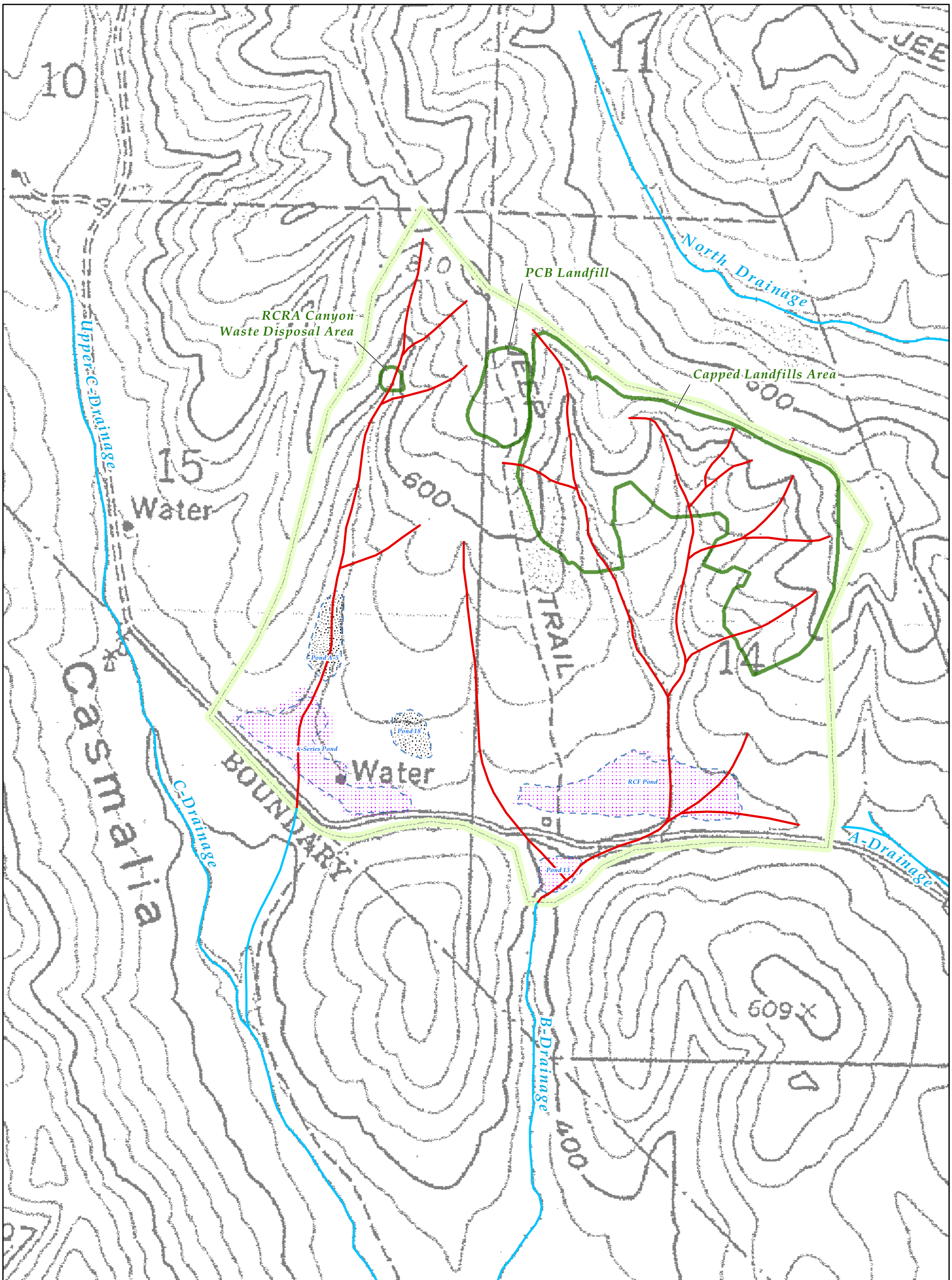


Explanation

Historical (1959) Features

- Off-Site Drainage
- On-Site Drainage

Current (2009) Features

- Casmalia Site Boundary
- Landfill Limits
- Approximate Pond Waterline
- Approximate Location of Stormwater Pond
- Approximate Location of Treated Liquid Impoundment

0 600 1,200

Scale in Feet (1 " = 600 ft)

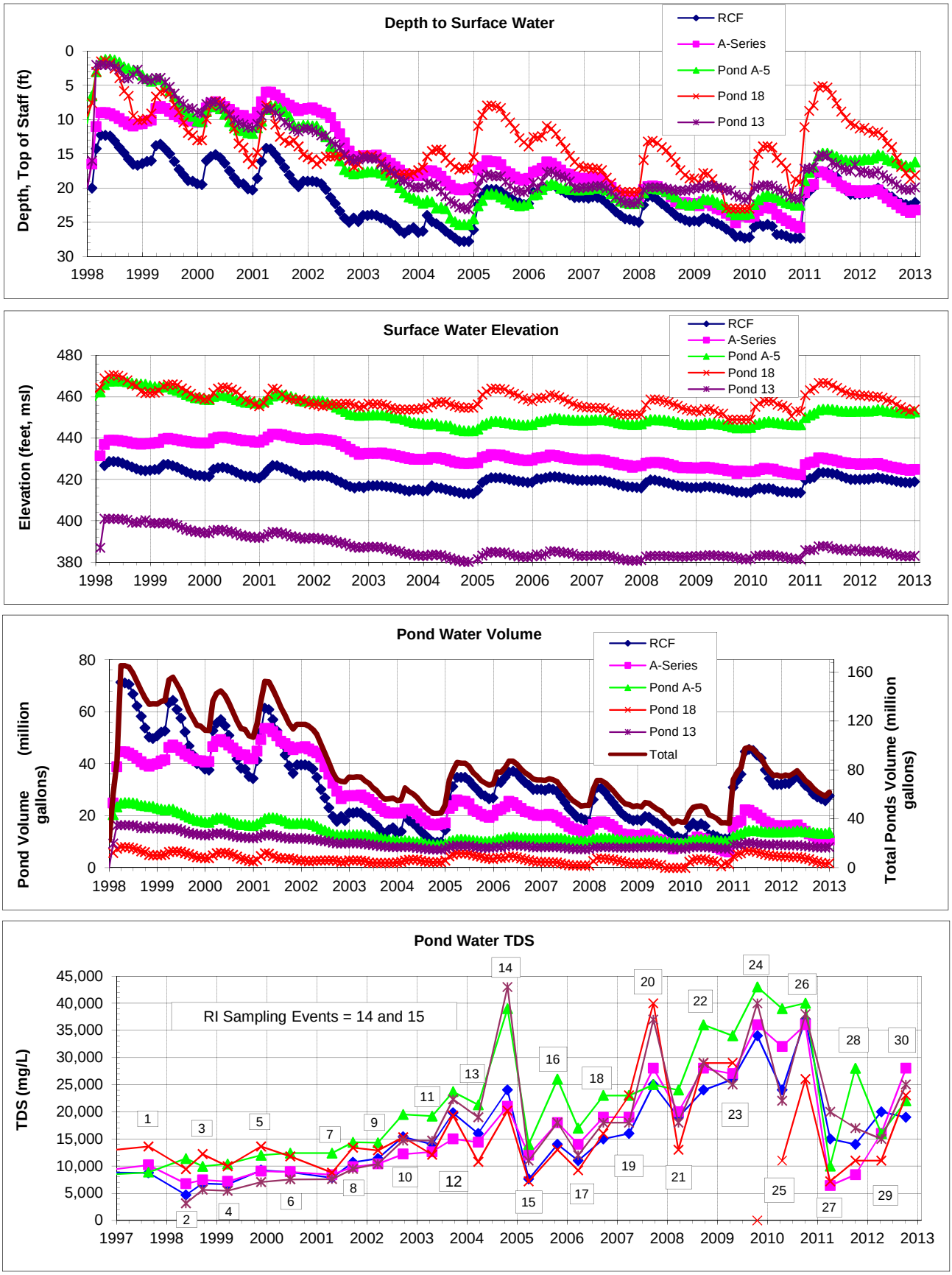
Figure 4-1

Pre-Development Site Drainage - 1959

Feasibility Study
Casmalia Resources Superfund Site

Source: Topographic base map provided by Pacific Engineering, Inc. from aerial survey dated March 4, 2004.

Figure 4-2
Pond Levels, Volumes, and TDS



Note: Pond volumes calculated from pond level-volume relationships in Groundwater Data Summary Report 1992-2000 (HLA, October 20, 2000)
Data compiled from January 1998 through December 2013

Qs | Qds | Qg | Qa | Qls

SURFICIAL SEDIMENTS

Qs *beach sand deposits*
Qds *dune sand deposits*
Qa *valley and floodplain alluvial deposits*
Qls *landslide debris*

Qos | Qoa | Qo

OLDER DISSECTED SURFICIAL SEDIMENTS

Qos *dune sand deposits, in places weakly consolidated*
Qoa *remnants of weakly consolidated stream terrace and alluvial fan deposits of silt, sand and gravel*
Qo *Orcutt Sand: tan to rusty brown, poorly consolidated to locally indurated, wind-deposited sand; pebble gravel at base locally*

Tsqd | Tsqo | Tsq

SISQUOC FORMATION

marine; late Miocene age

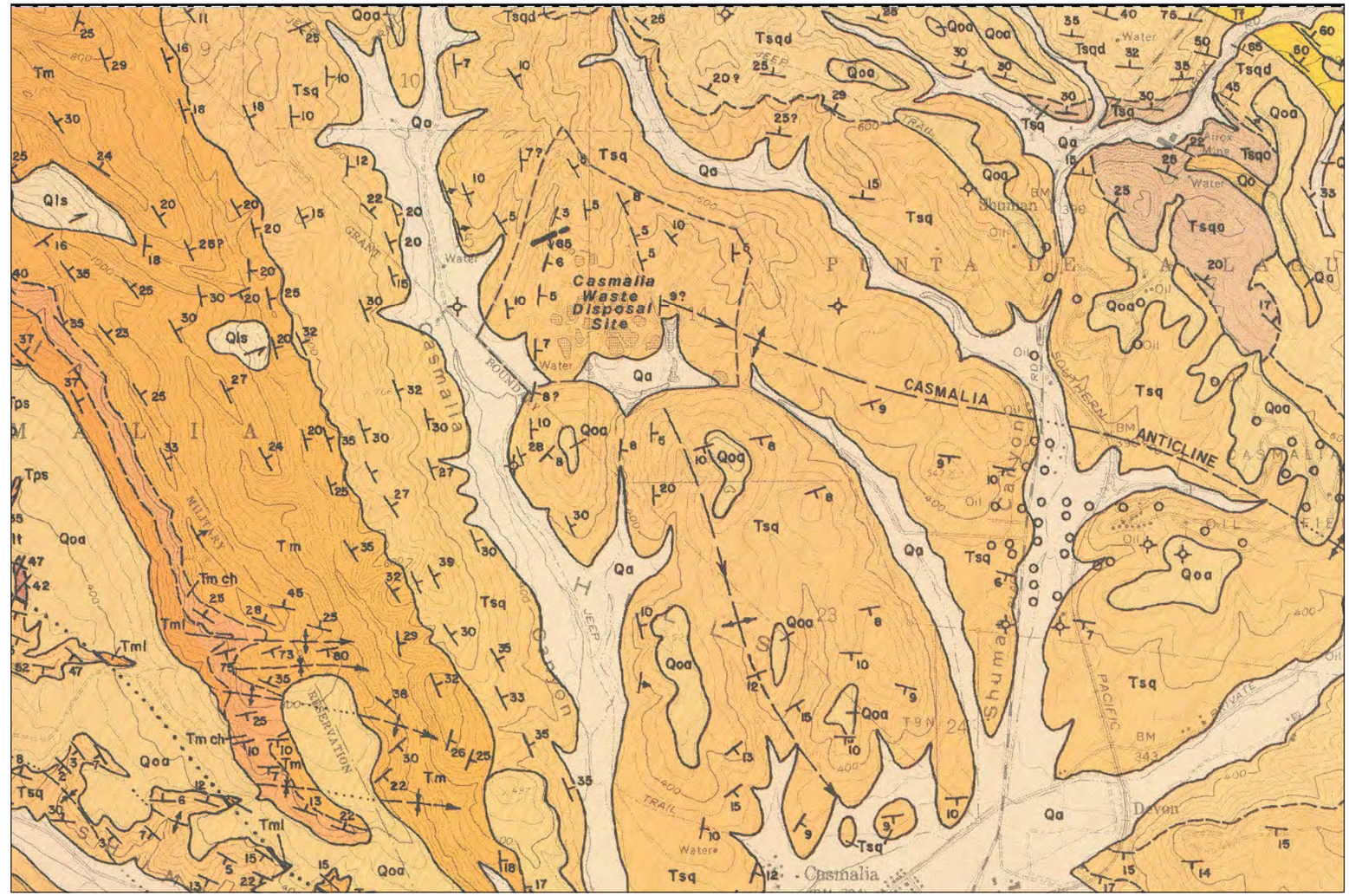
Tsqd *white to cream-white, punky, diatomaceous claystone and clayey diatomite*
Tsqo *same as Tsqd, but oil-saturated and partly burned locally to frothy stone*
Tsq *(Todos Santos Claystone Member of Woodring and Bramlette, 1950): light gray claystone and slightly diatomaceous or siliceous clay shale*

Tm | Tmch | Tml

MONTEREY SHALE

marine; middle to late Miocene age
Tm and Tmch - Mohnian Stage;
Tml - Luisian and Relizian(?) Stages

Tm *upper shale unit: white-weathering, thin bedded, hard, platy, porcelaneous siliceous shale*
Tmch *same as Tm, but brittle and cherty*
Tml *lower shale unit: white-weathering, thin bedded, fissile to platy, semi-siliceous shale with thin, hard limestone strata*



SYMBOLS

not all symbols present on each map

FORMATION CONTACT *dashed where inferred or indefinite*

MEMBER CONTACT

CONTACT BETWEEN SURFICIAL SEDIMENTS *located approximately in places*

U D 70 ?

