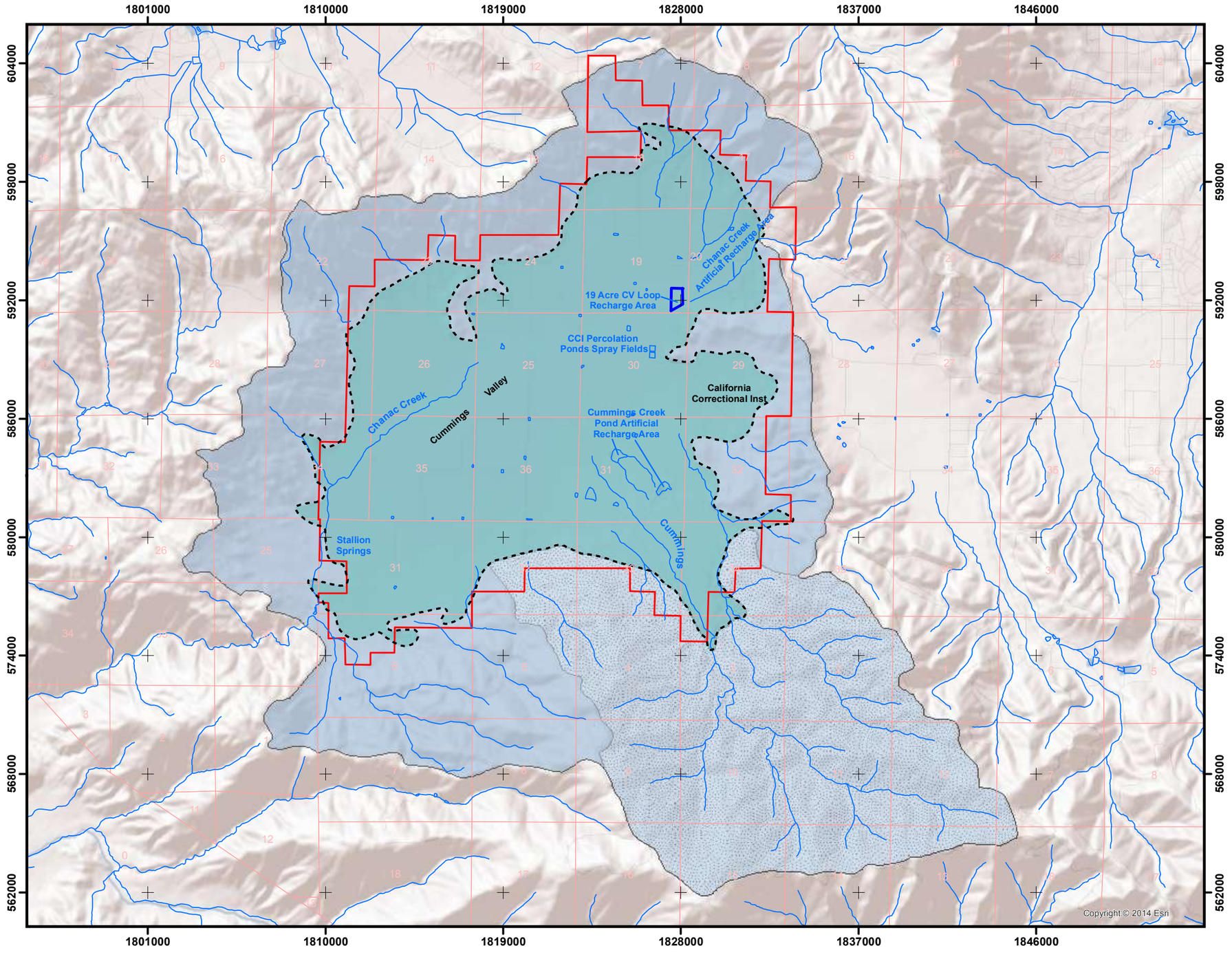
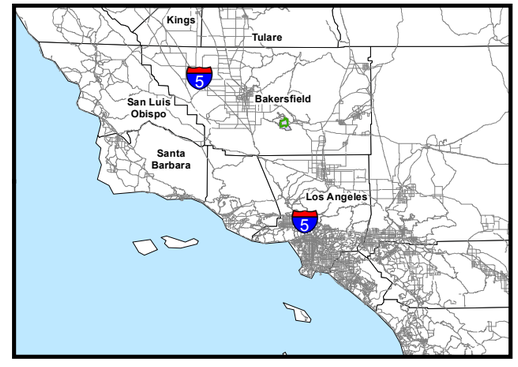
PLATES

March 2015
Project No. 04.62130169



Legend

- Cummings Creek Bedrock Watershed
- Other Cummings Valley Bedrock Watersheds
- Extent of Cummings Valley Alluvium
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid



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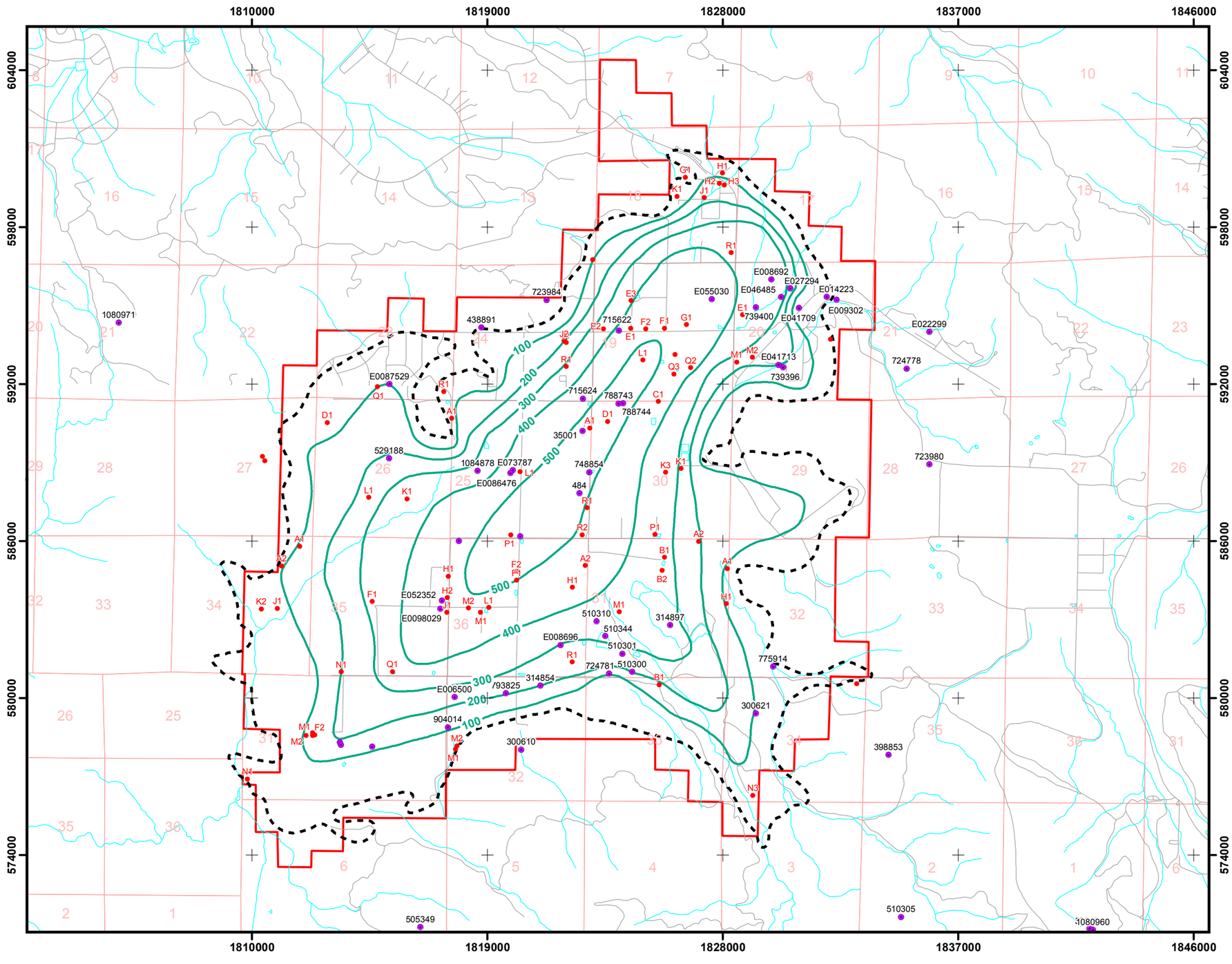
0 1 2
Miles

Cummings Basin Location Map

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 1

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_1_Cummings_Basin_Location_Map.mxd, 11/13/2014, wcupples



Legend

- New Well (Since 2003 Study)
- Well (Used in 2003 Study)
- Contour of Equal Depth to Unweathered Bedrock (in feet below ground surface)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

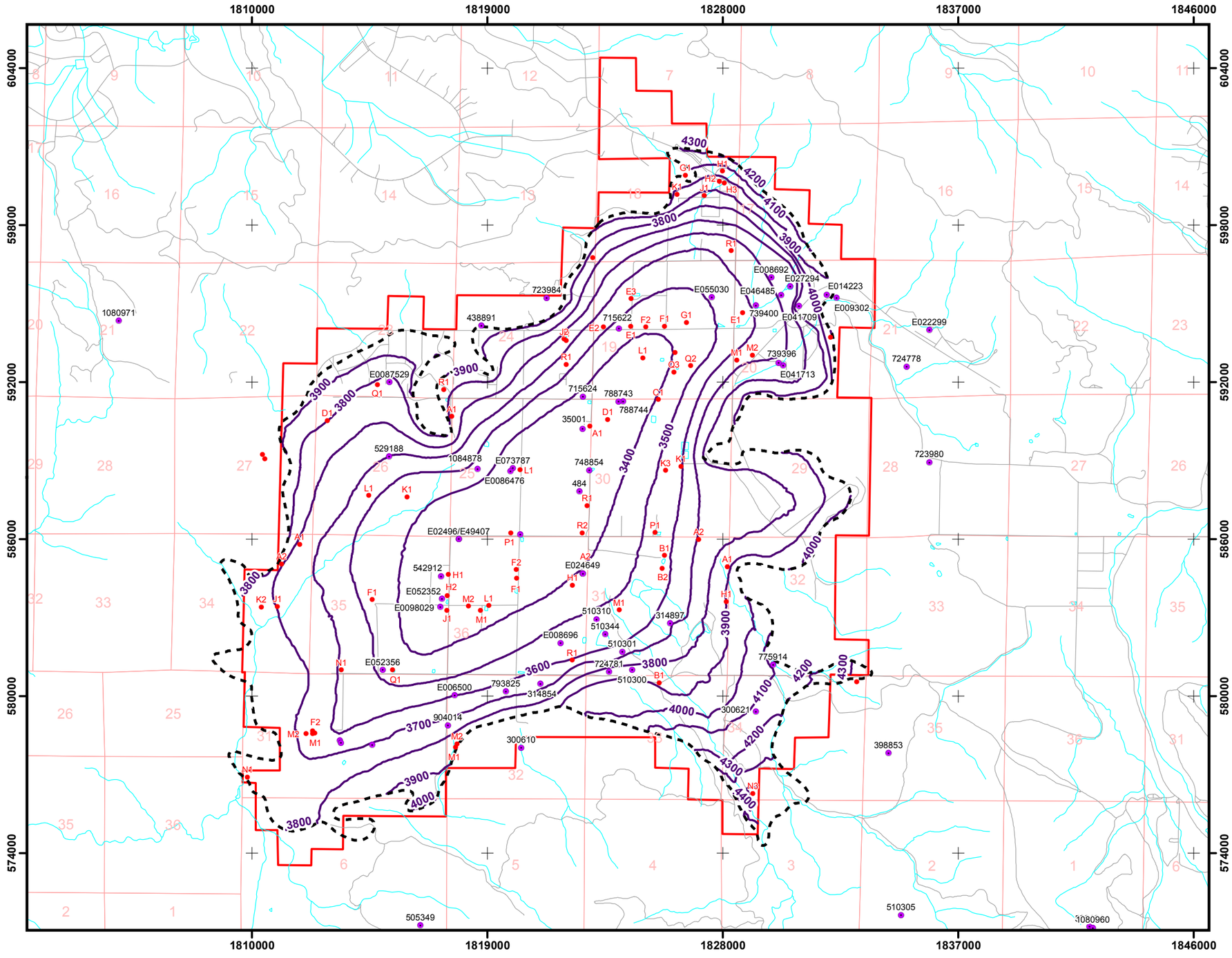
Revised Depth to Unweathered Bedrock

Groundwater Model Update Cummings Groundwater Basin

Fugro Consultants, Inc.

PLATE 2

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples



Legend

- New Well (Since 2003 Study)
- Well (Used in 2003 Study)
- Contour of Equal Depth to Unweathered Bedrock (in feet below ground surface)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

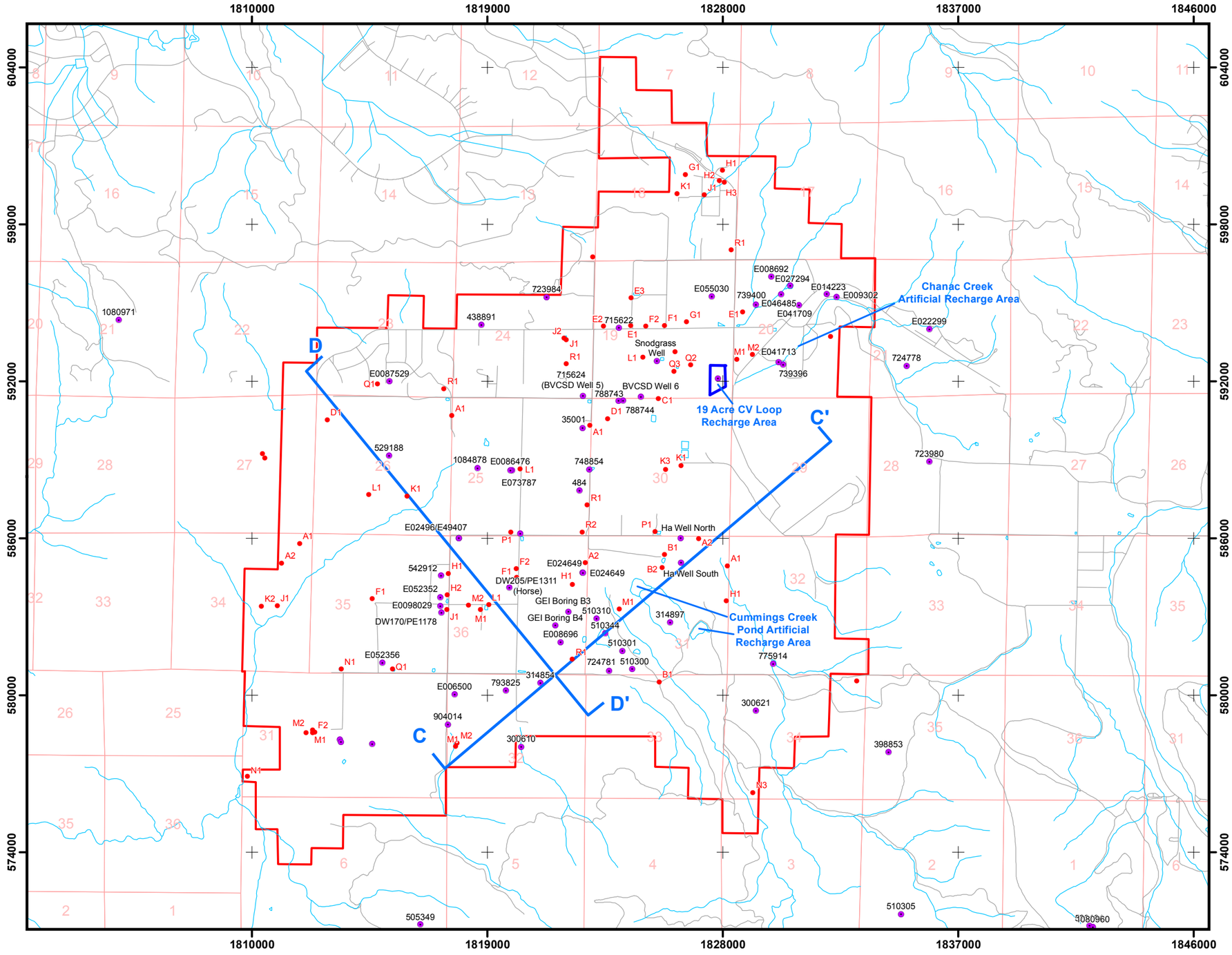
Revised Elevation of Unweathered Bedrock

Groundwater Model Update Cummings Groundwater Basin

Fugro Consultants, Inc.

