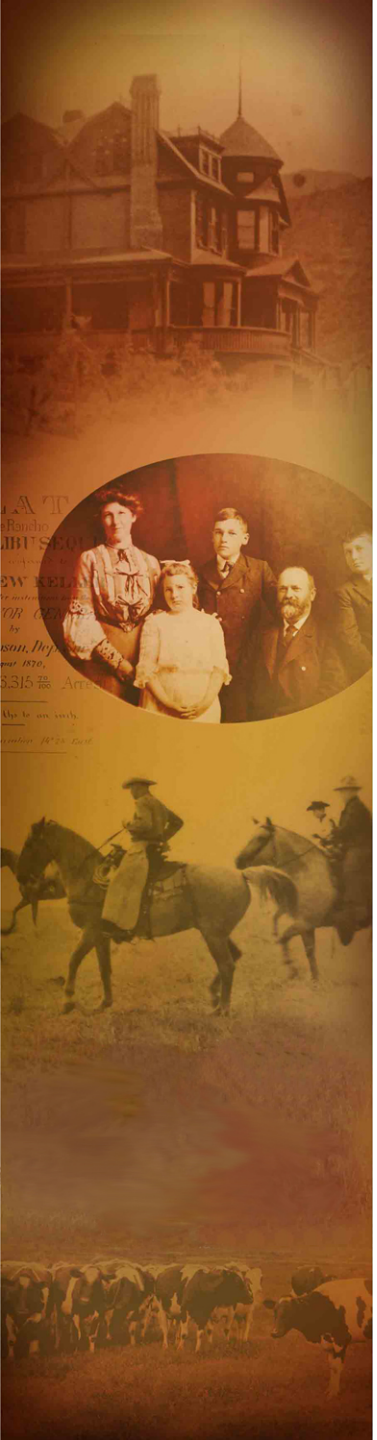
Stakeholder Meeting

Civic Center Wastewater Treatment Facility

February 27, 2014



Meeting Agenda

I. Introductions
II. Project Implementation
III. Groundwater Injection Studies and Findings
    - Model Update
    - Salt and Nutrient Management Plan
    - Ocean Water Quality Analysis
IV. CEQA/EIR Analysis
V. Conclusions

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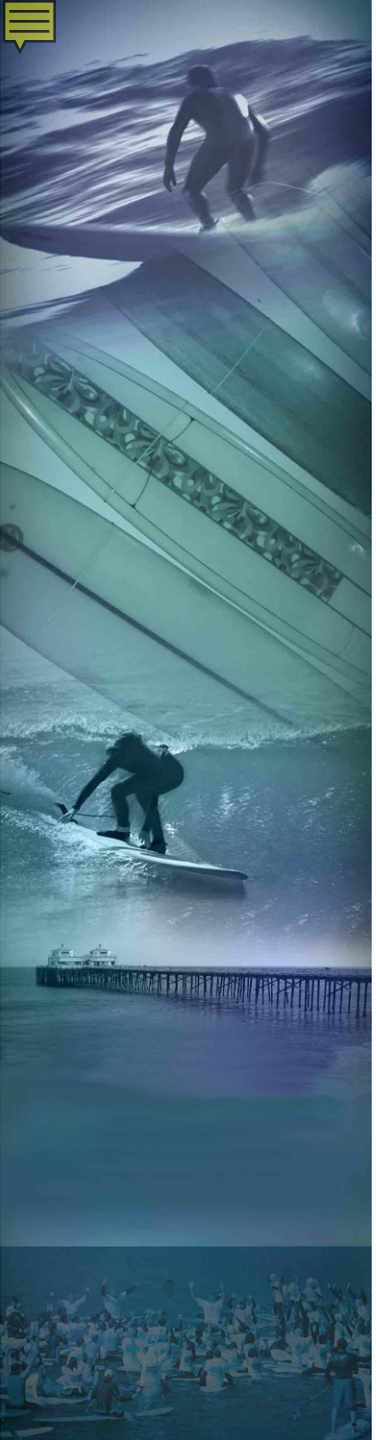
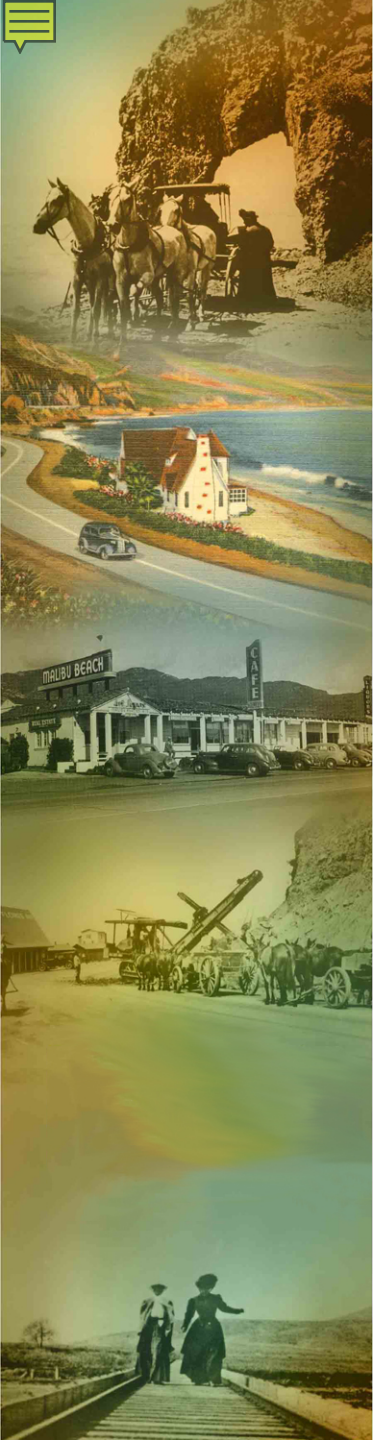
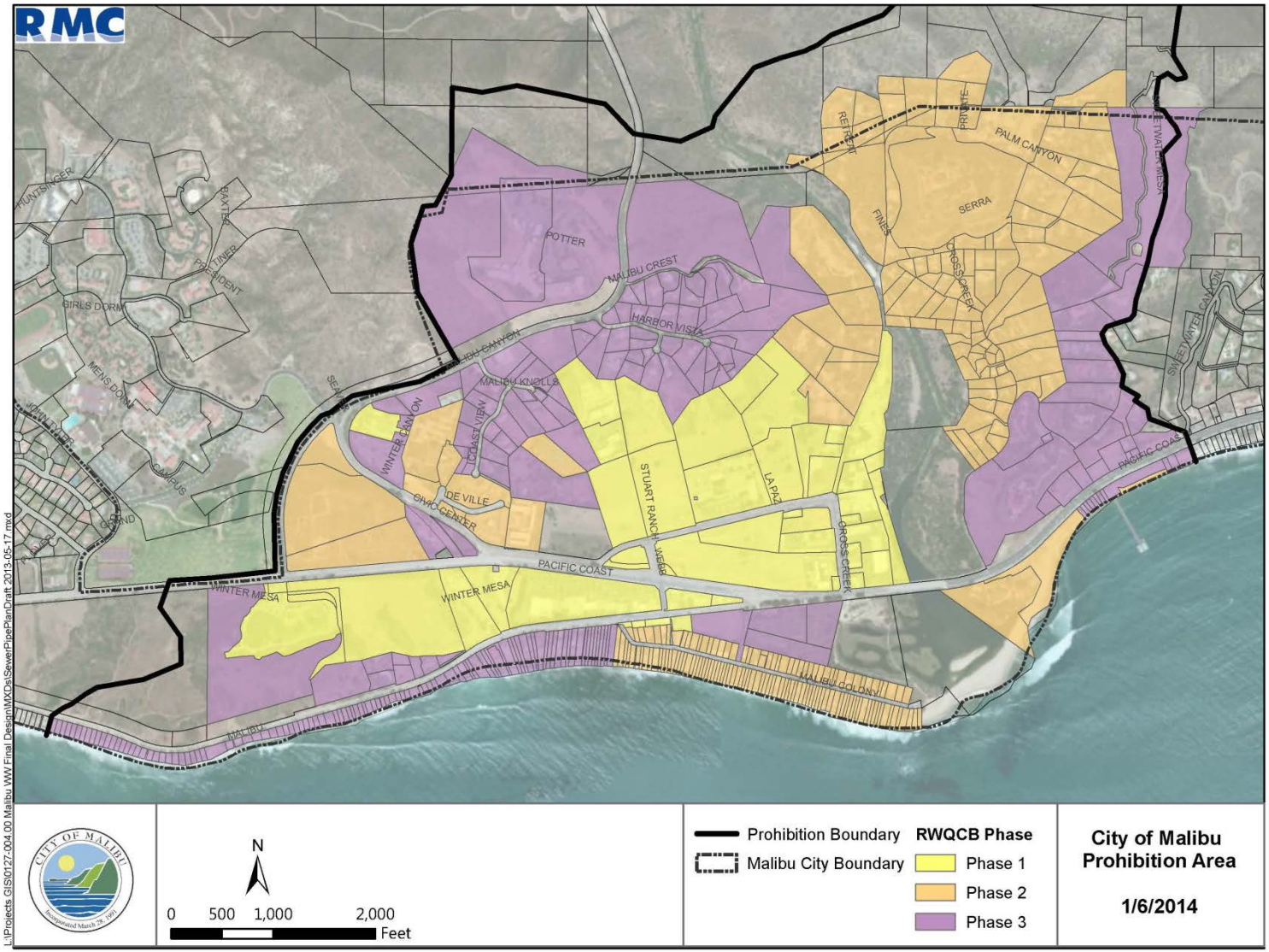


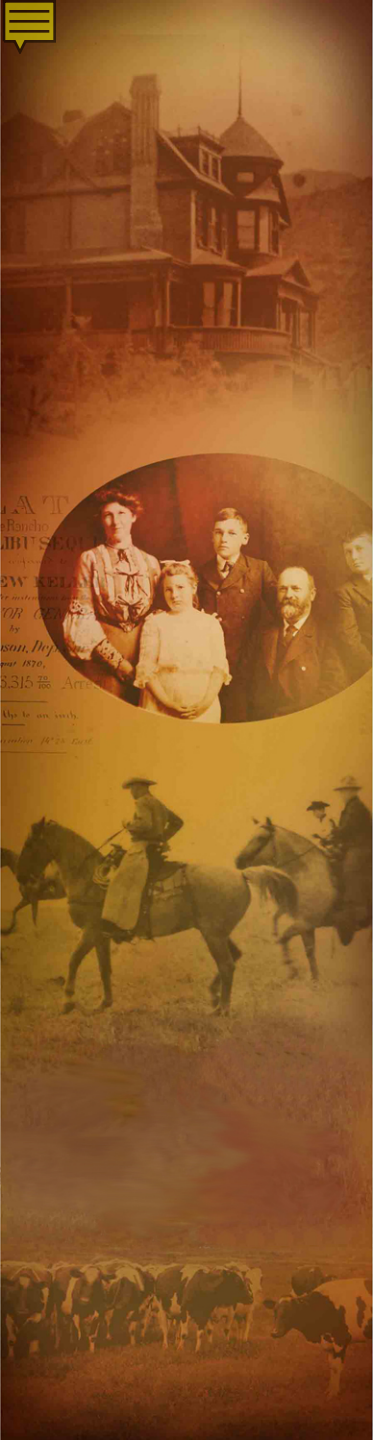
Project Implementation

- Phase 1 Project
  - Wastewater collection system
  - Civic Center Wastewater Treatment Facility
  - Recycled water distribution pipeline
- Phase 2 Project
  - Wastewater collection system pipeline extension
  - Civic Center Wastewater Treatment Facility expansion
  - Recycled water distribution pipeline
- Phase 3 Project
  - Wastewater collection system pipeline extension
  - Recycled water distribution pipeline

Project Phasing







Priorities for Reuse

1. Maximize reuse for landscape irrigation
2. Maximize reuse for other non-potable uses
3. Groundwater injection
4. Winter Canyon percolation

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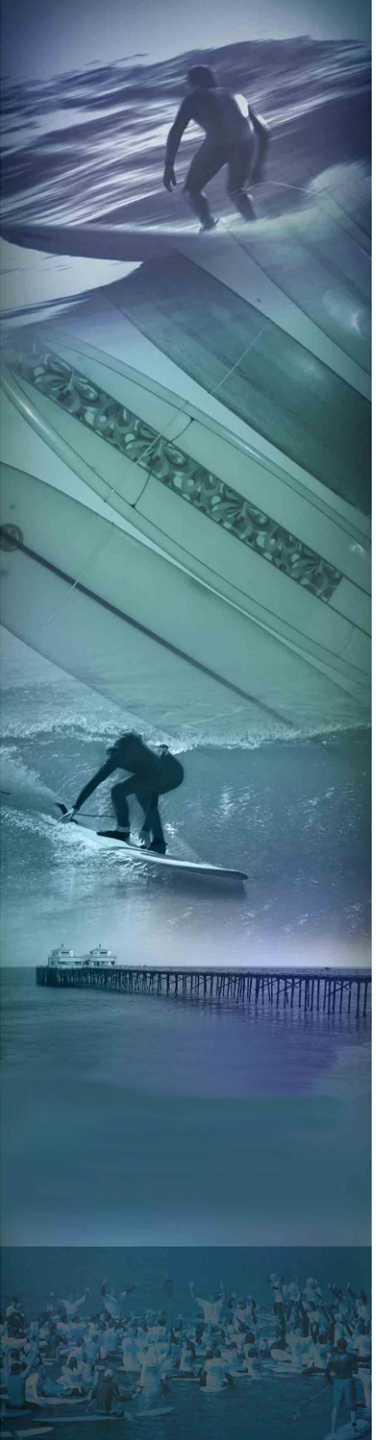
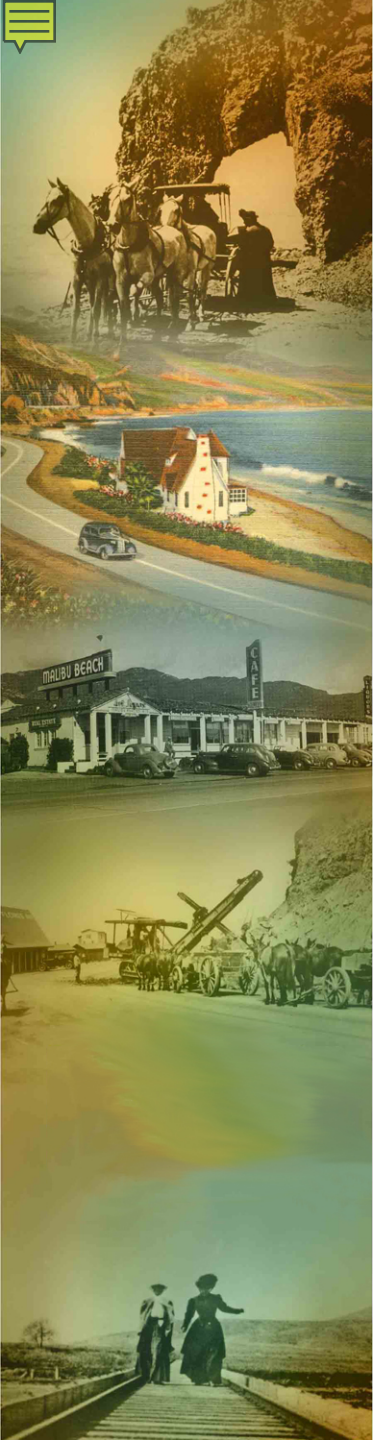


Checkpoints to Project Implementation

Checkpoint	Yes	No
1. Has recycled water reuse been maximized?		
2. Is there sufficient groundwater injection capacity?		
3. Will injected water flow to Malibu Creek and/or Lagoon?		
4. Will groundwater quality be impacted by the injection?		
5. Will there be ocean water quality impacts?		
6. Is the project permittable?		