FAULT

dashed where indefinite or inferred, dotted where concealed, queried where existence doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement shown by U/D (U = upthrown side D = downthrown side). Short arrow indicates dip of fault plane.

ANTICLINE

SYNCLINE

arrow on axis indicates direction of plunge, dotted where concealed

horizontal | 25 inclined | 20 inclined (approximate) | vertical | 25 overturned | 25 inclined metamorphic foliation

STRIKE AND DIP OF BEDDED ROCKS

DIRECTION OF LANDSLIDE MOVEMENT

SANDSTONE BED

CONGLOMERATE BED

ABANDONED EXPLORATORY OIL WELL

OIL WELL LOCATIONS INDICATED ON TOPOGRAPHIC BASE MAP.

Reference:
Dibblee, T.W. Jr., 1989, Geologic map of the Casmalia and Orcutt quadrangles, Santa Barbara County, California: Diblee Geological Foundation, Map DF-24 (Ehrenspeck, H.E., ed.), scale 1:24,000.

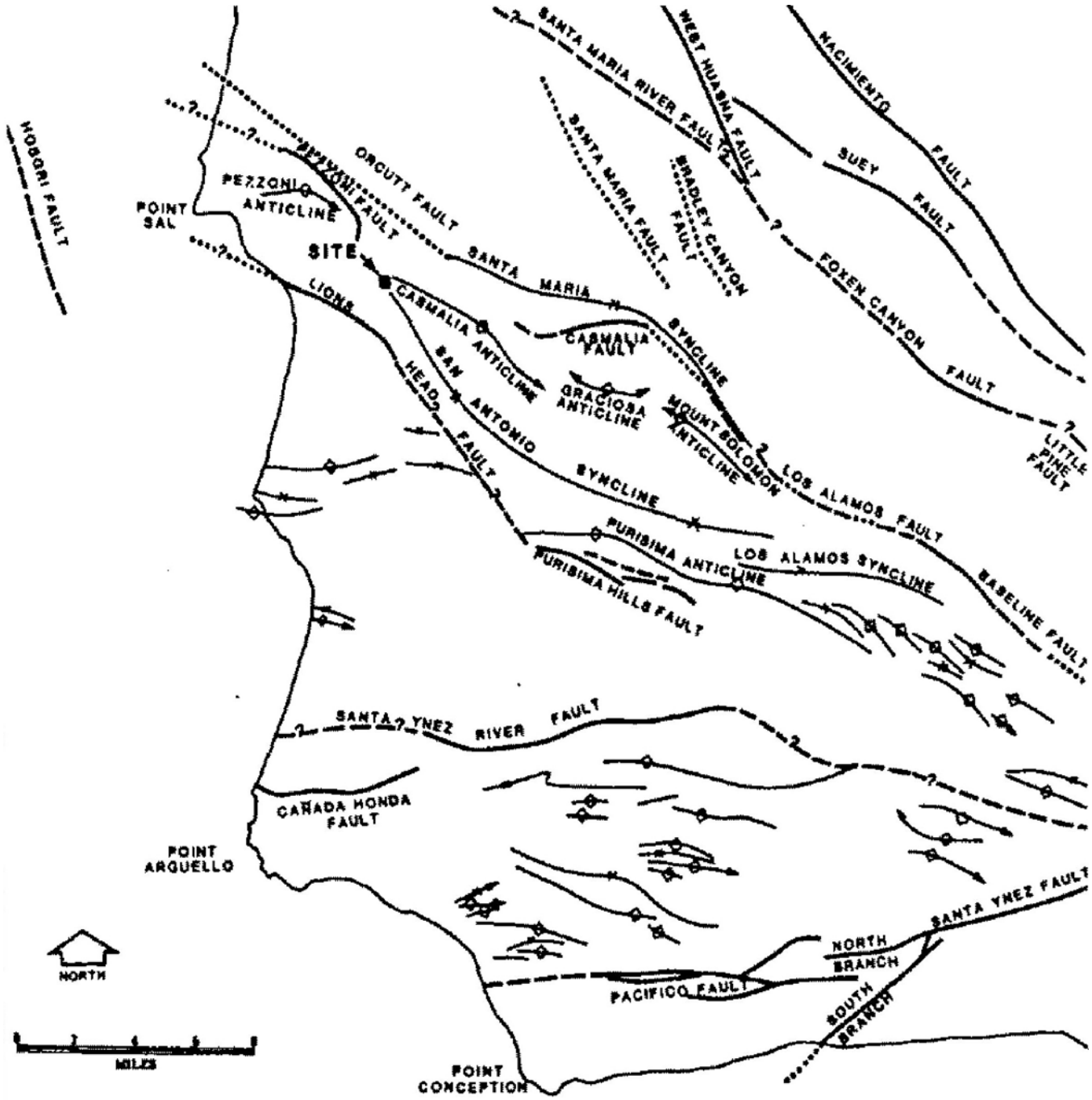
PUBLISHED IN COOPERATION WITH CALIFORNIA DEPARTMENT OF CONSERVATION, DIVISION OF MINES AND GEOLOGY; AND U.S. GEOLOGICAL SURVEY

0 2,000
Scale in Feet (1 " = 2,000 ft

Figure 4-3

Geologic Map of the Casmalia Quadrangle, Santa Barbara County, California

Feasibility Study
Casmalia Resources Superfund Site



Explanation

ANTICLINAL AXIS, END ARROWS INDICATE PLUNGE

SYNCLINAL AXIS, END ARROWS INDICATE PLUNGE

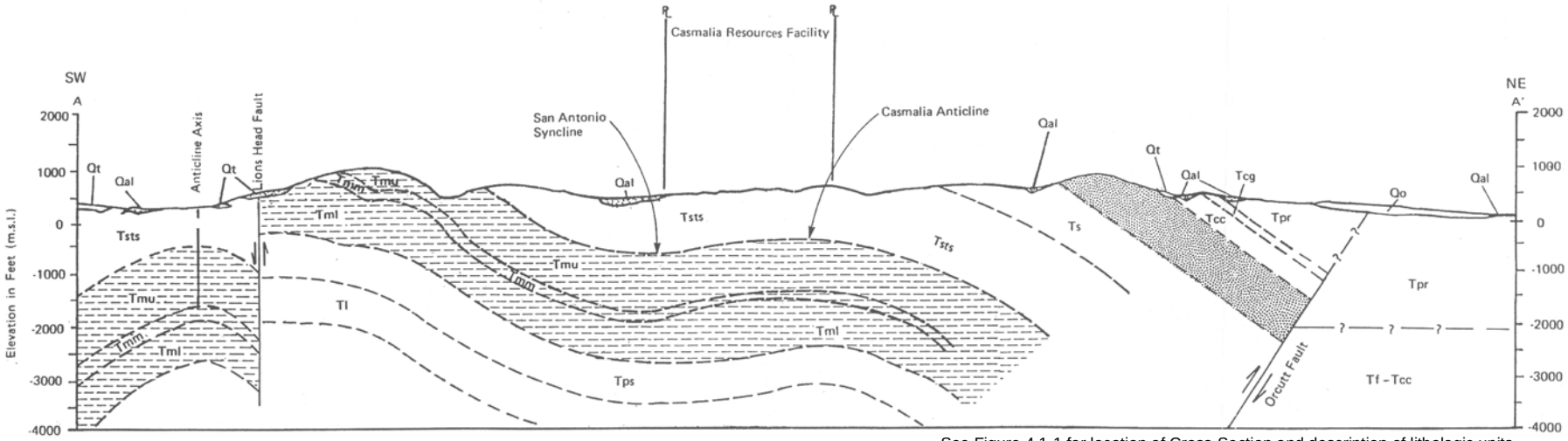
FAULTS, SOLID WHERE EXPOSED, DASHED WHERE INFERRED, DOTTED WHERE CONCEALED AND ? WHERE UNCERTAIN

Figure 4-4

Regional Folds and Faults

Feasibility Study
Casmalia Resources Superfund Site

Modified from Woodward-Clyde, 1988



See Figure 4.1-1 for location of Cross-Section and description of lithologic units

Source:
Modified from Woodring, W.P., and Bramlette, M.N., 1950, Geology and Paleontology of the Santa Maria District, California: U.S. Geological Survey Prof. Paper 222.

Note: All faults are schematic and are not to scale.

Explanation

Qal Alluvium	Tcg Graciosa Member	Tsts Todos Santos Claystone Member	Tps Point Sal Formation
Qt Terrace Deposits	Tcc Cebada Member	Tmu Monterey Shale Upper Member	Tl Undifferentiated Lospe Formation
Qo Orcutt Sand	Tf Foxen Mudstone	Tmm Monterey Shale Middle Member	
Tpr Paso Robles Formation	Ts Sisquoc Formation	Tml Monterey Shale Lower Member	

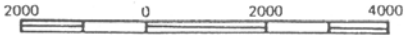
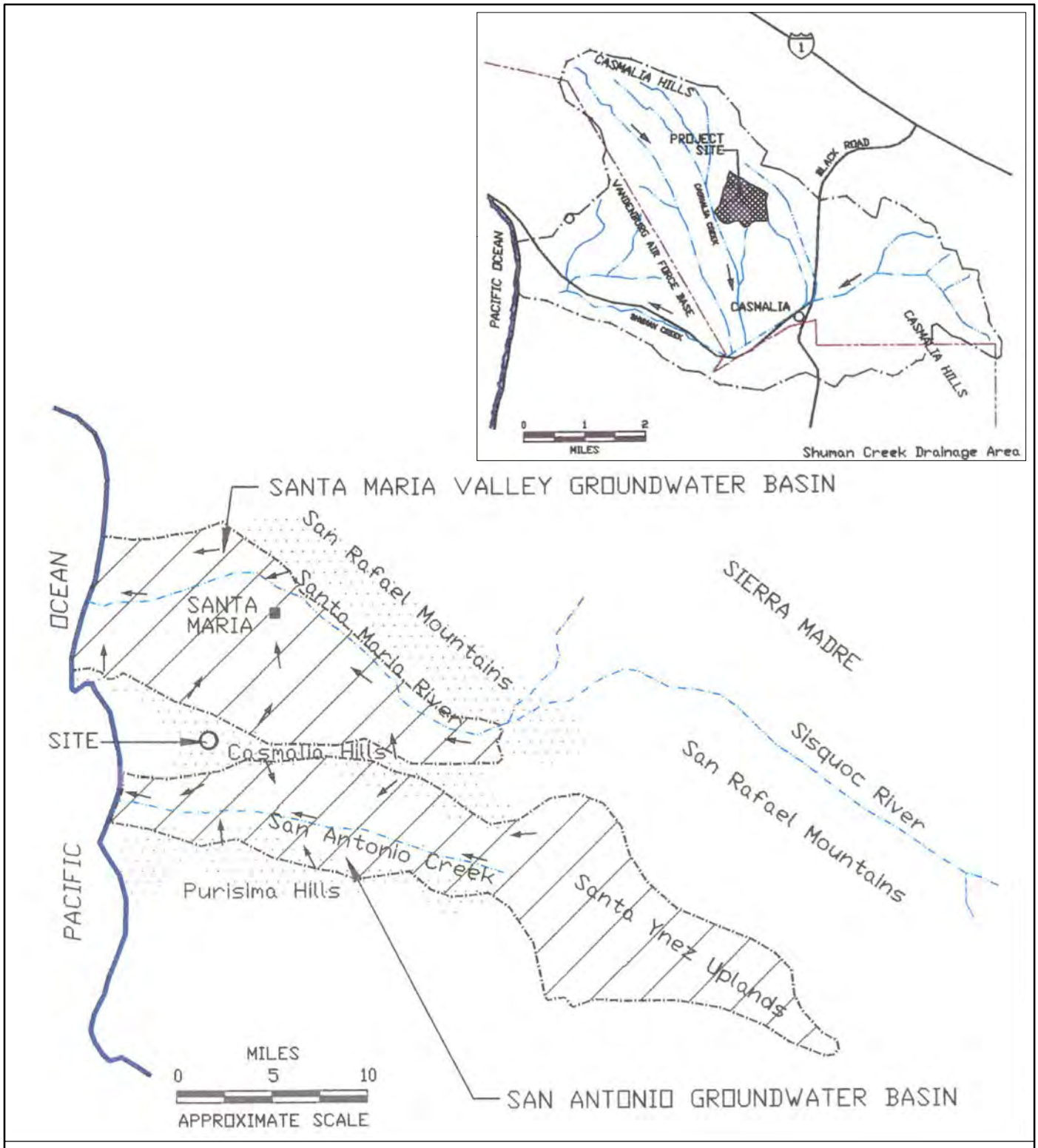