PLATE 3

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate4.mxd, 8/27/2014, wcupples

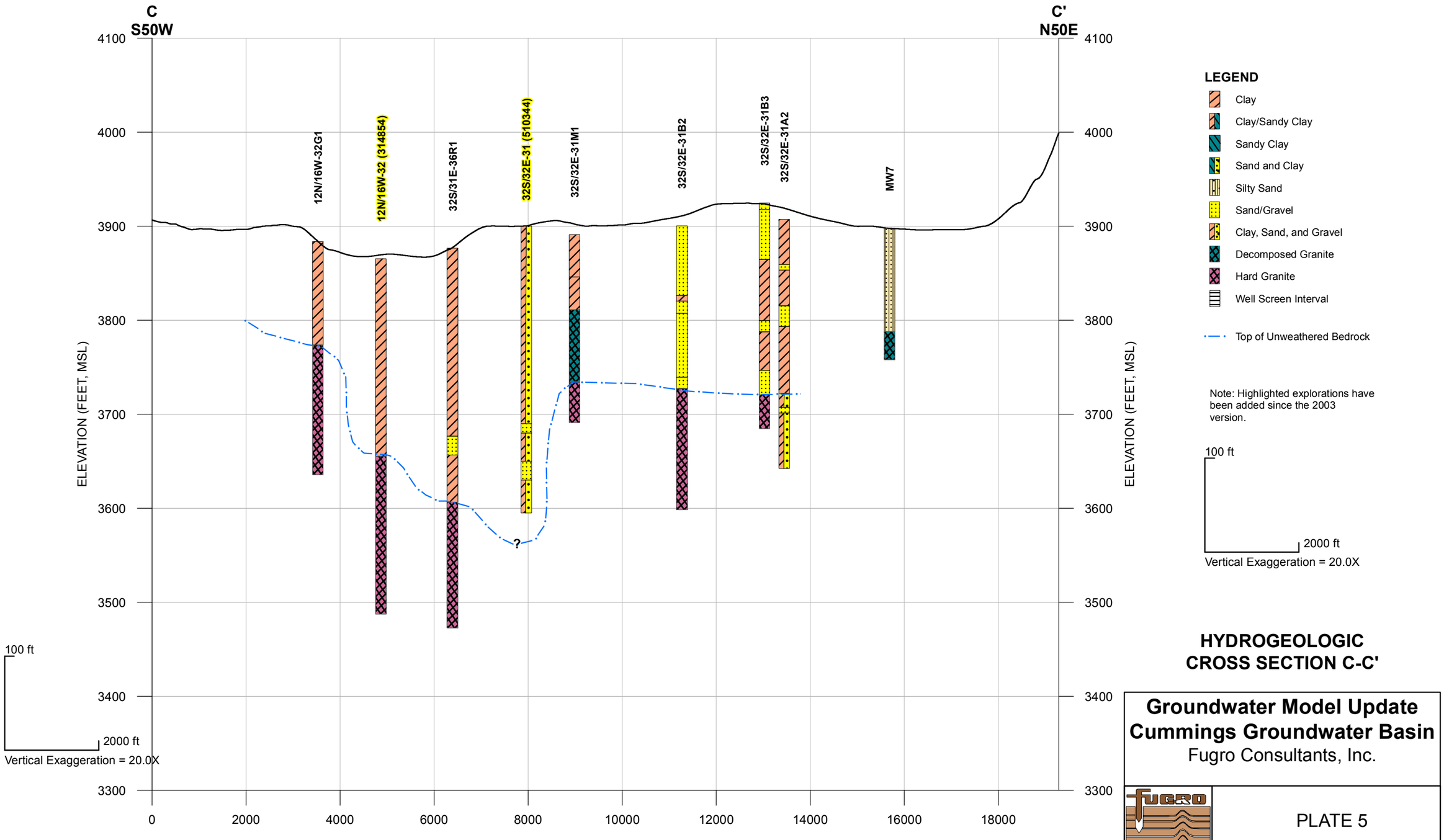


New Well Locations and Geologic Cross-Section Location Map

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 4

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate_6_Cross-Section_Location_map.mxd, 9/22/2014, wcupples

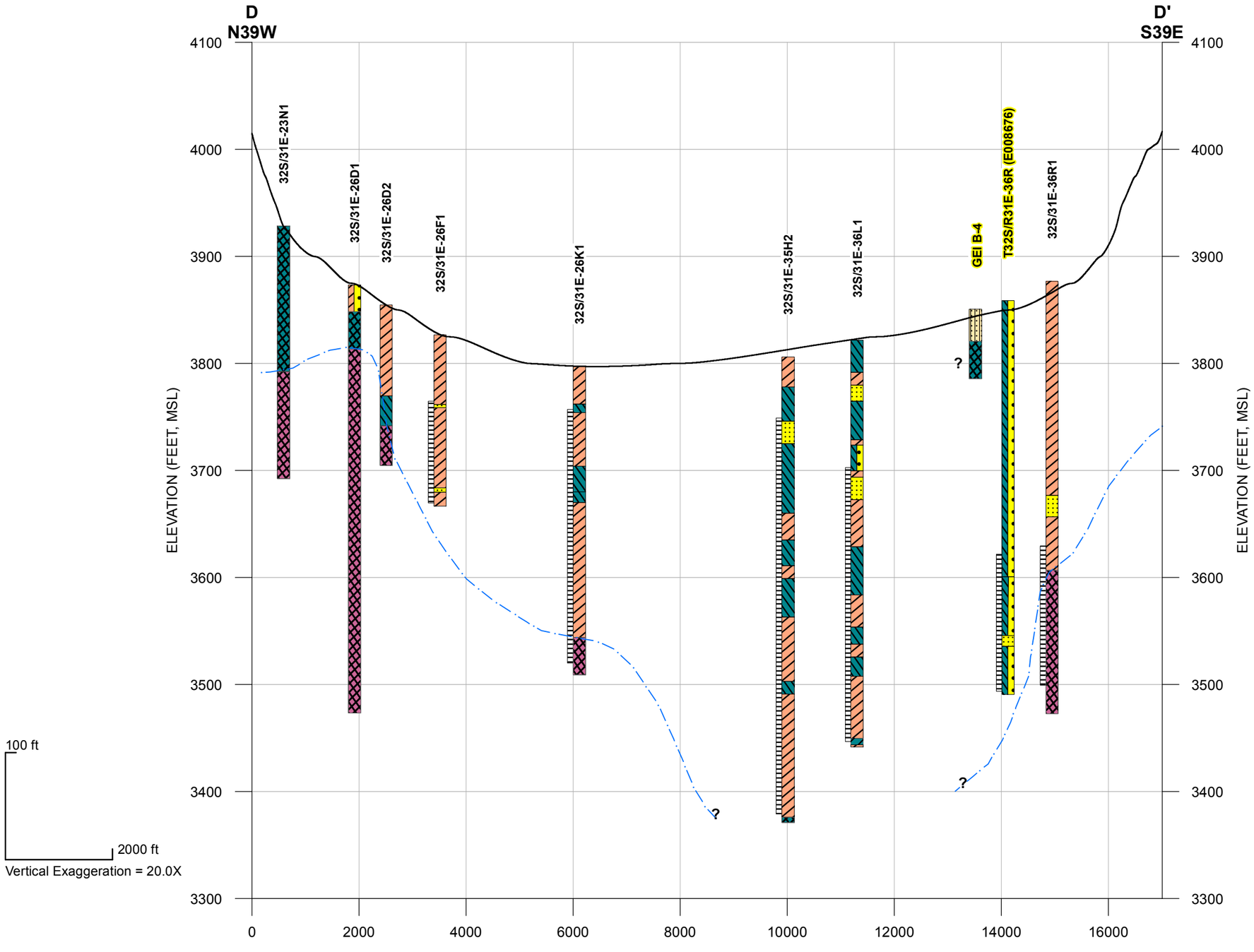


HYDROGEOLOGIC CROSS SECTION C-C'

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 5

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Profile_C-C'.mxd, 11/12/2014, wcupples



LEGEND

- Clay
- Clay/Sandy Clay
- Sandy Clay
- Sand and Clay
- Silty Sand
- Sand/Gravel
- Clay, Sand, and Gravel
- Decomposed Granite
- Hard Granite
- Well Screen Interval
- Top of Unweathered Bedrock

Note: Highlighted explorations have been added since the 2003 version.

100 ft
2000 ft
Vertical Exaggeration = 20.0X

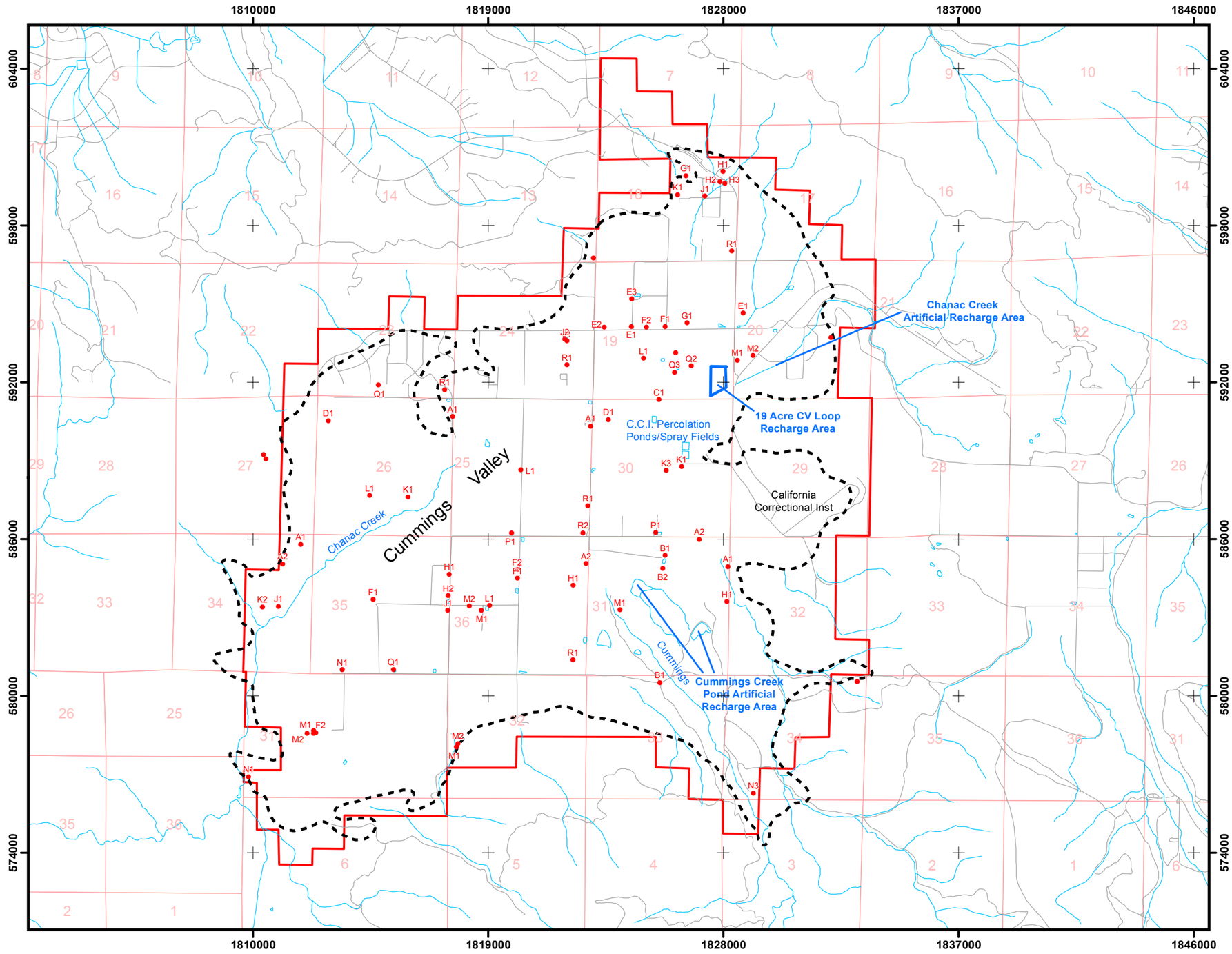
HYDROGEOLOGIC CROSS SECTION D-D'

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 6

C:\Users\WCUPPL~1.FUG\AppData\Local\Temp\arcCD7E\~DF65BEB15931E92CF5.TMP, 11/12/2014, wcupples

March 2015
Project No. 04.62130169



Legend

- Well Location
- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

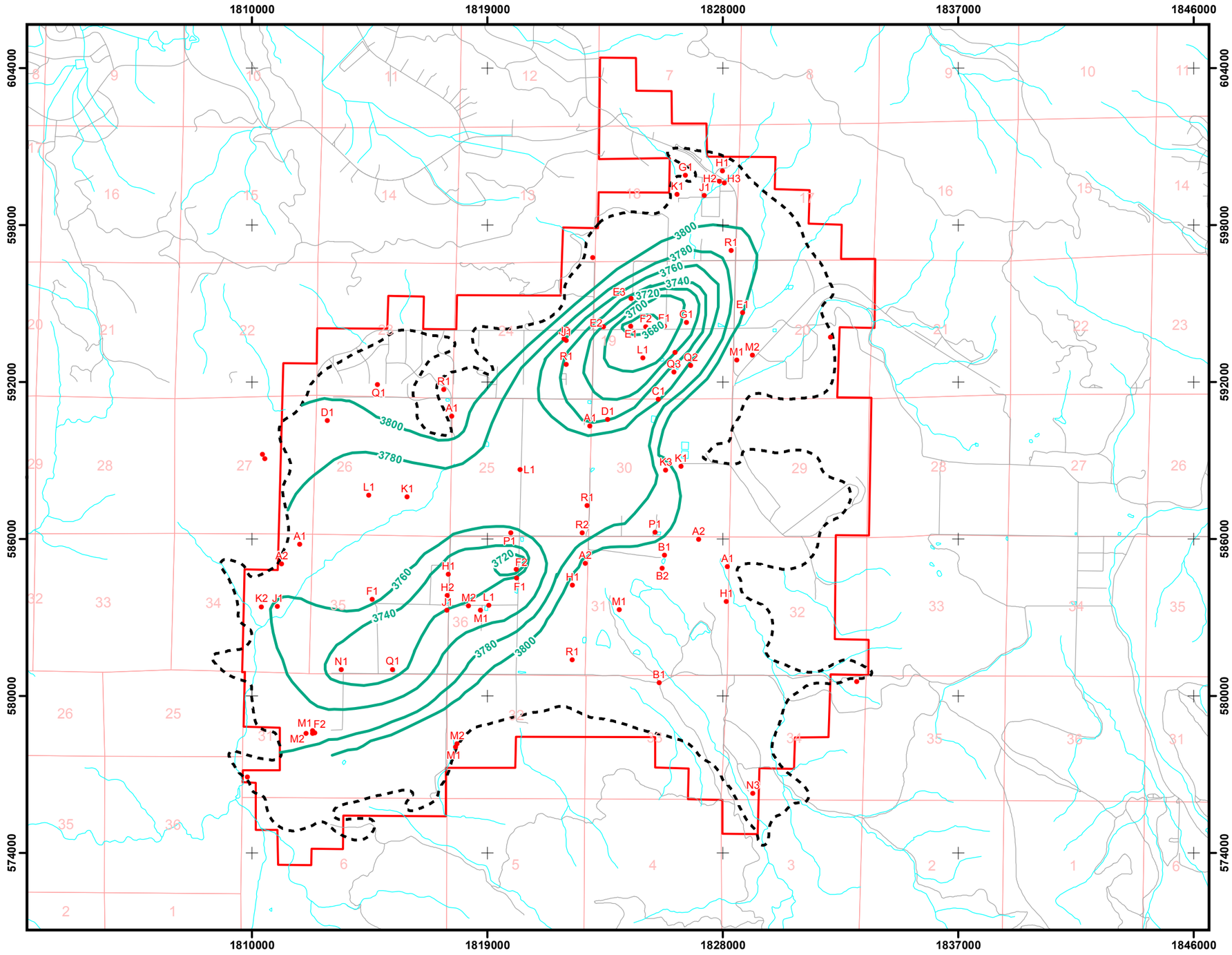
4,000 0 4,000 Feet

Well Locations with Water Level Data

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 7

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_7_Well_Locations_w_Water_Level_Data.mxd, 11/14/2014, wcupples



Legend

- Well
- Contour of Groundwater Elevations (in feet above MSL)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

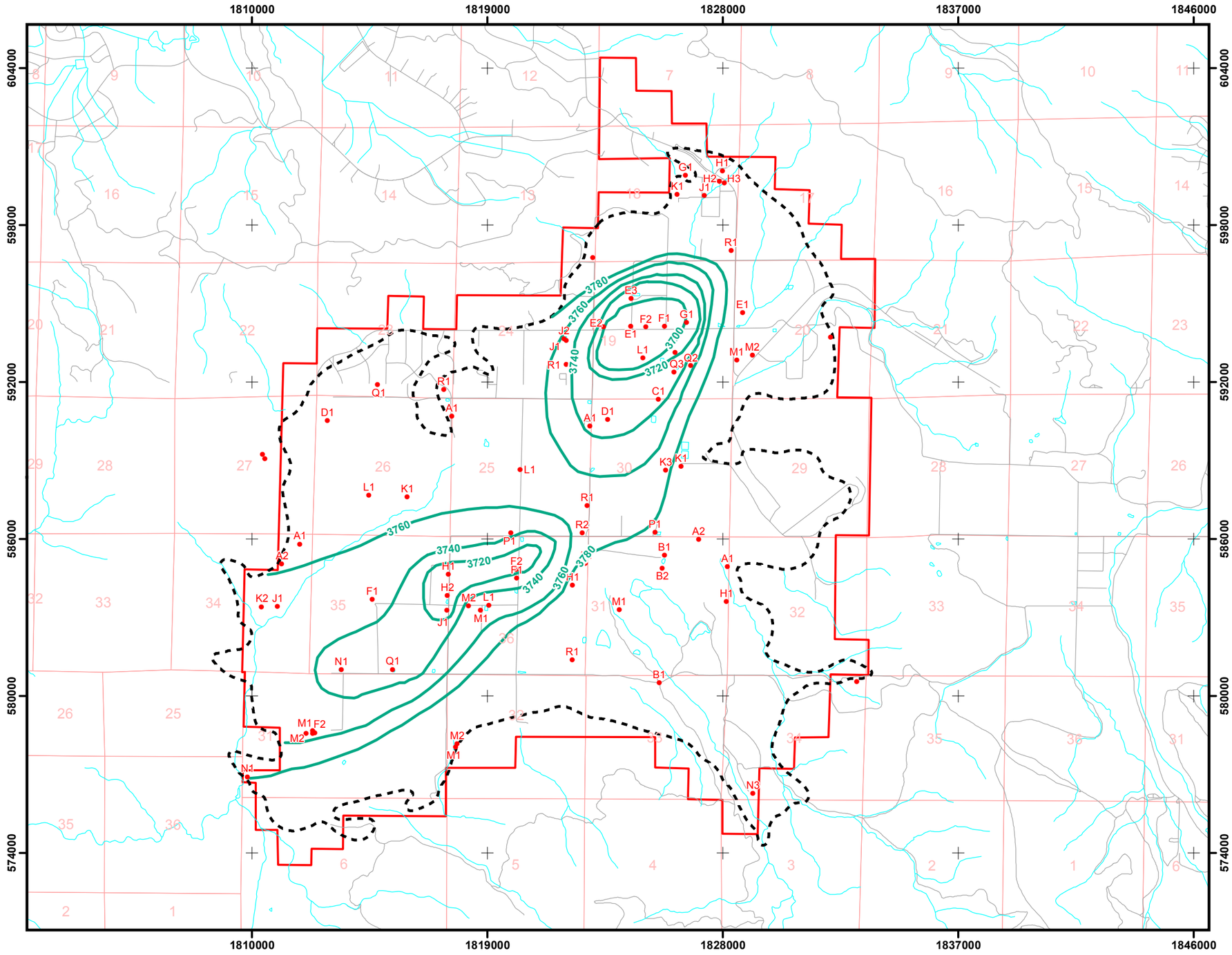
Groundwater Elevation Contours
Spring 2005

