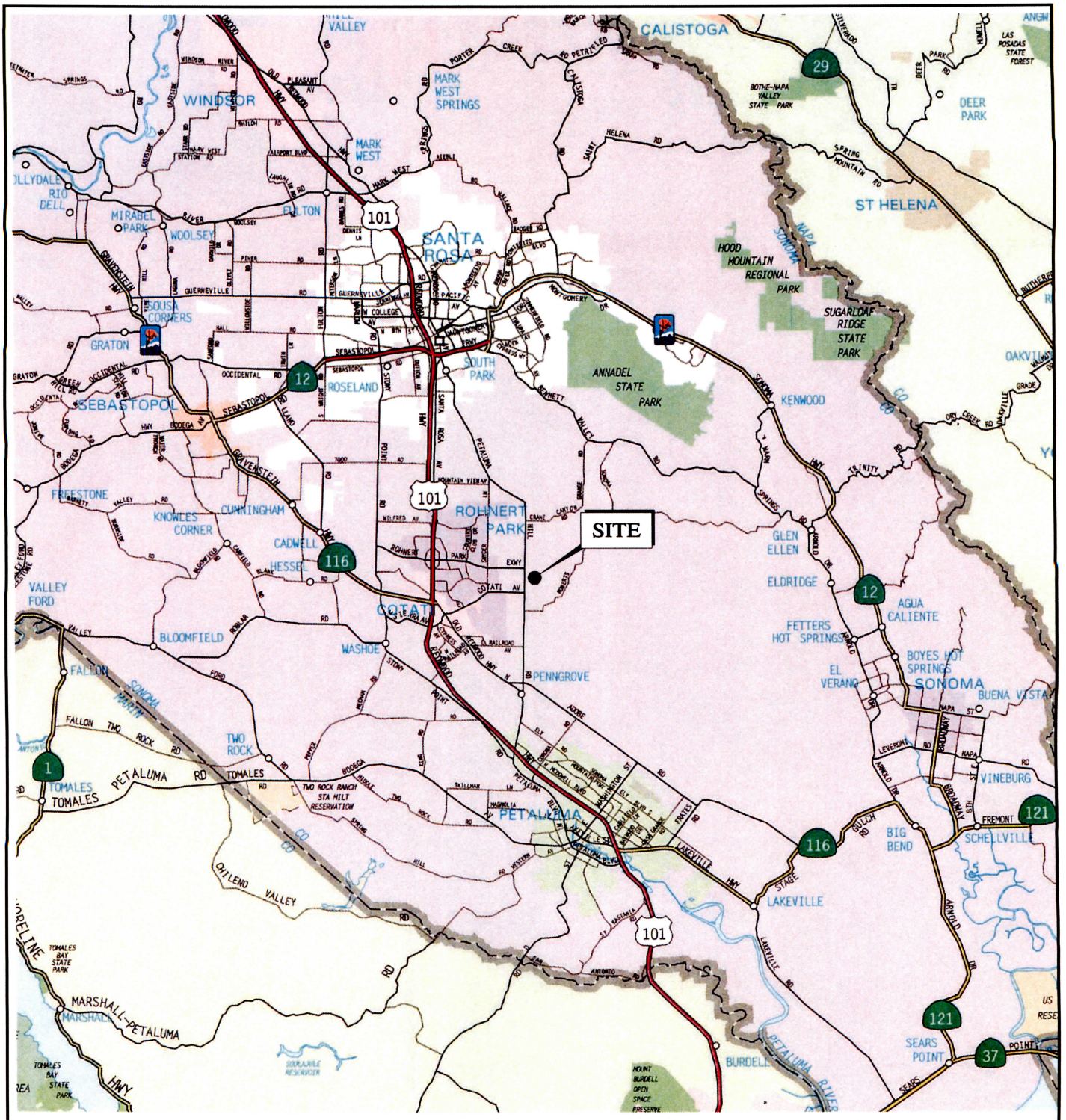
1" = 200'	SEPT. 09, 2010	19538-0
SCALE	DATE	JOB NO.

09-28-2010 7:29am Jim TempletonP:\19538\HYDRO\HEC-RAS\COPELAND CREEK X-SECT EXH.DWG

ANDERSON 128 PROPERTY (UNIVERSITY DISTRICT LLC.)