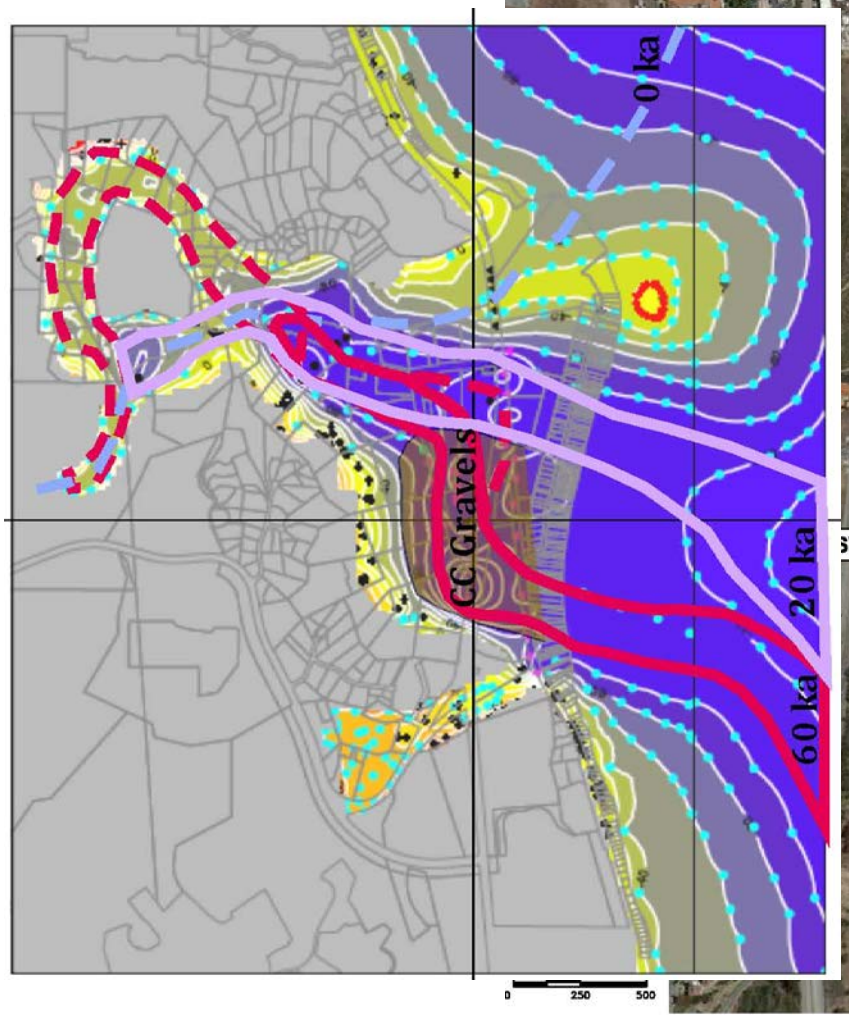


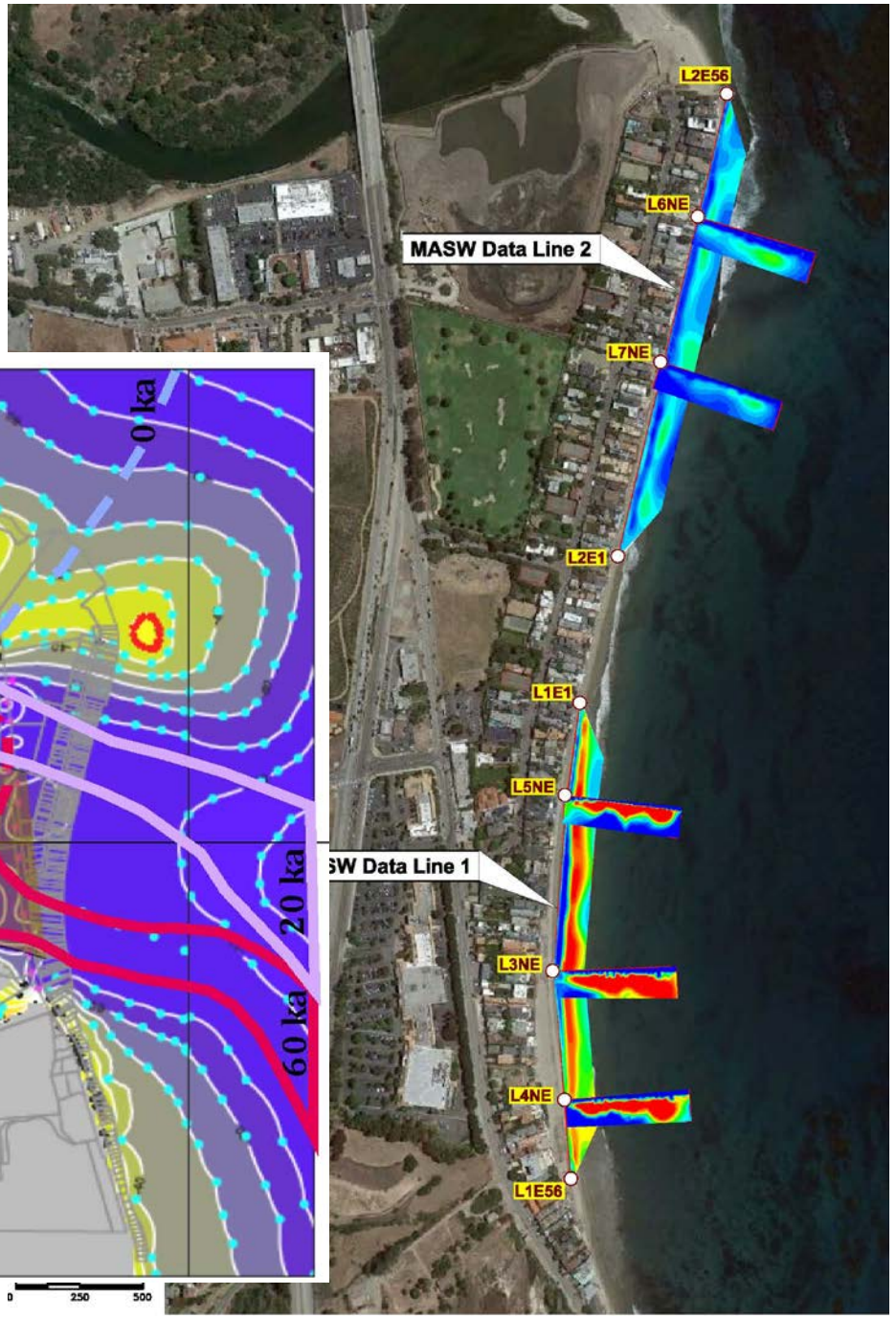
2013 Field Program

- 9 additional monitoring wells (7 to bedrock; 2 shallow alluvium)
- Shoreline Resistivity Survey
- Pumping and Injection Testing
- Groundwater Model Update (in progress)

Additional Monitoring Wells

Electrical Resistivity Survey



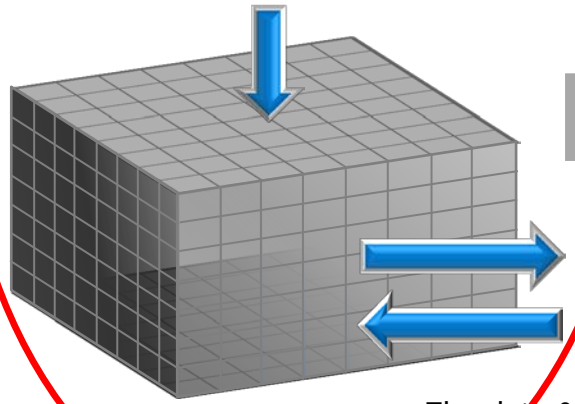


Injection Testing

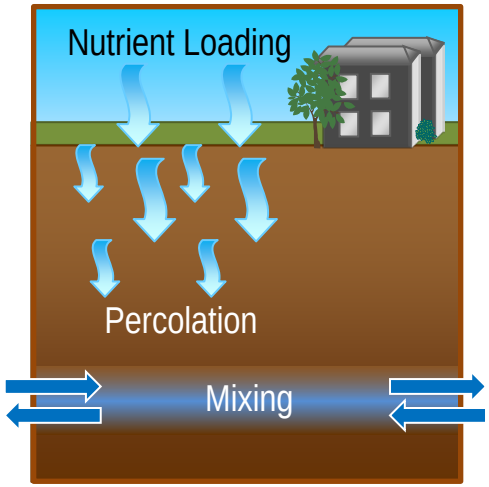
- Step-Injection Testing
- 24-hour Continuous Injection Testing
- 7-day Continuous Injection Testing

Modeling Strategy to Support Design and Analysis

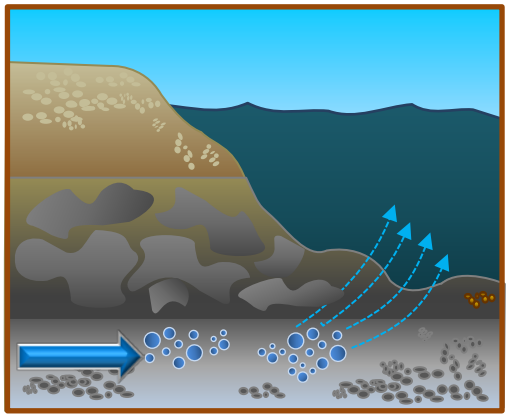
Groundwater Injection Analysis (MODFLOW)



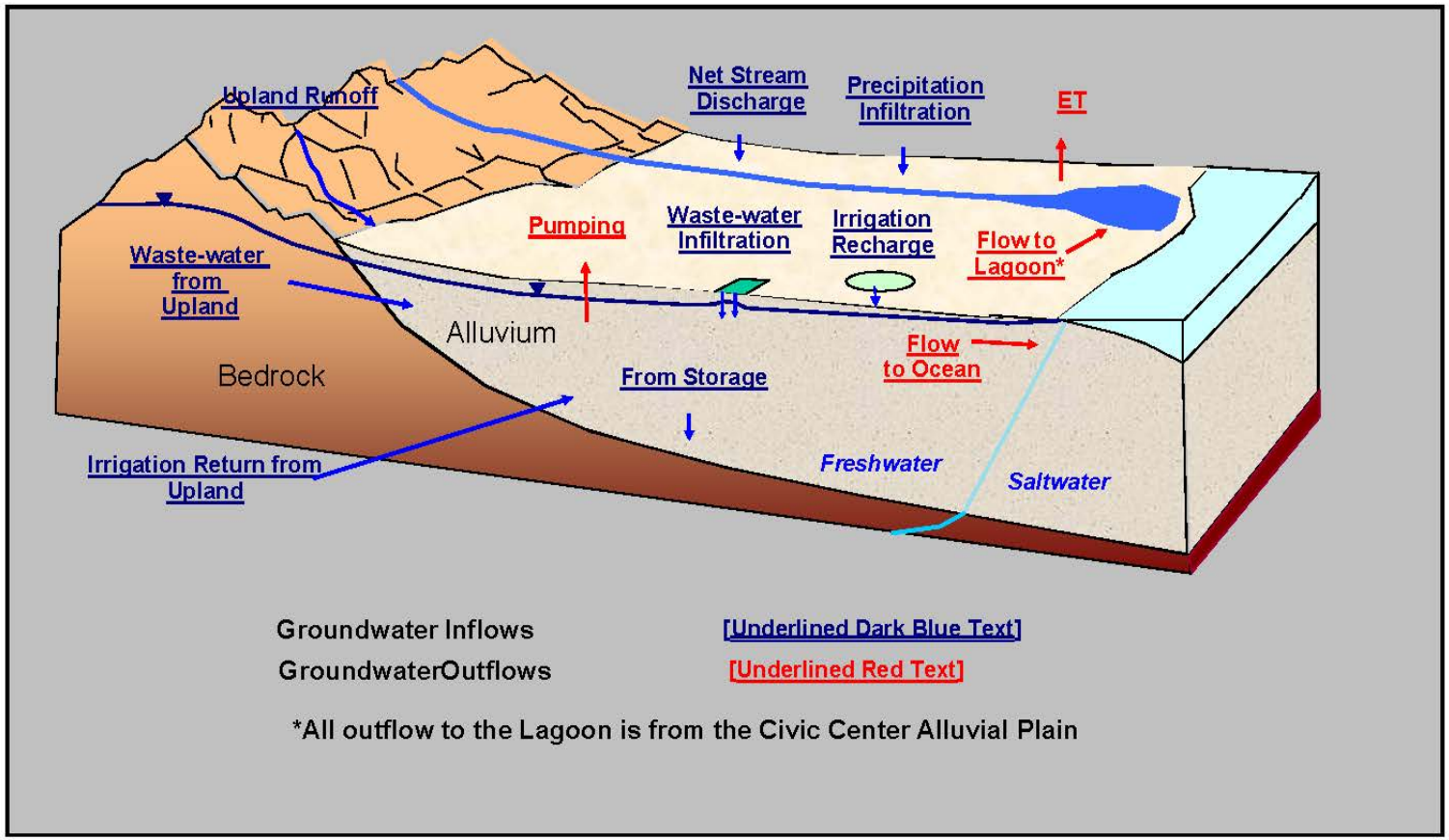
Salt-Nutrient Loading and Mixing Models



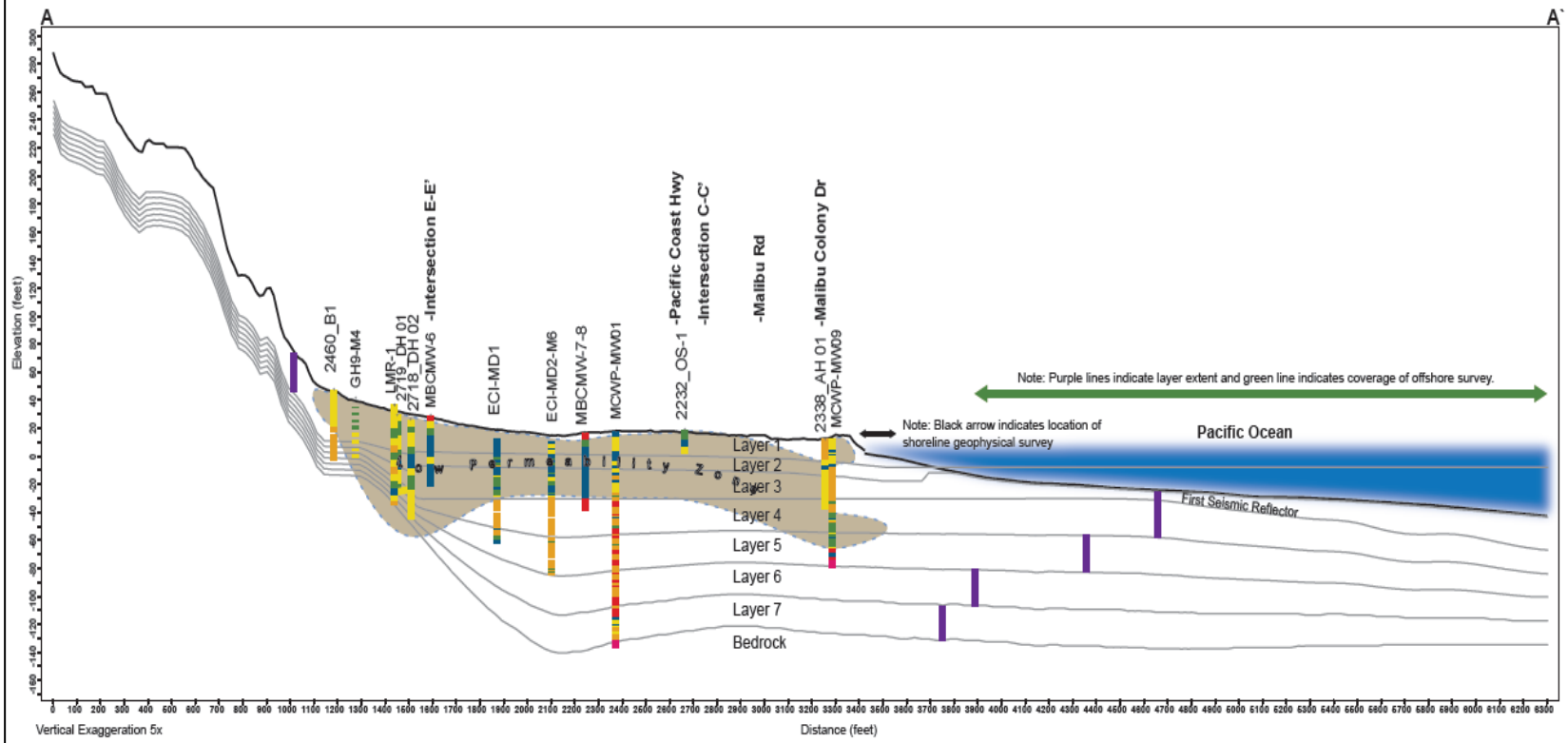
Analytical Ocean Diffusion Analysis



Sources and Sinks for Groundwater Flow System



Source: Malibu16_PEST



Cross Section A-A`

Legend

← North

- CL; ML/CL; CL-ML; CH
- ML; ML-SC; ML-SM
- SM; SM-SC; SC-SM; SC
- SP; SW; SW-SC; SP-SC
- GM; GP; GW; GP-SW
- BR
- Stratigraphic Contact Between Fine and Coarse Grains

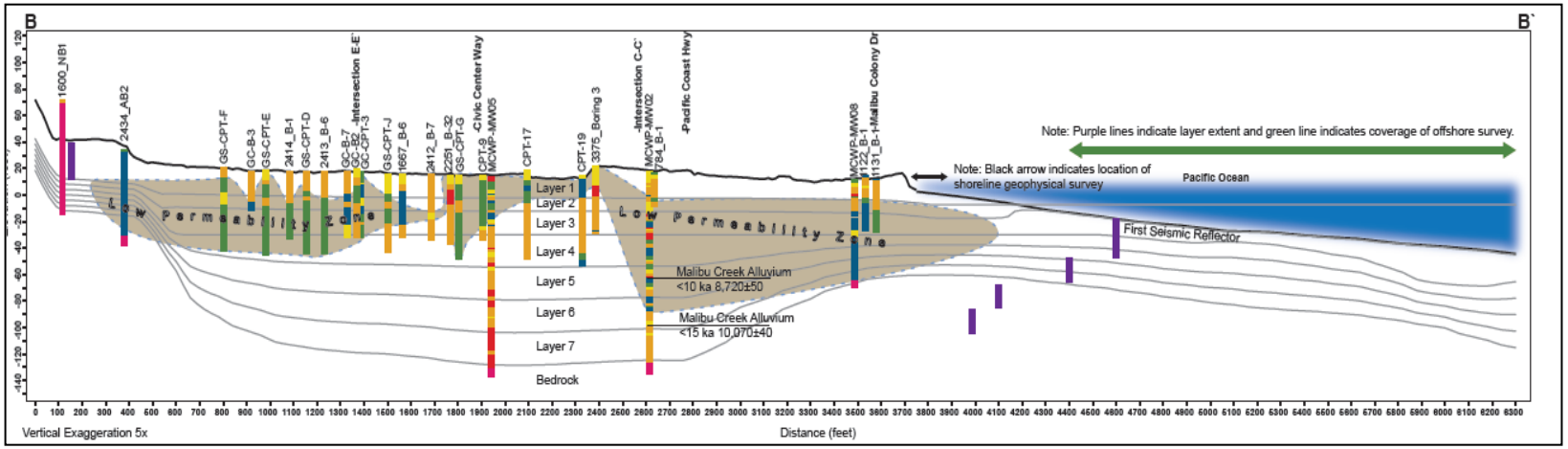
Cross-Section A-A'

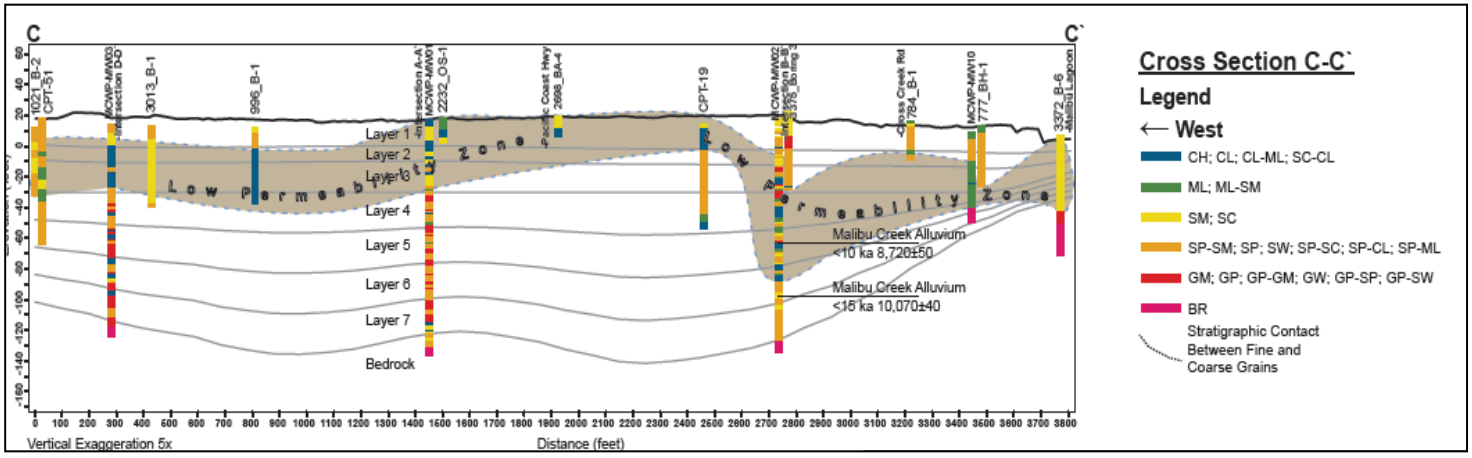
Malibu Centralized Wastewater Project
Civic Center Area
Malibu, CA

8/6/2013

earthforensics, inc.