Figure 4-5

Regional Geologic Cross-Section

Feasibility Study
Casmalia Resources Superfund Site



Explanation

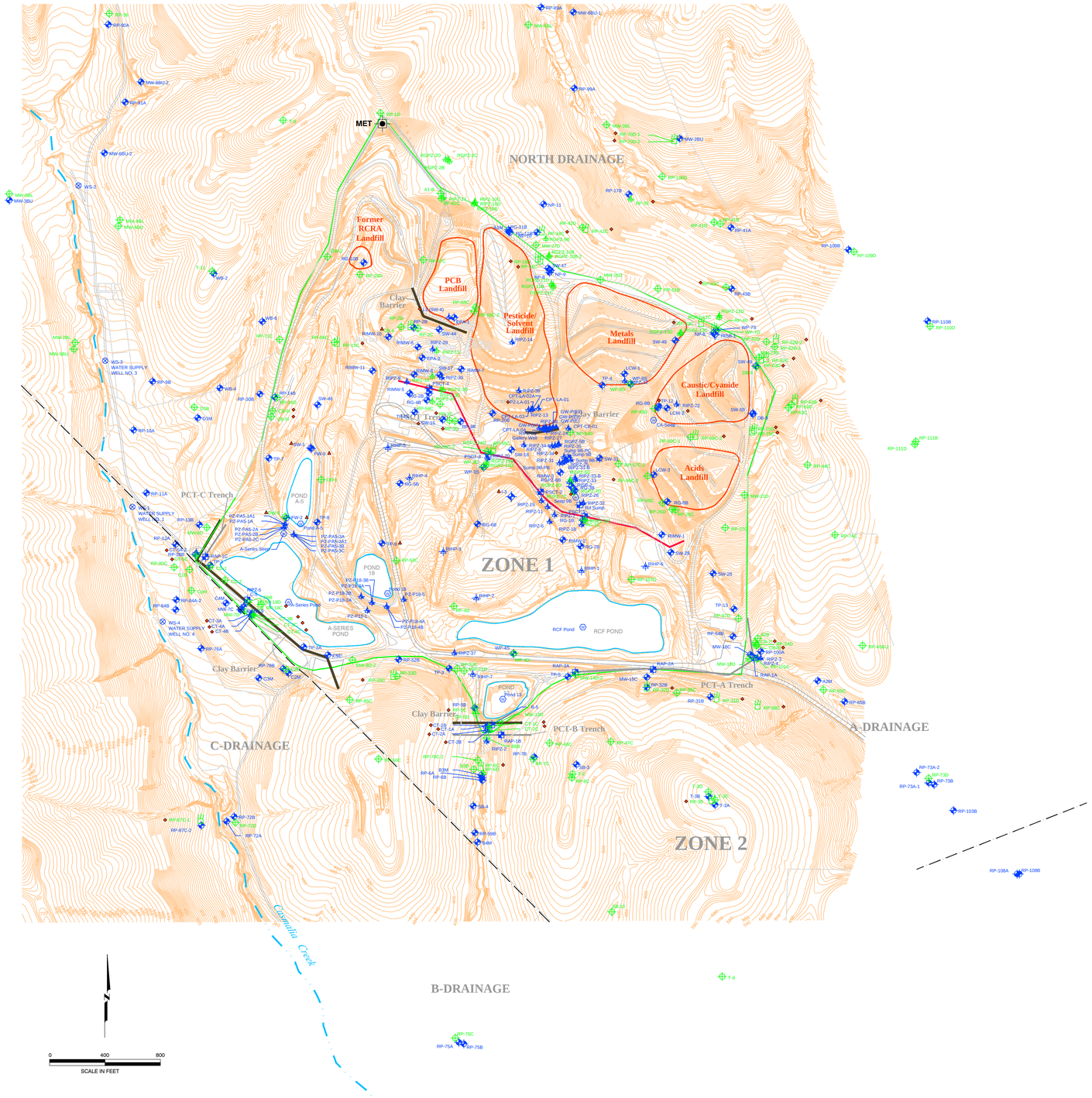
- Approximate Boundary of Groundwater Basin
- Casmalia Resources Facility
- Hills
- River/Creek
- Roads
- Pacific Coast
- Vandenburg Air Force Base Boundary
- Groundwater Flow Direction

Figure 4-6

Local Groundwater Basins

Feasibility Study
Casmalia Resources Superfund Site

Source: Topographic base map provided by Pacific Engineering, Inc. from aerial survey dated March 4, 2004.



LEGEND

- Burial Trench
- Landfill Boundaries
- Facility and Zone 1 Boundary
- Perimeter Source Control Trench (PSCT)
- Plume Capture Collection Trench (PCT)
- Clay Barrier
- Creek
- Pond Outline
- Approximate Bognuda Ranch Property Boundary (no well access)
- MW-15C — Upper HSU Monitoring Well
- GW-P(E) — Upper HSU Piezometer
- RAP-2A — Upper HSU Extraction Point
- POND18 — Upper HSU Surface Water Sample
- SW-17 — Upper HSU Other Sampling Point
- RHP-1 — Upper HSU Hydropunch
- Lower HSU Vibrating Wire Transducer
- RGPZ-6D — Lower HSU Piezometer
- RP-63C — Lower HSU Monitoring Well
- MET — Meteorological Station
- CB-4 — Indicates well is unsafe to access
- RP-63B — Indicates well is damaged/inoperable

NOTES:

Topo map revised 1998, 2000, 2004. Topo with P/S landfill and borrow area revised 2000. (Foster-Wheeler).

Zone 1 boundary (green) is approximate and includes the area within the facility boundary.

Map does not include historical wells.

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NO.	DATE	REVISIONS	BY	CHK

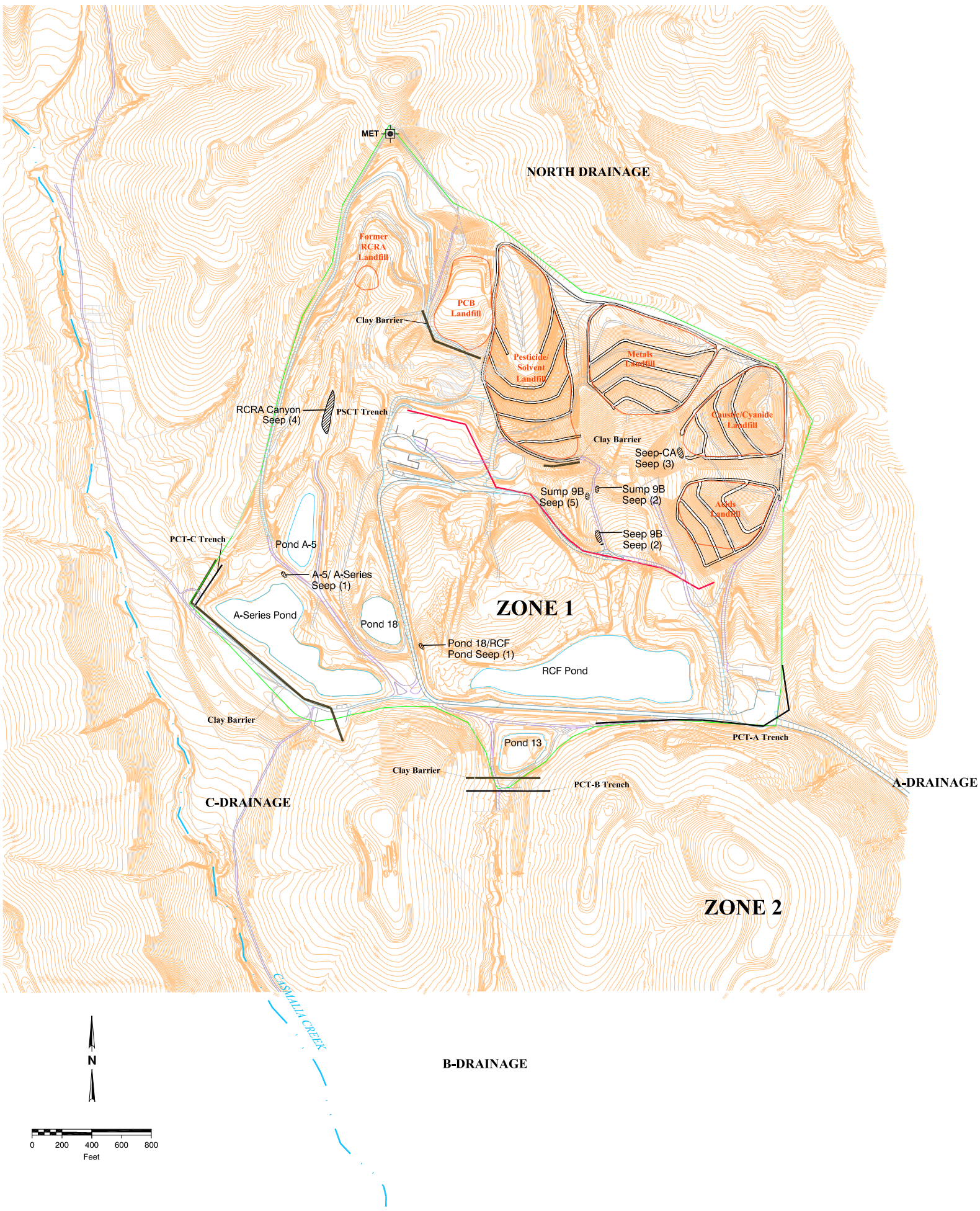
DRAWN: RJP	PROJECT NO: OD12162800		
ENGINEER:	SCALE: 1"= 400'		
CHECKED: WJF	APPROVED: WBC		
DATE: 8/2014	DATE: 8/2014		

Feasibility Study

Casmalia Resources Superfund Site
Casmalia, California

Well Location Map
All Site Wells

FIGURE: 4-7
SHEET: 1 OF 1
REVISION NUMBER: 0
DATE: August 2014



LEGEND

- Burial Trench
- Landfill Boundaries
- Facility and Zone 1 Boundary
- Perimeter Source Control Trench (PSCT)
- Plume Capture Collection Trench (PCT)
- Clay Barrier
- Creek
- Pond Outline

(1) Not Observed Since 2004
(2) Not Observed Since 1999
(3) Not Observed Since 2000
(4) Occurs Annually with the Winter Rainy Season
(5) Observed in 2012

NOTES:

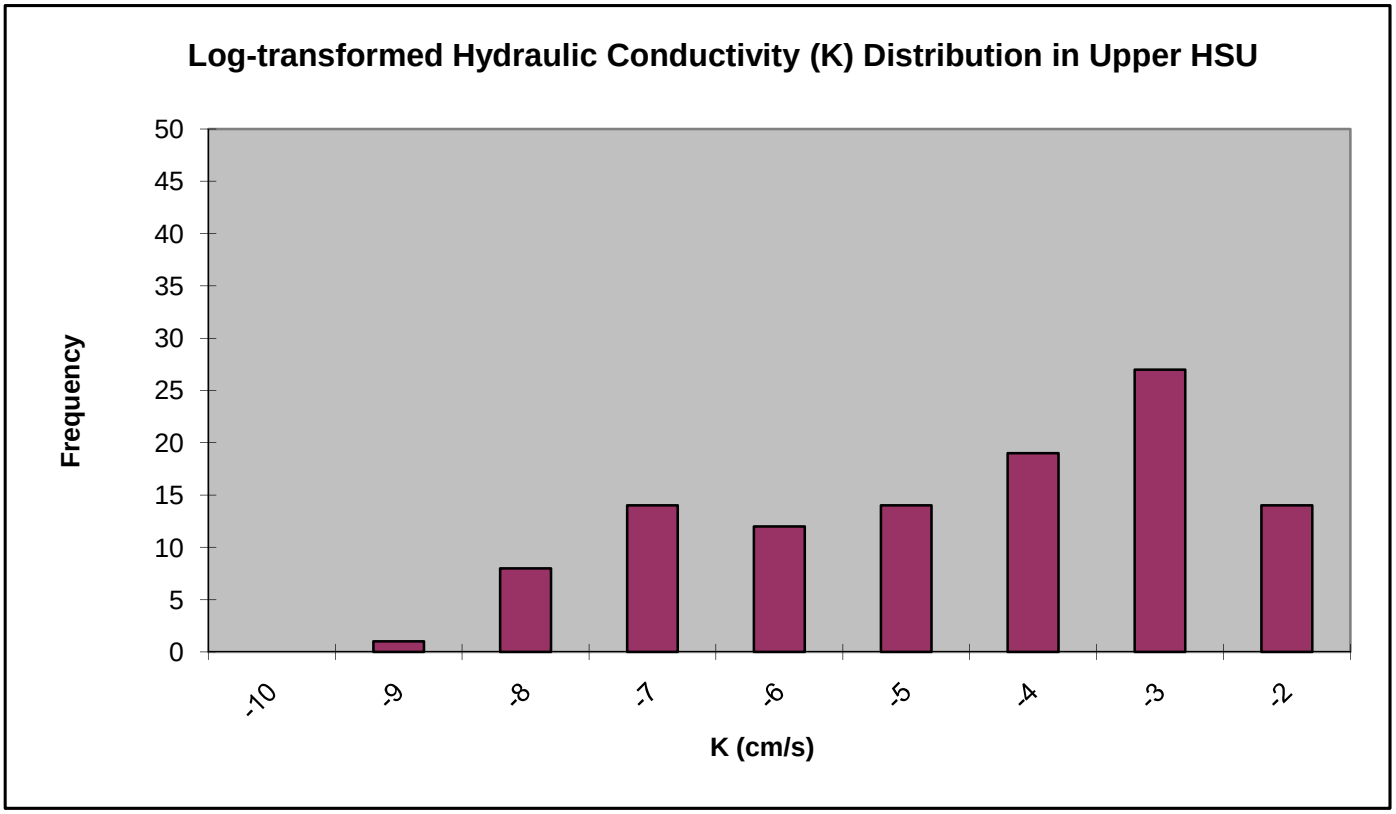
Topo map revised 1998, 2000, 2003.
Topo with P/S landfill and borrow area revised 2000 (Foster-Wheeler).

Zone 1 boundary (green) is approximate and includes the area within the facility boundary.

Figure 4-8

Areal Distribution of Historical Seeps

Feasibility Study
Casmalia Resources Superfund Site



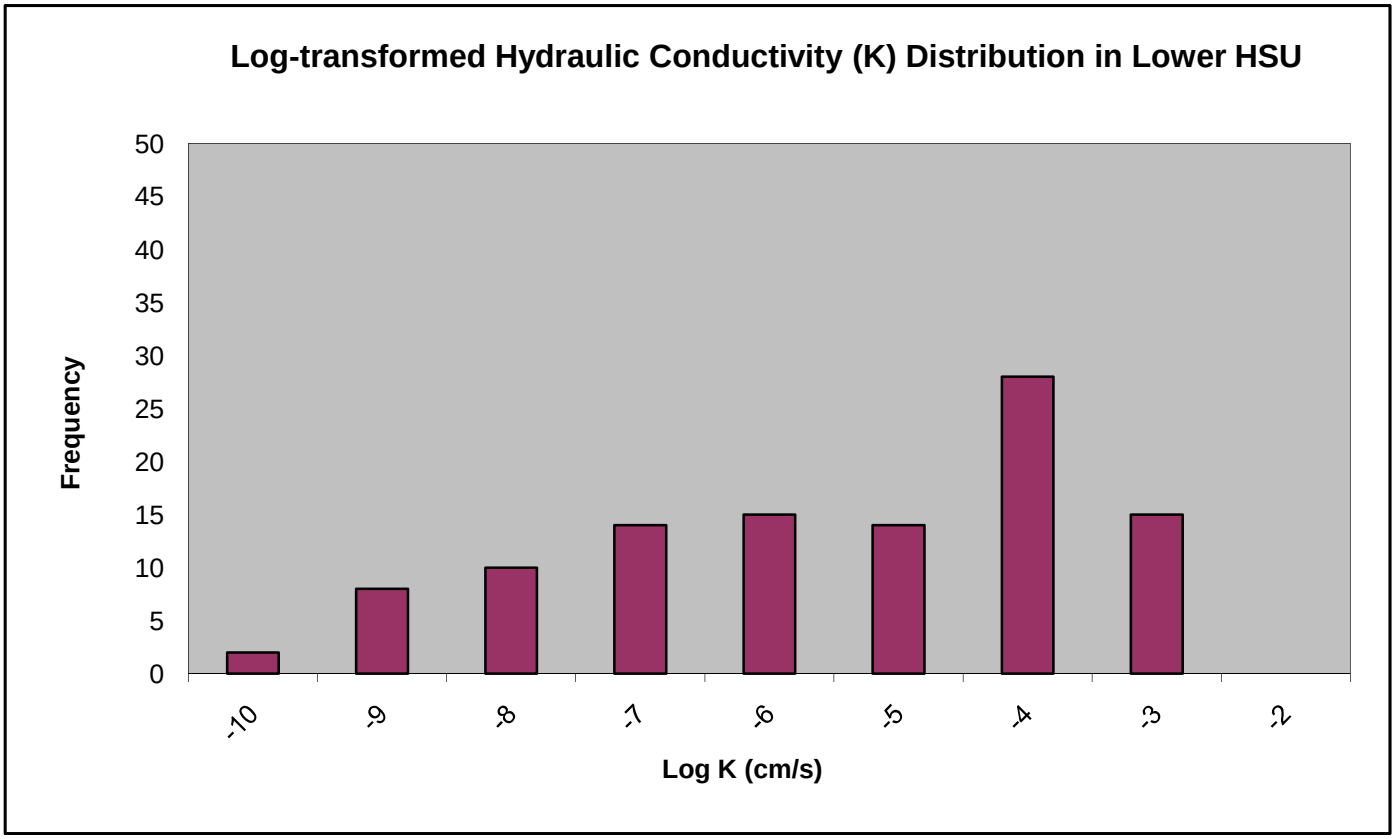
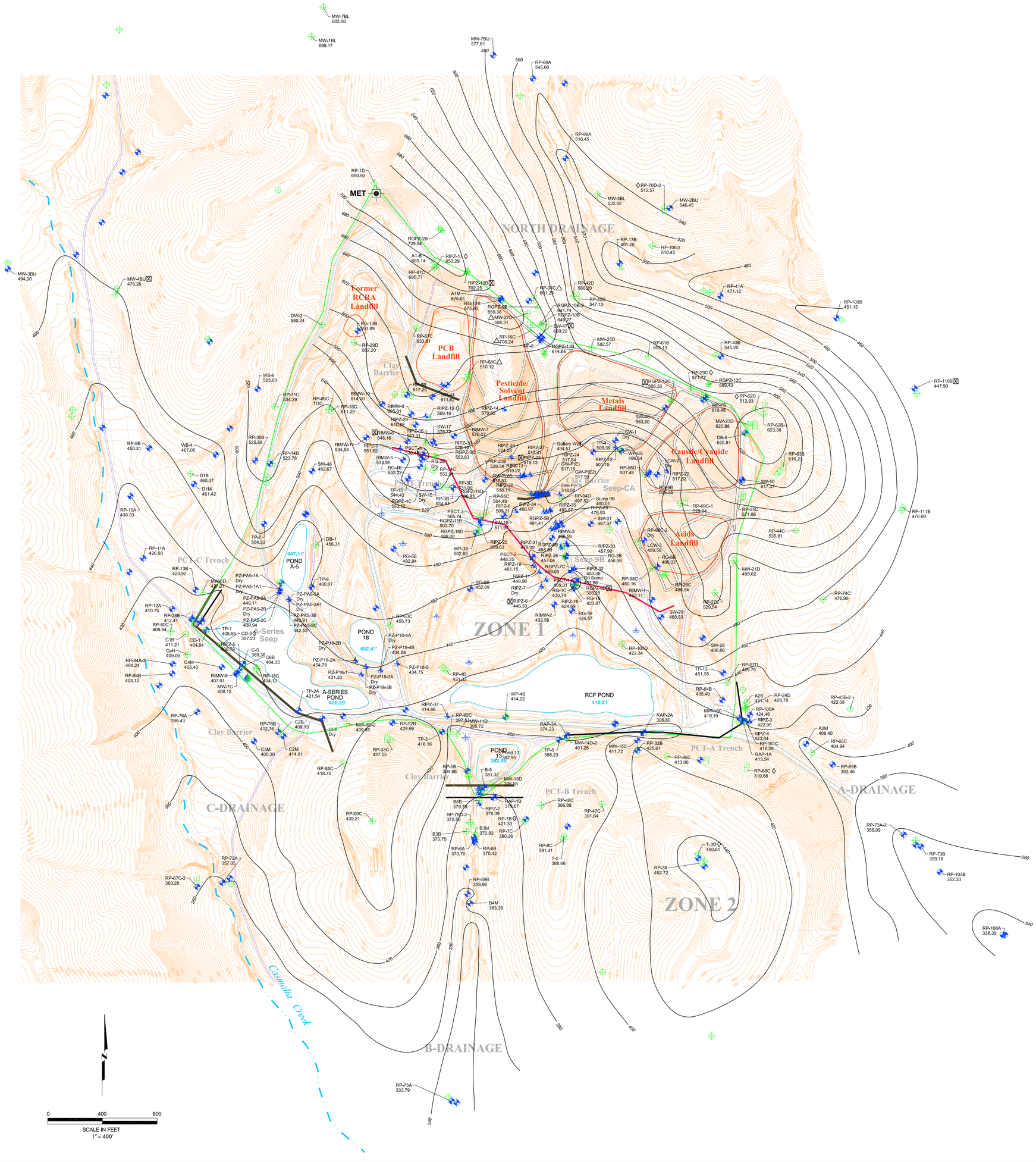


Figure 4-9

Statistical Representation of Hydraulic Conductivity Results for Upper/Lower HSUs

Feasibility Study
Casmalia Resources Superfund Site



LEGEND

- Burial Trench
- Landfill Boundaries
- Facility and Zone 1 Boundary
- Perimeter Source Control Trench (PSCT)
- Plume Capture Collection Trench (PCT)
- Clay Barrier
- Creek
- Pond Outline
- Topographic Contours (contour interval is 10 feet)
- 420 — Groundwater Elevation Contour (feet above mean sea level)
- 422.31 — Groundwater Elevation (feet above mean sea level); measured between December 16 and 29, 2008
- 422.0' — Pond Stage Elevation
- MW-15C — Upper HSU Monitoring Well
- GW-P(E) — Upper HSU Piezometer
- RAP-2A — Upper HSU Extraction Point
- RP-83D — Lower HSUPiezometer with Vibrating Wire Transducer
- RP-83C — Lower HSU Monitoring Well
- RIPZ-17 — Lower HSU Piezometer
- MET — Meteorological Station
- Water Level May Not Be in Equilibrium
- △ Deeper Lower HSU Well or Piezometer; water level not used in contouring
- ◊ Water Level Not Used in Contouring

NOTES:

Topo map revised 1998, 2000 and 2003.

Zone 1 boundary (green) is approximate and includes the area within the facility boundary.