ROHNERT PARK CALIFORNIA

10-12-2010 8:47am Lisa Vilhauer P:\19538\EXHIBITS\EXH-AERIALPHOTO.DWG



BASE MAP SOURCE: THOMAS BROTHERS

ENGEO INCORPORATED
EXCELLENT SERVICE SINCE 1971

SITE VICINITY MAP

ANDERSON 128 PROPERTY

ROHNERT PARK, CALIFORNIA

PROJECT NO.: 5716.1.007.01		FIGURE NO. 1
DATE: SEPTEMBER 2005		
DRAWN BY: KN	CHECKED BY: JT	

ORIGINAL FIGURE PRINTED IN COLOR

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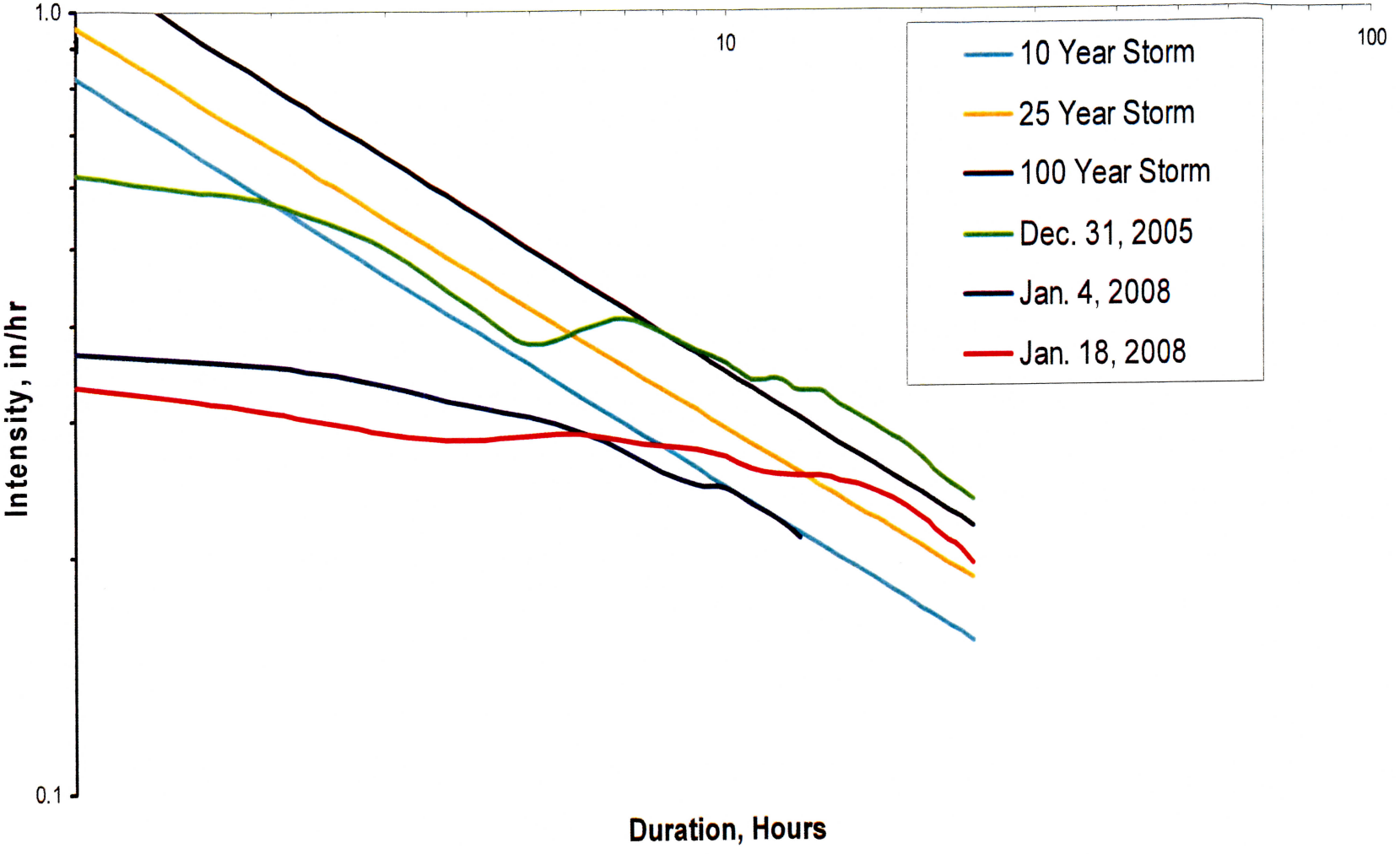
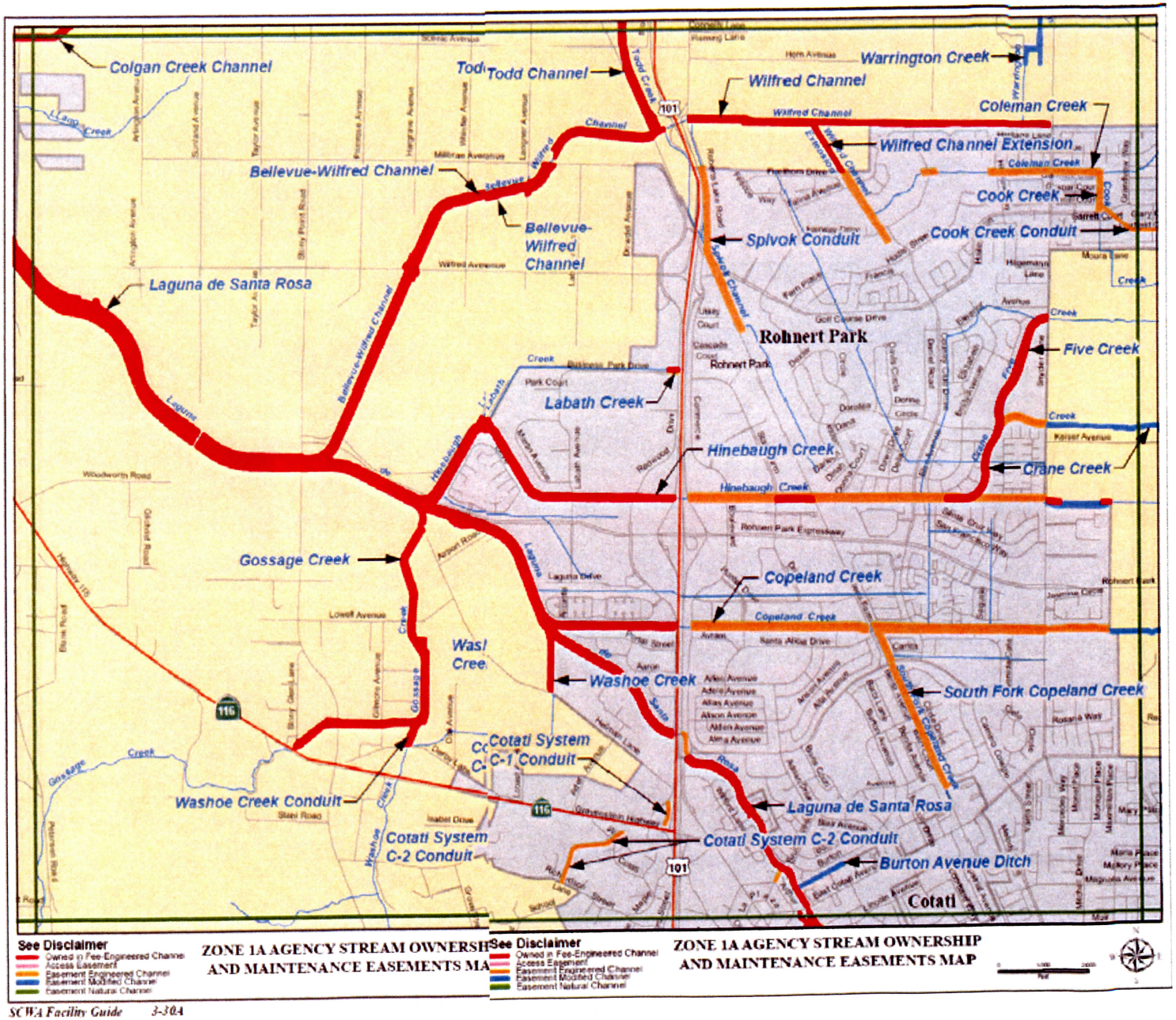
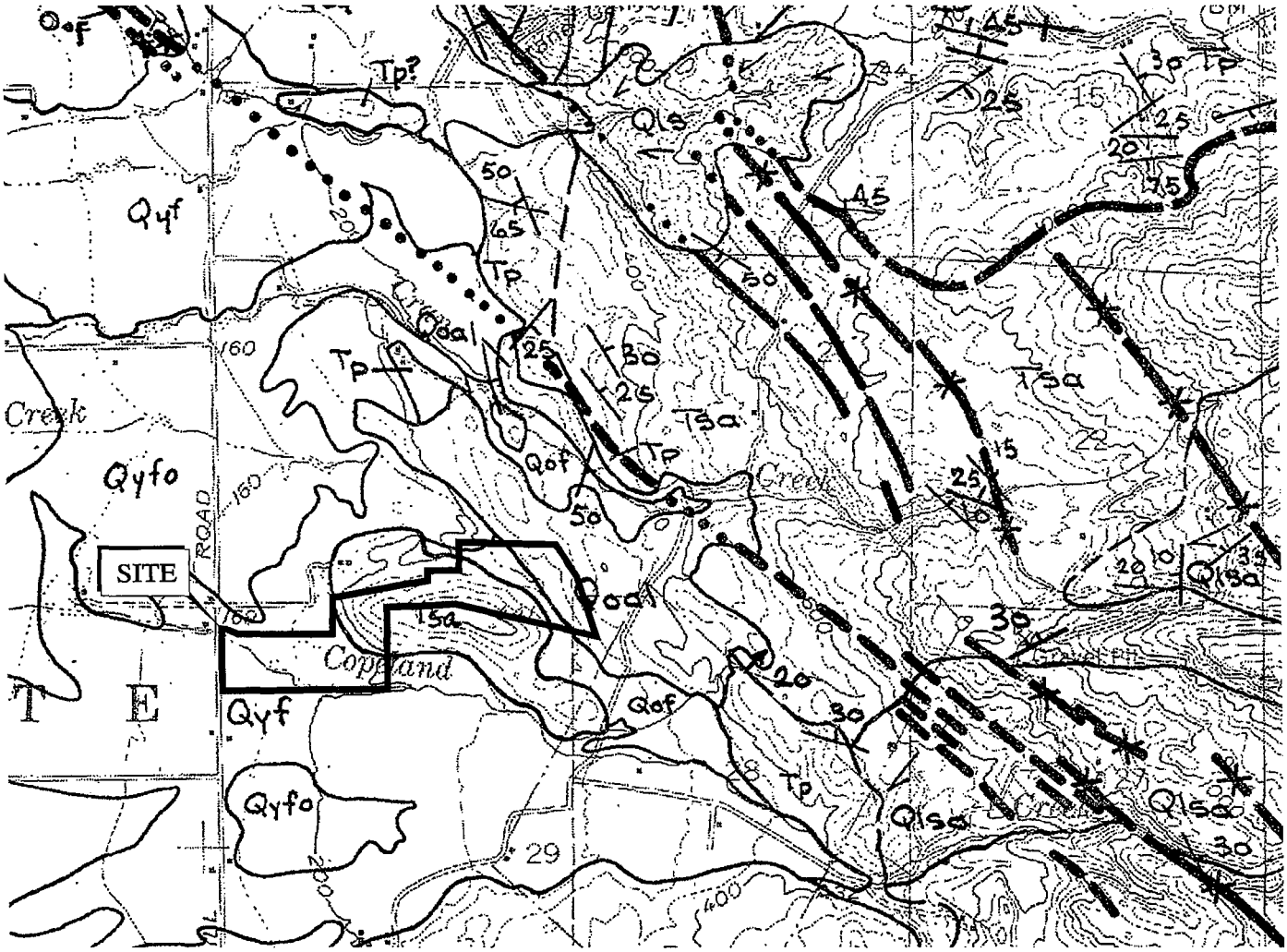