Figure 2


B
B`
Low permeability zone
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
Layer 7
Bedrock
Malibu Creek Alluvium
<10 ka 8,720±50
Malibu Creek Alluvium
<15 ka 10,070±40
Note: Purple lines indicate layer extent and green line indicates coverage of offshore survey.
Note: Black arrow indicates location of shoreline geophysical survey
Pacific Ocean
First Seismic Reflector
Vertical Exaggeration 5x
Distance (feet)


C
C`
Low permeability zone
Layer 1
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Layer 5
Layer 6
Layer 7
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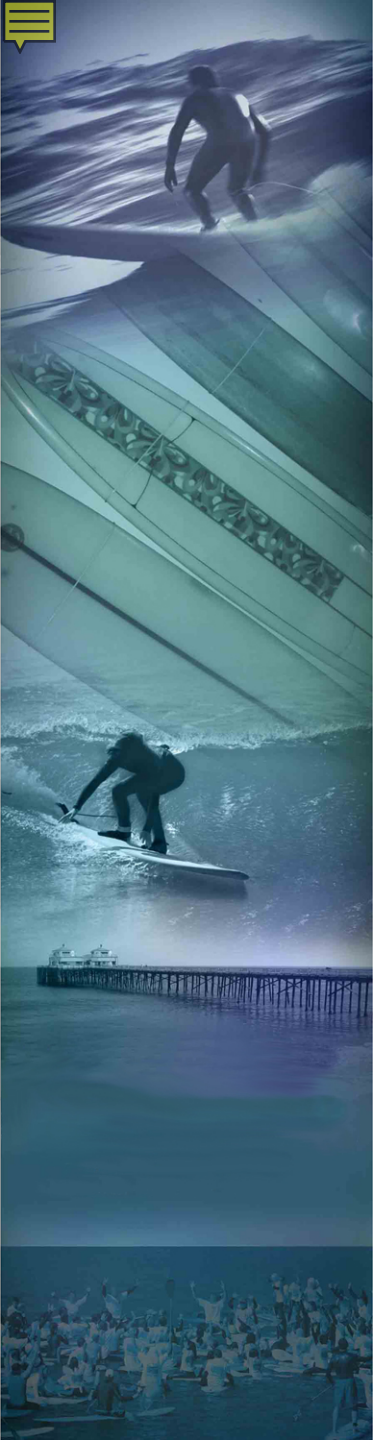
<10 ka 8,720±50
Malibu Creek Alluvium
<15 ka 10,070±40
Vertical Exaggeration 5x
Distance (feet)
Cross Section C-C`
Legend
← West
CH; CL; CL-ML; SC-CL
ML; ML-SM
SM; SC
SP-SM; SP; SW; SP-SC; SP-CL; SP-ML
GM; GP; GP-GM; GW; GP-SP; GP-SW
BR
Stratigraphic Contact Between Fine and Coarse Grains

Groundwater Model (MODFLOW) Update

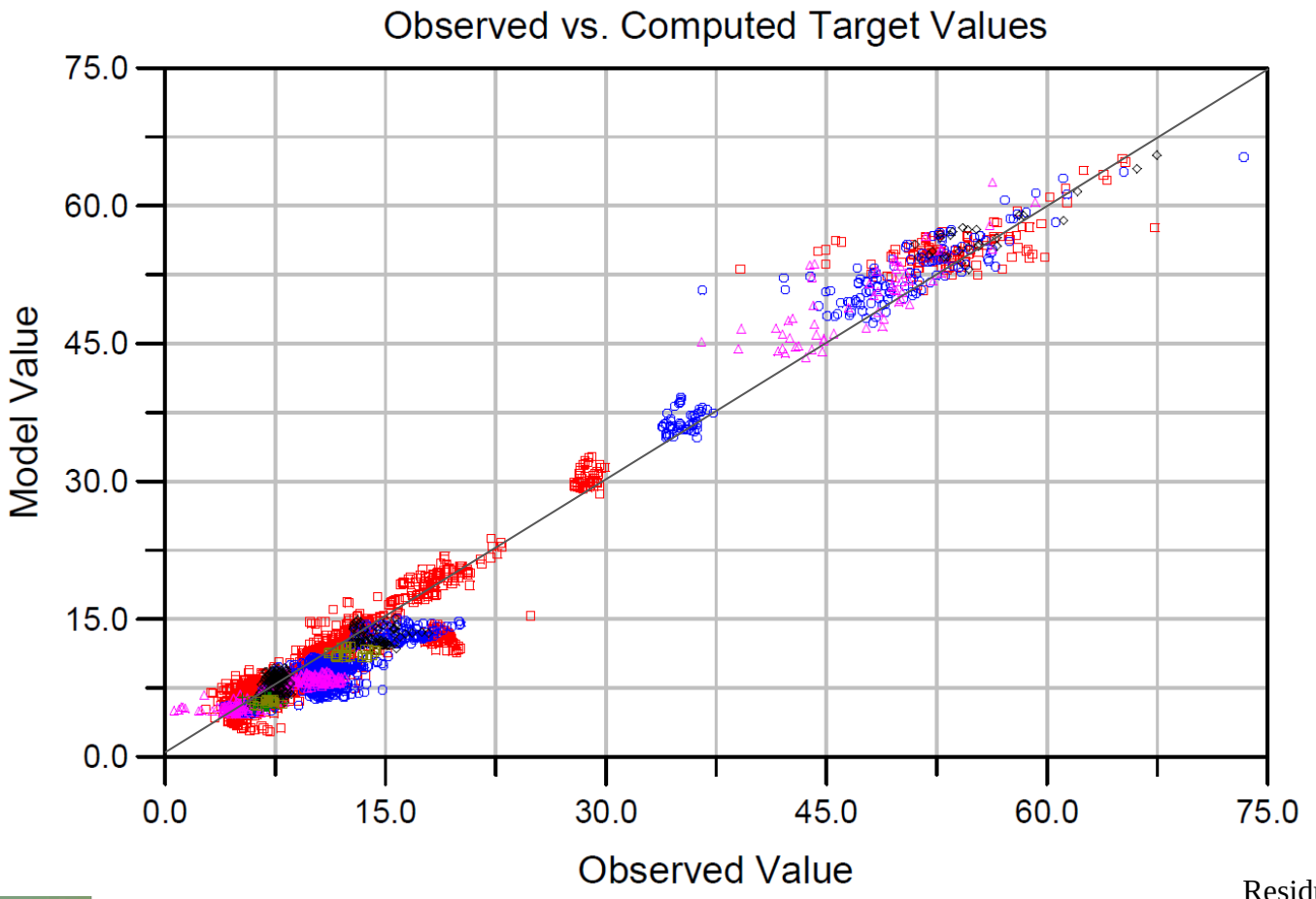
- Update Hydrogeology
- Calibration
- Scenario Planning and Analysis
- Sensitivity Analyses



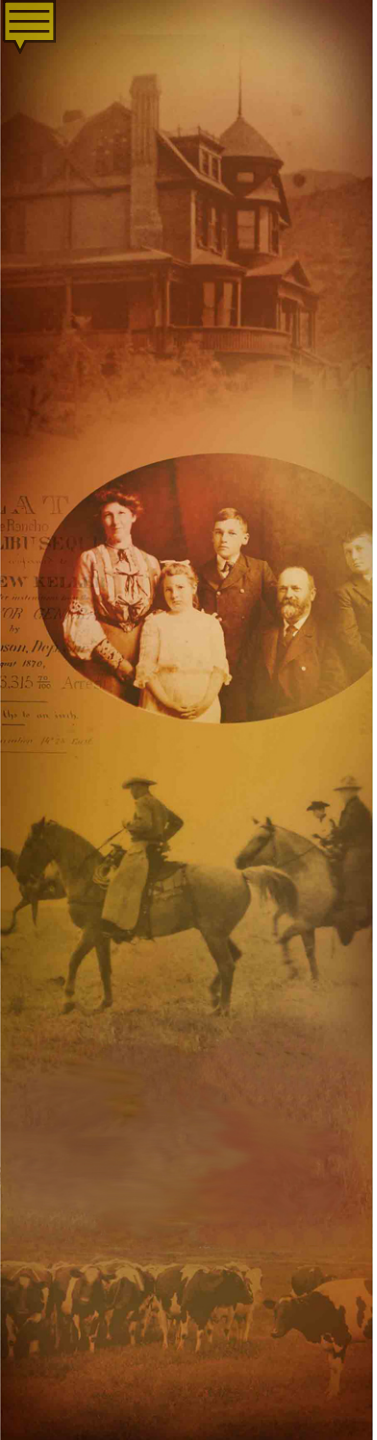
Model Calibration Strategy

- Compare model-calculated ground water elevations to field measurements for transient simulation 2003-2012
- Compare model-calculated hydraulic responses with field observations during injection testing

Recalibration Shows Good Results



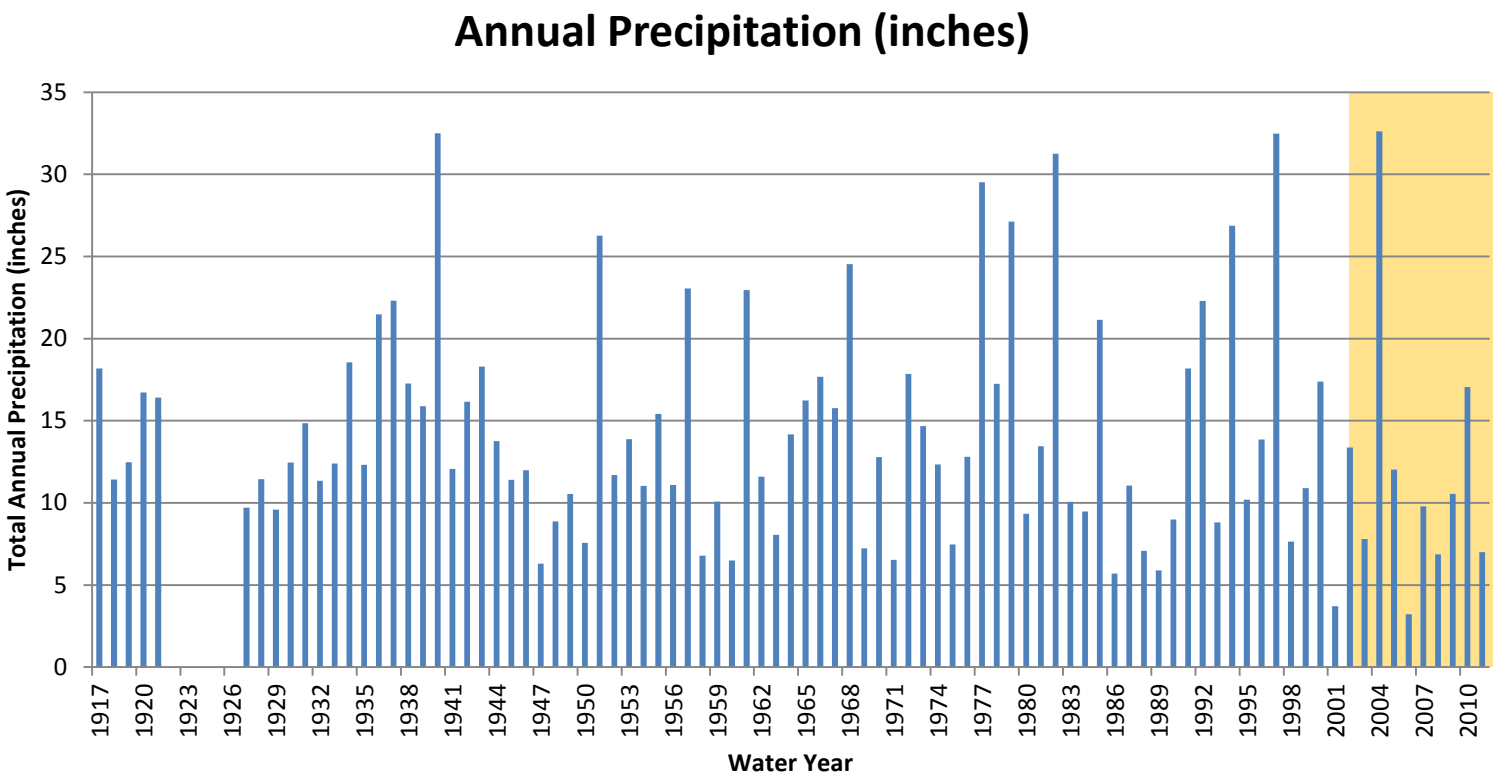
Residual Mean = 0.19 ft
Absolute Residual Mean = 1.47 ft
Sum of Squares = 1.49e4 ft2
Number of Observations = 3513
Number of Locations = 101

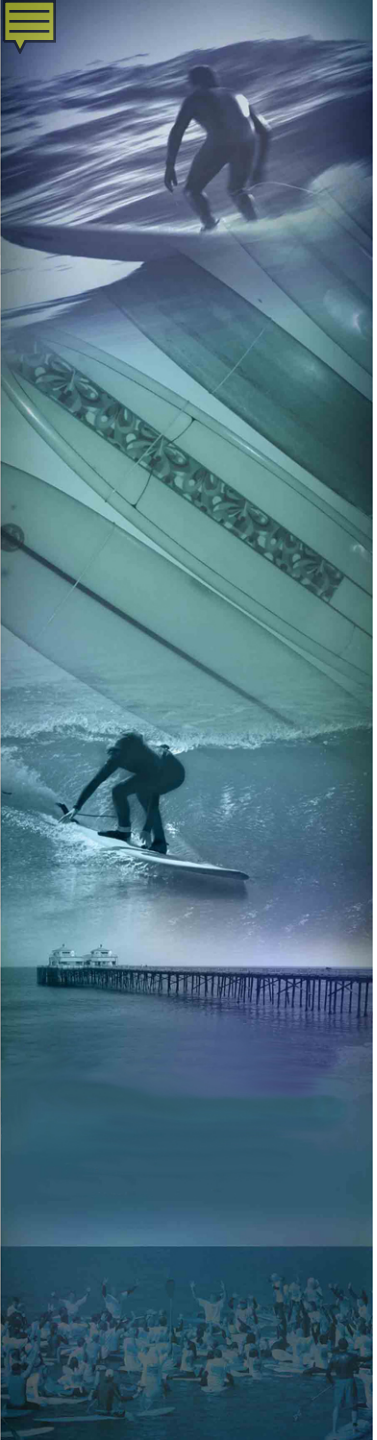


Model Application Runs

- Effects of proposed injection on groundwater elevations
- Maximum injection rates
- Effects of proposed percolation in Winter Canyon