0 400 800
SCALE IN FEET
1" = 400'

Figure 4-10

Water Table Contour Map December 2008

Feasibility Study
Casmalia Resources Superfund Site
October 2011

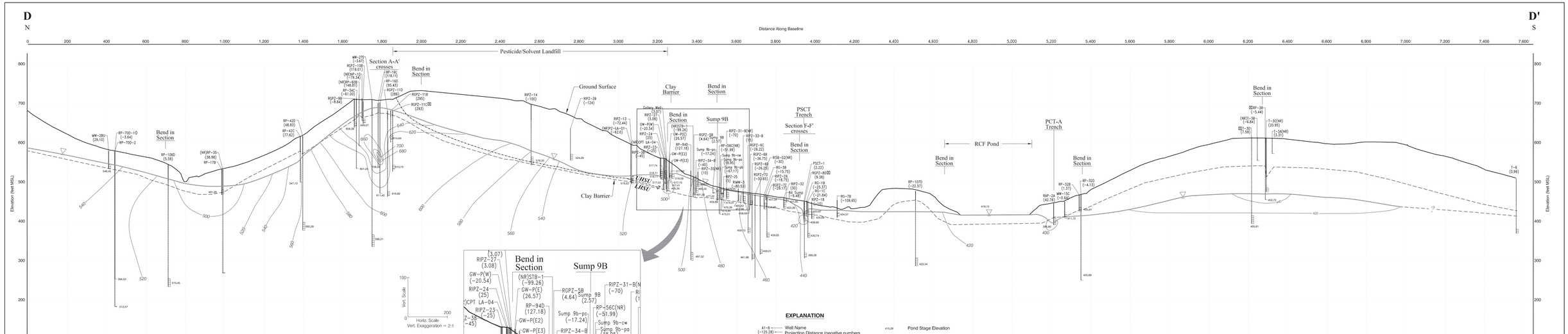


Figure 4-11

Site-wide Cross-section D-D'

Feasibility Study
Casmalia Resources Superfund Site

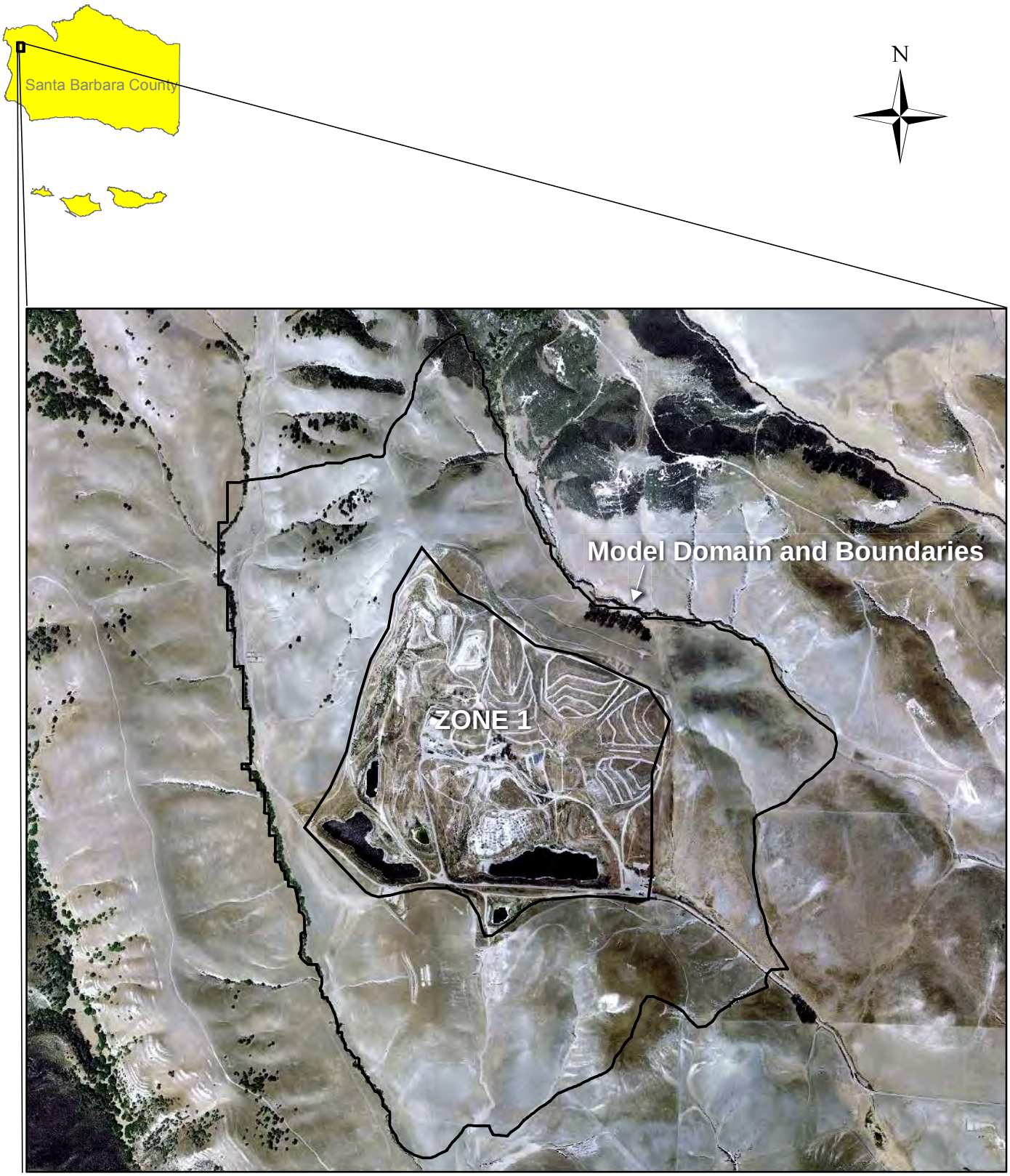
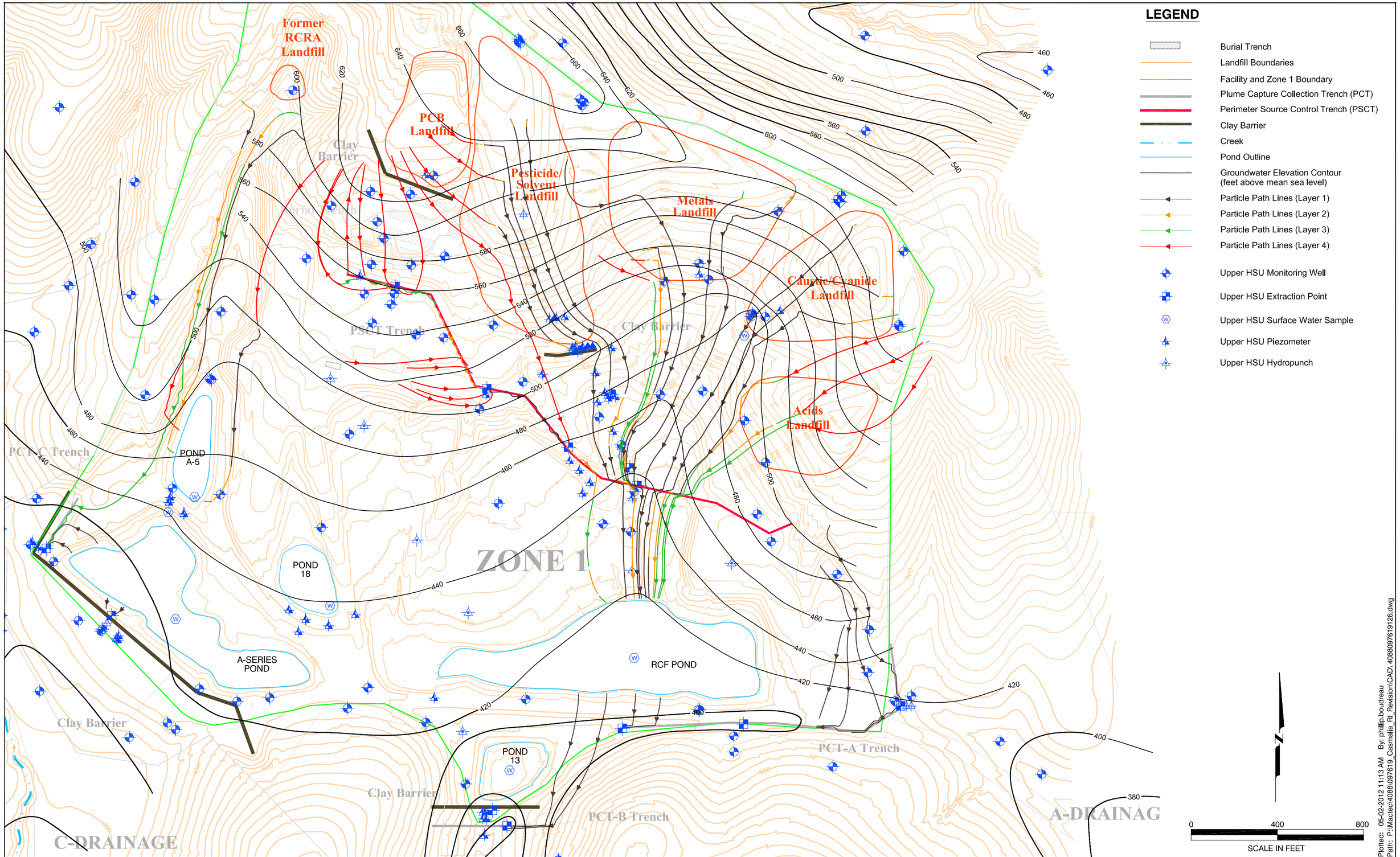


Figure 4-12

Model Domain and Boundaries

Feasibility Study
Casmalia Resources Superfund Site



NO.	DATE	REVISIONS	BY	CHK

DRAWN:	LNC	PROJECT NO:	4088097619
ENGINEER:		SCALE:	1"=400'
CHECKED:	NAM	APPROVED:	WJF
DATE:	4/2012	DATE:	4/2012

Feasibility Study

Casmalia Resources Superfund Site
Casmalia, California

Potentiometric Surface Contours/Particle Flow Map
Upper HSU, 2004 (Dry)