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 8

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples

March 2015
Project No. 04.62130169



Legend

- Well
- Contour of Groundwater Elevations (in feet above MSL)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

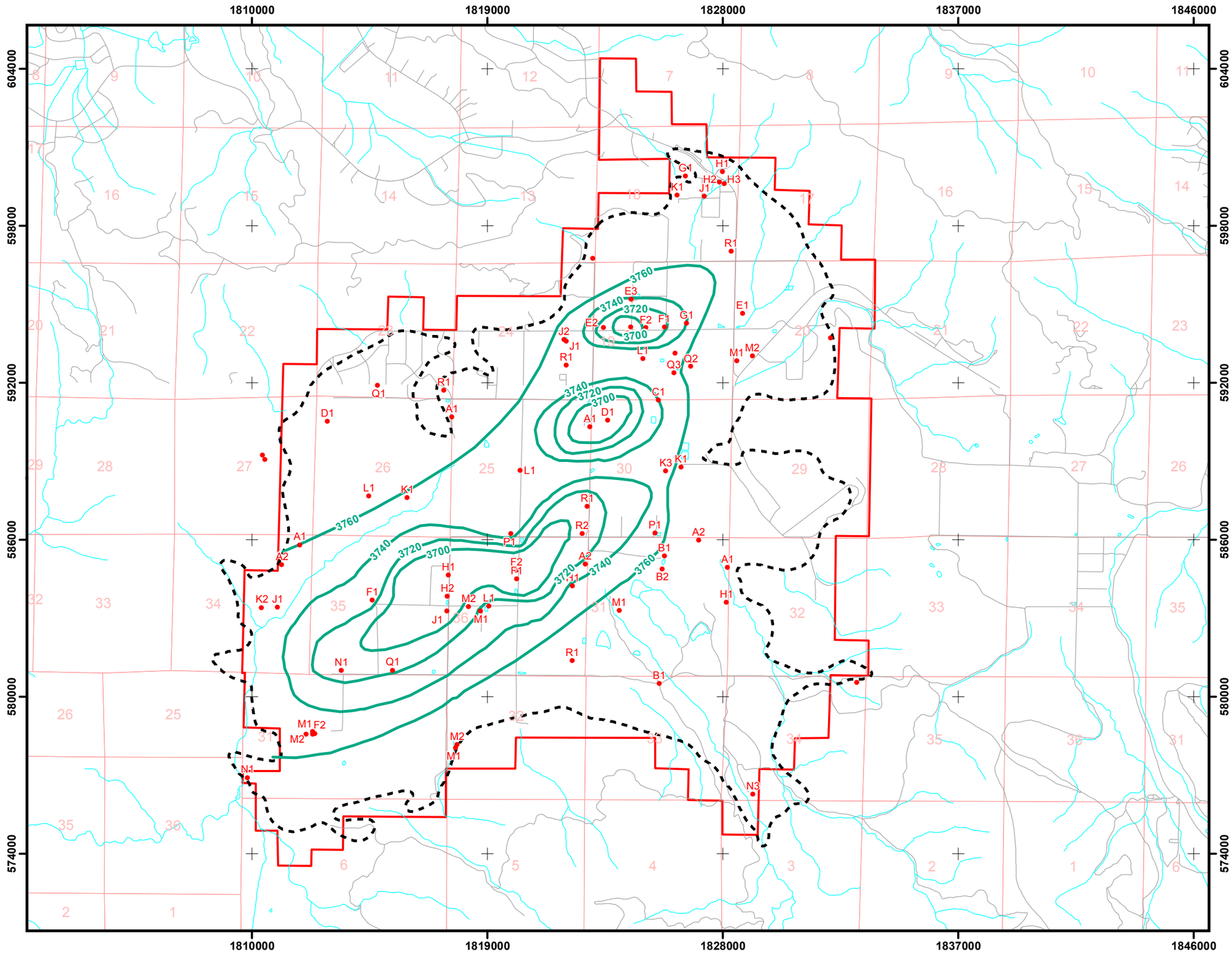
Groundwater Elevation Contours
Fall 2005

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 9

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples

March 2015
Project No. 04.62130169



Legend

- Well
- Contour of Groundwater Elevations (in feet above MSL)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

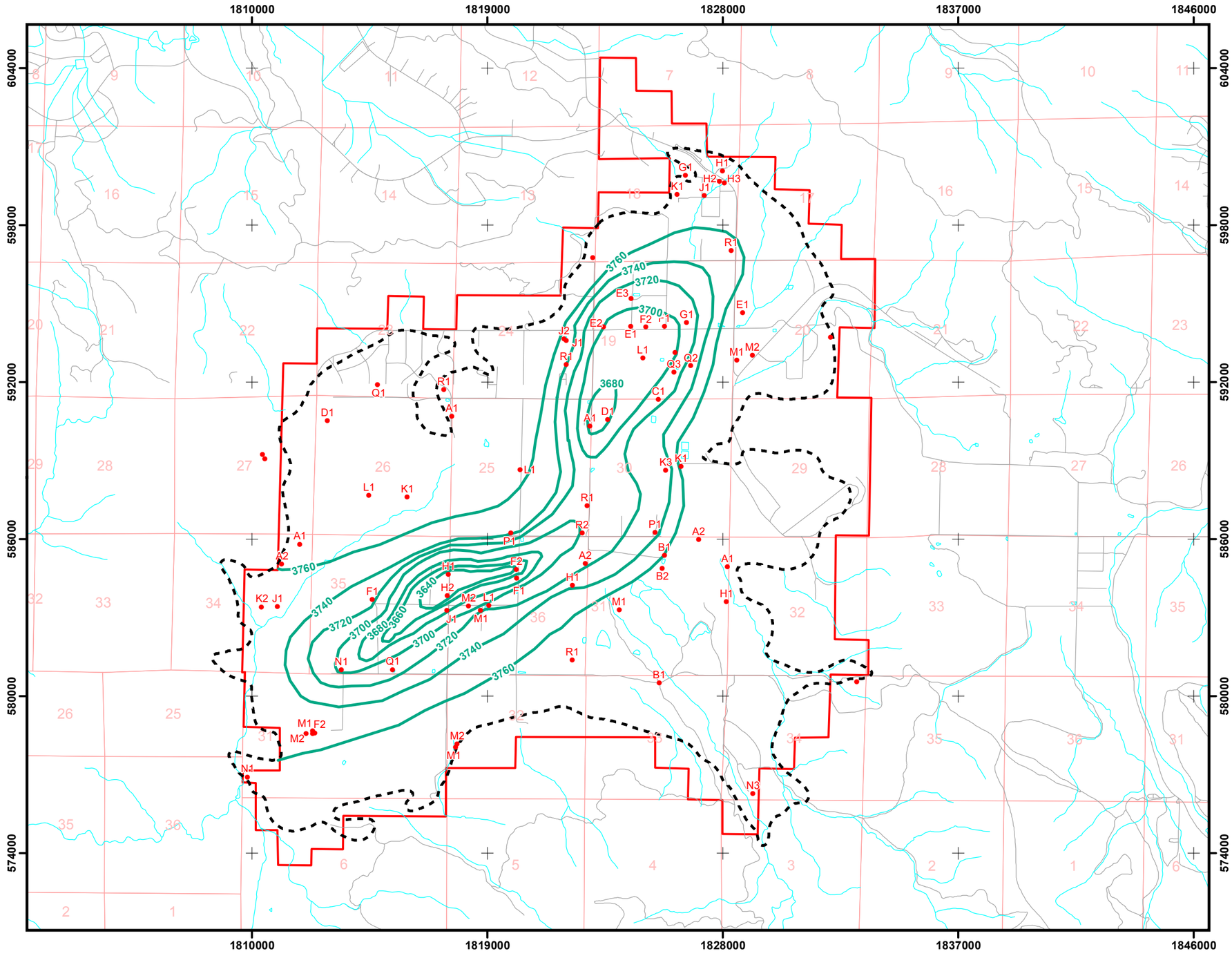
Groundwater Elevation Contours Spring 2009

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 10

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples

March 2015
Project No. 04.62130169



Legend

- Well
- Contour of Groundwater Elevations (in feet above MSL)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

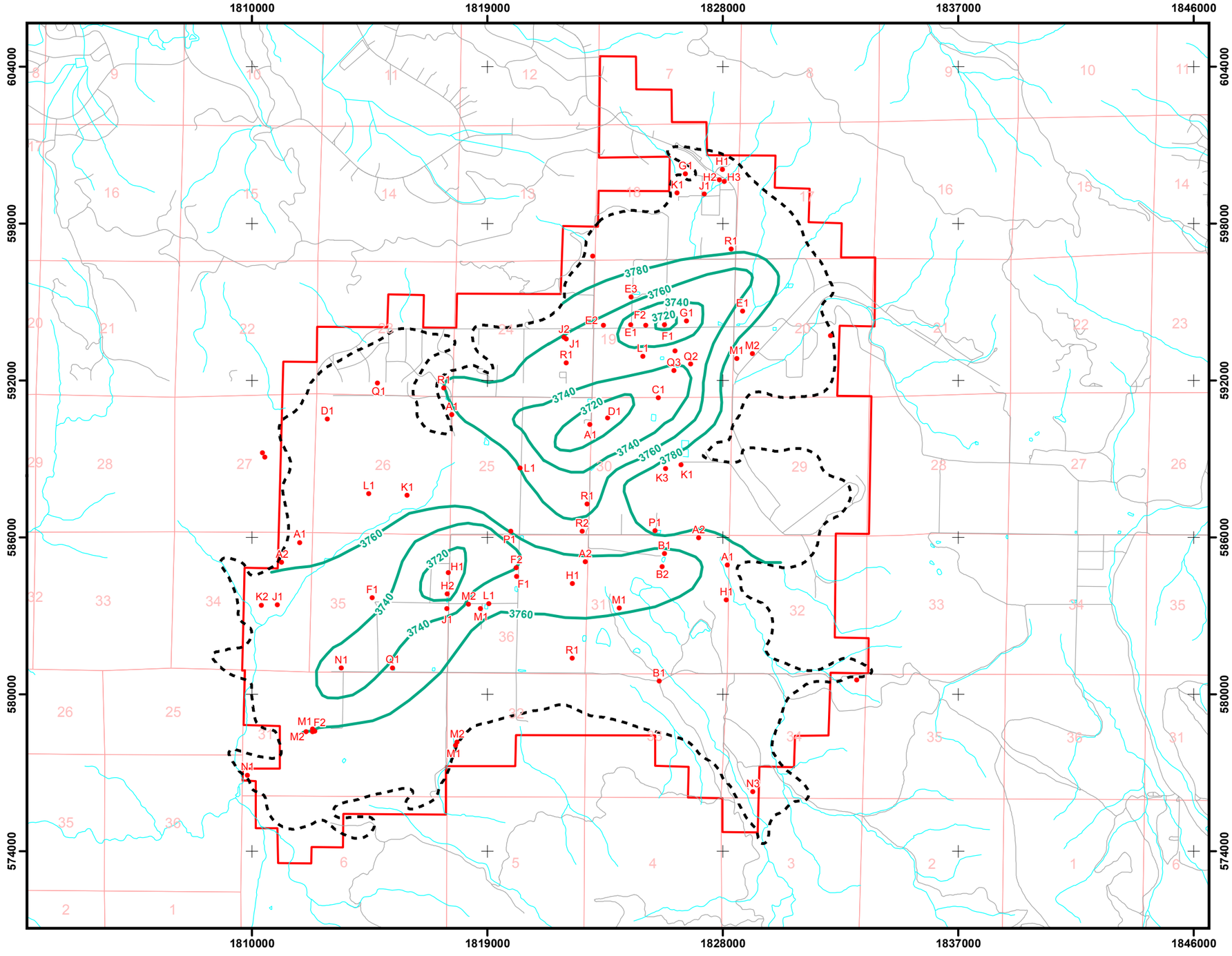
Groundwater Elevation Contours
Fall 2009

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 11

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples

March 2015
Project No. 04.62130169



Legend

- Well
- Contour of Groundwater Elevations (in feet above MSL)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

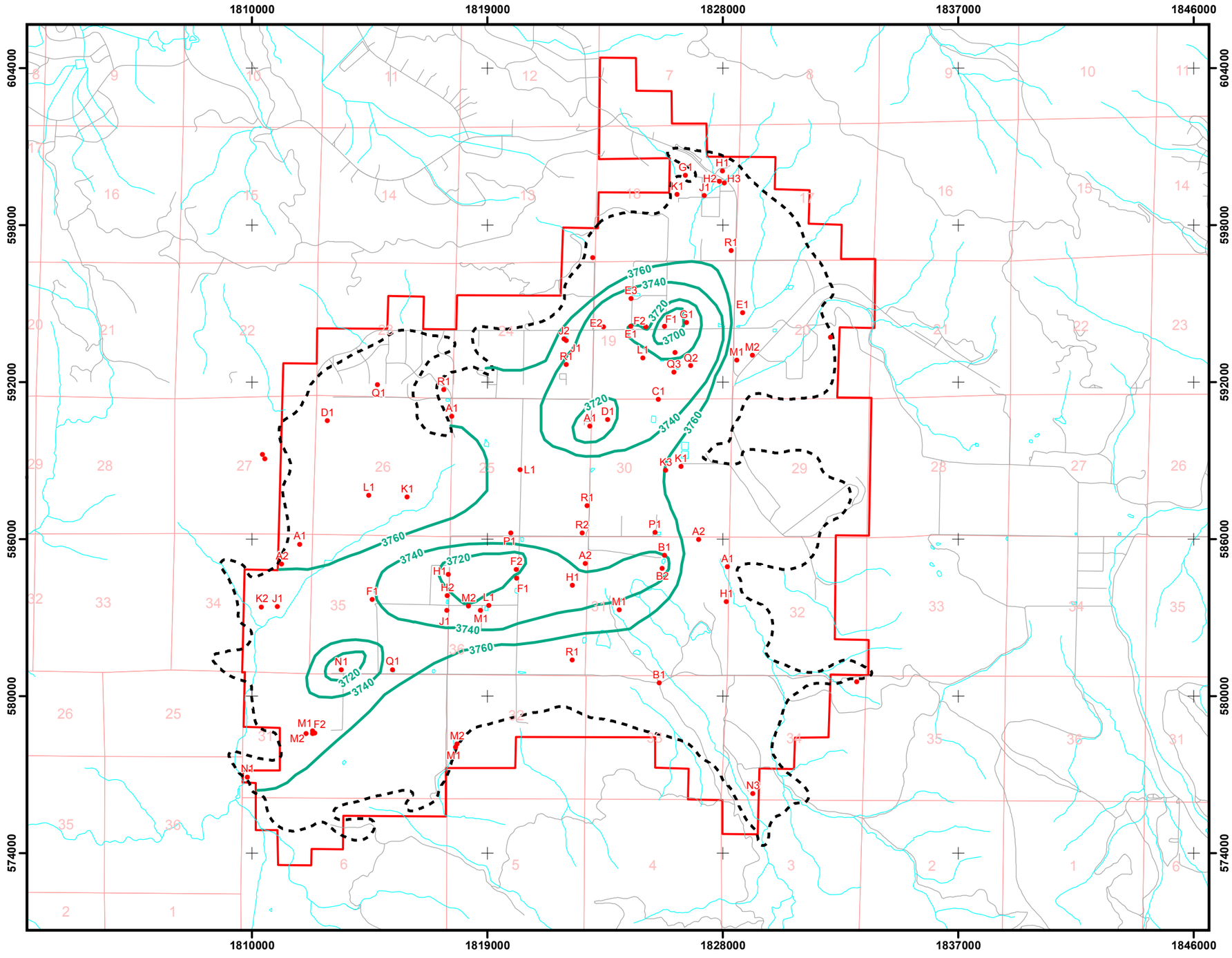
Groundwater Elevation Contours
Spring 2013

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 12

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples

March 2015
Project No. 04.62130169



Legend

- Well
- Contour of Groundwater Elevations (in feet above MSL)
- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