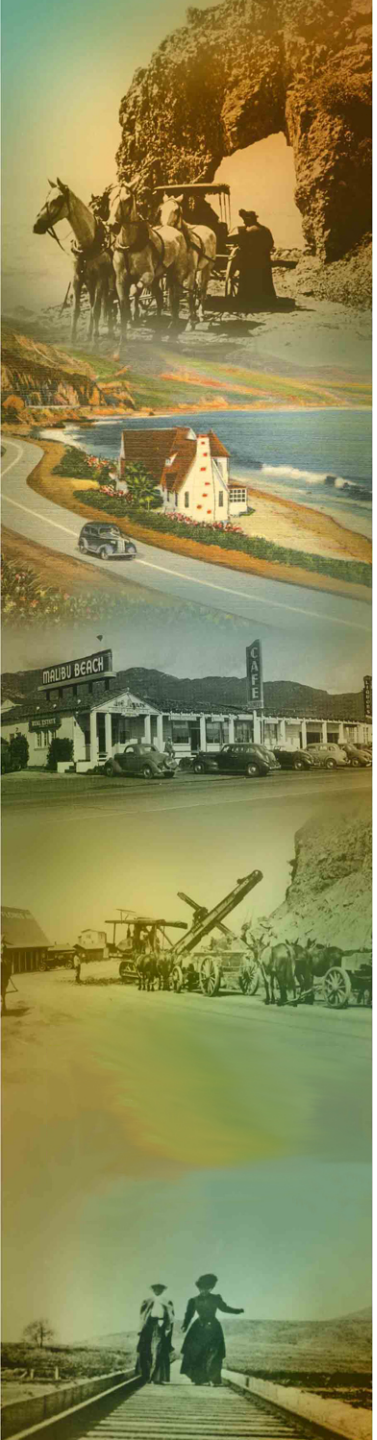
Model Simulation Period



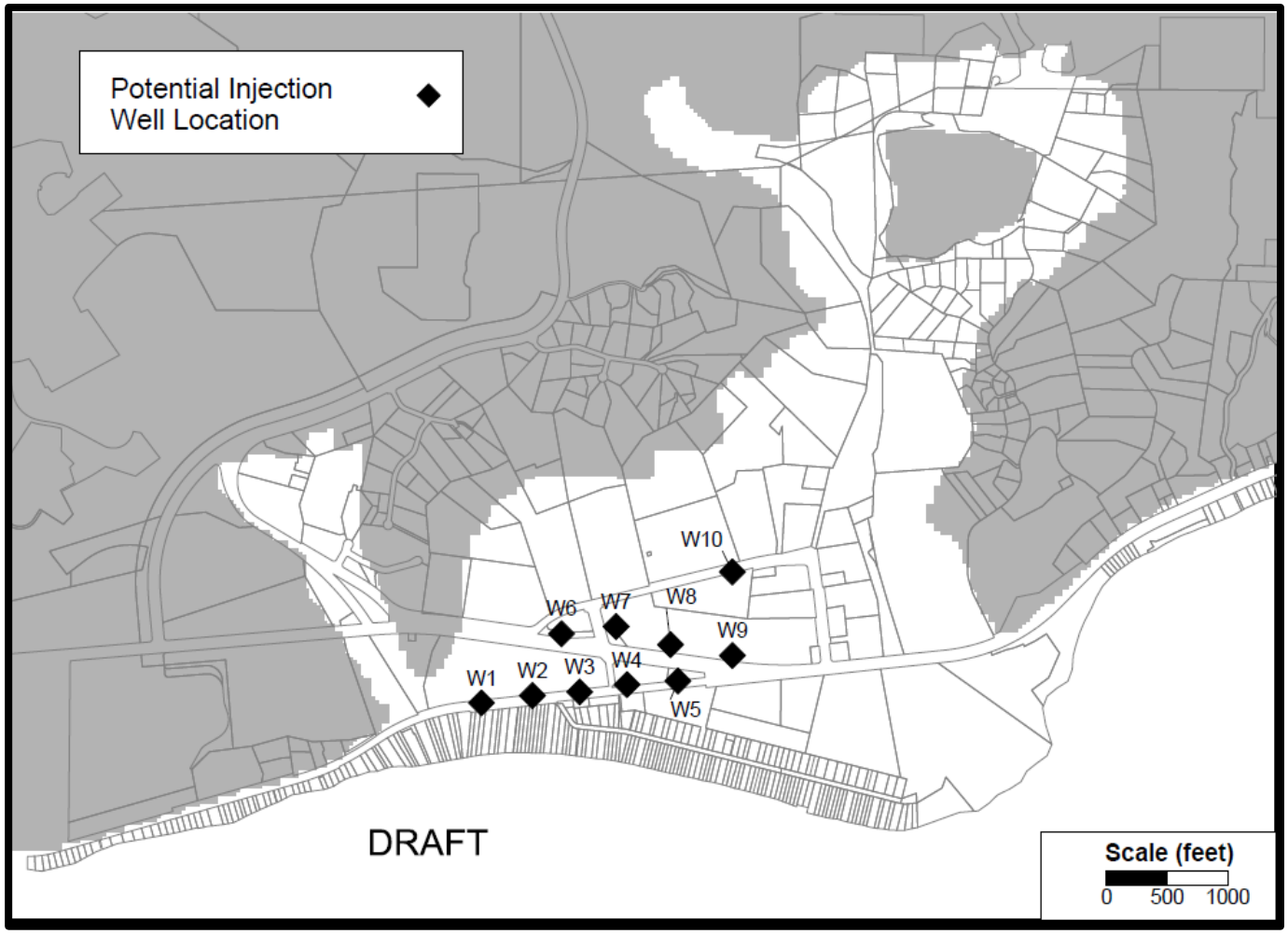


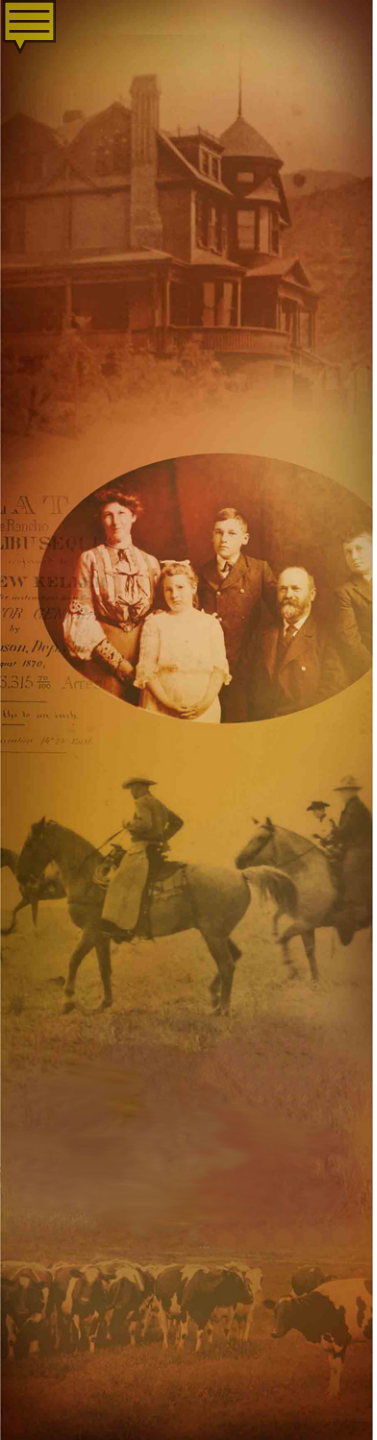
Scenarios Evaluated

- Baseline (current conditions)
- All disposal to injection (no percolation or irrigation)
  - Phase 1
  - Phase 2
  - Phase 3
- All disposal to injection and Winter Canyon percolation
  - Phase 1
  - Phase 2
  - Phase 3



Possible Injection Well Locations





Model Results Demonstrate Sufficient Injection Capacity

	Phase 1	Phase 2	Phase 3
Particles to Lagoon?	**No**	**No**	**No**
Design Requirements			
Total Recycled Water Produced - No Irrigation (gpd)	191,000	361,000	507,000
Estimated Annual Reuse for Irrigation (gpd)	68,000	176,000	299,000
Needed Injection Rate (gpd)	123,000	185,000	208,000
Model Results (assuming no reuse for irrigation)			
Available Injection Capacity (gpd)	311,135	497,642	611,654
Percent Factor of Safety	252%	269%	295%

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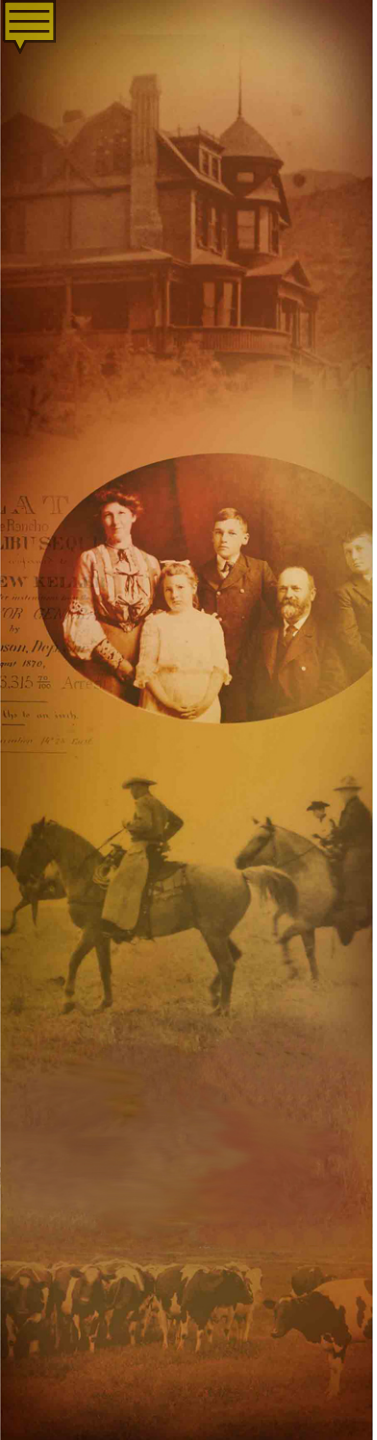

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Model Results (assuming no reuse for irrigation)			
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Percent Factor of Safety	252%	269%	295%
Winter Canyon Backup Percolation Capacity (gpd)	50,000	100,000	100,000

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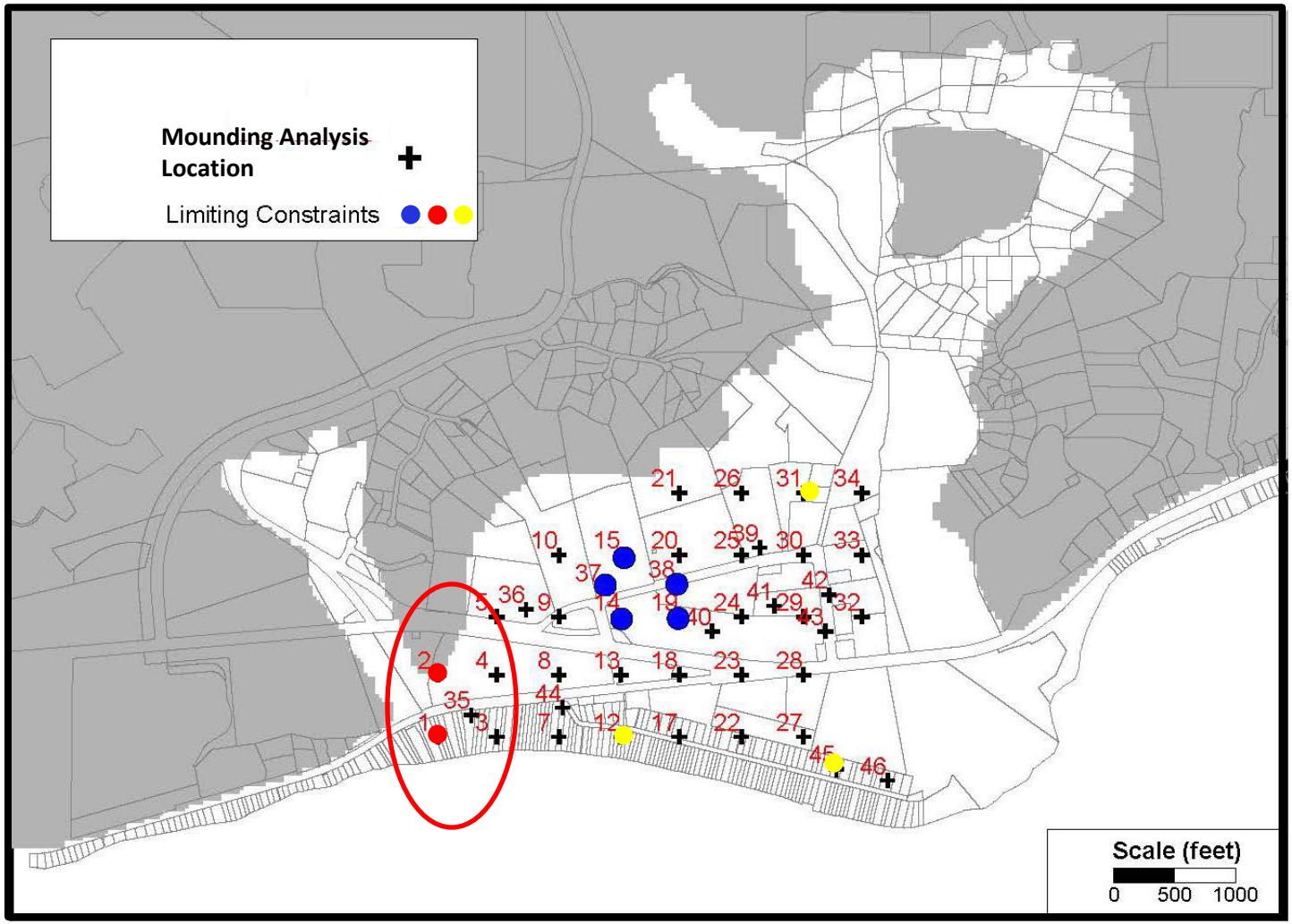
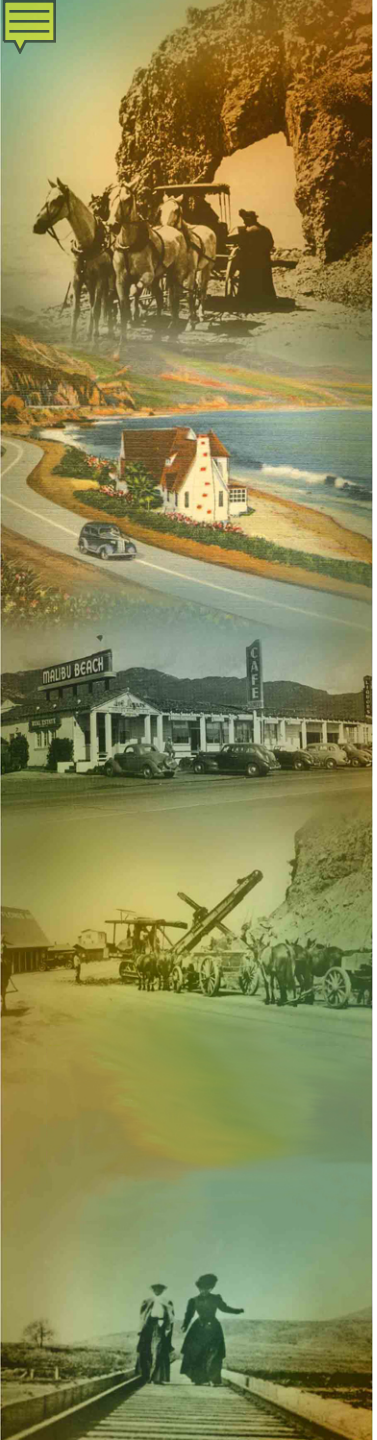
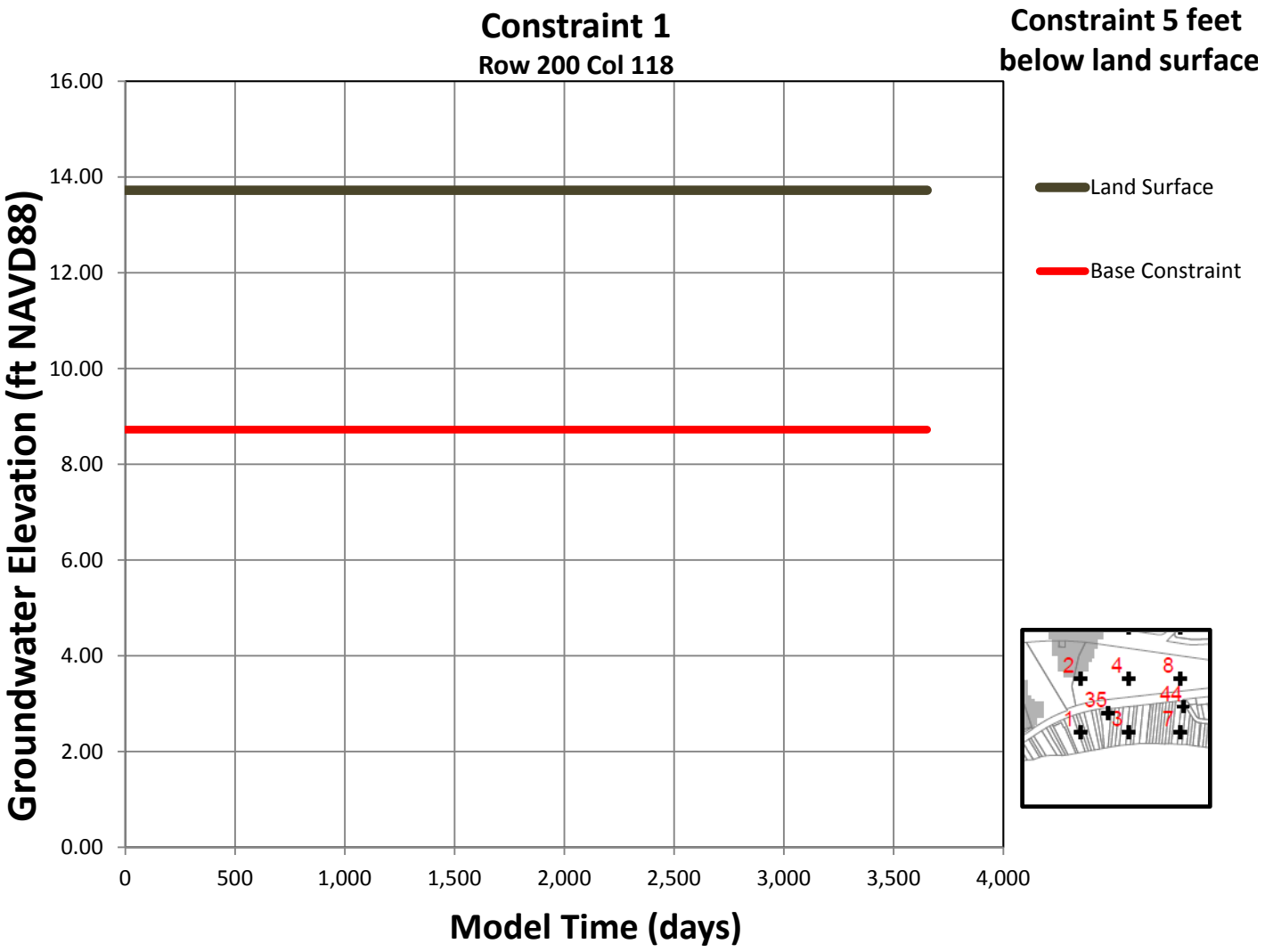
Groundwater Elevation Analysis Locations

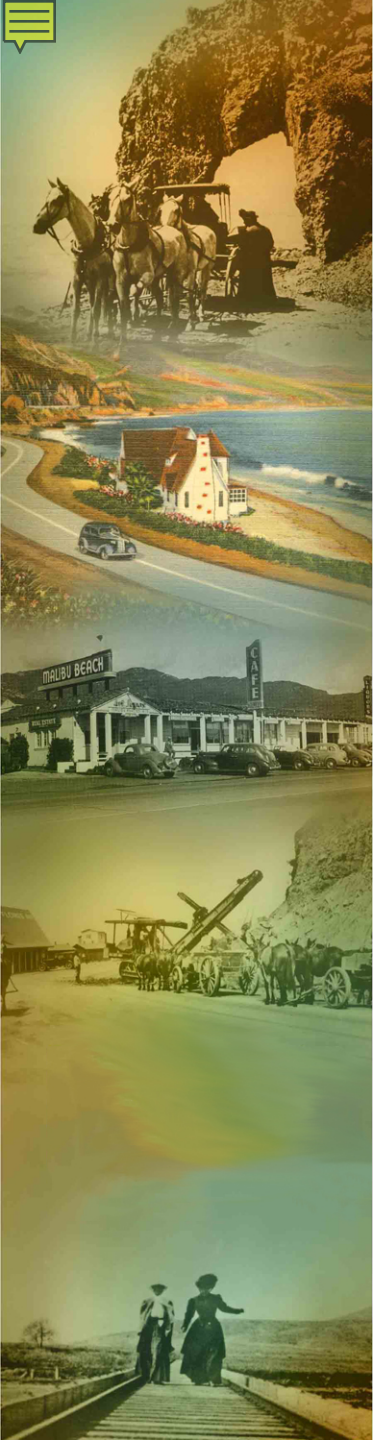




Mounding Analysis – Location 1

(Project lowers groundwater elevations)