PLATE: 4-14
SHEET: 1 OF 1
REVISION NUMBER: 0
DATE: April 2012

Plotted: 05-02-2012 11:13 AM By: phillip.boudreau
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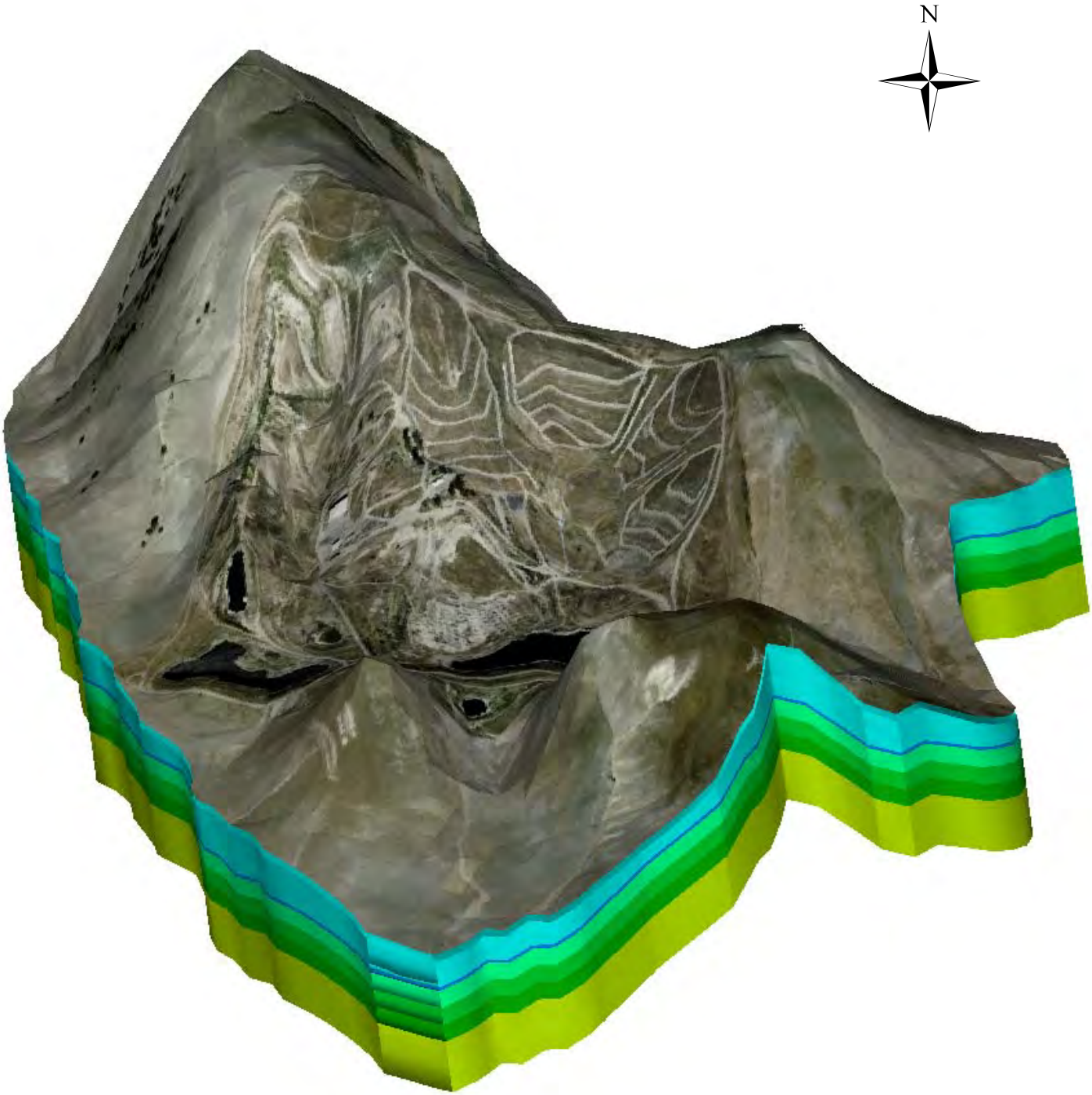
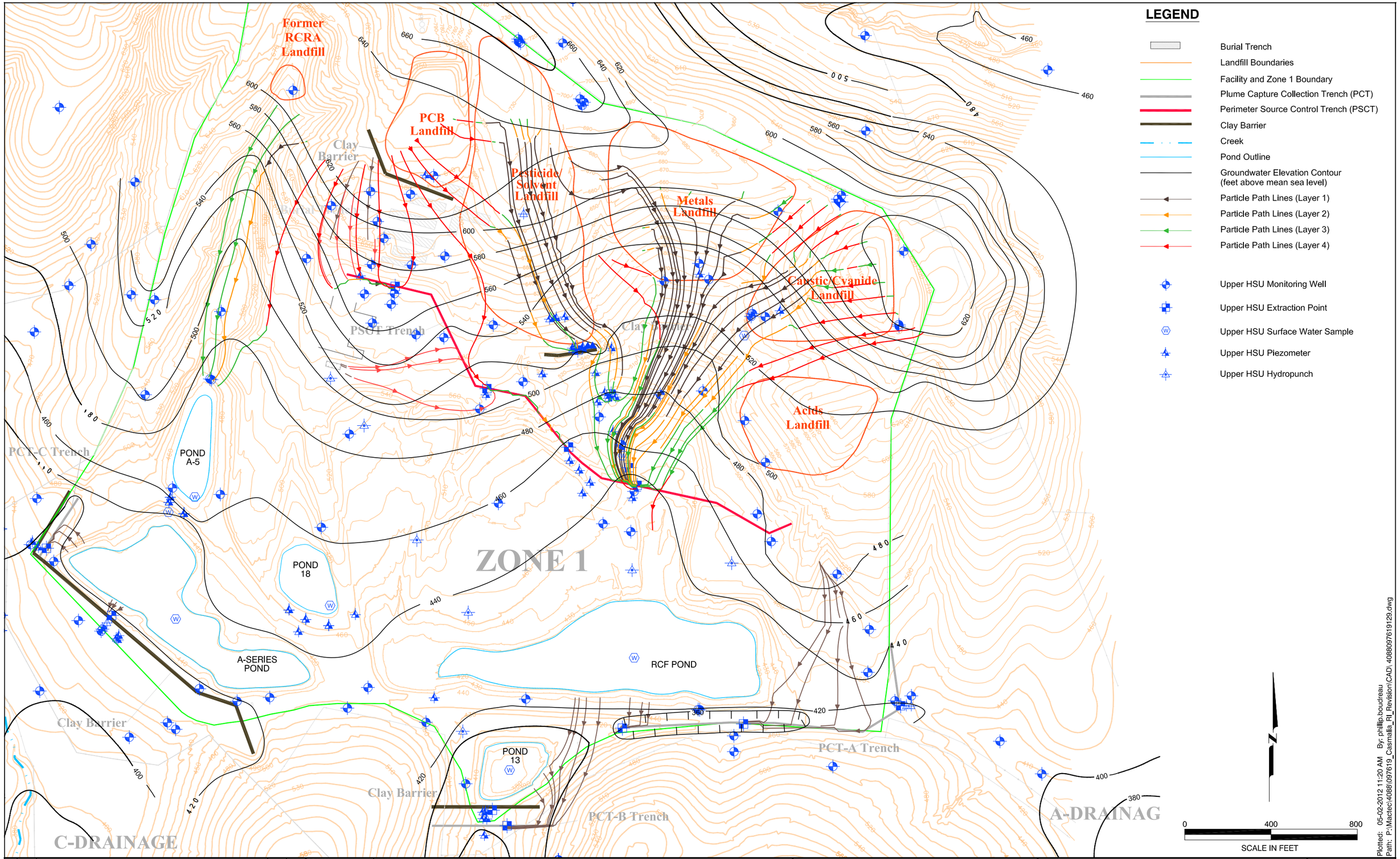


Figure 4-13

MODFLOW Model Domain and Layering

Feasibility Study
Casmalia Resources Superfund Site



NO.	DATE	REVISIONS	BY	CHK

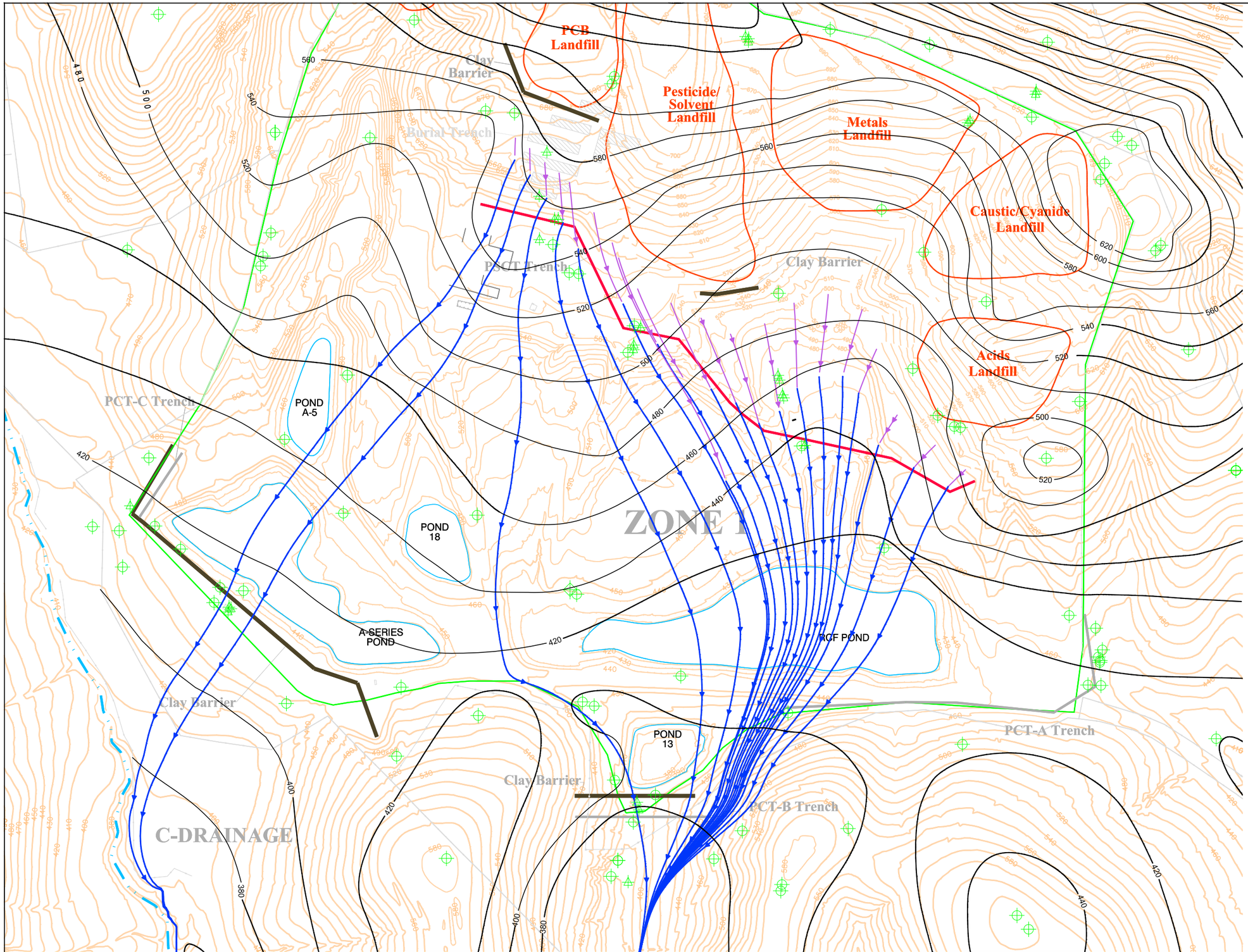
DRAWN:	LNC	PROJECT NO:	4088097619
ENGINEER:		SCALE:	1"=400'
CHECKED:	NAM	APPROVED:	WJF
DATE:	4/2012	DATE:	4/2012

Feasibility Study

Casmalia Resources Superfund Site
Casmalia, California

Potentiometric Surface Contours/Particle Flow Map
Upper HSU, 2001 (Wet)

PLATE: **4-15**
SHEET: 1 OF 1
REVISION NUMBER: 0
DATE: April 2012



LEGEND

- Burial Trench
- Landfill Boundaries
- Facility and Zone 1 Boundary
- Plume Capture Collection Trench (PCT)
- Plume Capture Collection Trench (PCT)
- Clay Barrier
- Creek
- Pond Outline
- Groundwater Elevation Contour (feet above mean sea level)
- Particle Path Lines (Layer 6)
- Particle Path Lines (Layer 7)
- Lower HSU Monitoring Well
- Lower HSU Piezometer

N

0 400 800

SCALE IN FEET

Plotted: 05-03-2012 5:03 PM By: phillip.boudreau
Path: P:\Mactec\4088\097619_Casmalia_RI_Revision\CAD\ 4088097619131.dwg

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ENGINEER:	SCALE: 1"=400'		
CHECKED: NAM	APPROVED: WJF		
DATE: 4/2012	DATE: 4/2012		

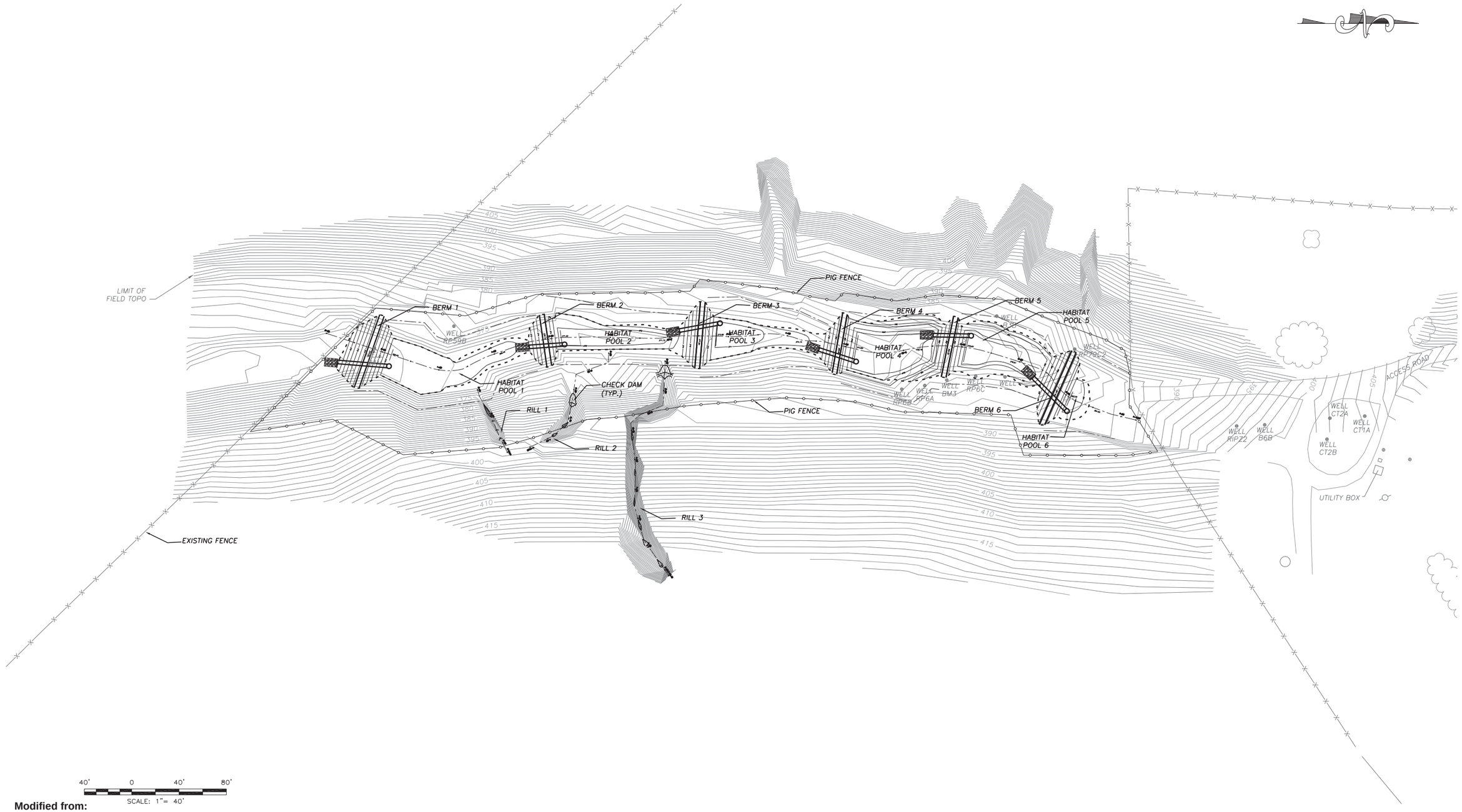
Feasiblity Study

Casmalia Resources Superfund Site
Casmalia, California

Potentiomentric Surface Contours/Particle Flow Map
Lower HSU, 2004 (Dry)

FIGURE: **4-16**
SHEET: 1 OF 1
REVISION NUMBER: 0
DATE: April 2012

T/Ladd/Casmalia/312-047



Modified from:

Final Design Report, Former Casmalia Hazardous Waste Facility B-Drainage Alternate Habitat Area. Casmalia Resources Site Steering Committee, June 2008.