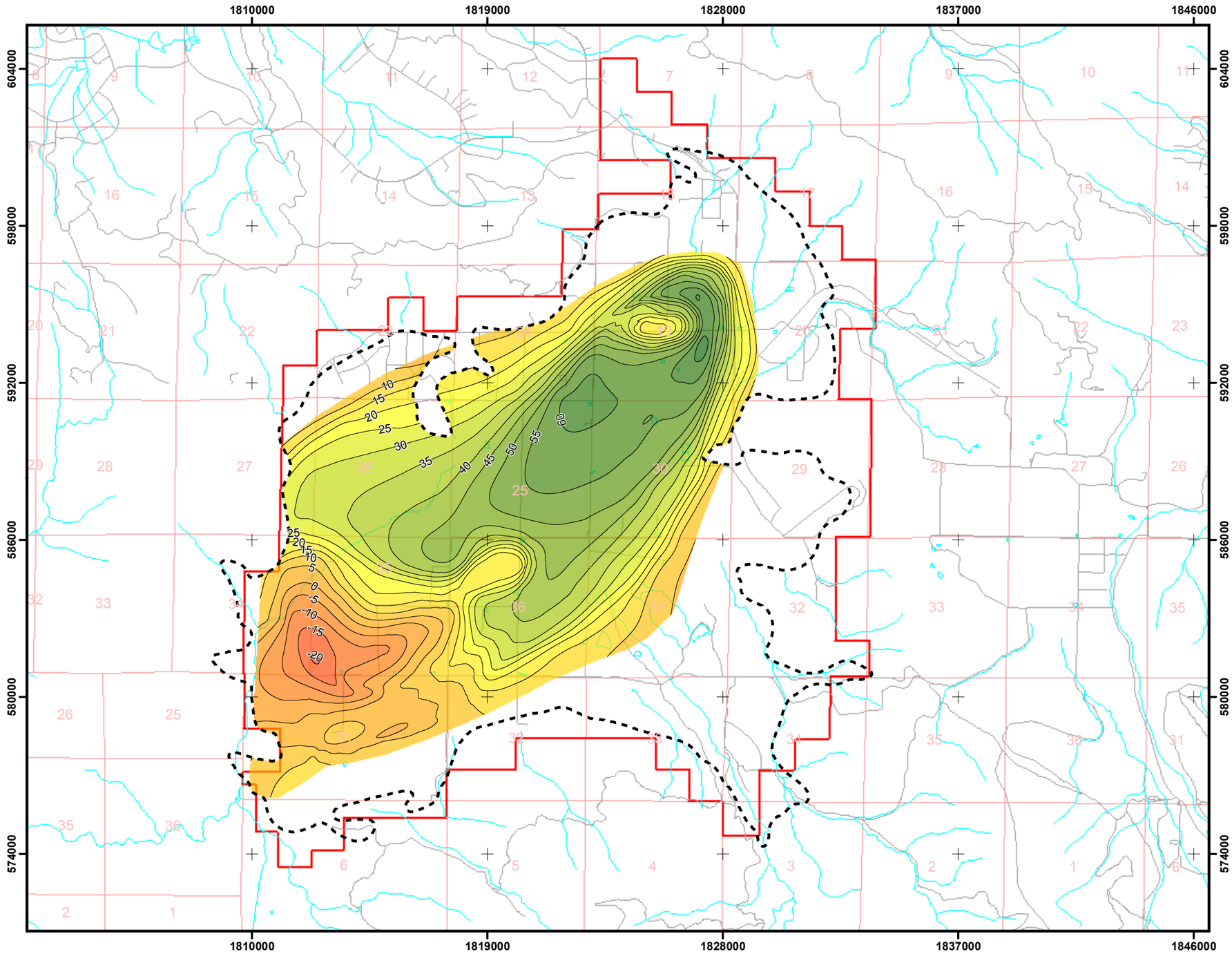
4,000 0 4,000 Feet

Groundwater Elevation Contours
Fall 2013

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 13

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\Working\mxd\Plate2.mxd, 3/5/2015, wcupples



Legend

- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

Groundwater Elevation Difference (Feet)

65 to 70	15 to 20
60 to 65	10 to 15
55 to 60	5 to 10
50 to 55	0 to 5
45 to 50	-5 to 0
40 to 45	-10 to -5
35 to 40	-15 to -10
30 to 35	-20 to -15
25 to 30	-25 to -20
20 to 25	

N
W E
S

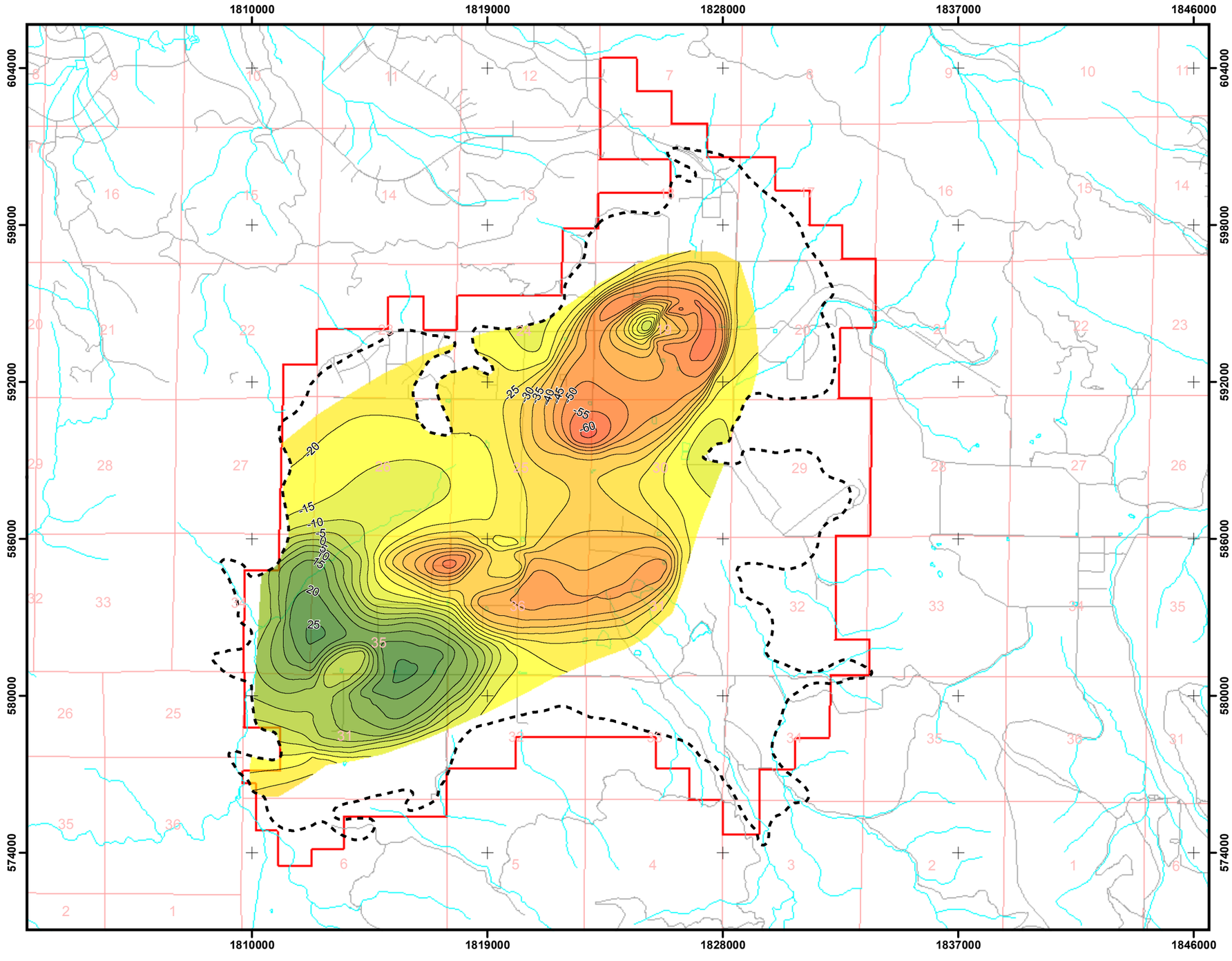
4,000 0 4,000 Feet

Fall 2001 - Fall 1980
Groundwater Elevation Difference Map

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 14

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_14_Oct01_Nov80_difference map.mxd, 11/20/2014, wupples



Legend

- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

Groundwater Elevation Difference (Feet)

25 to 30	-25 to -20
20 to 25	-30 to -25
15 to 20	-35 to -30
10 to 15	-40 to -35
5 to 10	-45 to -40
0 to 5	-50 to -45
-5 to 0	-55 to -50
-10 to -5	-60 to -55
-15 to -10	-65 to -60
-20 to -15	

N
W E
S

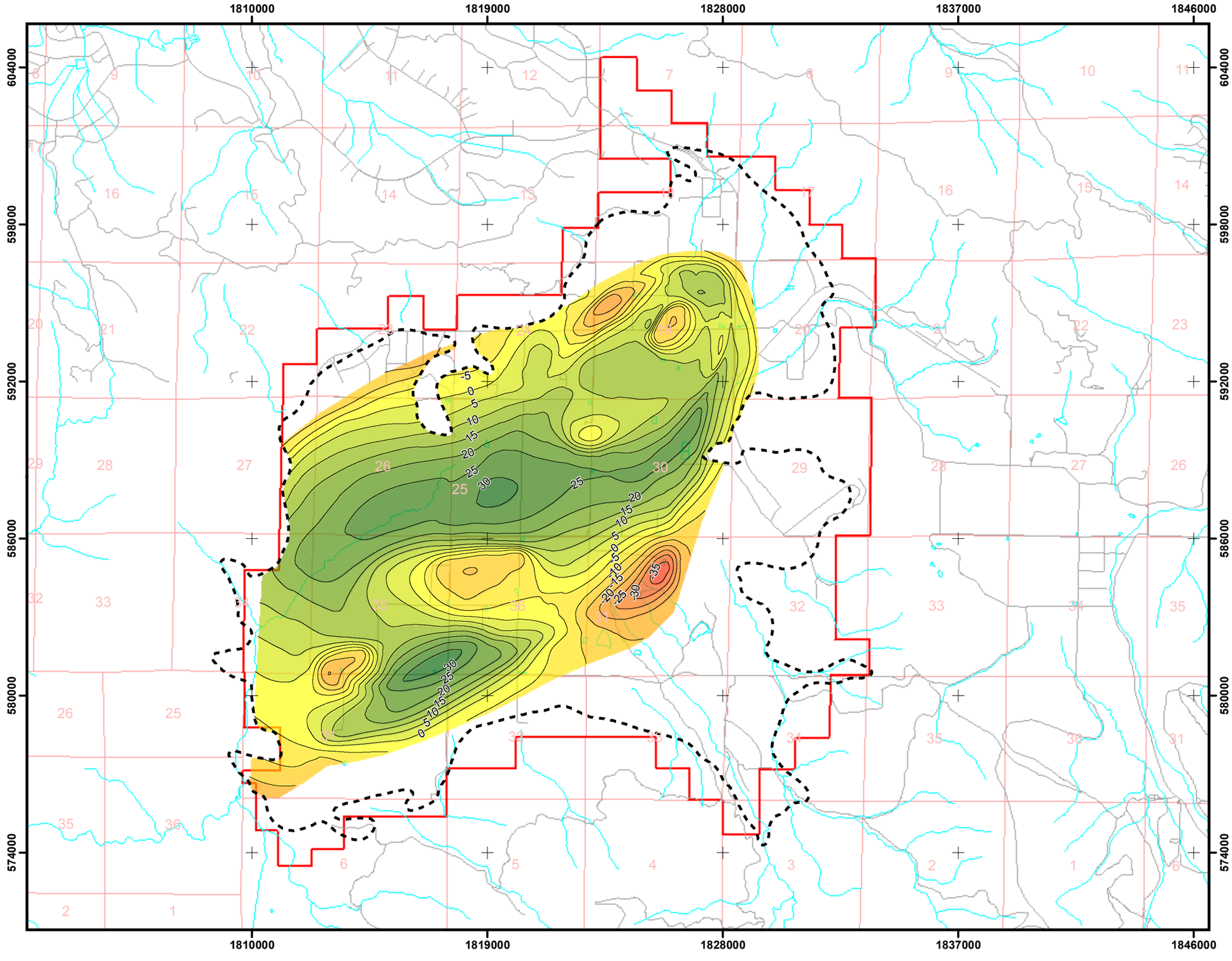
4,000 0 4,000 Feet

Fall 2013 - Fall 2001
Groundwater Elevation Difference Map

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 15

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_15_Oct13_Oct01_difference map.mxd, 11/20/2014, wcupples



Legend

- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

Groundwater Elevation Difference (Feet)

30 to 35	-10 to -5
25 to 30	-15 to -10
20 to 25	-20 to -15
15 to 20	-25 to -20
10 to 15	-30 to -25
5 to 10	-35 to -30
0 to 5	-37 to -35
-5 to 0	

N
W E
S

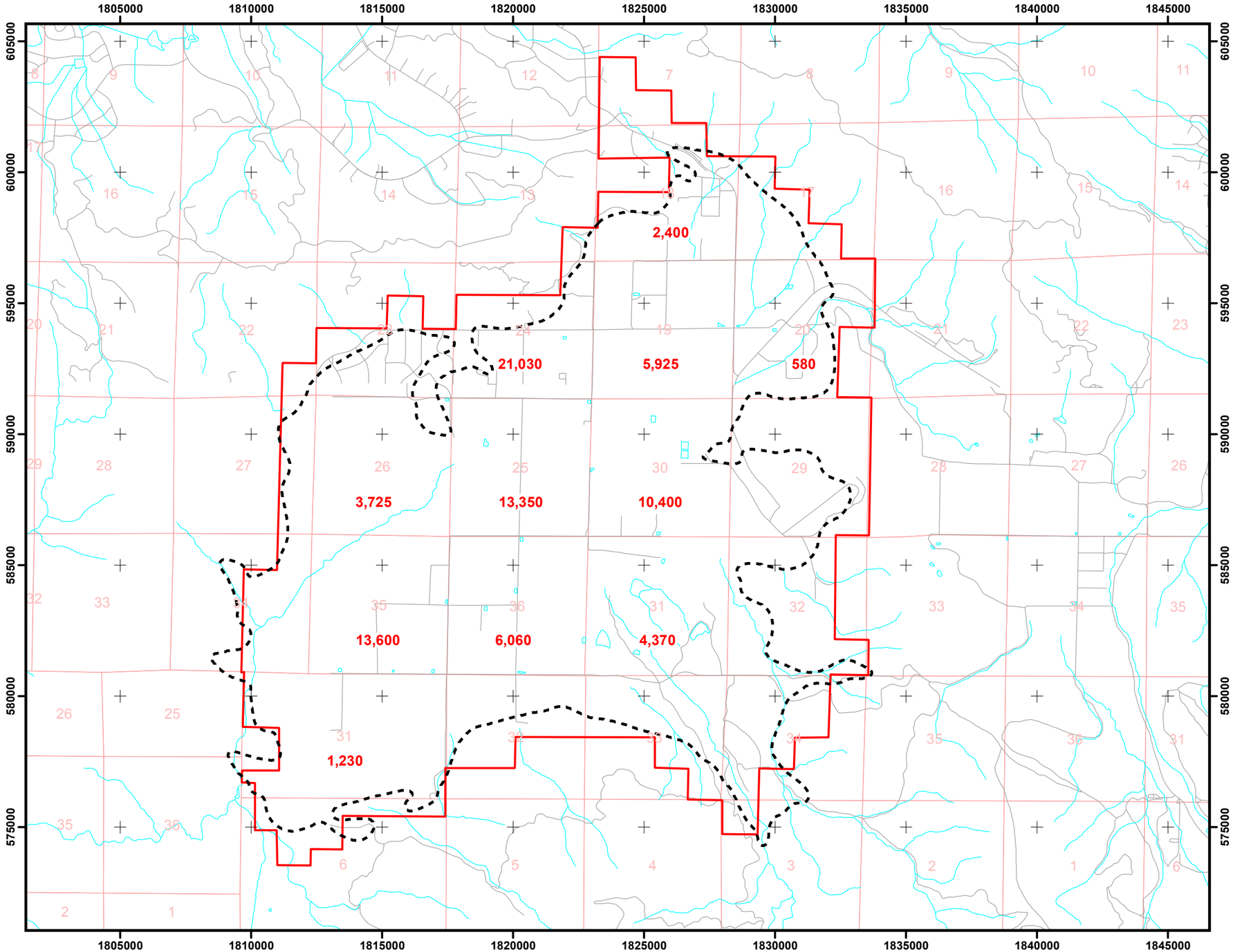
4,000 0 4,000 Feet

Fall 2013 - Fall 1980
Groundwater Elevation Difference Map

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 16

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_16_Oct13_Nov80_difference map.mxd, 11/20/2014, wupples



Legend

- 10,400 — Geometric Mean Transmissivity by Section (gpd/ft)
- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N W E S