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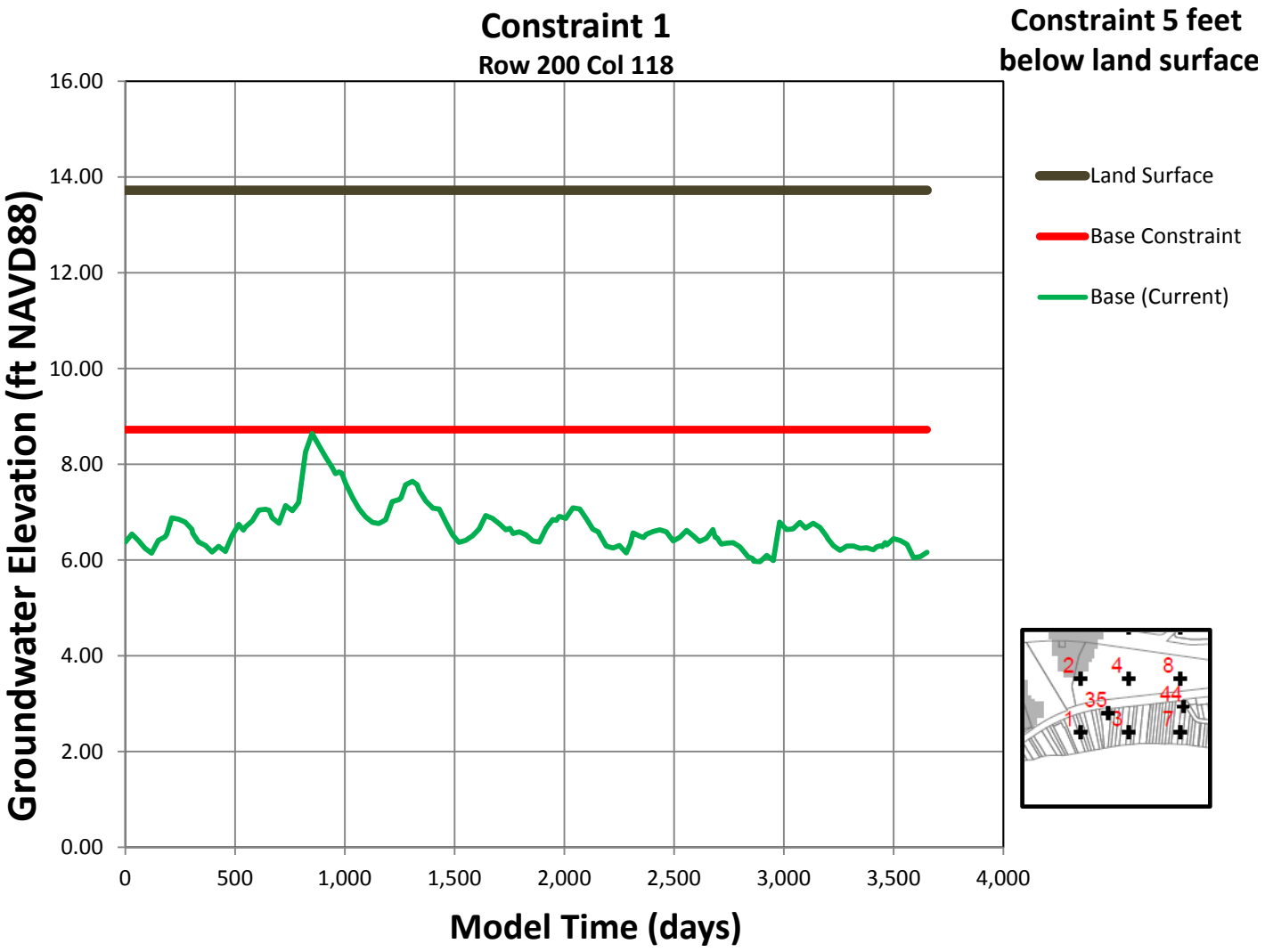

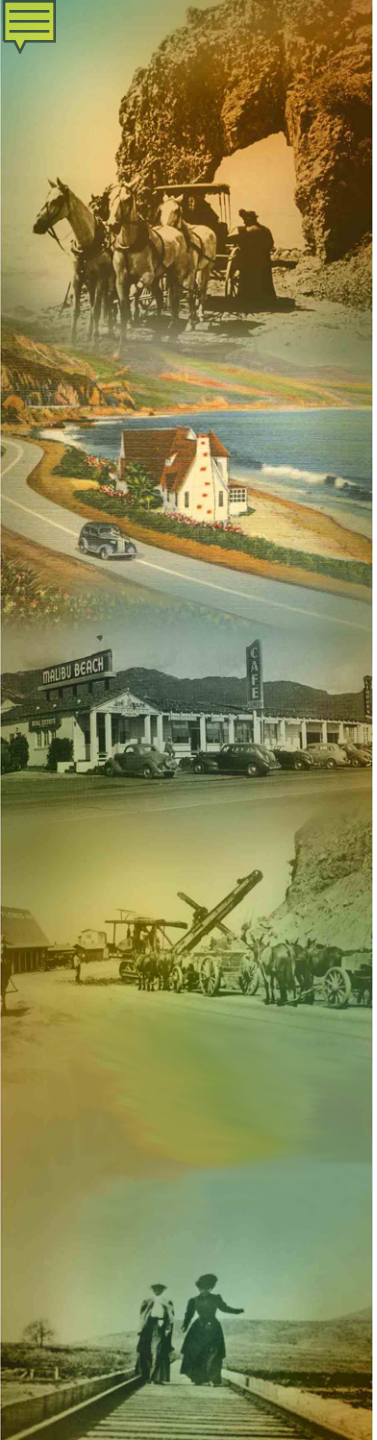

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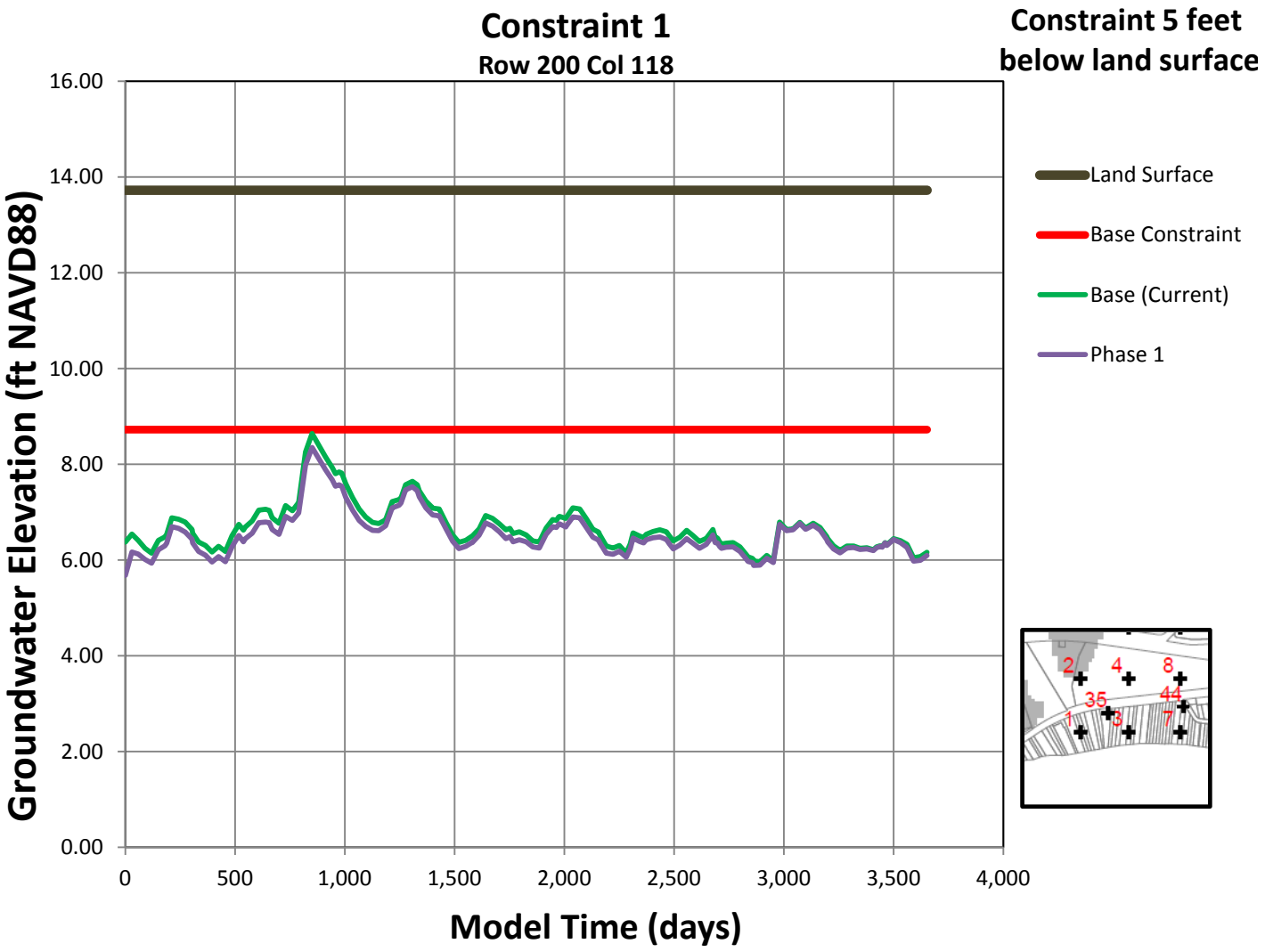

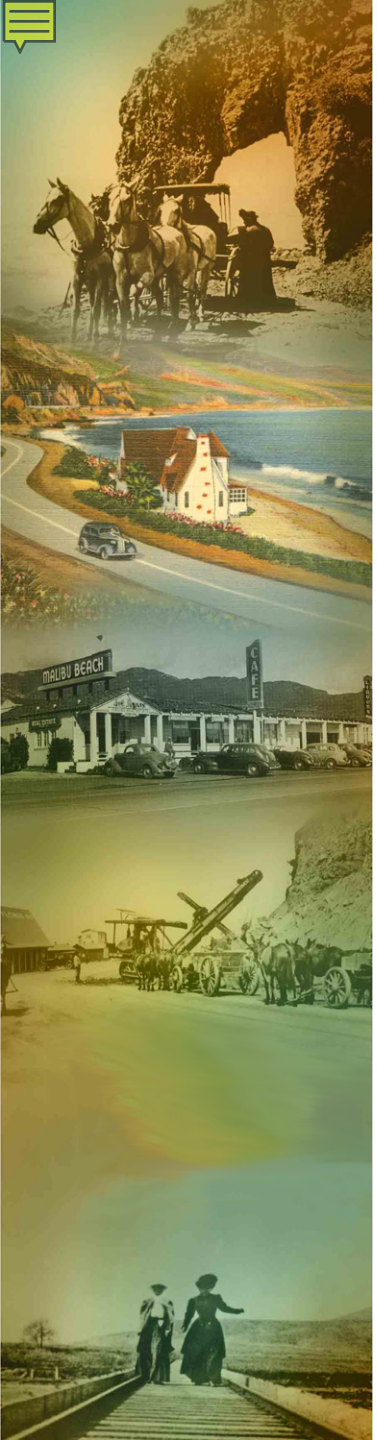

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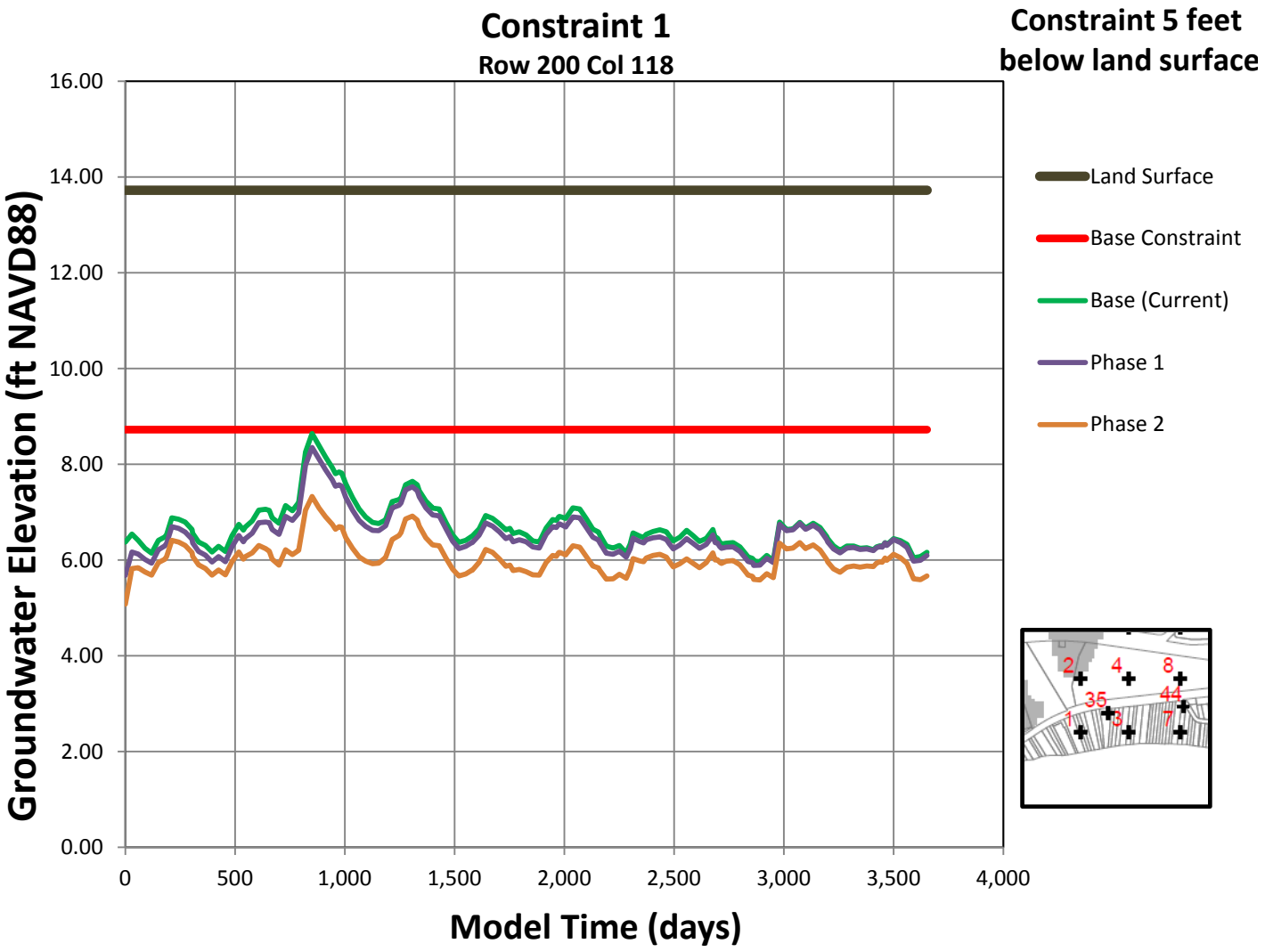

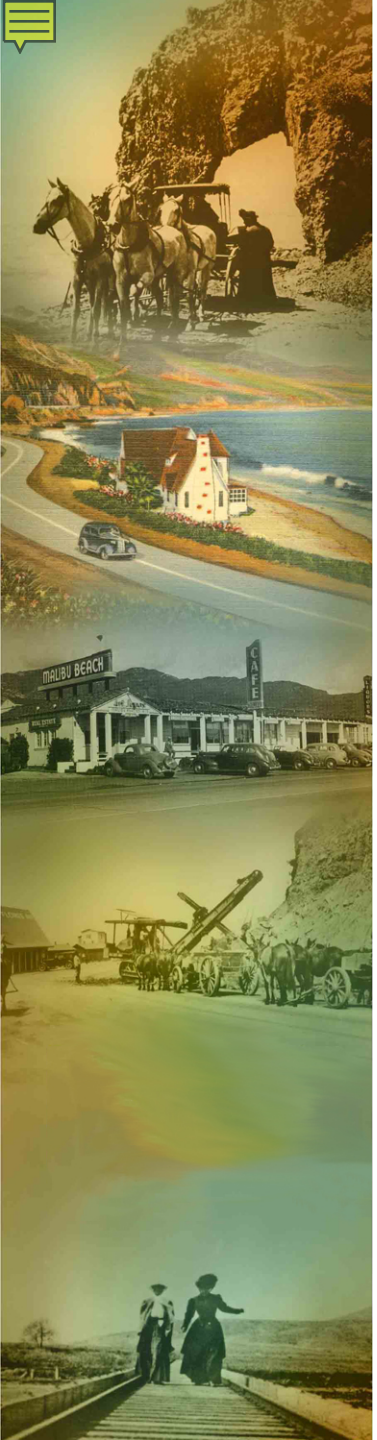

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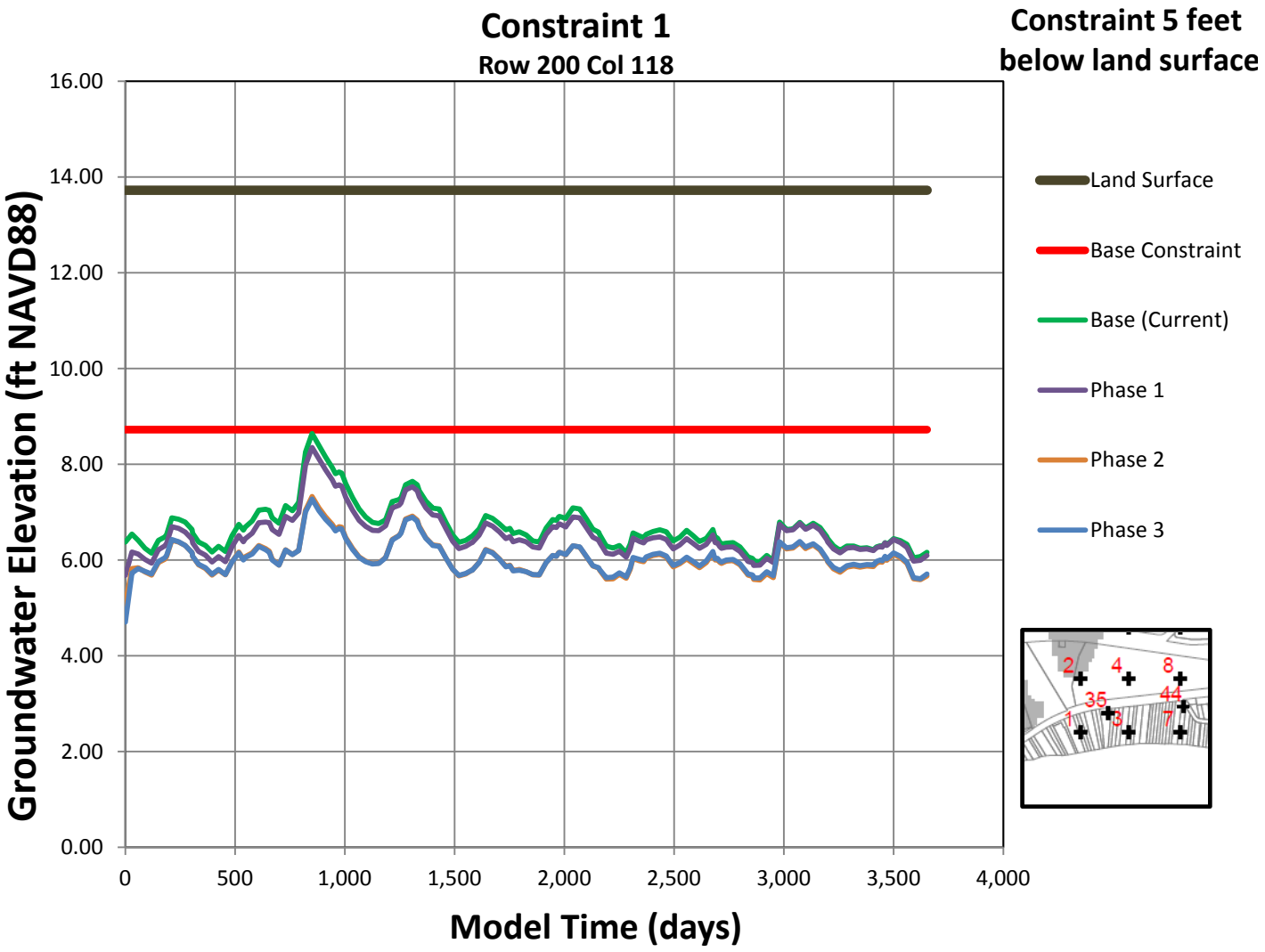