Figure 4-17

REV. NO.	DATE	BY	DESCRIPTION

ENGINEER'S STAMP: REGISTERED PROFESSIONAL ENGINEER SETH A. GENTELLER NO. C 62765 Exp 6/30/08 CIVIL STATE OF CALIFORNIA

DESIGNED & DRAWN: SS/AZJ DATE: 06/06/08

CHECKED: SH DATE: 06/06/08

APPROVED: SAG DATE: 06/06/08

CASMALIA RESOURCES SITE STEERING COMMITTEE

SANTA BARBARA COUNTY, CA

PREPARED BY: URS

1333 BROADWAY, SUITE 800
OAKLAND, CA 94612
PHONE: (510) 893-3600
FAX: (510) 874-3268

B- DRAINAGE HABITAT POOL DESIGN

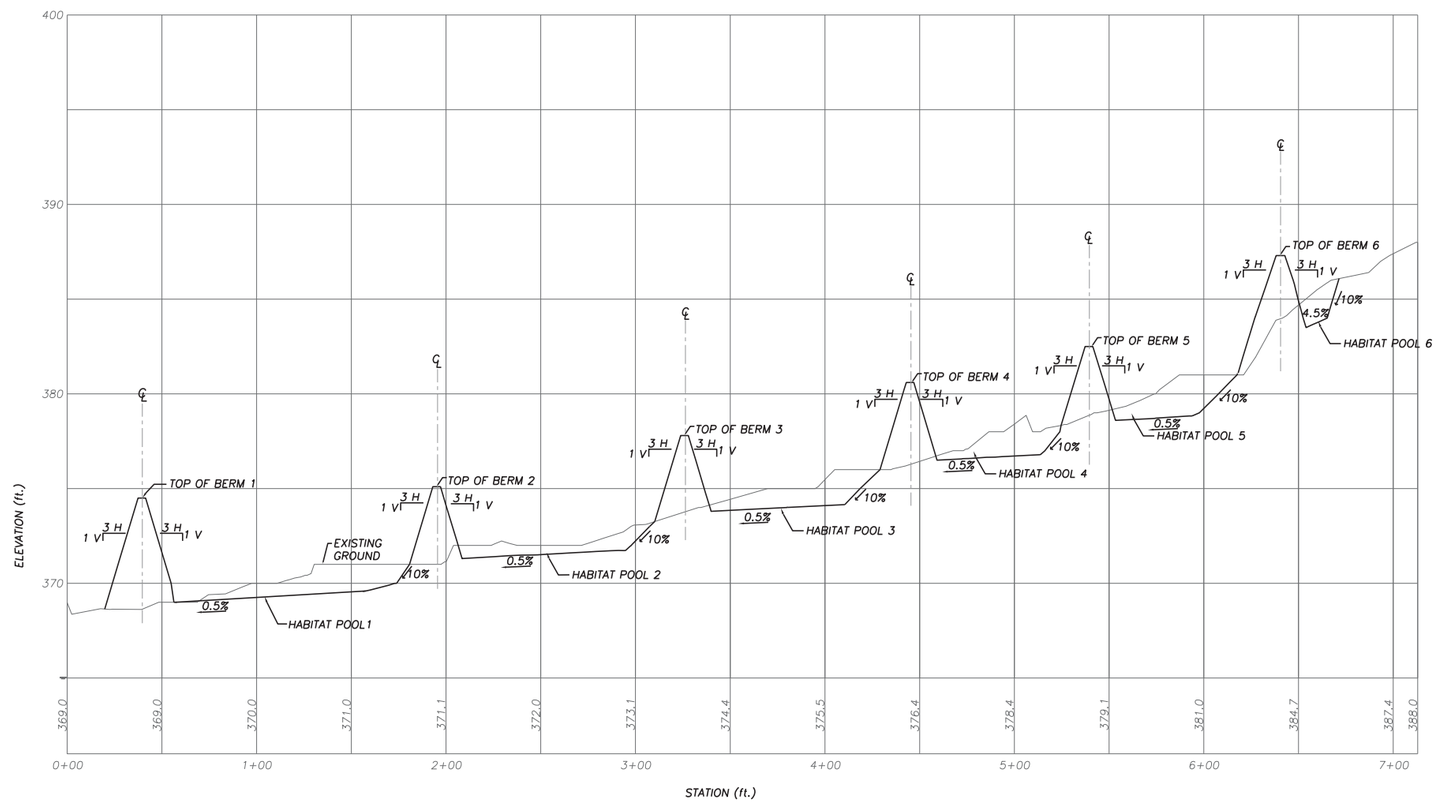
Feasibility Study

GENERAL ARRANGEMENT PLAN

PROJ. NO. 28906988

SHT. 4 OF 26 SHTS.

DWG. NO. T-4



POOL CENTERLINE PROFILE

HORIZONTAL SCALE 1" = 40'
VERTICAL SCALE 1" = 4'

Modified from:

Final Design Report, Former Casmalia Hazardous Waste Facility B-Drainage Alternate Habitat Area, Casmalia Resources Site Steering Committee, June 2008.

Figure 4-18

REV. NO.	DATE	BY	DESCRIPTION

ENGINEER'S STAMP

REGISTERED PROFESSIONAL ENGINEER SETH A. GENTZLER NO. C 62765 Exp. 6/30/08 CIVIL STATE OF CALIFORNIA

DESIGNED & DRAWN: SS/AZJ DATE: 06/06/08

CHECKED: SH DATE: 06/06/08

APPROVED: SAG DATE: 06/06/08

CASMALIA RESOURCES SITE STEERING COMMITTEE

SANTA BARBARA COUNTY, CA

PREPARED BY: URS

1333 BROADWAY, SUITE 800
OAKLAND, CA 94612
PHONE: (510) 893-3600
FAX: (510) 874-3268

B- DRAINAGE HABITAT POOL DESIGN

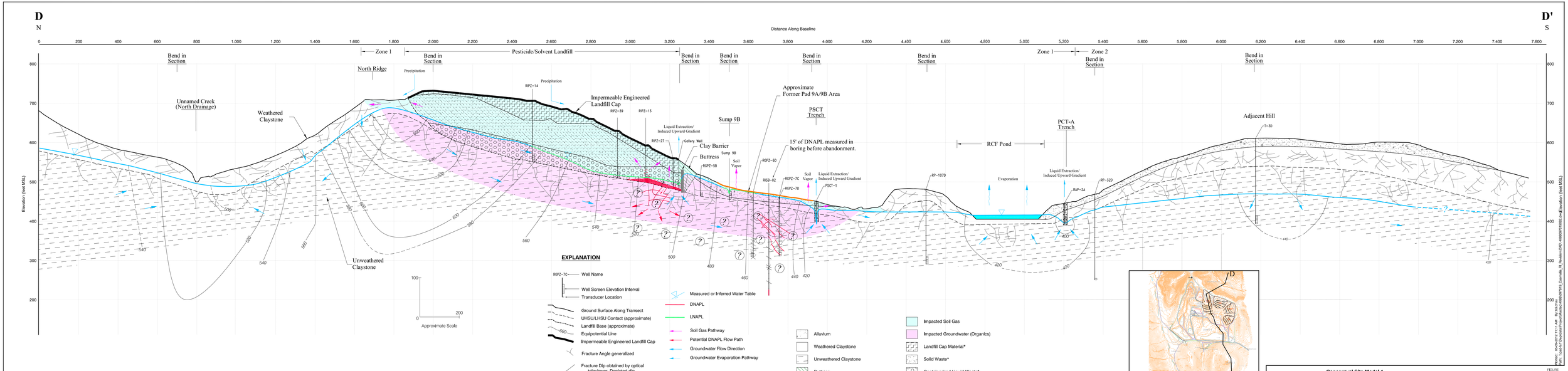
Feasibility Study

POOL CENTERLINE PROFILE

PROJ. NO. 28906988

SHT. 11 OF 26 SHTS.

DWG. NO. G-5



Conceptual Site Model 1
Transect through P/S Landfill, Central Drainage Area, former Ponds and Pads Area, and RCF Pond
Feasibility Study
Casmalia Resources Superfund Site
Casmalia, California

FIGURE
4-19

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
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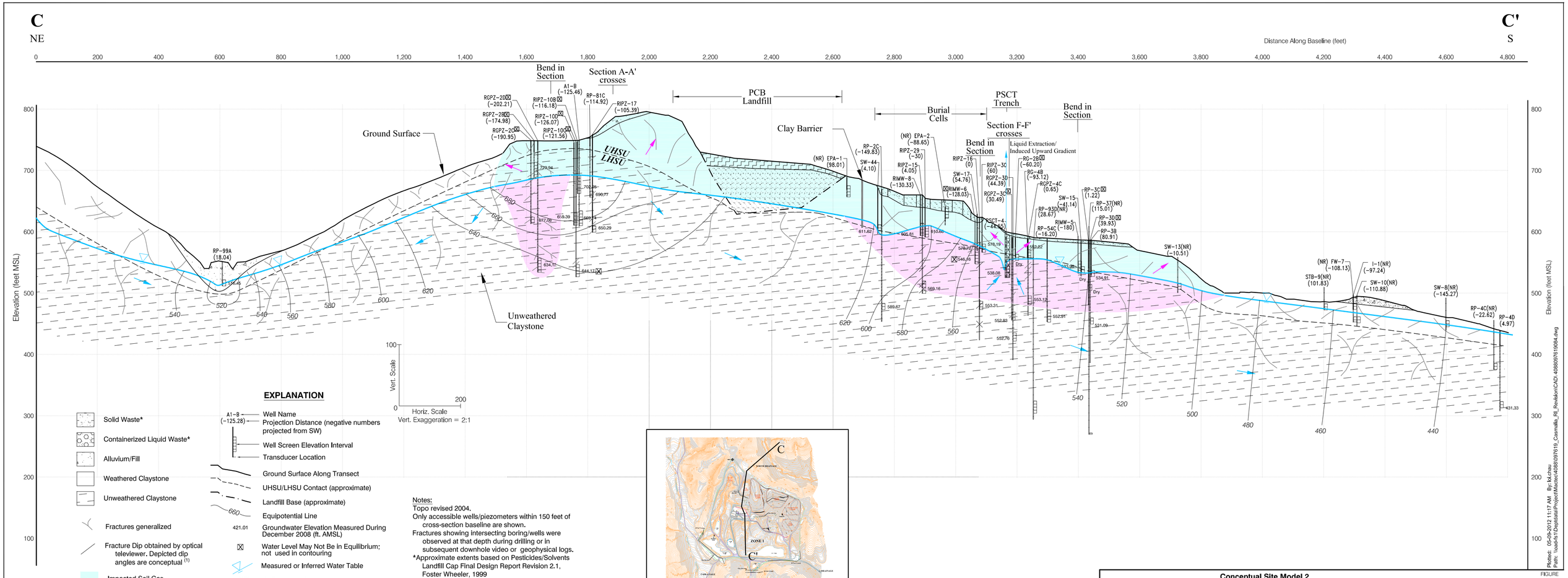