1.0
10
100
0.1
Intensity, in/hr
Duration, Hours
10 Year Storm
25 Year Storm
100 Year Storm
Dec. 31, 2005
Jan. 4, 2008
Jan. 18, 2008



See Disclaimer
Owned in Fee-Engineered Channel
Access Easement
Easement Engineered Channel
Easement Modified Channel
Easement Natural Channel
ZONE 1A AGENCY STREAM OWNERSHIP AND MAINTENANCE EASEMENTS MAP



EXPLANATION

BEDROCK CONTACT-DASHED WHERE GRADATIONAL OR APPROXIMATELY LOCATED

FAULT-DASHED WHERE INFERRED, DOTTED WHERE CONCEALED, QUERIED WHERE EXISTENCE IS DOUBTFUL

U UPTHROWN SIDE

D DOWNTHROWN SIDE RELATIVELY

AXIS OF FOLD

ANTICLINE SYNCLINE

STRIKE AND DIP OF STRATA

INCLINED VERTICAL OVERTURNED

Qof ALLUVIAL FAN DEPOSITS BORDERING UPLANDS. INCISED CHANNELS FILLED WITH YOUNGER ALLUVIUM

Qyf YOUNGER ALLUVIAL FAN DEPOSITS GRADING HEADWARD TO TERRACE DEPOSITS

Qyfo YOUNGER OUTER ALLUVIAL FAN DEPOSITS

Qb INTERFLUVIAL MARSH-LIKE BASIN DEPOSITS

Qlsa LANDSLIDE DEPOSITS

Qoal OLDER ALLUVIUM

Tsa ANDESITIC TO BASALTIC LAVA FLOWS

Tp PETALUMA FORMATION-- CLAYTONE AND SILTSTONE WITH THICK LENSES OF SANDSTONE AND PEBBLE CONGLOMERATE, THIN BEDS OF TUFF AND TUFFACEOUS SILTSTONE, LOCALLY THICK DIATOMITE BEDS

N

BASE MAP SOURCE: Fox et al, USGS 1973

NO SCALE

ENGEO INCORPORATED
EXCELLENT SERVICE SINCE 1971

REGIONAL GEOLOGIC MAP
ANDERSON 128 PROPERTY
ROHNERT PARK, CALIFORNIA

PROJECT NO.: 5716.1.007.01		FIGURE NO. 3
DATE: SEPTEMBER 2005		
DRAWN BY: KN	CHECKED BY: JT	

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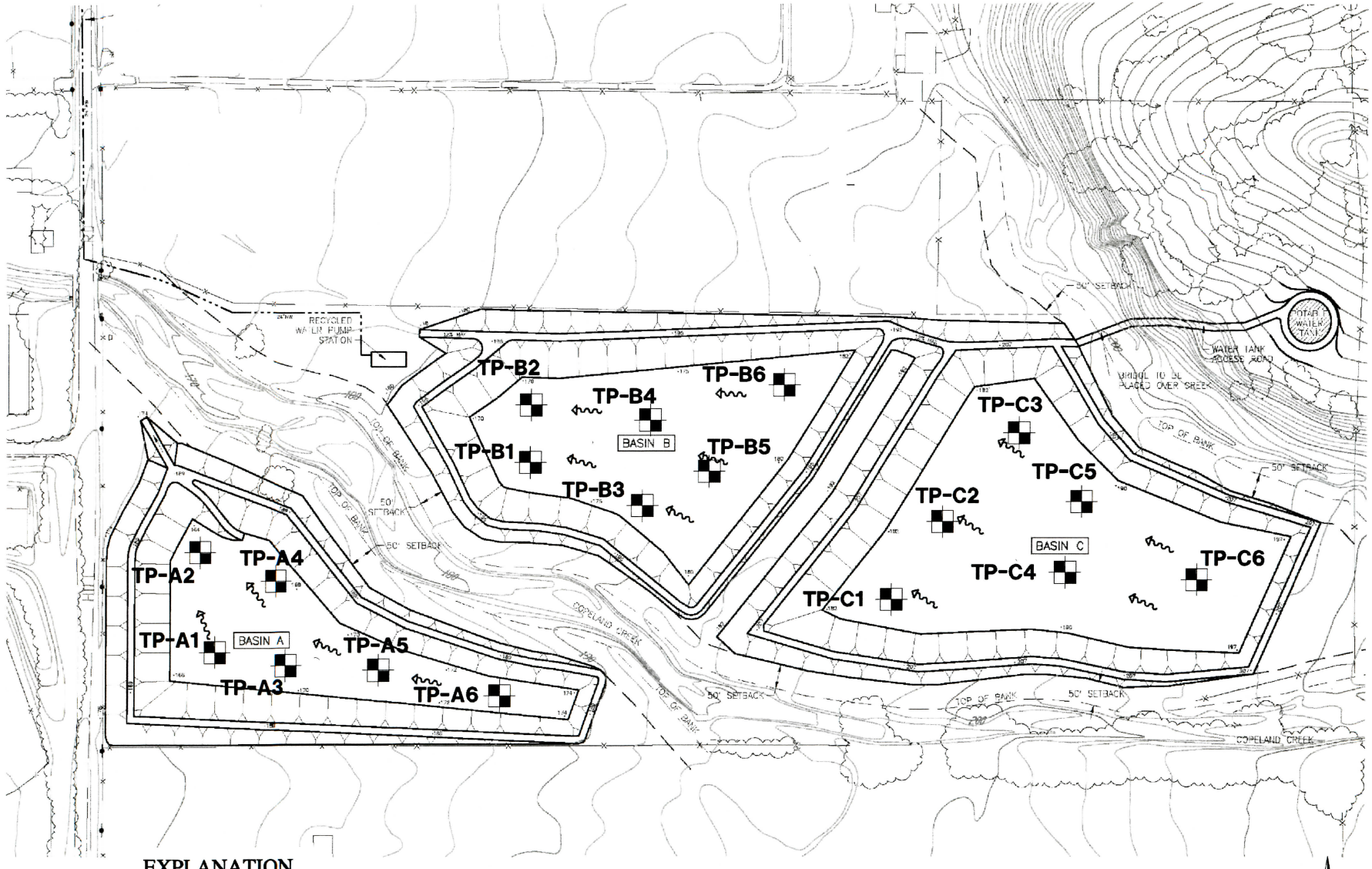