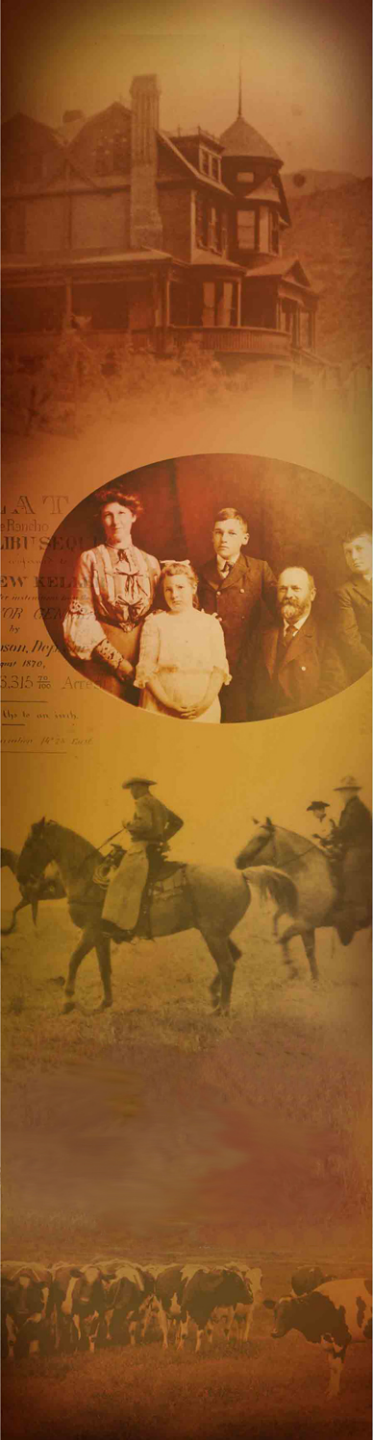

Mounding Analysis – Location 2

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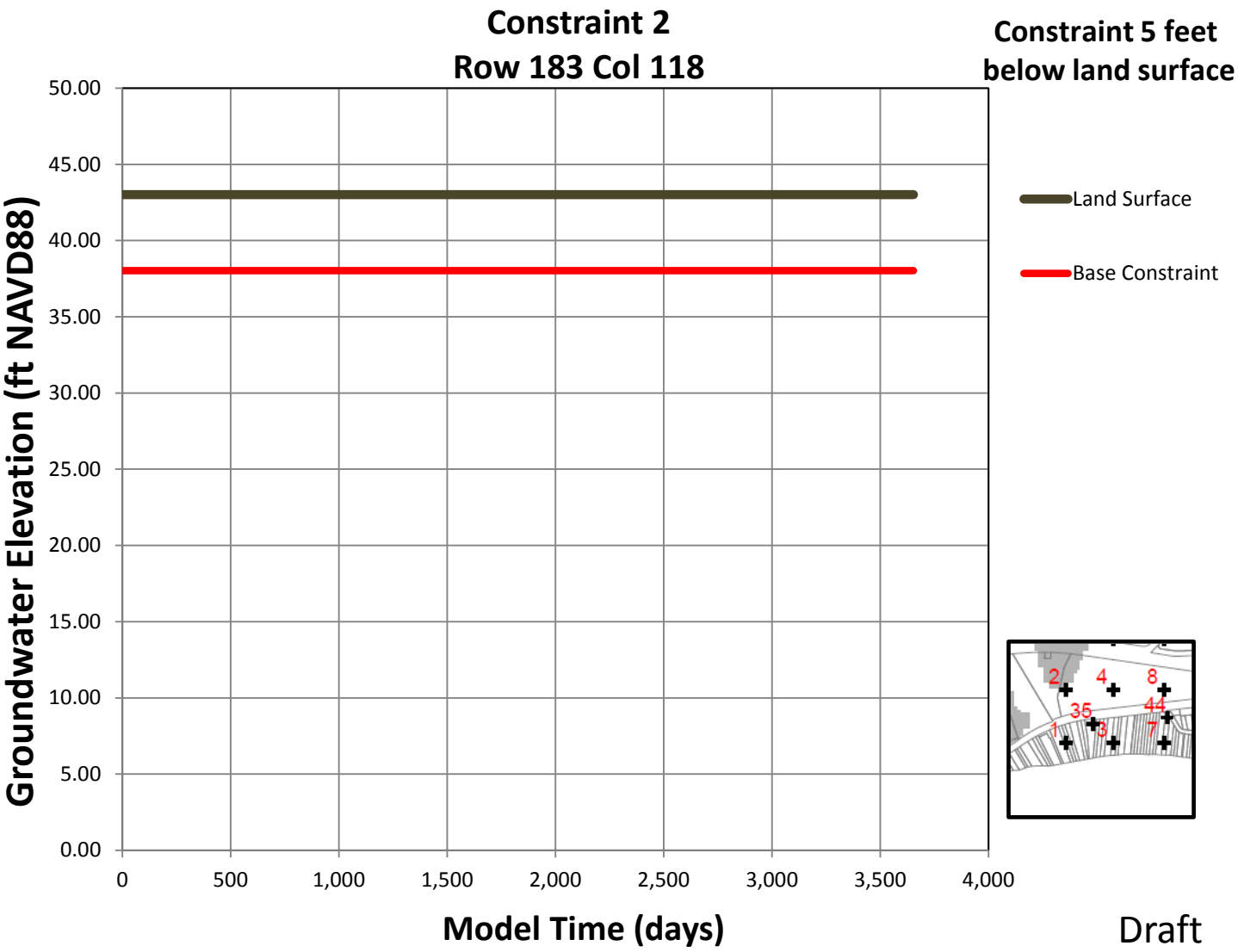

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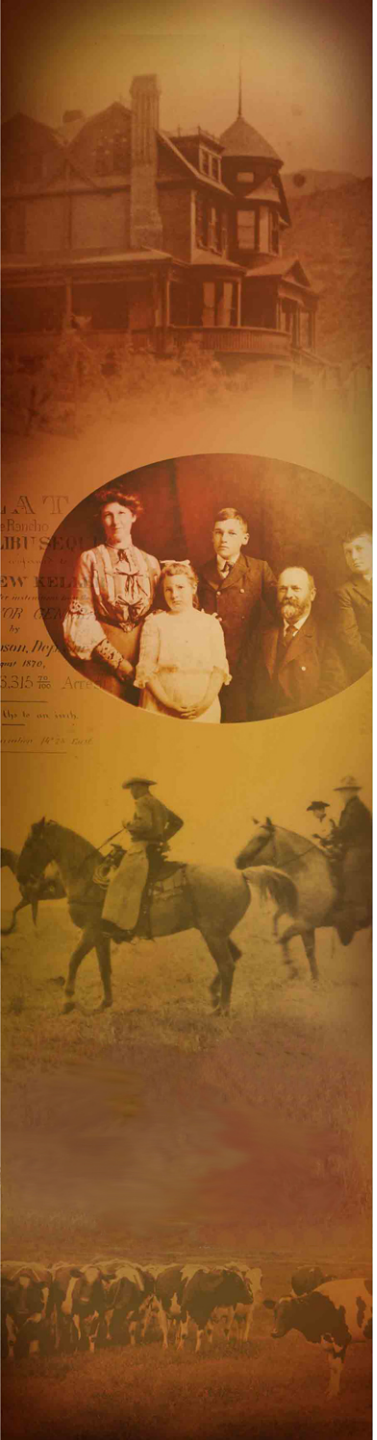

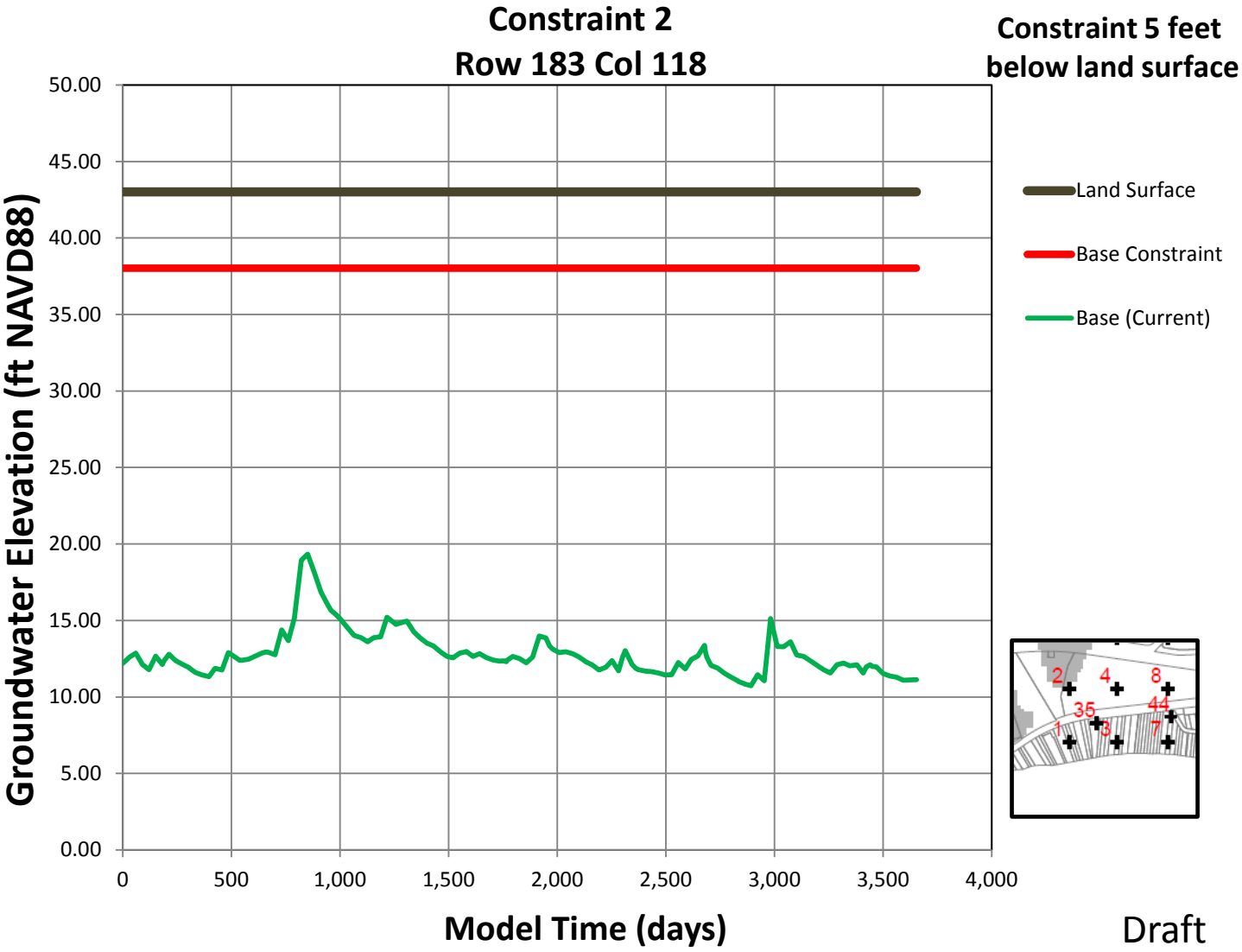

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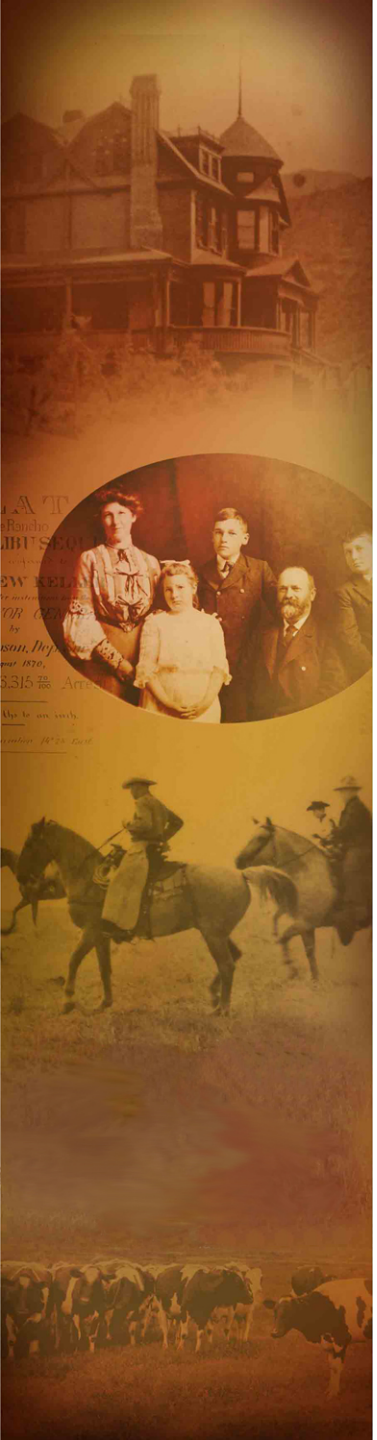

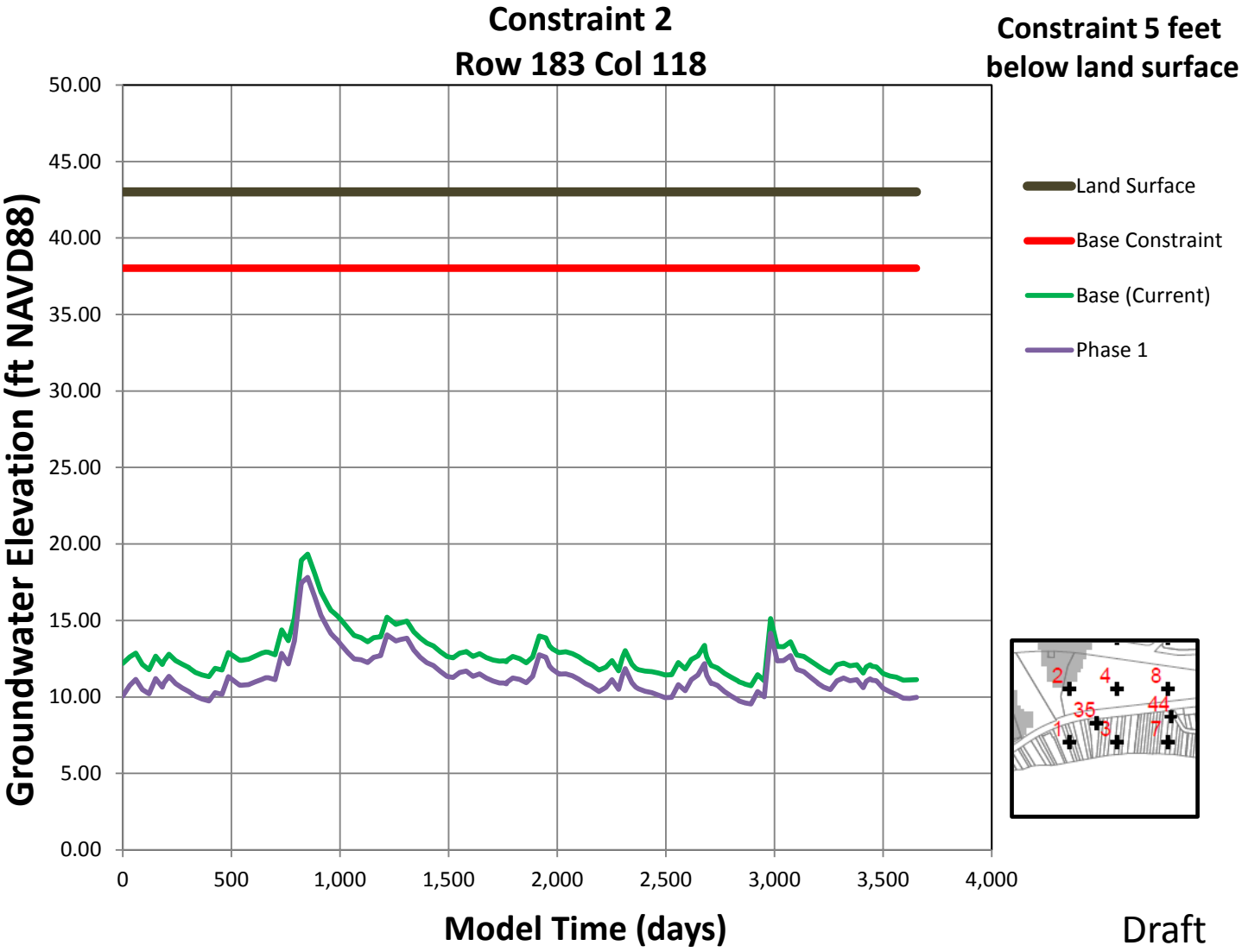

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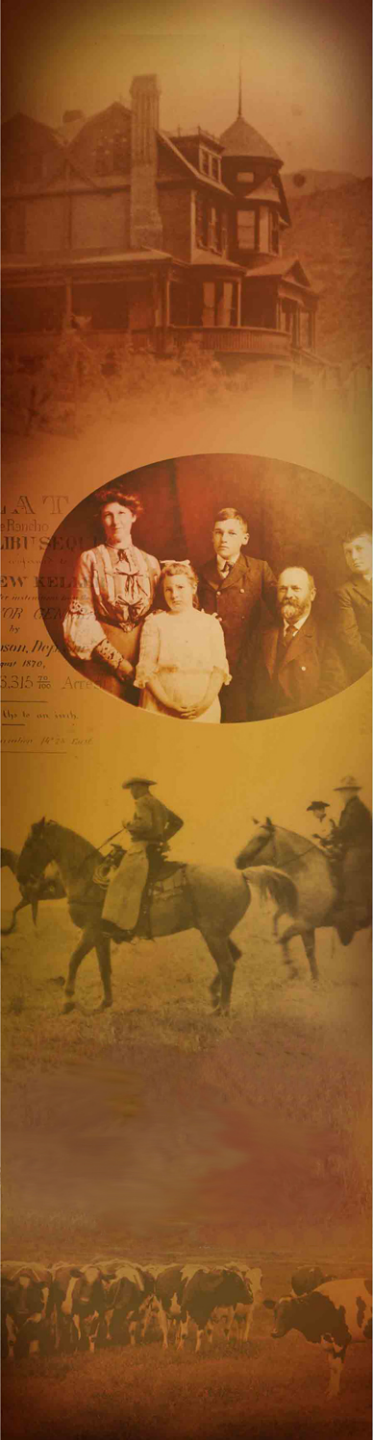