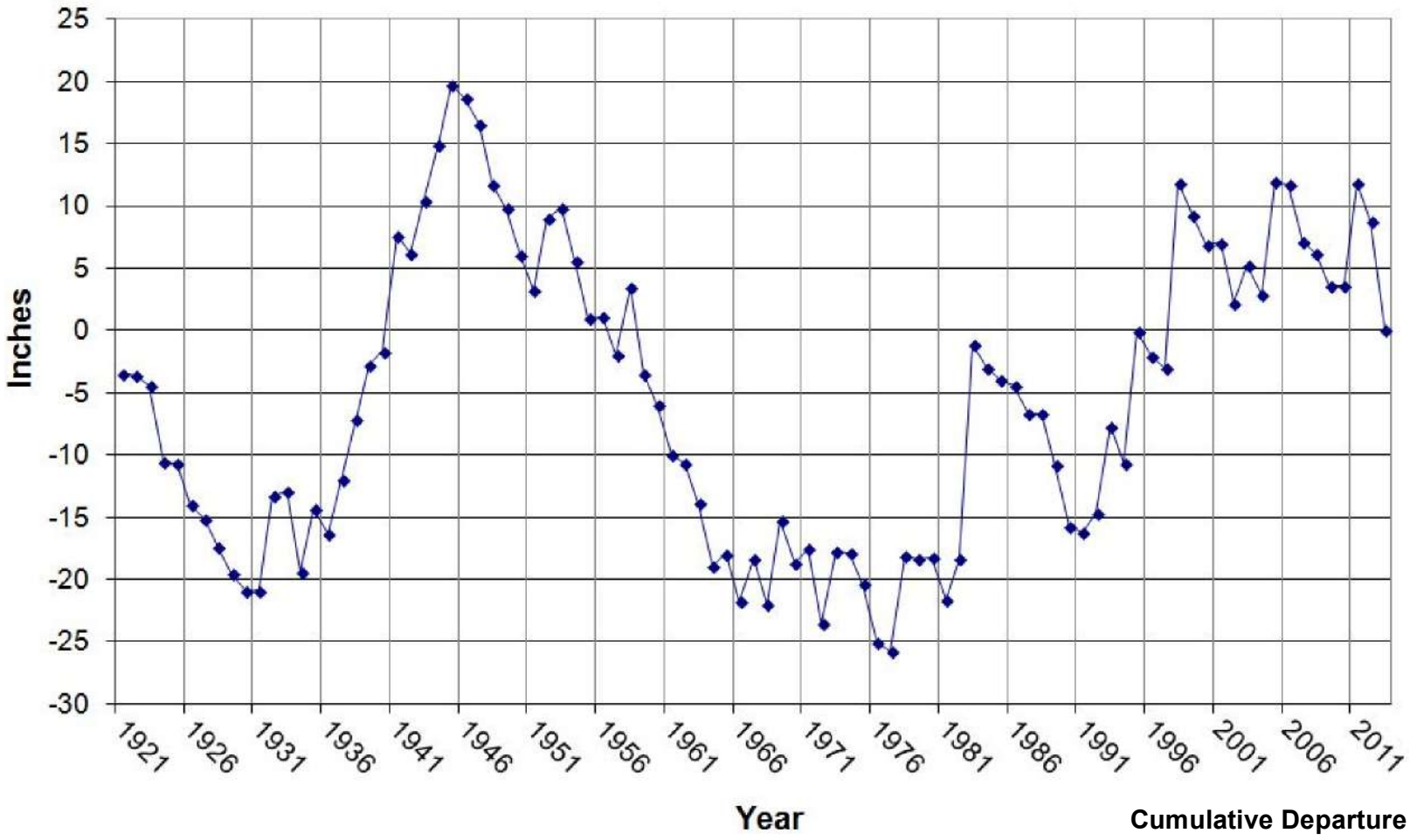
4,000 0 4,000 Feet

Aquifer Transmissivity Values

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 17

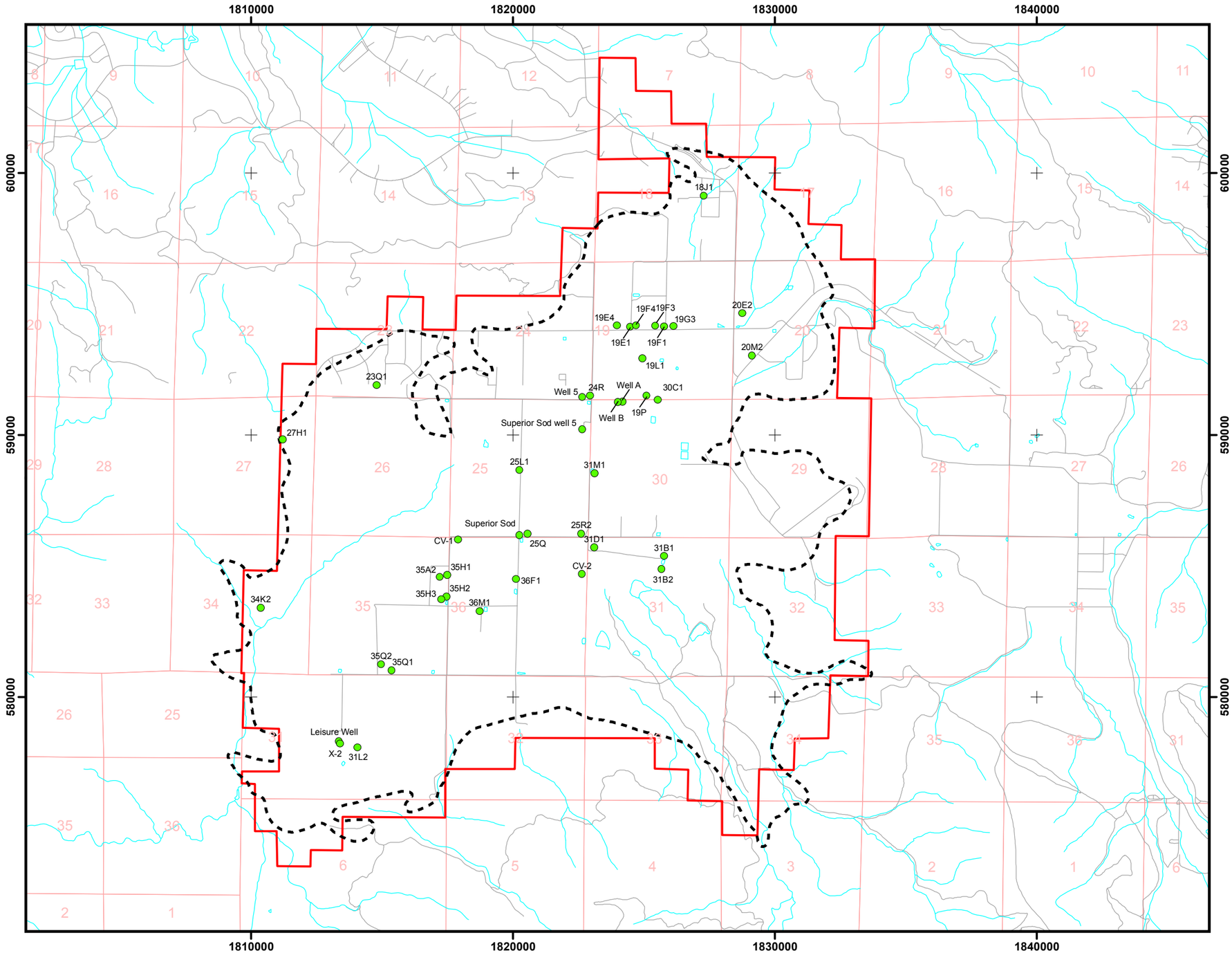
N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_17_Aquifer_Transmissivity_Values.mxd, 11/11/2014, wcupples



Cumulative Departure from Mean for Precipitation at Tehachapi

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 18



Legend

- Groundwater Production Well
- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

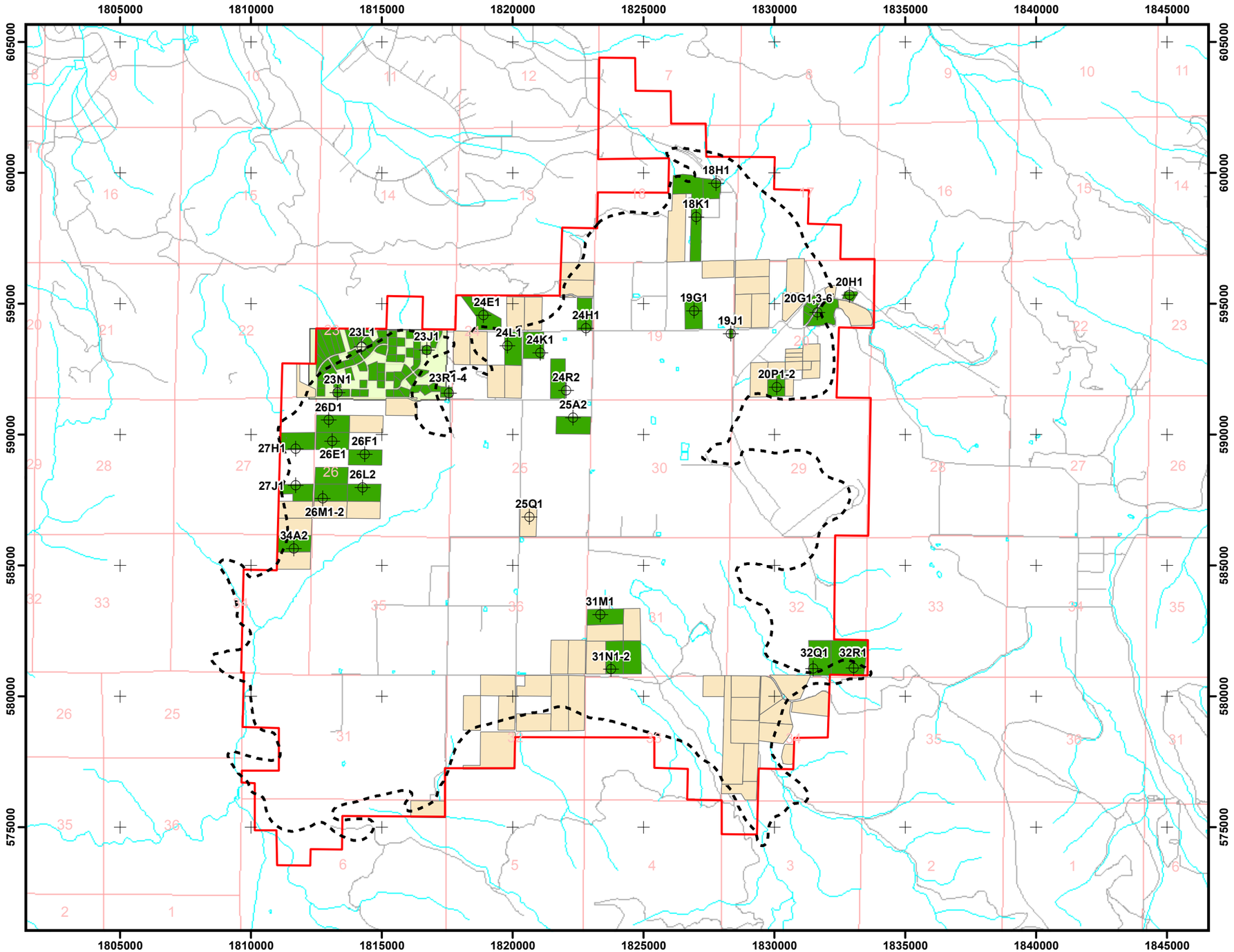
4,000 0 4,000 Feet

Groundwater Production Well Locations

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 19

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_19_Groundwater_Prod_Well_Loc.mxd, 11/18/2014, wcupples



Legend

- Domestic Well Location
- Basin Outline (adjudicated basin definition)
- Boundary of Alluvium
- Streams
- Roads
- Township and Range Grid
- Fairview Water Co.
- Parcels with Known Wells
- Parcels without Known Wells

N

W E

S

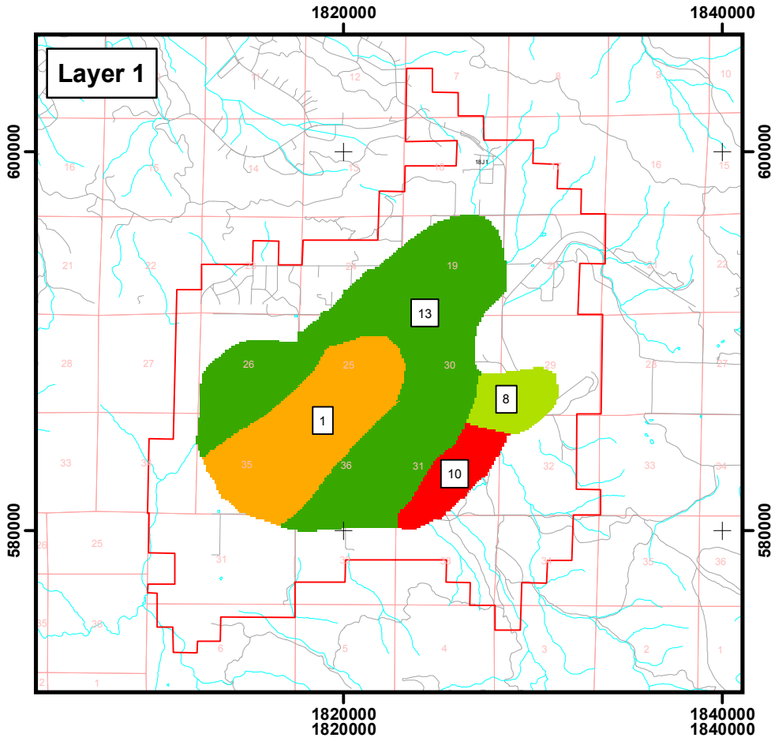
4,000 0 4,000 Feet

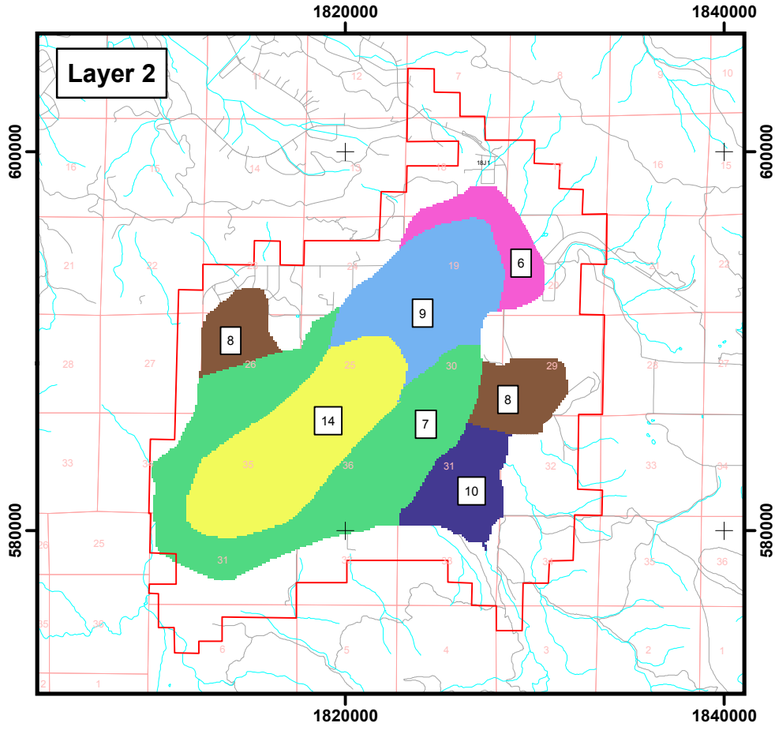
Domestic Well Locations

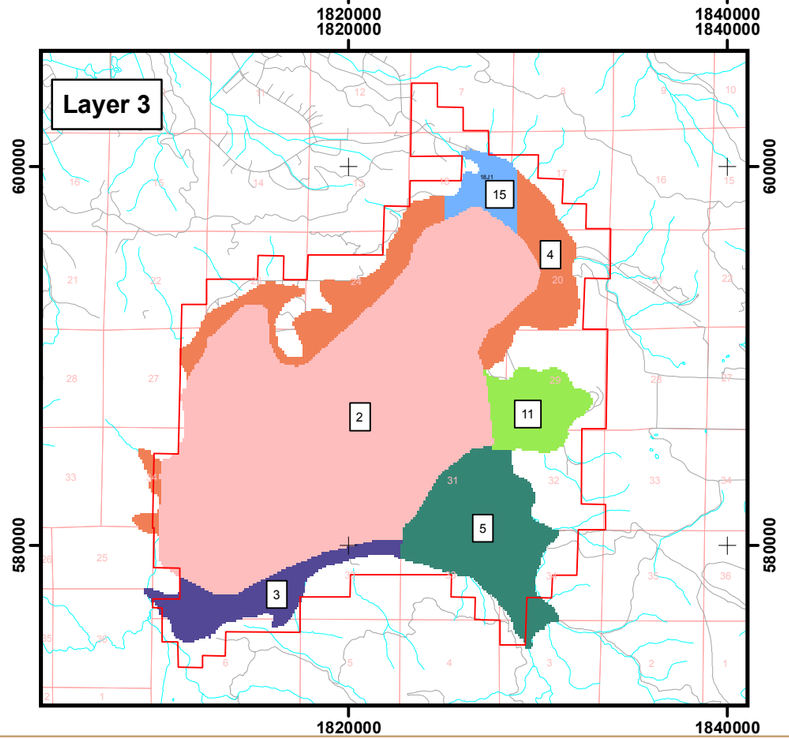
Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 20

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_20_Parcel_Well_Locations.mxd, 11/11/2014, wcupples







Legend

- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid
- 2 Hydraulic Conductivity Zones

Note: Zone 12 is not used in the model.