EXPLANATION

TP-C6 APPROXIMATE LOCATION OF BORING

BASE MAP SOURCE: UNKNOWN

ENGEO INCORPORATED
EXCELLENT SERVICE SINCE 1971

SITE PLAN WITH TEST PIT LOCATIONS

ANDERSON 128 PROPERTY

ROHNERT PARK, CALIFORNIA

PROJECT NO.: 5716.1.007.01		FIGURE NO. 5
DATE: SEPTEMBER 2005		
DRAWN BY: CLL	CHECKED BY: JT	

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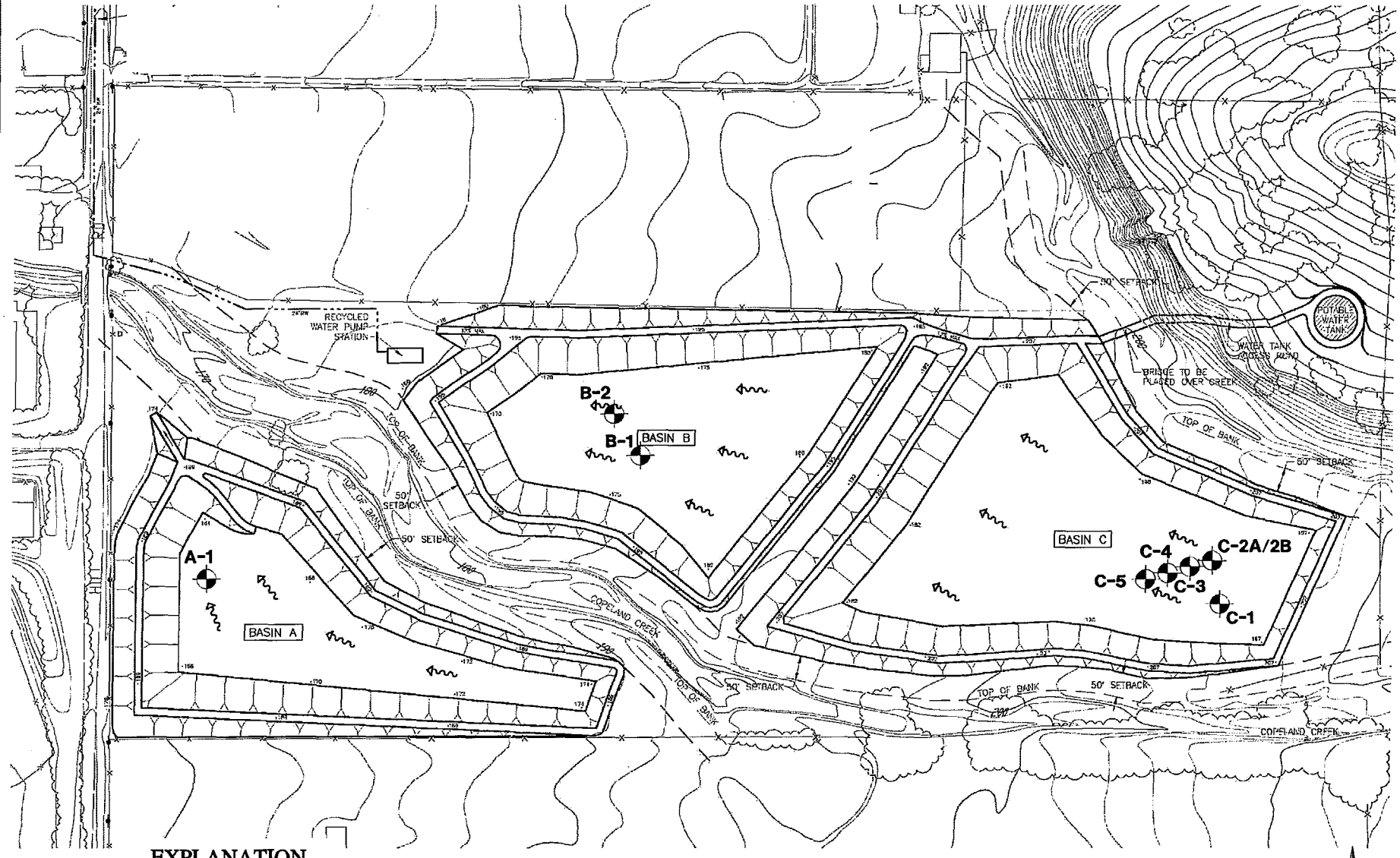