Conceptual Site Model 2
Transect Through PCB Landfill, Burial Tranch Area, Former Ponds and Pad, and RCF Pond
Feasibility Study
Casmalia Resources Superfund Site
Casmalia, California

FIGURE **4-20**

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
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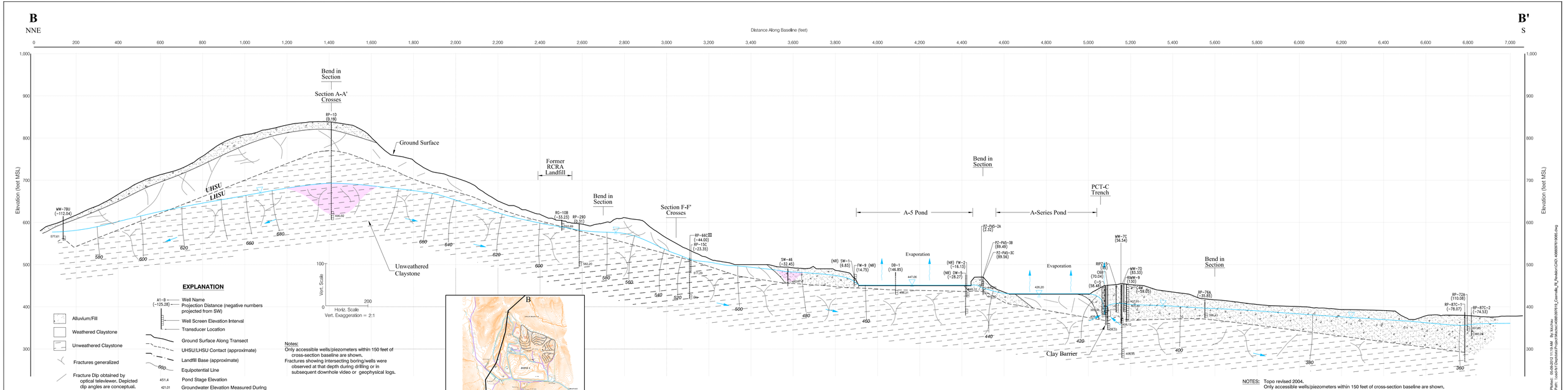

Conceptual Site Model 3
Transect through RCRA Canyon, Pond A-5, A-Series Pond and C-Drainage
Feasibility Study
Casmalia Resources Superfund Site
Casmalia, California

FIGURE **4-21**

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
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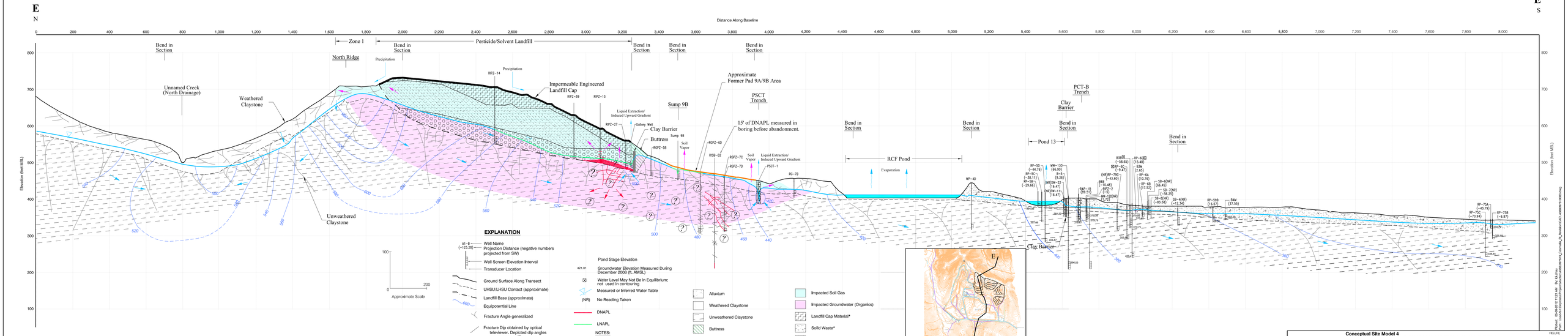

Conceptual Site Model 4
Transect through PSCT-1, former Ponds and Pads Area, and B-Drainage
Feasibility Study
Casmalia Resources Superfund Site
Casmalia, California

FIGURE **4-22**

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
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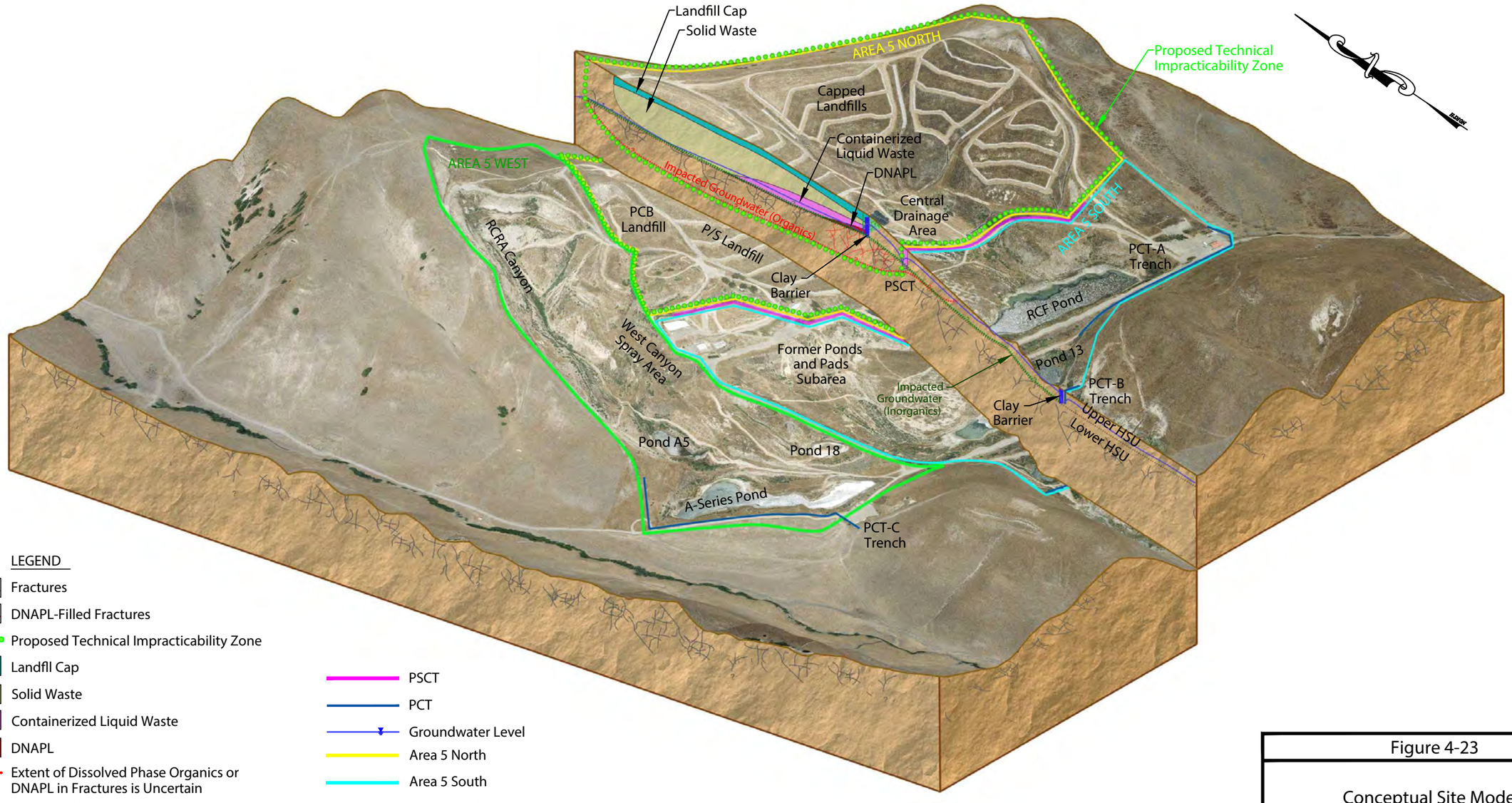

LEGEND

- Fractures
- DNAPL-Filled Fractures
- Proposed Technical Impracticability Zone
- Landfll Cap
- Solid Waste
- Containerized Liquid Waste
- DNAPL
- Extent of Dissolved Phase Organics or DNAPL in Fractures is Uncertain
- Extent of Dissolved Phase Metals is Uncertain
- Upper/Lower HSU Contact (Approximate)
- PSCT
- PCT
- Groundwater Level
- Area 5 North
- Area 5 South
- Area 5 West

Note: Oblique graphic, not to scale, vertical exaggeration is approximately 2 times.

Figure 4-23

Conceptual Site Model
Block Diagram

Feasibility Study
Casmalia Resources Superfund Site

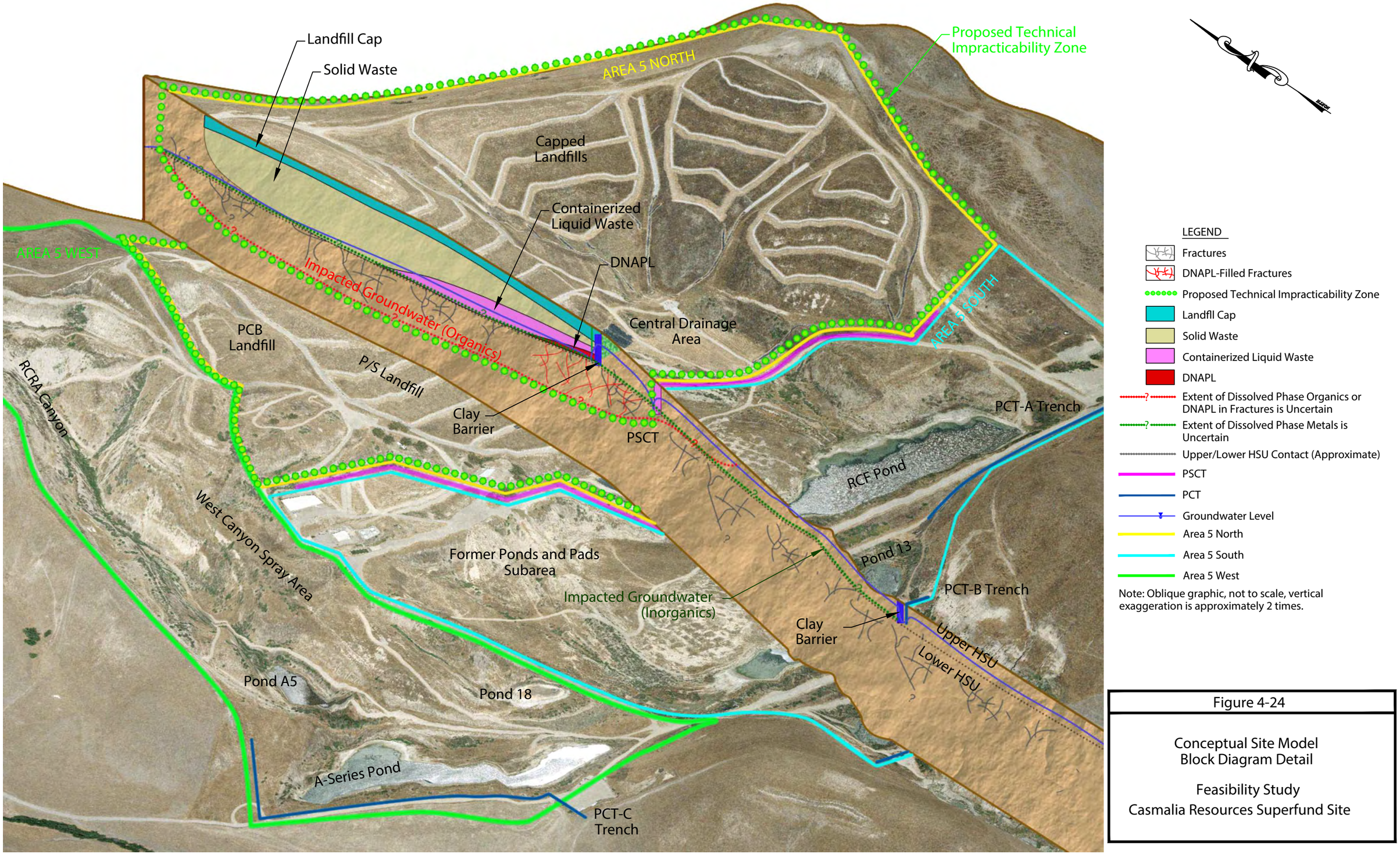

Figure 4-24

Conceptual Site Model
Block Diagram Detail

Feasibility Study
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