Zone	Horizontal Hydraulic Conductivity (ft/day)	Vertical Hydraulic Conductivity (ft/day)
1	3	0.05
2	1.5	0.05
3	0.5	0.05
4	0.8	0.05
5	1	0.05
6	4	0.05
7	3	0.05
8	1.2	0.05
9	3	0.05
10	3	0.05
11	1.2	0.05
13	3	0.05
14	2.4	0.05
15	0.4	0.05

N
W E
S

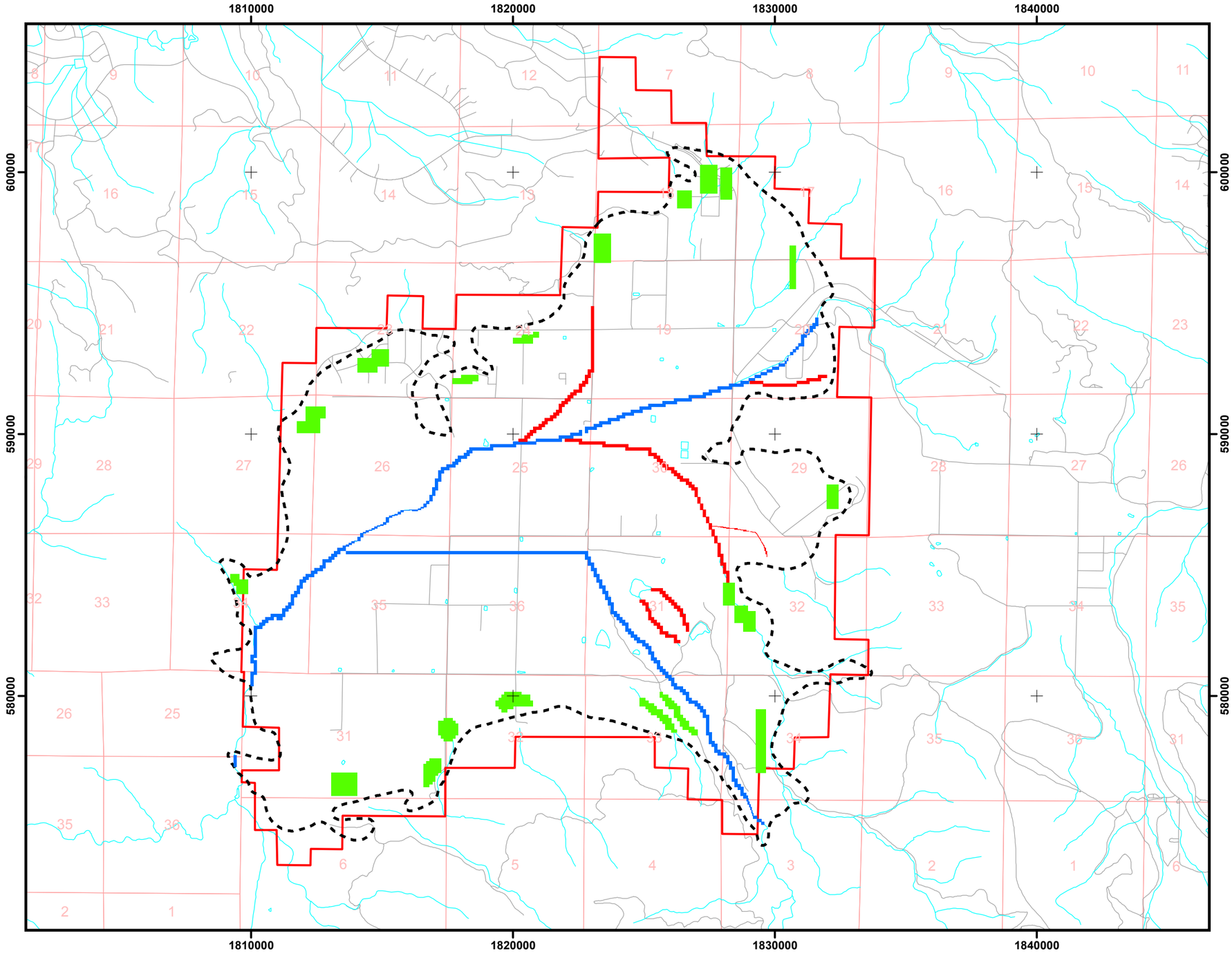
8,000 0 8,000 Feet

Hydraulic Conductivity Distribution By Model Layer

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 21

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_21_Hydraulic Conductivity Distribution per Model Layer.mxd, 3/5/2015, wcupples



Legend

- Boundary of Alluvium (Depth to Bedrock = 0)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid
- Surface Water Feature Simulated Using MODFLOW Drain Package
- Surface Water Feature Simulated Using MODFLOW Stream Package
- Surface Water Feature Simulated Using MODFLOW Well Package

N W E S

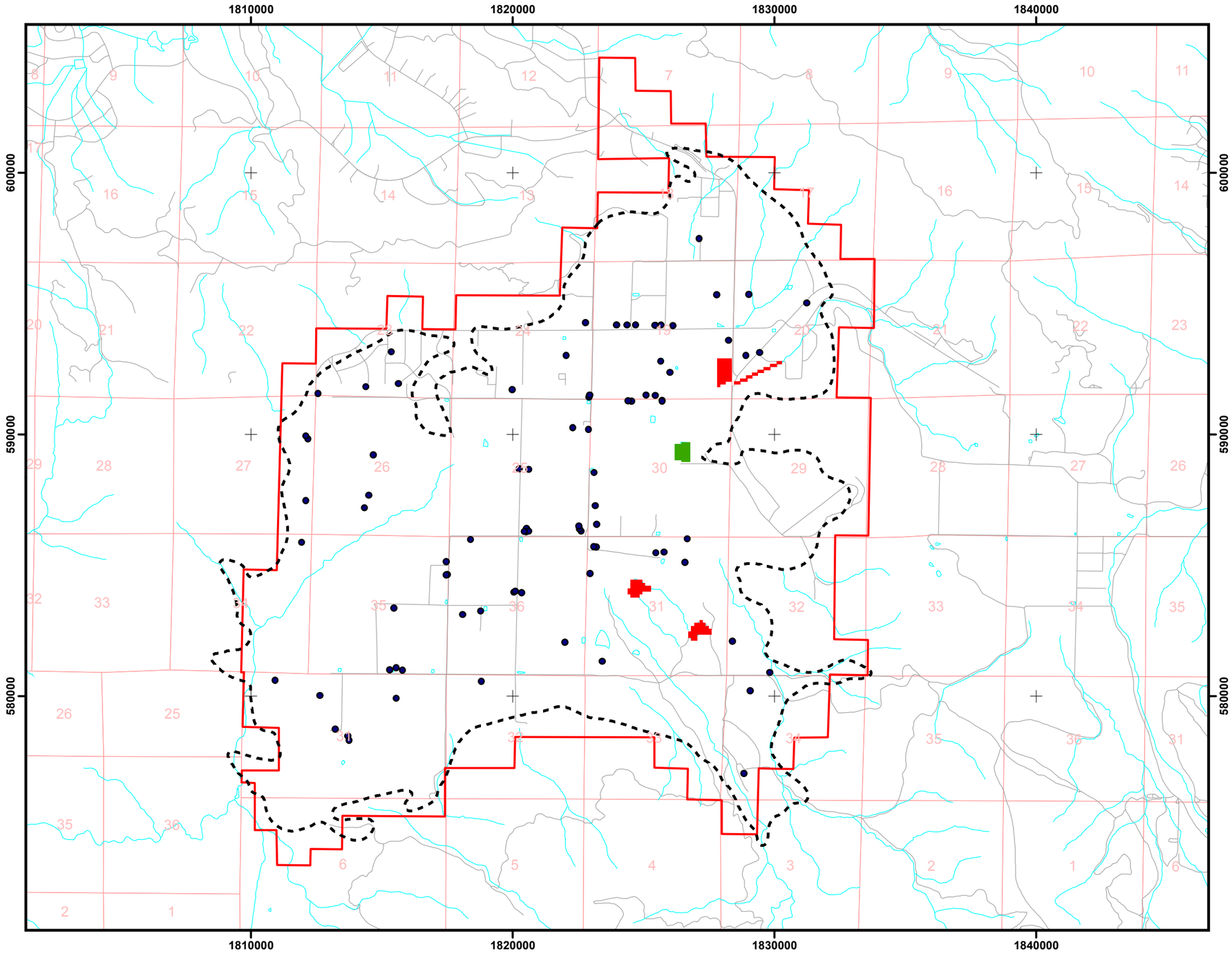
4,000 0 4,000 Feet

Location of Surface Water Features in Numerical Model

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 22

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_22_Location_of_Surface_Water_Num_Model.mxd, 11/21/2014, wcupples



Legend

- Pumping Wells
- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid
- Artificial Recharge
- CCI Treated Wastewater Return Flows

N

W E

S

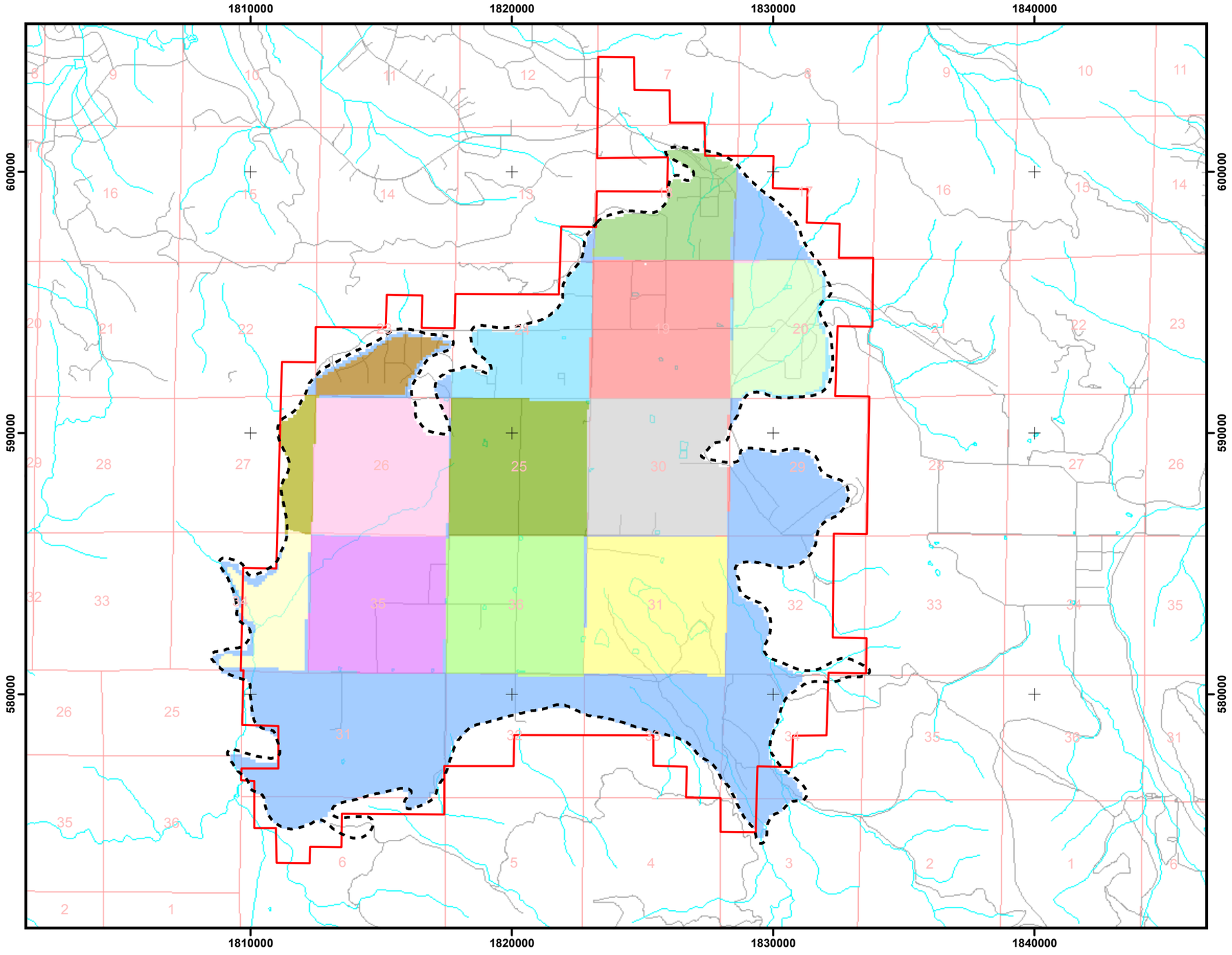
4,000 0 4,000 Feet

Location of Wells and Artificial Recharge in Numerical Model

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 23

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_23_Location_of_Wells_in_Recharge_Model.mxd, 11/21/2014, wcupples



Legend

- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

Note:
Different colors show areas of varying recharge rate. Each year and stress period has different amounts of recharge within each colored area.

N
W E
S

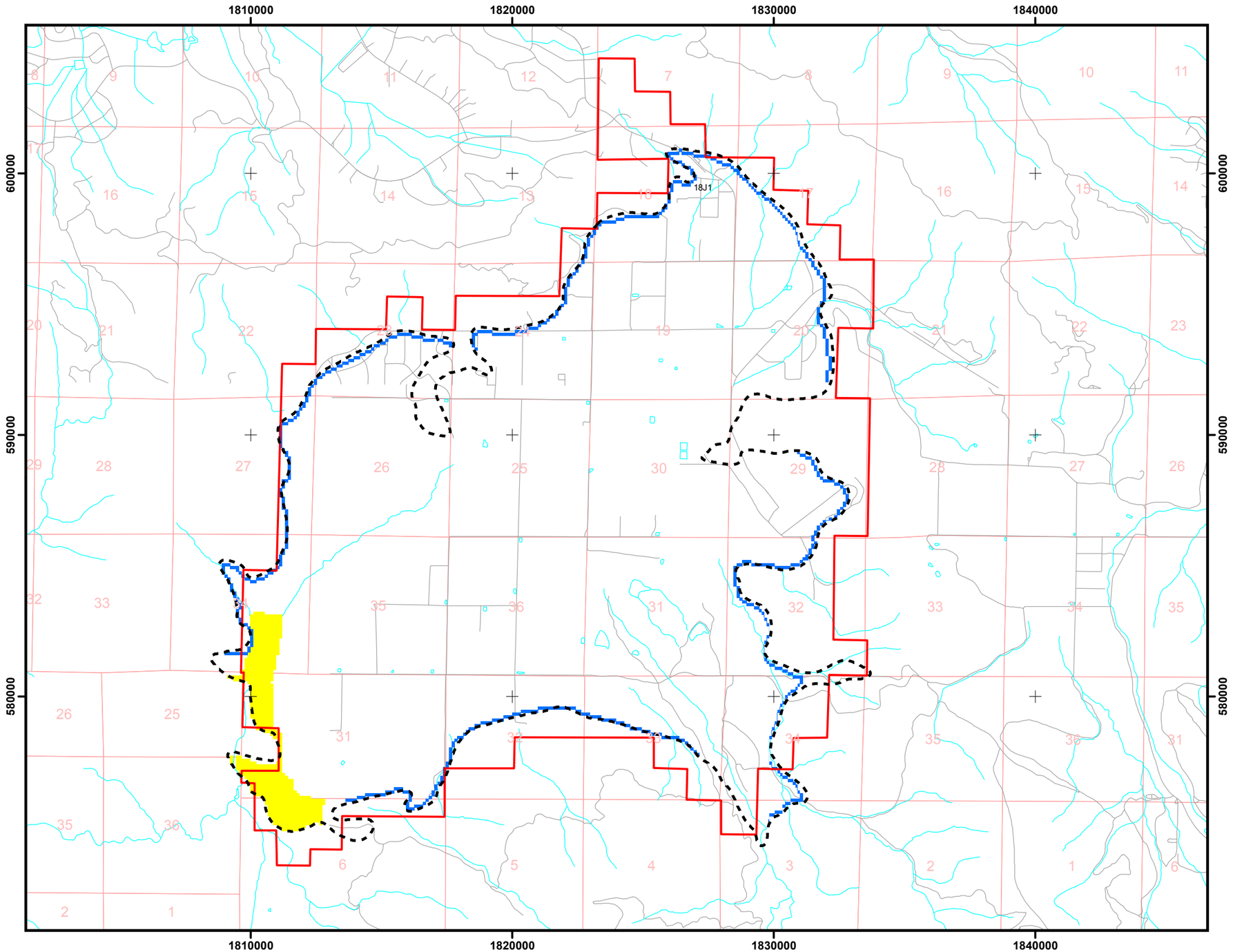
4,000 0 4,000 Feet

Distribution of Return Flow and Precipitation Recharge in Numerical Model

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 24

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_24_Distribution_of_Ag_Pumpage_Return_Flow.mxd, 11/21/2014, wcupples



Legend

- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid
- Subsurface Inflow
- Subsurface Outflow

N
W E
S

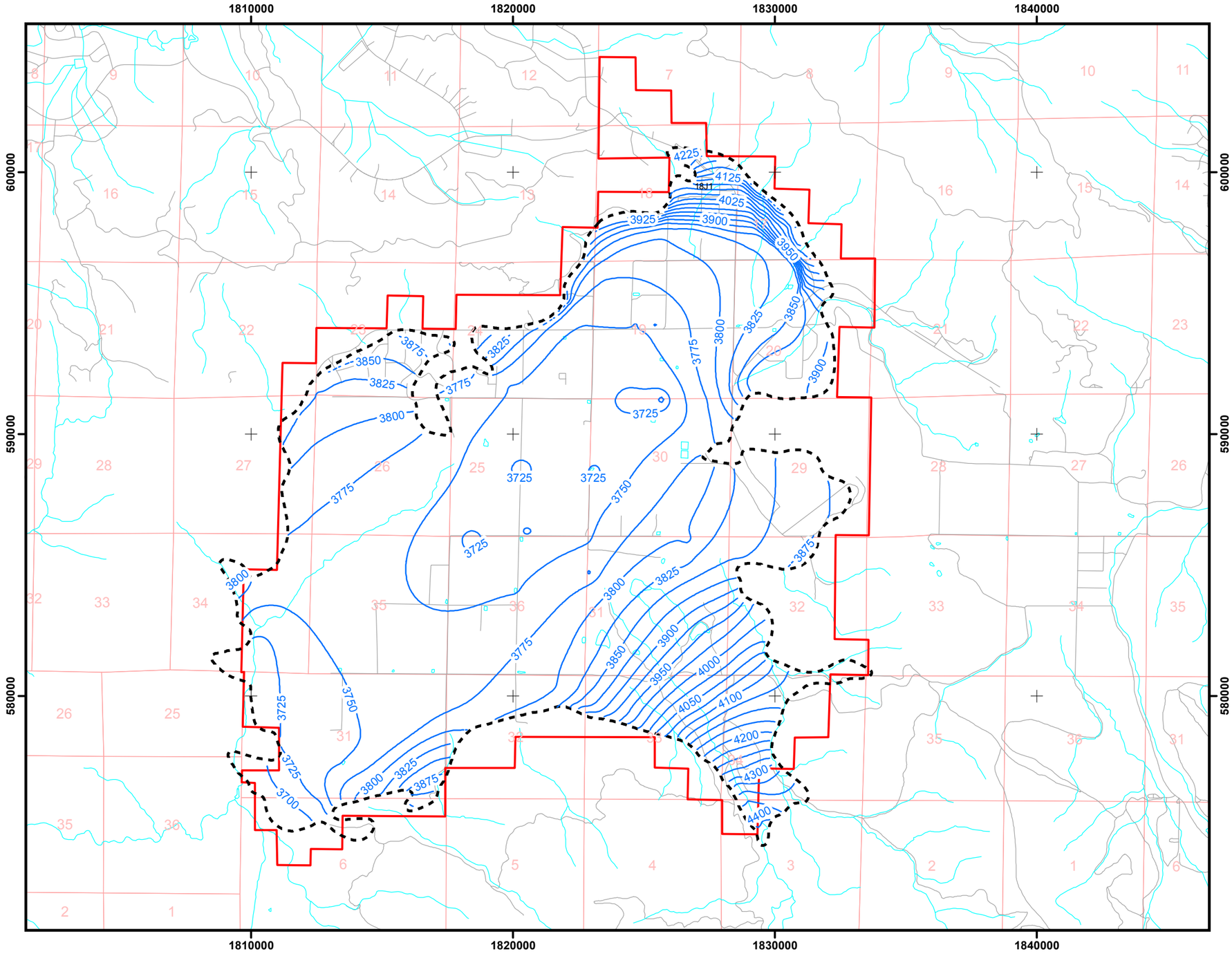
4,000 0 4,000 Feet

Distribution of Subsurface Inflow and Outflow in Numerical Model

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 25

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_25_Distr_Subsurface_Inflow_Outflow.mxd, 11/21/2014, wcupples