EXPLANATION

C-5 APPROXIMATE LOCATION OF PIEZOMETER

0 FEET 300
0 METERS 150

N

BASE MAP SOURCE: UNKNOWN

ENGEO INCORPORATED
EXCELLENT SERVICE SINCE 1971

SITE PLAN SHOWING PIEZOMETER LOCATIONS

ANDERSON 128 PROPERTY

ROHNERT PARK, CALIFORNIA

PROJECT NO.: 5716.1.007.01		FIGURE NO. 6
DATE: SEPTEMBER 2005		
DRAWN BY: KN	CHECKED BY: JT	

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TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-A1	0 – 0.8	Dark grayish brown CLAYEY SAND, SC, loose, very moist, fine roots common, trace subrounded gravel to 1¼ inches maximum dimension.
	0.8 – 3.0	Black CLAYEY SAND, SC, loose to medium dense, very moist, trace fine roots, trace subrounded gravel to 1 inch maximum dimension.
	3.0 – 4.7	Grayish brown CLAYEY SAND, SC, medium dense, very moist, fine roots common, minor subrounded gravel to 2¼ inches maximum dimension.
	4.7 – 7.5	Grayish brown CLAYEY GRAVEL, GC, loose to medium dense, very moist, fine to coarse subrounded gravel, with cobbles.
	7.5 – 8.5	Grayish brown POORLY GRADED GRAVEL, GP, loose to medium dense, wet, fine to coarse subrounded gravel, very cobbly, (cobbles to 10 inches maximum dimension).
		Bottom at 8.5 feet. Free ground water encountered at 8.3 feet.
TP-A2	0 – 1.5	Grayish brown CLAYEY SAND, SC, very moist, loose, abundant fine roots, minor subrounded gravel to 2 inches maximum dimension.
	1.5 – 3.8	Very dark gray / black CLAYEY SAND, SC, very moist, medium dense, trace fine roots, trace subrounded gravel to 1½ inches maximum dimension.
	3.8 – 7.3	Yellowish brown CLAYEY SAND, SC, very moist, loose to medium dense, minor subrounded gravels and cobbles (to 6 inches maximum dimension).
	7.3 – 7.7	Yellowish brown CLAYEY GRAVEL, GC, medium dense, very moist, fine to coarse subrounded gravels, with cobbles (to 6 inches maximum dimension).

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
	7.7 – 8.3	Yellowish brown CLAYEY SAND, SC, wet, medium dense, minor subrounded fine to coarse gravels and cobbles (to 8 inches maximum dimension).
	8.3– 9.0	Dark yellowish brown CLAYEY SAND, SC, wet, medium dense, minor subrounded gravel to 1¼ inches maximum dimension.
		Bottom at 9.0 feet. Free ground water encountered at 8.3 feet.
TP-A3	0 - 0.7	Grayish brown CLAYEY SAND, SC, very moist abundant fine roots, minor subrounded gravel to 1 inch maximum dimension.
	0.7 – 4.1	Dark grayish brown CLAYEY SAND, SC, very moist, medium dense, minor gravel to 1½ inches maximum dimension, gravels predominantly subrounded.
	4.1 – 4.8	Dark yellowish brown CLAYEY GRAVEL, GC, loose to medium dense, very moist, fine-to-coarse subangular-to-subrounded gravel, with cobbles (to 5 inches maximum dimension).
	4.8 – 6.5	Dark yellowish brown SILTY CLAY, CL, very moist, medium stiff, with sand, trace subrounded gravel to 1 inch maximum dimension.
	6.5– 9.5	Dark yellowish brown CLAYEY SAND, SC, very moist to wet, medium dense, minor subrounded gravel to 1¼ inches maximum dimension.
		Bottom at 9.5 feet. Free ground water encountered at 9.2 feet.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-4A	0 – 1.3	Grayish brown SANDY CLAY, CL, very moist fine roots common, trace subrounded gravel to ½ inch maximum dimension.
	1.3 – 3.7	Black SILTY CLAY, CH, very moist, medium stiff, with sand, trace subrounded gravel to 1¼ inches maximum dimension.
	3.7 – 8.6	Dark yellowish brown CLAYEY SAND, SC, very moist, medium dense, trace subrounded gravel to 1¼ inches maximum dimension.
	8.6 – 8.9	Dark yellowish brown SILTY CLAY, CL, very moist, medium stiff, with fine to medium grain sand.
		Bottom at 8.9 feet. Free ground water encountered at 8.4 feet.
TP-A5	0 – 0.9	Grayish brown SANDY CLAY, CL, very moist to wet, soft, abundant fine roots, trace subrounded gravel to 1 inch maximum dimension.
	0.9 – 2.2	Dark grayish brown CLAYEY SAND, SC, very moist, loose to medium dense, trace subrounded gravel to 1½ inches maximum dimension.
	2.2 – 7.5	Dark yellowish brown CLAYEY SAND, SC, very moist, medium dense, trace subrounded gravel to ¾ inch maximum dimension, sand is fine to coarse grain.
		Bottom at 7.5 feet. Free ground water encountered at 7.2 feet.
TP-A6	0 – 0.8	Dark grayish brown CLAYEY SAND, SC, very moist, loose, trace subrounded gravel to 1¼ inches maximum dimension, abundant fine roots.
	0.8 – 2.8	Dark gray CLAYEY SAND, SC, very moist, loose to medium dense, trace subrounded gravel to 1 inch maximum dimension, minor fine roots in upper foot.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
	2.8 – 6.5	Dark yellowish brown CLAYEY SAND, SC, very moist, medium dense, sand is predominantly fine to medium grain.
	6.5 – 7.3	Dark yellowish brown CLAYEY GRAVEL, GC, medium dense, very moist, gravel predominantly coarse, cobbles (to 10-inches maximum dimension) common.
	7.3 – 7.8	Dark yellowish brown SANDY CLAY, CL, very moist to wet, medium stiff, trace subrounded gravel to 2 inches maximum dimension.
		Bottom at 7.8 feet. Free ground water encountered at 6.0 feet.
TP-B1	0 – 0.8	Grayish brown CLAYEY SAND, SC, very moist, loose, abundant fine to medium roots.
	0.8 – 3.6	Dark gray SILTY CLAY, CH, very moist, medium stiff, with sand, roots common.
	3.6 – 4.3	Dark yellowish brown CLAYEY SAND – SANDY CLAY, SC / CL, very moist, medium dense, sand is predominantly fine to medium grain.
	4.3 – 7.0	Dark yellowish brown CLAYEY SAND, SC, very moist, medium dense, sand is predominantly fine to medium grain, trace roots.
	7.0 – 8.2	Dark yellowish brown SILTY CLAY, CL, very moist, with sand, medium stiff becoming grayish brown and stiff.
		Bottom at 8.2 feet. Free ground water encountered at 7.2 feet.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-B2	0 – 0.7	Grayish brown CLAYEY SAND, SC, very moist, loose, fine roots common.
	0.7 – 4.0	Black SILTY CLAY, CH, very moist, medium stiff, with fine sand.
	4.0 – 6.2	Dark yellowish brown CLAYEY SAND – SANDY CLAY, SC / CL, very moist becoming wet, loose to medium dense.
	6.2 – 7.0	Dark yellowish brown CLAYEY SAND, SC, wet, loose to medium dense, sand is fine to coarse grain, trace subrounded gravel to ⅔ inch maximum dimension.
	7.0 – 7.4	Dark yellowish brown CLAYEY GRAVEL, GC, medium dense, very moist, gravels to 2¼ inches maximum dimension, subrounded.
	7.4 – 8.3	Dark yellowish brown CLAYEY SAND, SC, wet, loose to medium dense, sand is fine to coarse grain.
		Bottom at 8.3 feet. Free ground water encountered at 7.1 feet.
TP-B3	0 – 1.2	Mottled grayish brown - dark yellowish brown CLAYEY SAND, SC, very moist, loose to medium dense, with gravel to 2 inches maximum dimension, predominantly subrounded, fine roots common.
	1.2 – 2.7	Dark gray SILTY CLAY, CH, very moist, medium stiff, with sand and trace fine subrounded gravel.
	2.7 – 6.7	Dark yellowish brown CLAYEY SAND, SC, very moist, medium dense, minor subrounded gravel to 1¼ inches maximum dimension.
	6.7 – 7.4	Dark yellowish brown CLAYEY GRAVEL, GC, medium dense, very moist, subrounded gravels, abundant cobbles (to 8 inches maximum dimension).