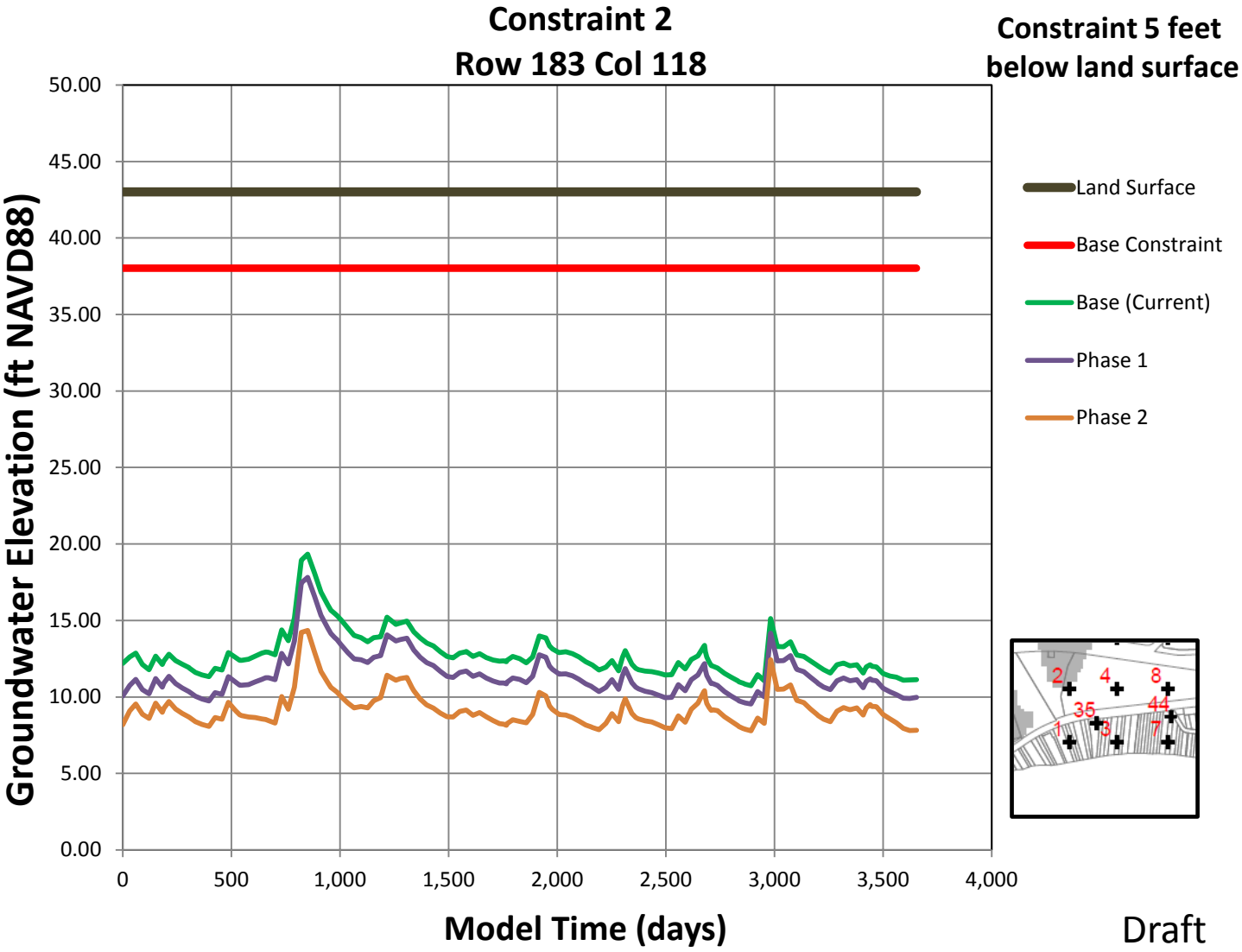

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Mounding Analysis – Location 2

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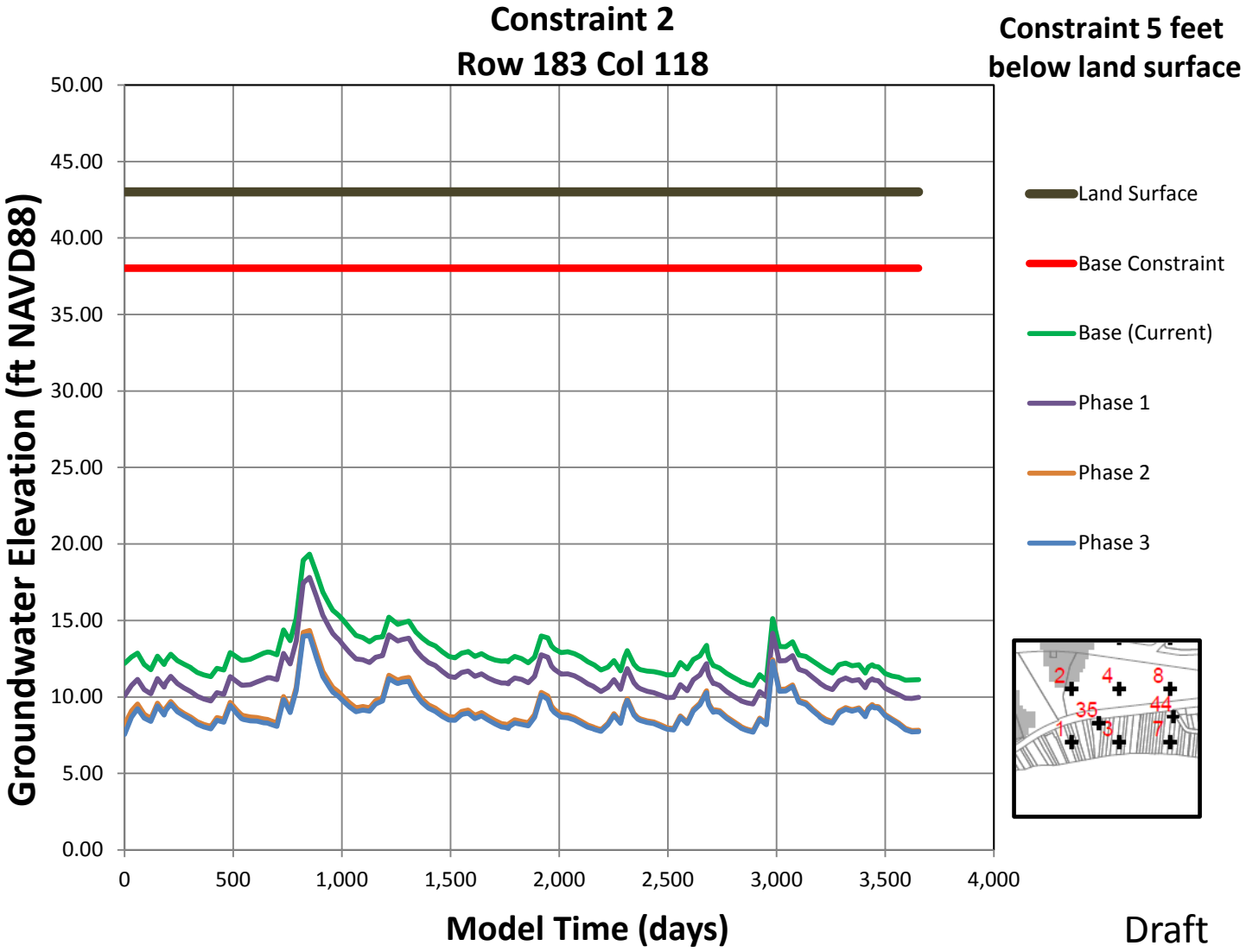

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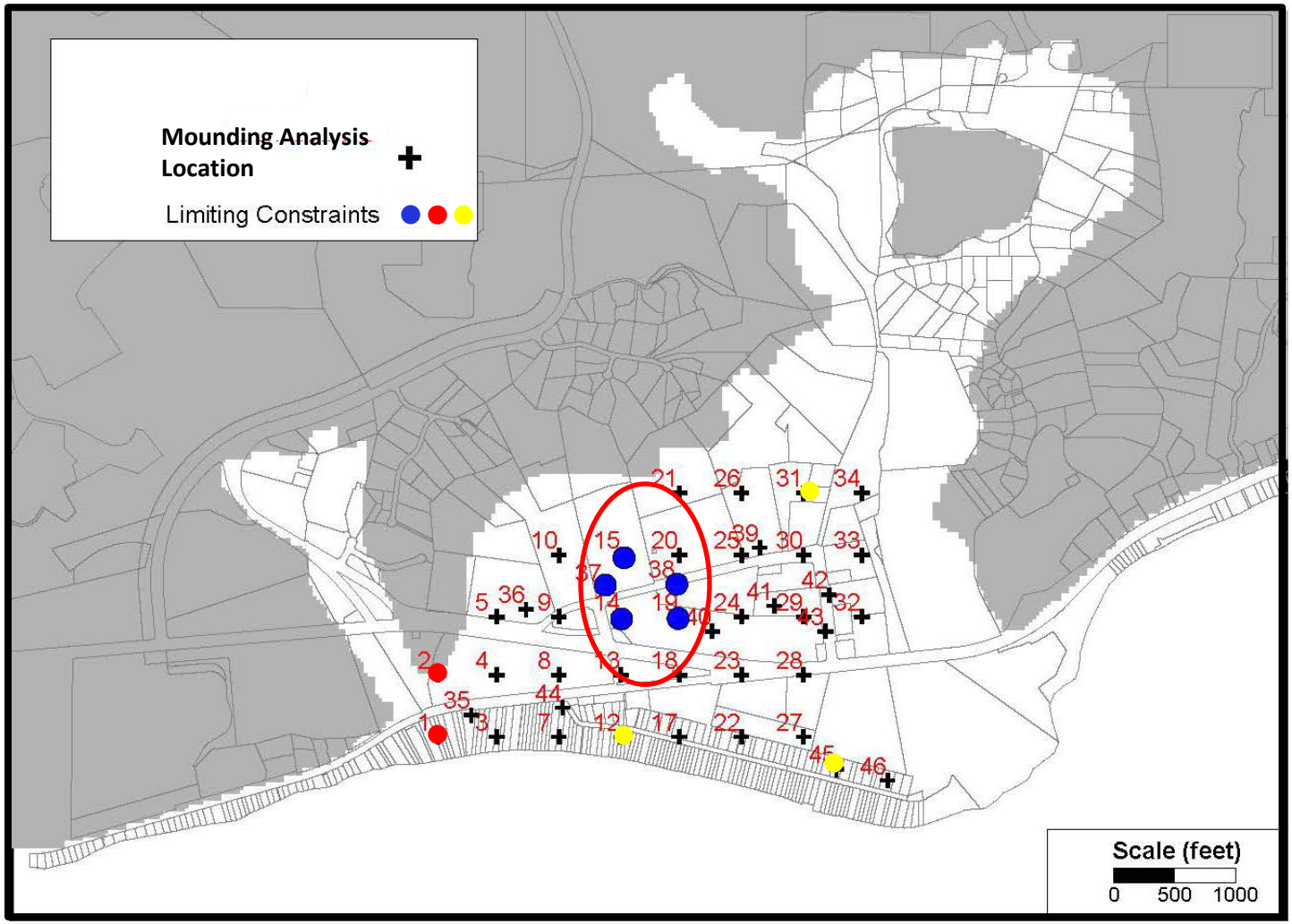
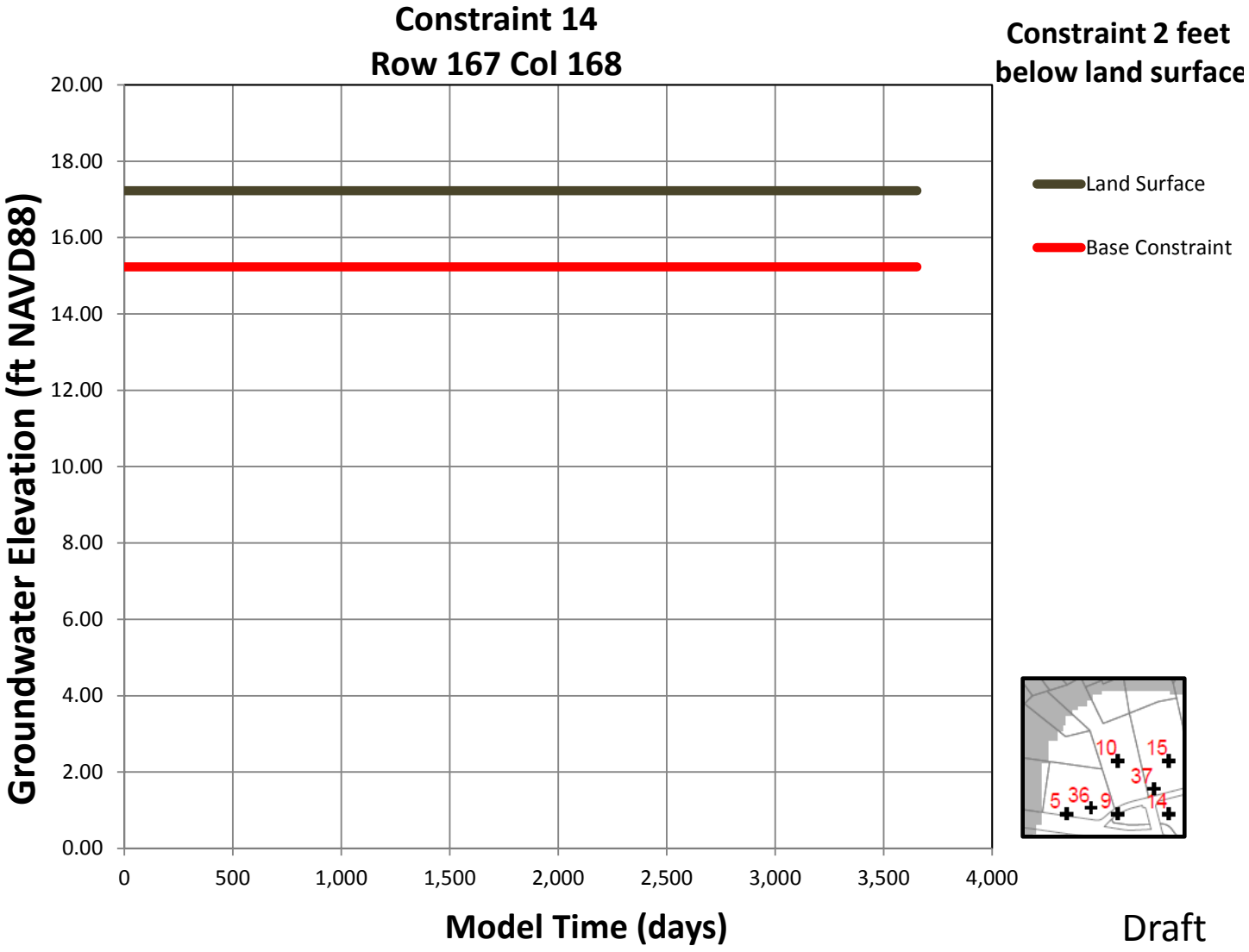


Mounding Analysis – Location 14

(Project lowers groundwater elevations)



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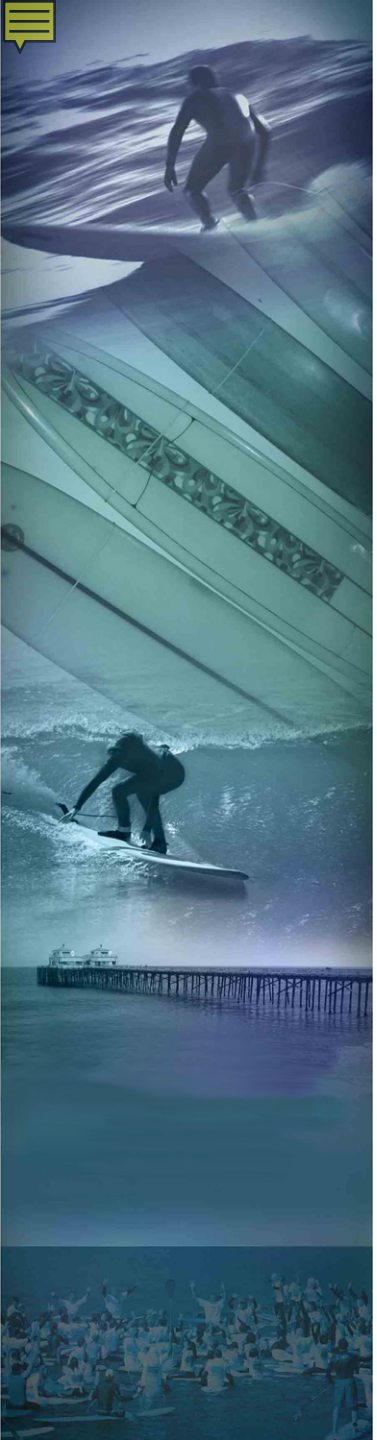
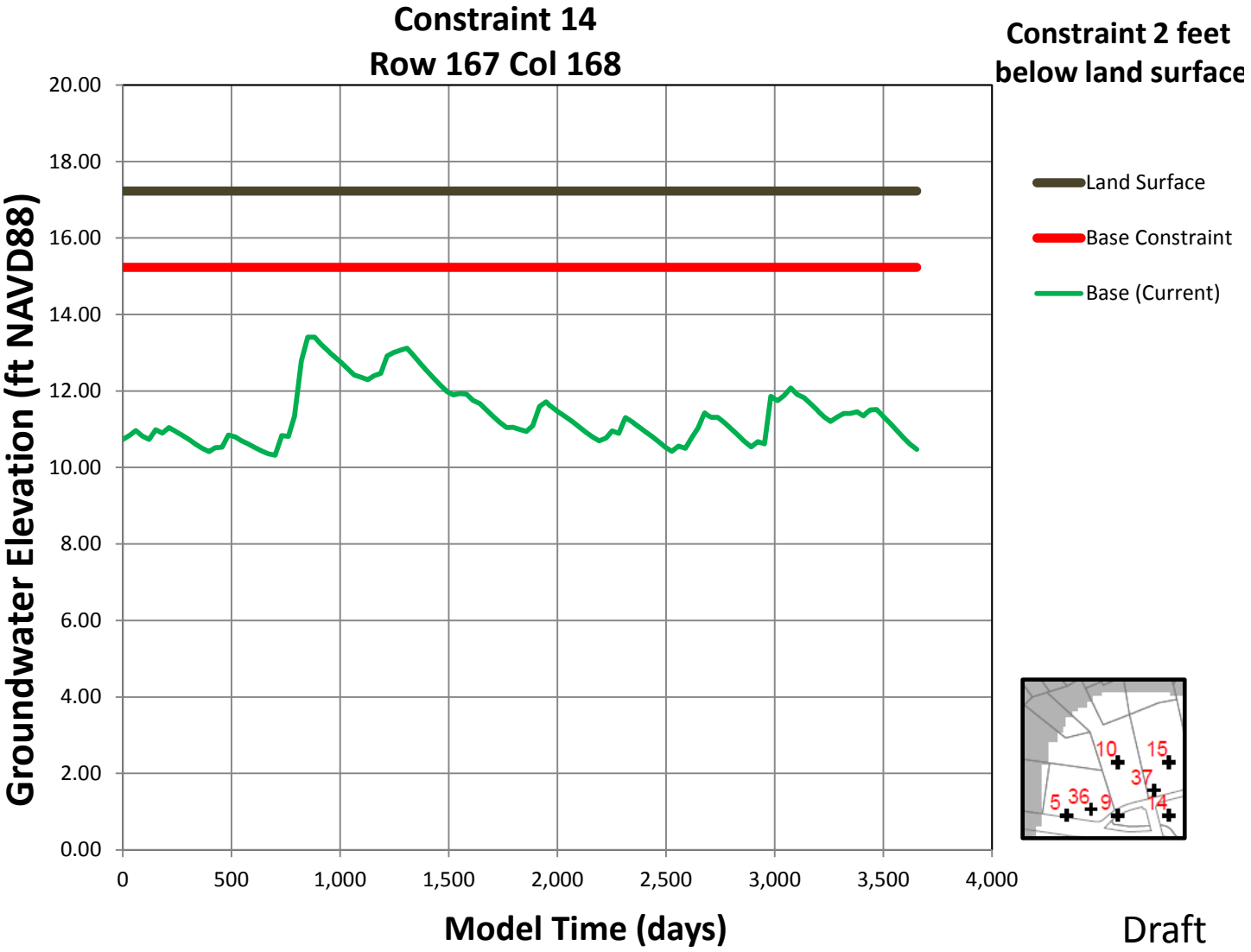