Legend

- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid
- Groundwater Elevation Contour (in feet above MSL)

N
W E
S

4,000 0 4,000 Feet

Model Calibration Simulated Groundwater Elevations for Spring 2009 Model Layer 3

Groundwater Model Update
Cummings Groundwater Basin
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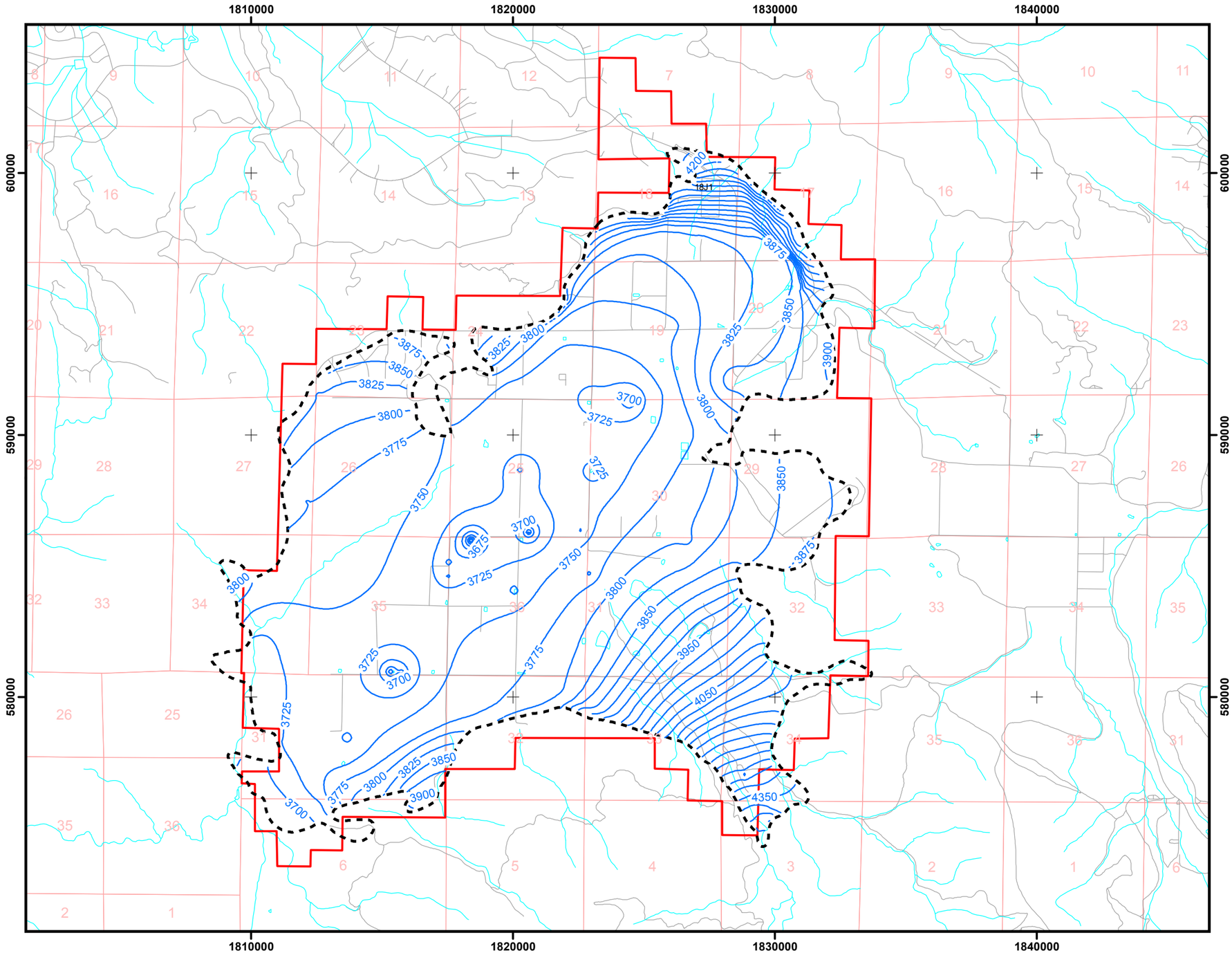
PLATE 26

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_26_Model Calibration Simulated Groundwater Elevations for May 2009.mxd, 3/5/2015, wcupples



Legend

- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid
- Groundwater Elevation Contour (in feet above MSL)

N

W E

S

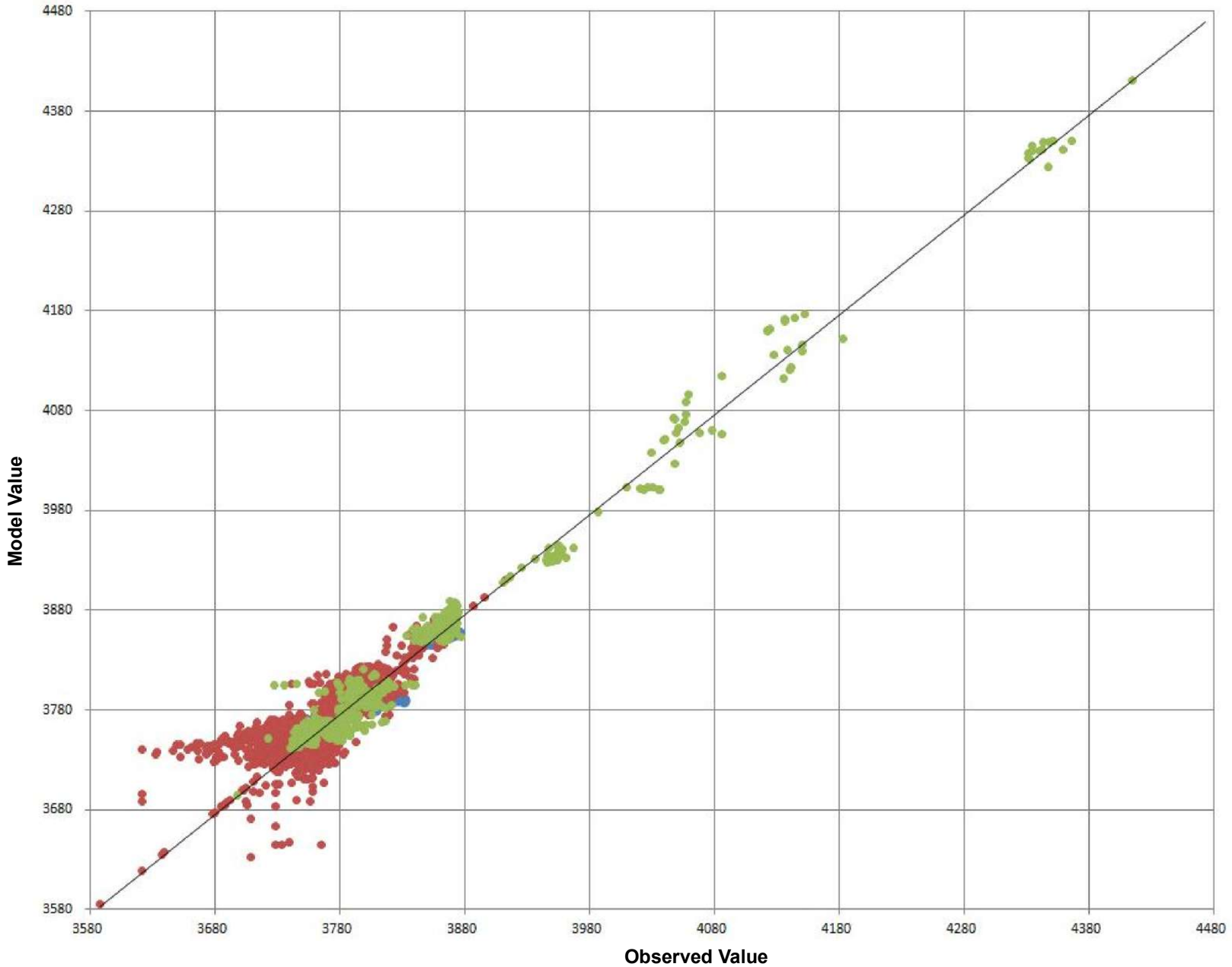
4,000 0 4,000 Feet

Model Calibration Simulated Groundwater Elevations for Fall 2013 Model Layer 3

Groundwater Model Update
Cummings Groundwater Basin
Fugro Consultants, Inc.

PLATE 27

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_26_Model Calibration Simulated Groundwater Elevations for May 2009.mxd, 3/5/2015, wcupples



Legend

- Layer 1
- Layer 2
- Layer 3

Residual Mean	-2.91
Absolute Residual Mean	14.28
Residual Std. Deviation	19.88
RMS Error	20.09
Min. Residual	-122
Max. Residual	118
Number of Observations	2488
Range in Observations	826.1
Scaled Residual Std. Deviation	0.0241
Scaled Absolute Residual Mean	0.0173
Scaled RMS Error	0.0243
Scaled Residual Mean	-0.0035

Model Calibration Summary Plot and Statistics

Groundwater Model Update
Cummings Groundwater Basin
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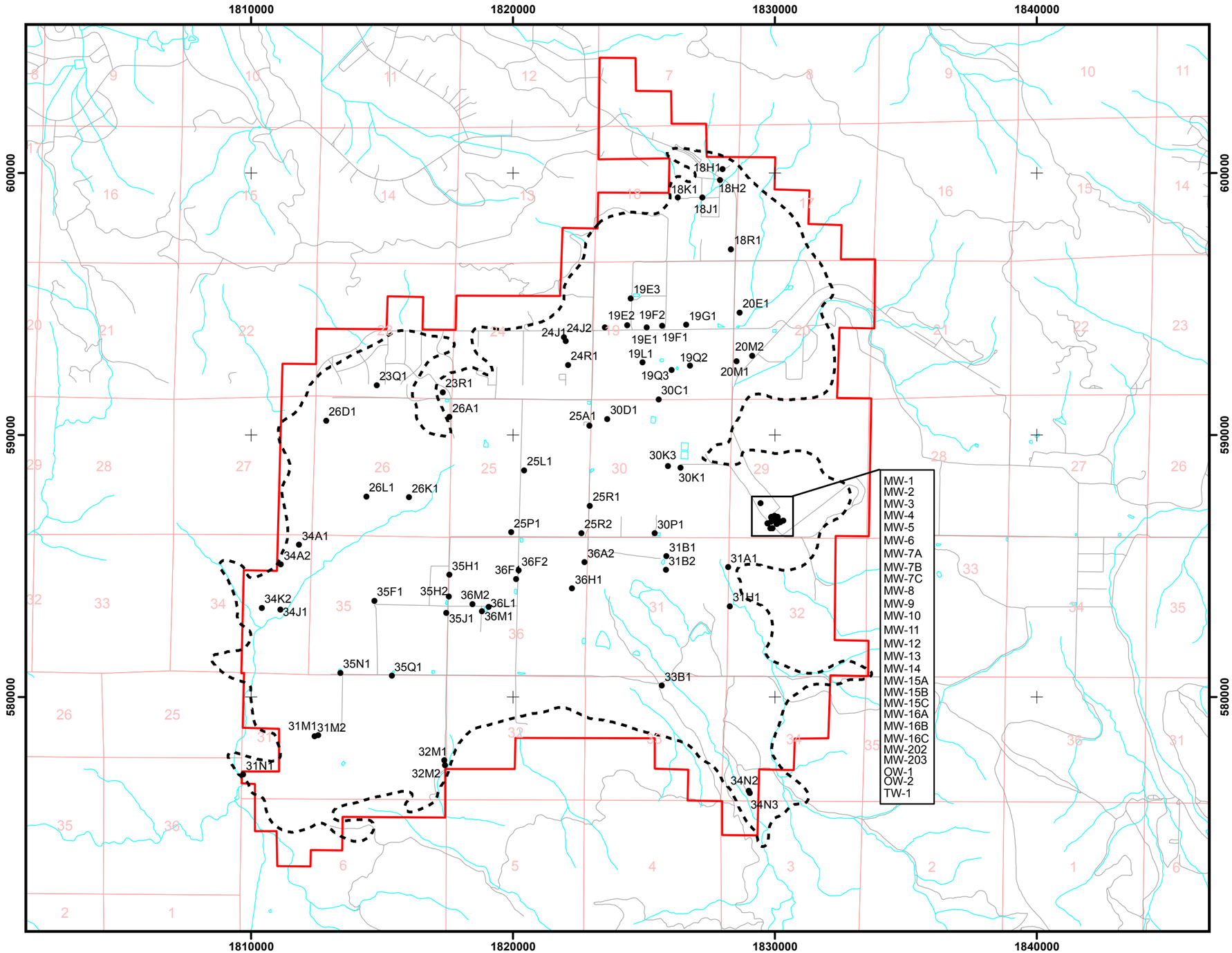
PLATE 28

N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_28_Model_Calibration_Summary_Plot_and_Statistics.mxd, 3/5/2015, wcupples



Legend

- Location of Well with Groundwater Elevation Used in Calibration
- Boundary of Alluvium (Bedrock elevation = surface elevation)
- Basin Outline (adjudicated basin definition)
- Streams
- Roads
- Township and Range Grid

N
W E
S

4,000 0 4,000 Feet

Location Map For Model Calibration Data

Groundwater Model Update
Cummings Groundwater Basin
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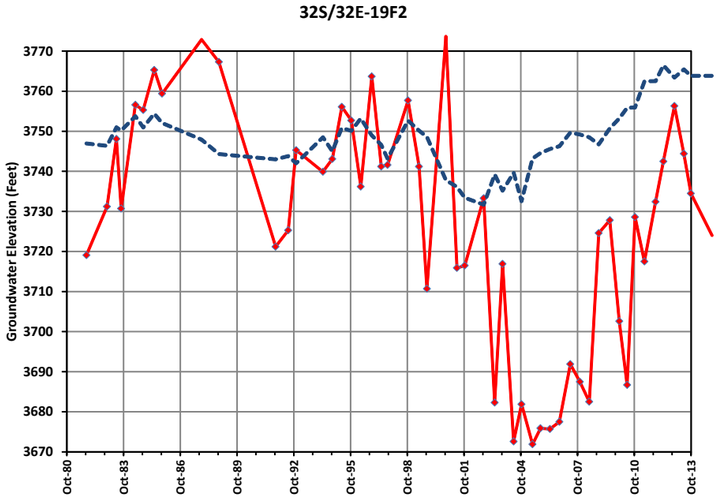
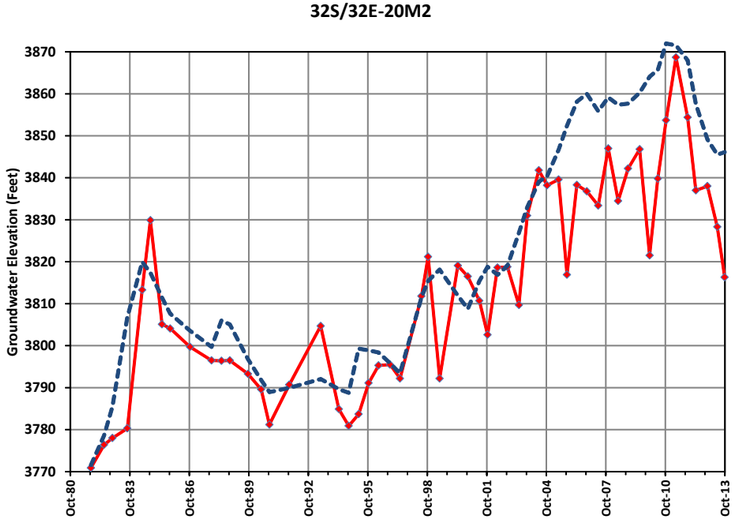
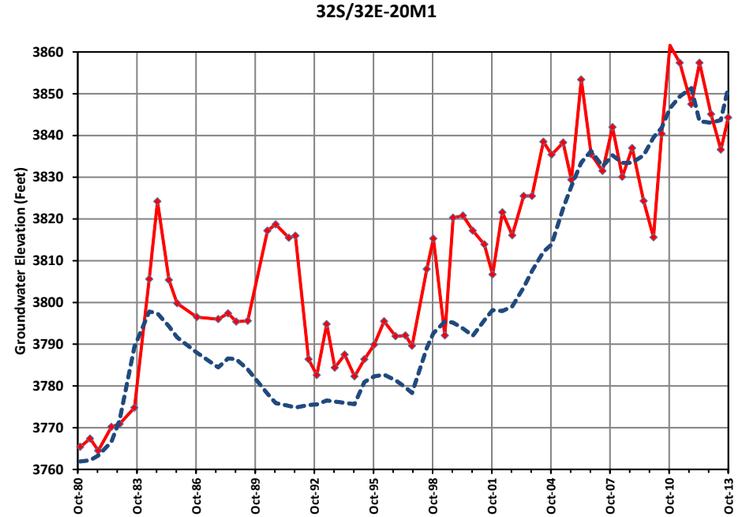
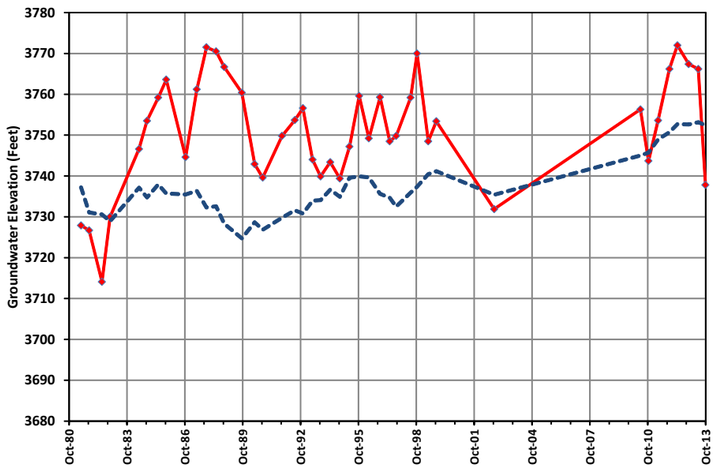
PLATE 29