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
	7.4 – 8.7	Brown POORLY GRADED GRAVEL, GP, saturated, gravels predominantly subrounded, with sand, abundant cobbles (to 10 inches maximum dimension). Bottom at 8.7 feet. Free ground water encountered at 6.8 feet.
TP-B4	0 – 0.5	Dark grayish brown CLAYEY SAND, SC, very moist, loose to medium dense, with minor subrounded gravel to 1½ inches maximum dimension, abundant fine roots.
	0.5 – 2.4	Dark gray- black CLAYEY SAND, SC, very moist, medium dense, trace subrounded gravel to 1 inch maximum dimension, trace fine roots.
	2.4 – 3.8	Dark yellowish brown CLAYEY SAND, SC, very moist, medium dense, minor subrounded gravel to 1 inch maximum dimension.
	3.8 – 6.4	Dark yellowish brown CLAYEY GRAVEL, GC, medium dense, very moist, subrounded gravels, abundant cobbles (to 8 inches maximum dimension).
	6.4 – 7.3	Yellowish brown SILTY CLAY, CL, very moist, medium dense, with fine to medium grain sand Bottom at 7.3 feet. Free ground water encountered at 4.0 feet.
TP-B5	0 – 1.0	Grayish brown CLAYEY SAND, SC, very moist, loose to medium dense, with subangular to subrounded gravell to 1¼ inches maximum dimension, abundant fine roots.
	1.0 – 2.4	Black SILTY CLAY, CH, very moist, medium stiff, with sand and gravel (to 1½ inches maximum dimension, subangular to subrounded), minor fine roots.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
	2.4 – 3.2	Dark grayish brown CLAYEY GRAVEL, GC, medium dense, very moist, gravels predominantly subrounded to 2½ inches maximum dimension, abundant cobbles (to 6 inches maximum dimension).
	3.2 – 5.5	Grayish brown CLAYEY SAND, SC, very moist, medium dense, with trace subrounded gravel, trace subangular to subrounded cobbles to 6 inches maximum dimension.
	5.5 – 6.5	Grayish brown CLAYEY GRAVEL, GC, medium dense, very moist to wet, gravels predominantly subrounded to 1½ inches maximum dimension, trace cobbles (to 5 inches maximum dimension).
	6.5 – 7.2	Grayish brown CLAYEY SAND, SC, very moist, medium dense, with minor subrounded gravel to 1¼ inches maximum dimension.
		Bottom at 7.2 feet. Free ground water encountered at 5.3 feet.
TP-B6	0 – 2.3	Dark grayish brown SILTY CLAY, CL, very moist, soft to medium stiff, with sand and trace subrounded gravel to 1¼ inches maximum dimension, fine roots common.
	2.3 – 3.8	Dark grayish brown SILTY CLAY, CL, very moist, soft to medium stiff, with sand and trace subrounded gravel to 1¼ inches maximum dimension, fine roots common.
	3.8 – 6.0	Dark yellowish brown CLAYEY GRAVEL, GC, loose to medium dense, wet, gravels predominantly subrounded to 2 inches maximum dimension.
		Bottom at 6.0 feet. Free ground water encountered at 4.0 feet.
TP-C1	0 – 1.1	Grayish brown CLAYEY SAND, SC, very moist, loose to medium dense, fine roots common, sand is fine to coarse grain.
	1.1 – 2.8	Dark gray / black SILTY CLAY, CH, very moist, soft to medium stiff, with minor sand, trace fine roots.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
	2.8 – 4.2	Dark yellowish brown CLAYEY SAND, SC, very moist becoming wet, medium dense, sand is fine to medium grain.
	4.2 – 4.4	Dark yellowish brown SILTY CLAY, CL, very moist, medium stiff, with sand.
	4.4 – 5.7	Dark yellowish brown CLAYEY SAND, SC, very moist to wet, medium dense, sand is fine to medium grain.
	5.7 – 6.5	Dark yellowish brown CLAYEY GRAVEL, GC, loose to medium dense, wet, gravels predominantly subrounded to 2 inches maximum dimension.
	6.5 – 7.4	Bottom at 7.4 feet. Free ground water encountered at 5.7 feet.
TP-C2	0 – 1.2	Grayish brown CLAYEY SAND, SC, very moist, medium dense, with minor subangular to subrounded gravel to 1¼ inches maximum dimension, fine roots common.
	1.2 – 4.2	Dark gray becoming dark yellowish brown CLAYEY GRAVEL, GC, loose to medium dense, wet, gravels predominantly subrounded, subangular to subrounded cobbles to 8 inches maximum dimension common.
	4.2 – 5.7	Dark gray becoming dark yellowish brown CLAYEY GRAVEL, GP–GC, loose to medium dense, wet, gravels predominantly subrounded, subangular to subrounded cobbles to 6 inches maximum dimension common. Bottom at 5.7 feet. Free ground water encountered at 5.5 feet.
TP-C3	0 – 1.2	Grayish brown CLAYEY SAND, SC, very moist, medium dense, with minor subrounded gravel to 2½ inches maximum dimension, fine and medium roots.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
	1.2 – 3.1	Dark grayish brown CLAYEY SAND, SC, very moist, medium dense to dense, with minor subrounded gravel to 2½ inches maximum dimension, trace fine roots in upper foot.
	3.1 – 3.7	Grayish brown CLAYEY SAND, SC, very moist, medium dense.
	3.7 – 5.2	Grayish brown CLAYEY GRAVEL, GC, medium dense, very moist becoming wet, with abundant subangular to subrounded cobbles to 10 inches maximum dimension.
	5.2 – 6.3	Brown WELL GRADED GRAVEL, GW, loose to medium dense, wet, with abundant subangular to subrounded cobbles, trace boulders to 15 inches maximum dimension.
		Bottom at 6.3 feet. Free ground water encountered at 5.1 feet.
TP-C4	0 – 1.1	Dark grayish brown CLAYEY SAND, SC, very moist, medium dense, with minor predominantly subrounded gravel to 1 inches maximum dimension, fine roots common.
	1.1 – 2.2	Black CLAYEY SAND, SC, very moist, medium dense, with minor predominantly subrounded gravel to 1 inches maximum dimension, trace fine roots
	2.2 – 3.9	Dark grayish brown CLAYEY GRAVEL, GC, medium dense, very moist, with minor cobbles to 5 inches maximum dimension.
	3.9 – 5.5	Dark grayish brown POORLY GRADED GRAVEL, GP, medium dense, very moist becoming wet, gravels predominantly coarse grain, with abundant subangular to subrounded cobbles to 10 inches maximum dimension.
	5.5 – 6.1	Brown WELL GRADED GRAVEL, GW, loose to medium dense, wet, with abundant subangular to subrounded cobbles, trace boulders to 15 inches maximum dimension.
		Bottom at 6.1 feet. Free ground water encountered at 4.3 feet.