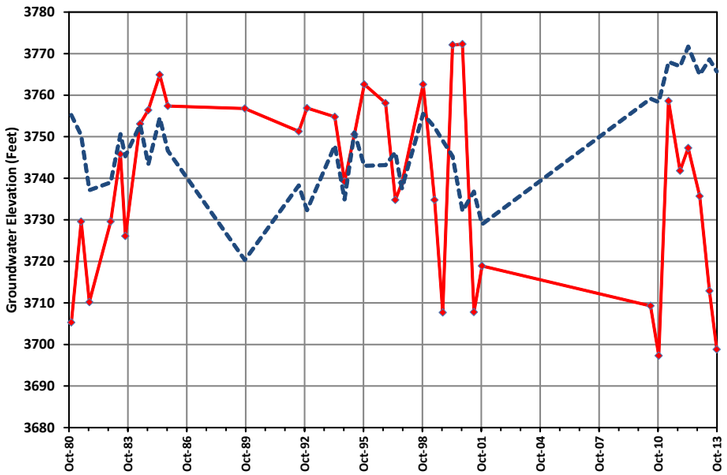
N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_29_Location Map for Model Calibration Data.mxd, 3/5/2015, wcupples

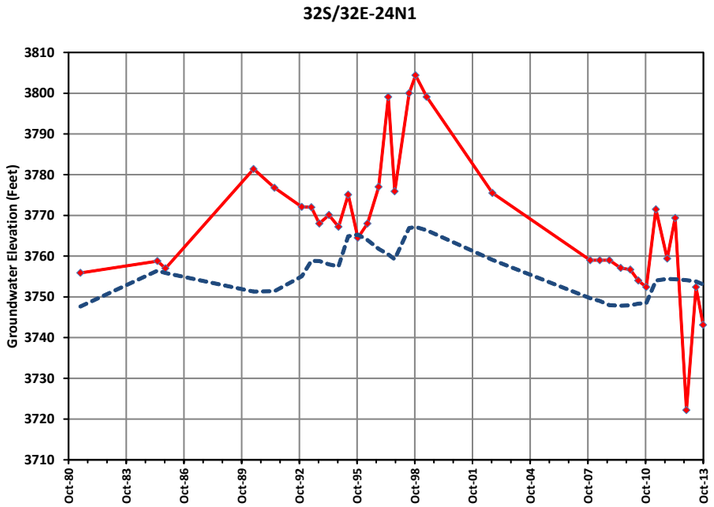












Legend
- Measured Data
- Simulated Data

Model Calibration Individual Hydrographs for Northern Basin

Groundwater Model Update
Cummings Groundwater Basin
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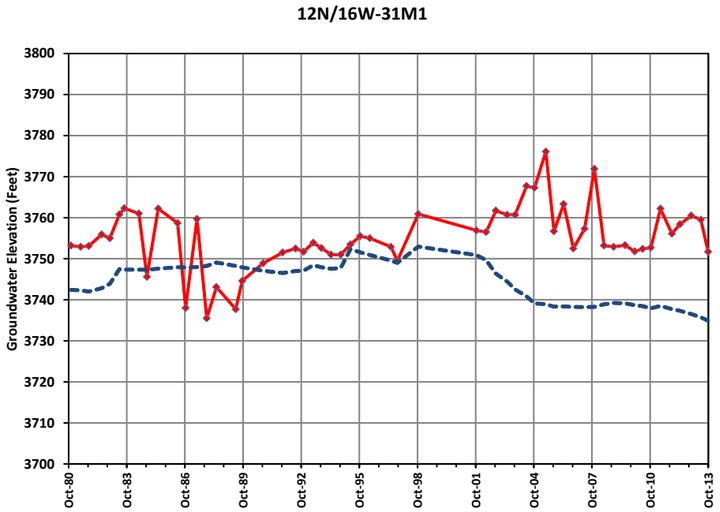
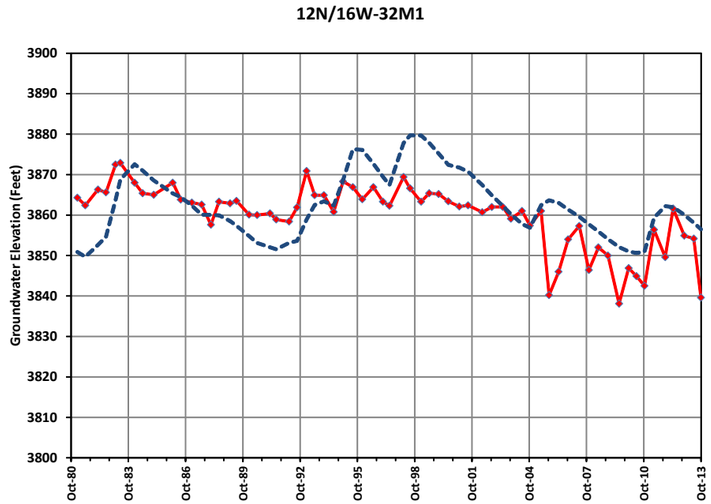
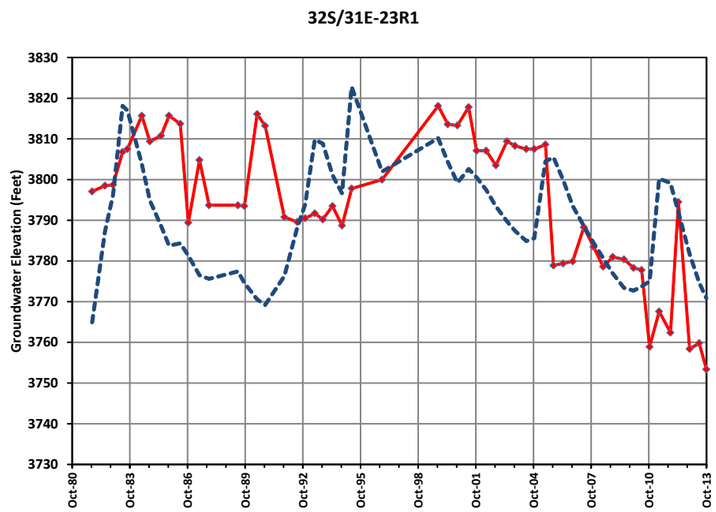
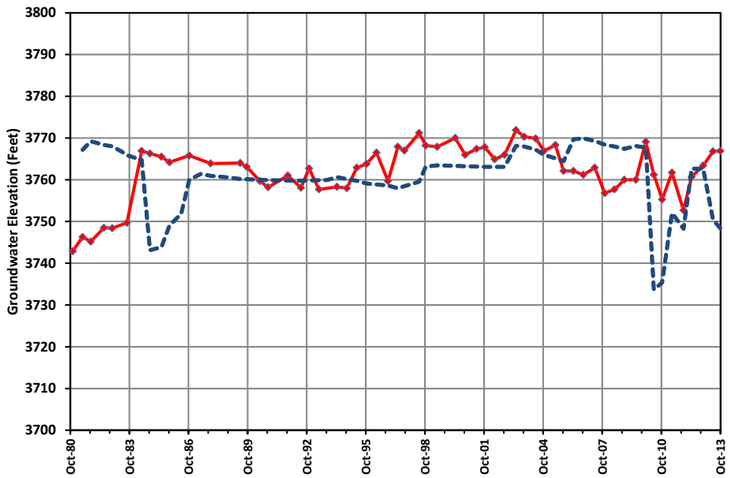
PLATE 30

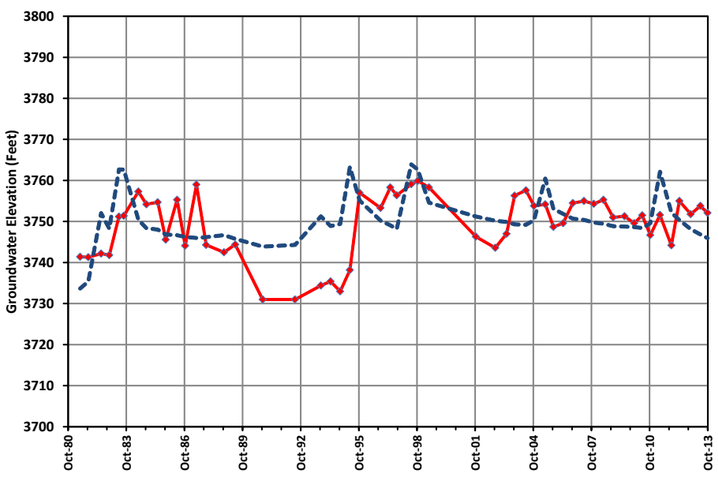
N:\Projects\04_2013\04_6213_0169_CummingsBasin\Outputs\2014_11_Draft_Rpt\mxd\Plate_30_Model_Calibration_Individual_Hydrographs_for_Northern_Basin.mxd, 3/5/2015, wcupples

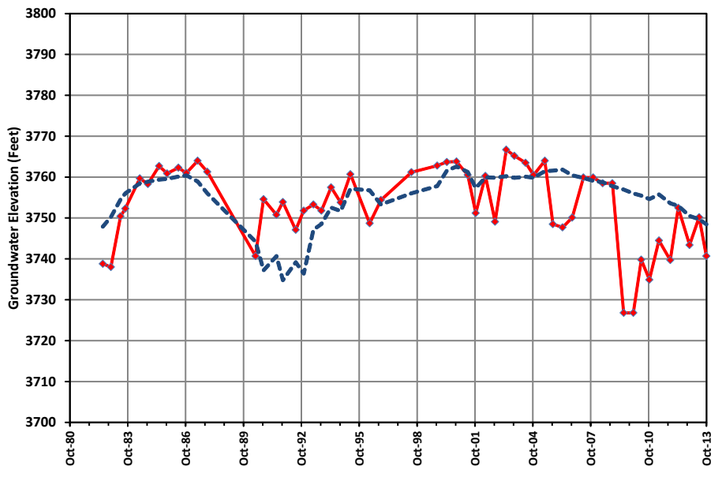


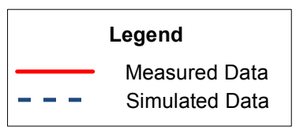












Model Calibration Individual Hydrographs for Western Basin

Groundwater Model Update
Cummings Groundwater Basin
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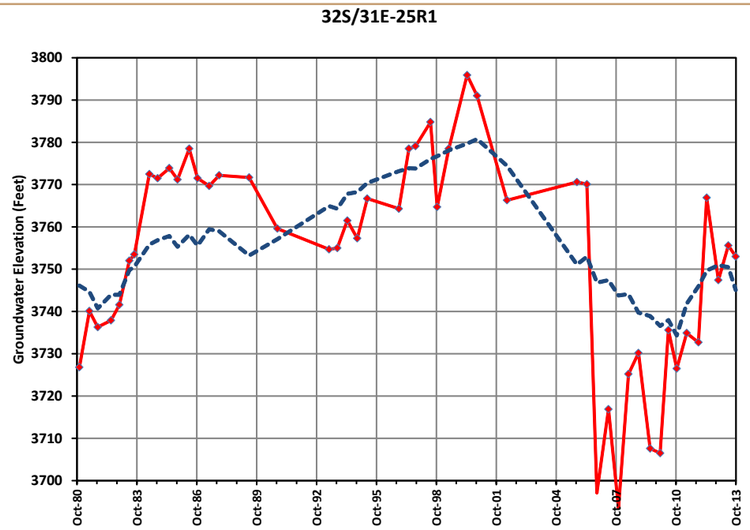
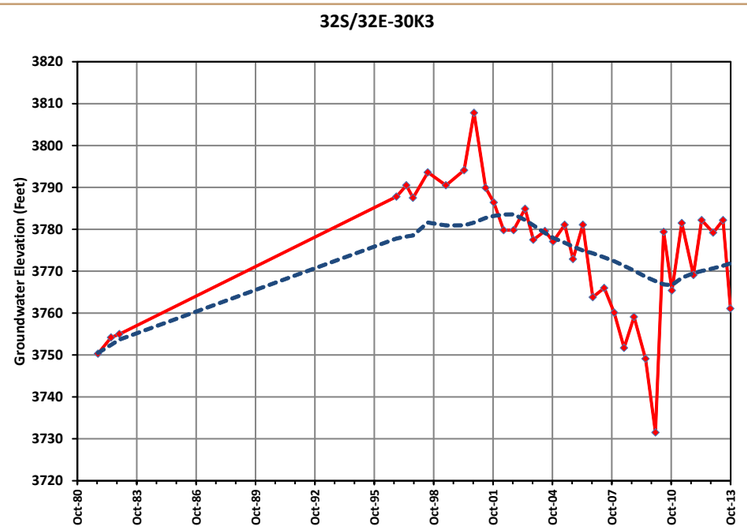
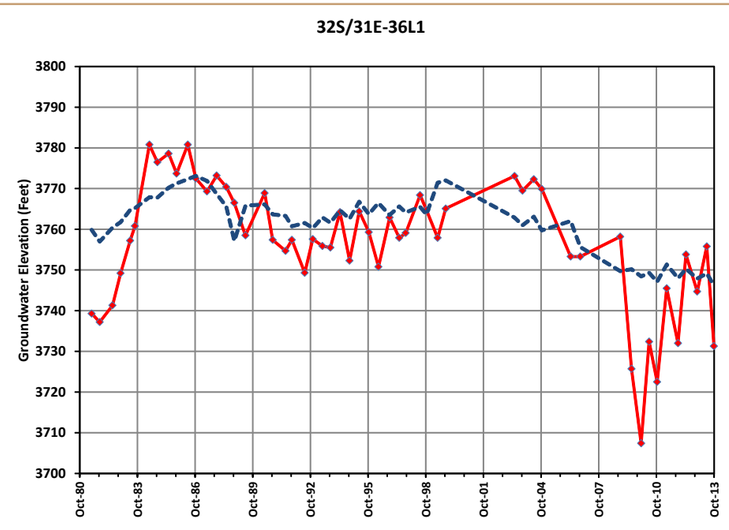
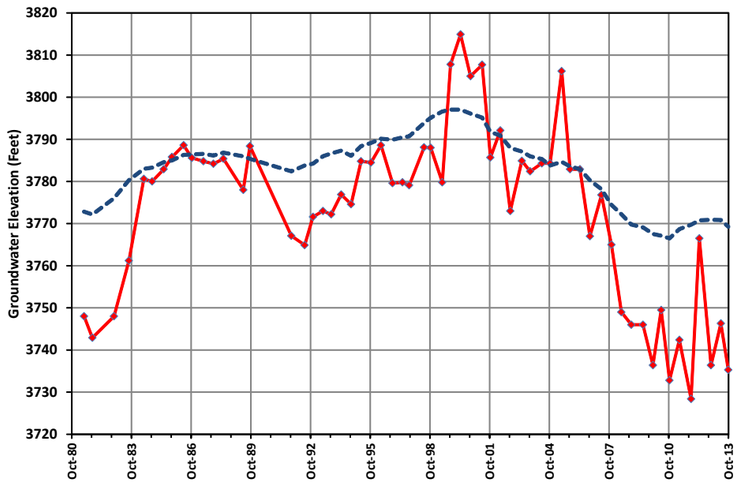
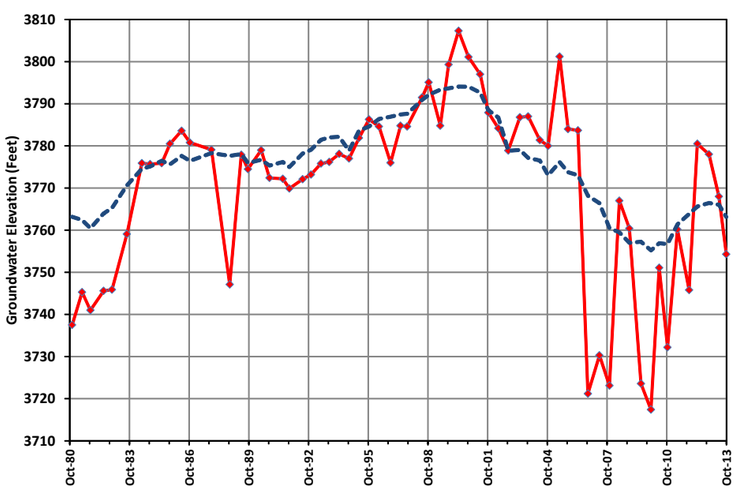
PLATE 31

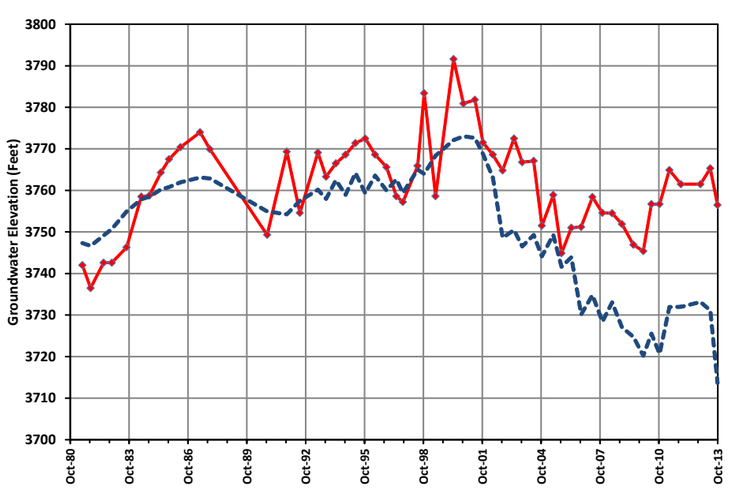


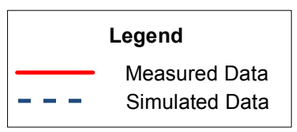












Model Calibration Individual Hydrographs for Southern Basin

Groundwater Model Update
Cummings Groundwater Basin
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PLATE 32