TEST PIT LOGS

Test Pit Number	Depth (Feet)	Description
TP-C5	0 – 1.2	Grayish brown CLAYEY SAND, SC, very moist, loose to medium dense, with minor predominantly subrounded gravel to 1¼ inches maximum dimension, fine roots common.
	1.2 – 3.0	Dark grayish brown CLAYEY SAND, SC, moist to very moist, medium dense to dense, with minor subangular to subrounded gravel to 2 inches maximum dimension, trace fine roots.
	3.0 – 4.4	Dark yellowish brown CLAYEY SAND, SC, moist to very moist, medium dense, with minor subangular to subrounded gravel to 2½ inches maximum dimension.
	4.4 – 6.0	Dark grayish brown CLAYEY SAND, SC, very moist to wet, medium dense, with minor subangular to subrounded predominantly fine gravel.
		Bottom at 6.0 feet. Free ground water encountered at 5.7 feet.
TP-C6	0 – 1.4	Dark grayish brown CLAYEY SAND, SC, very moist, loose to medium dense, with minor subangular to subrounded gravel to 1½ inches maximum dimension, fine roots common.
	1.4 – 3.2	Grayish brown CLAYEY SAND, SC, very moist, medium dense, with minor predominantly subrounded gravel to 1½ inches maximum dimension, trace fine roots.
	3.2 – 7.2	Grayish brown POORLY GRADED GRAVEL, GP, loose to medium dense, very moist becoming wet, gravels predominantly subrounded and coarse grain, with cobbles to 7 inches maximum dimension common.
		Bottom at 7.2 feet. Free ground water encountered at 3.8 feet.