Mounding Analysis – Location 14

(Project lowers groundwater elevations)



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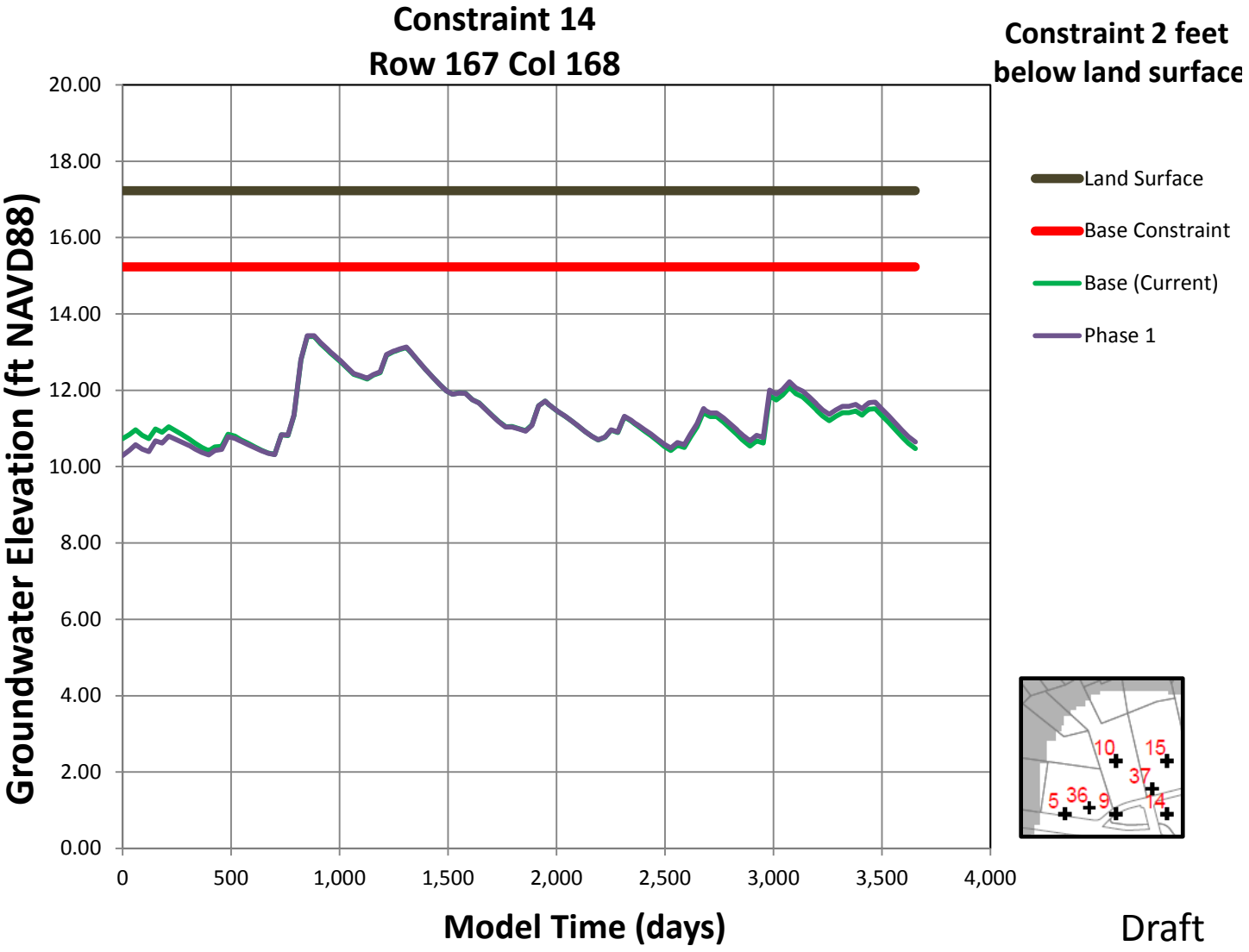
Mounding Analysis – Location 14

(Project lowers groundwater elevations)



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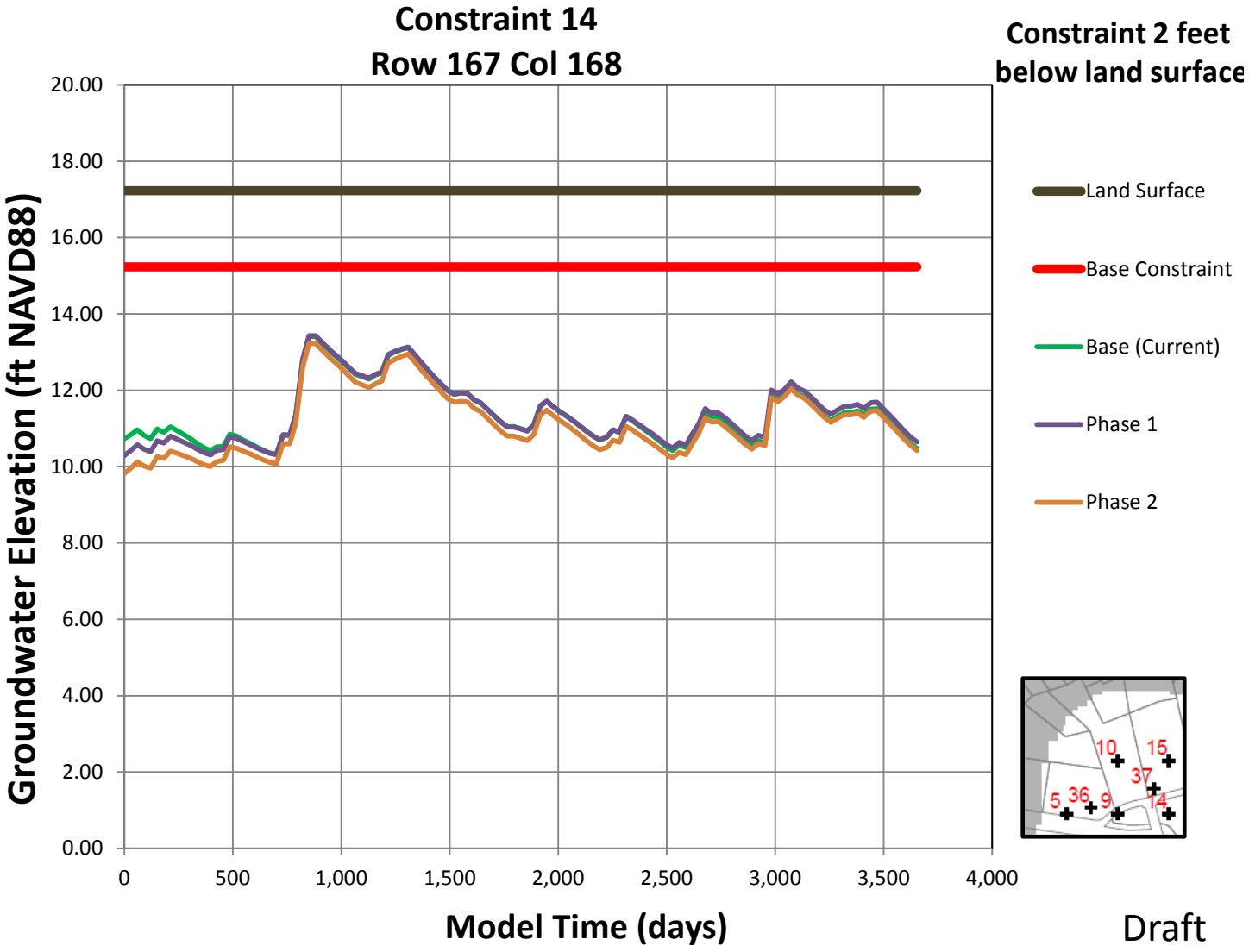
Mounding Analysis – Location 14

(Project lowers groundwater elevations)



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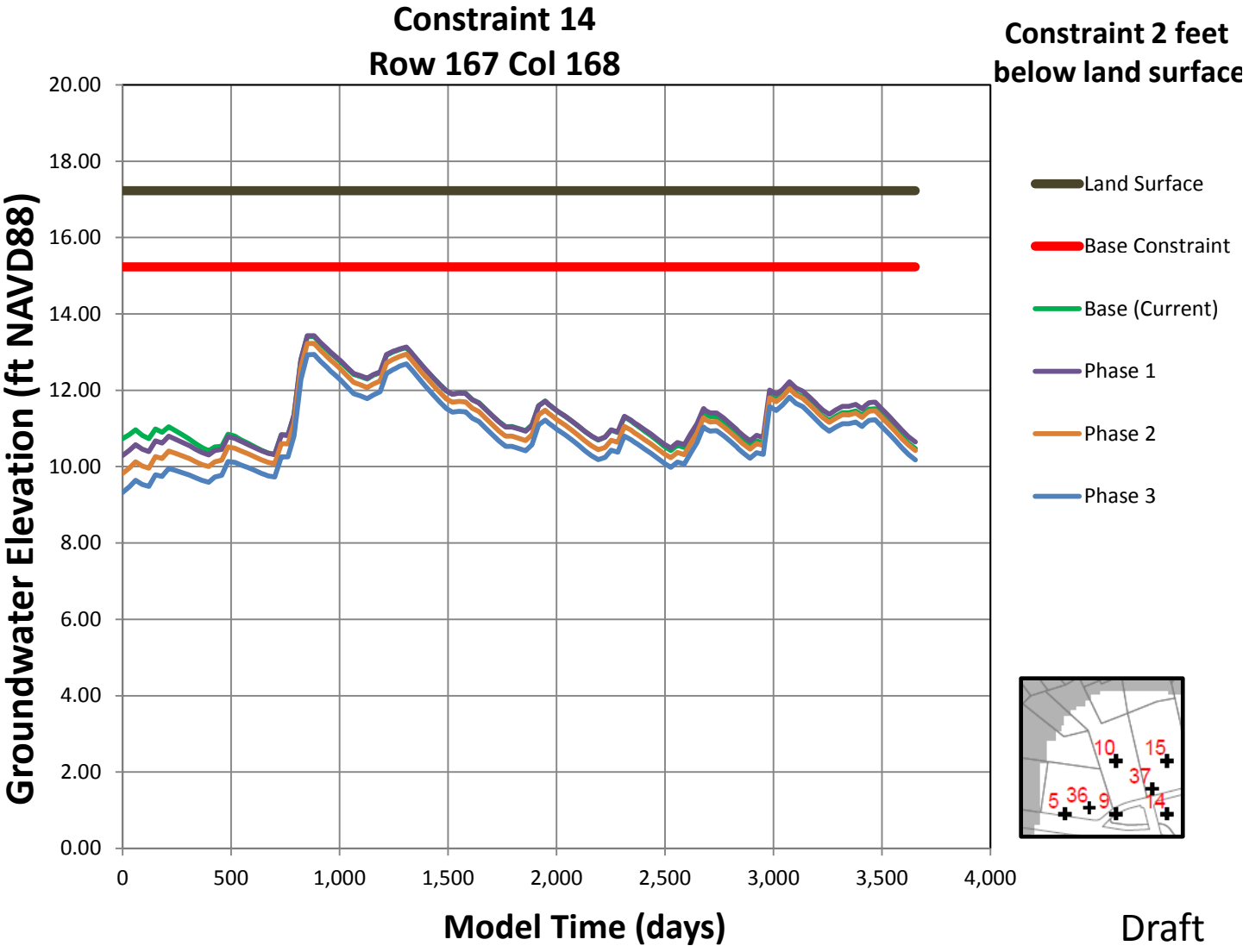
Mounding Analysis – Location 14

(Project lowers groundwater elevations)



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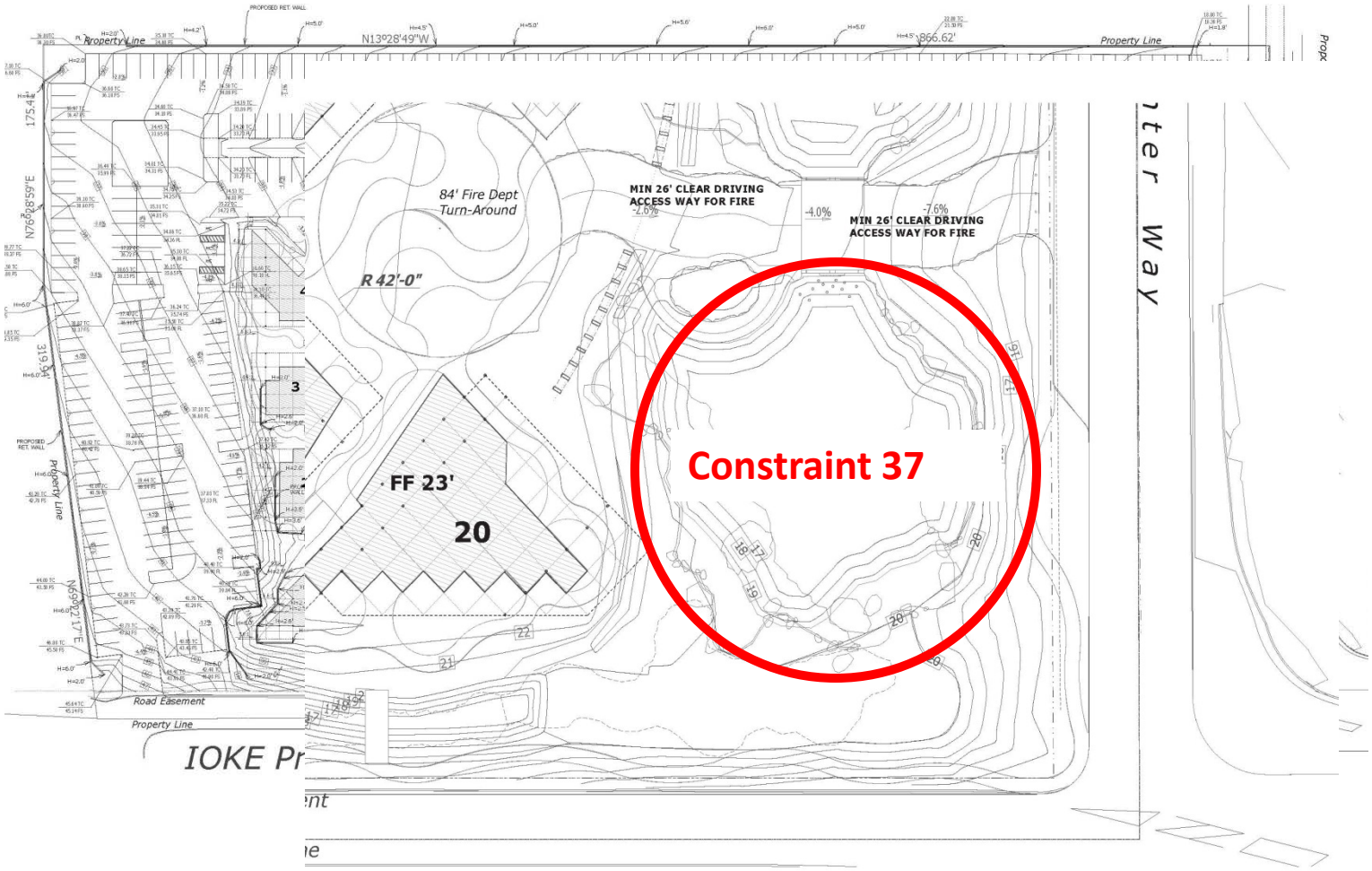
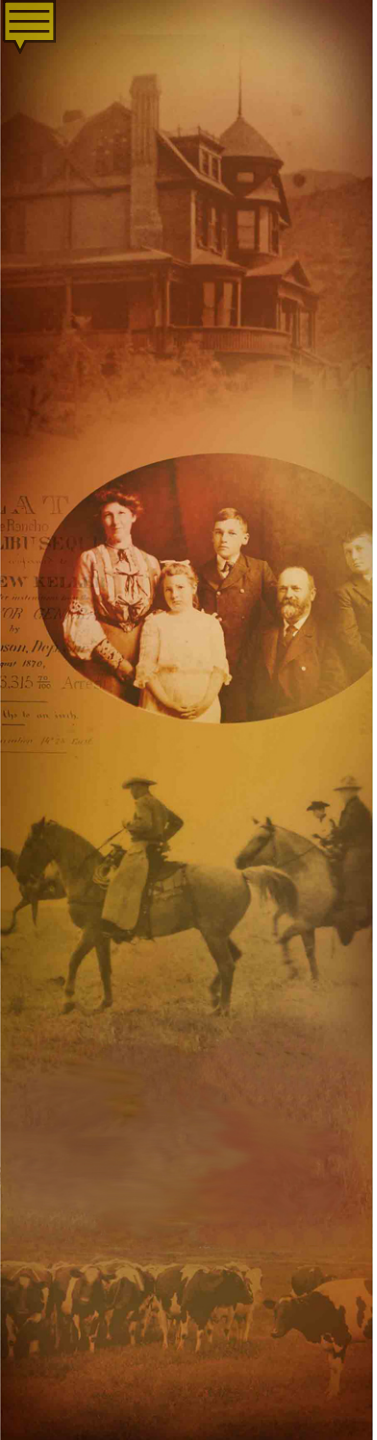
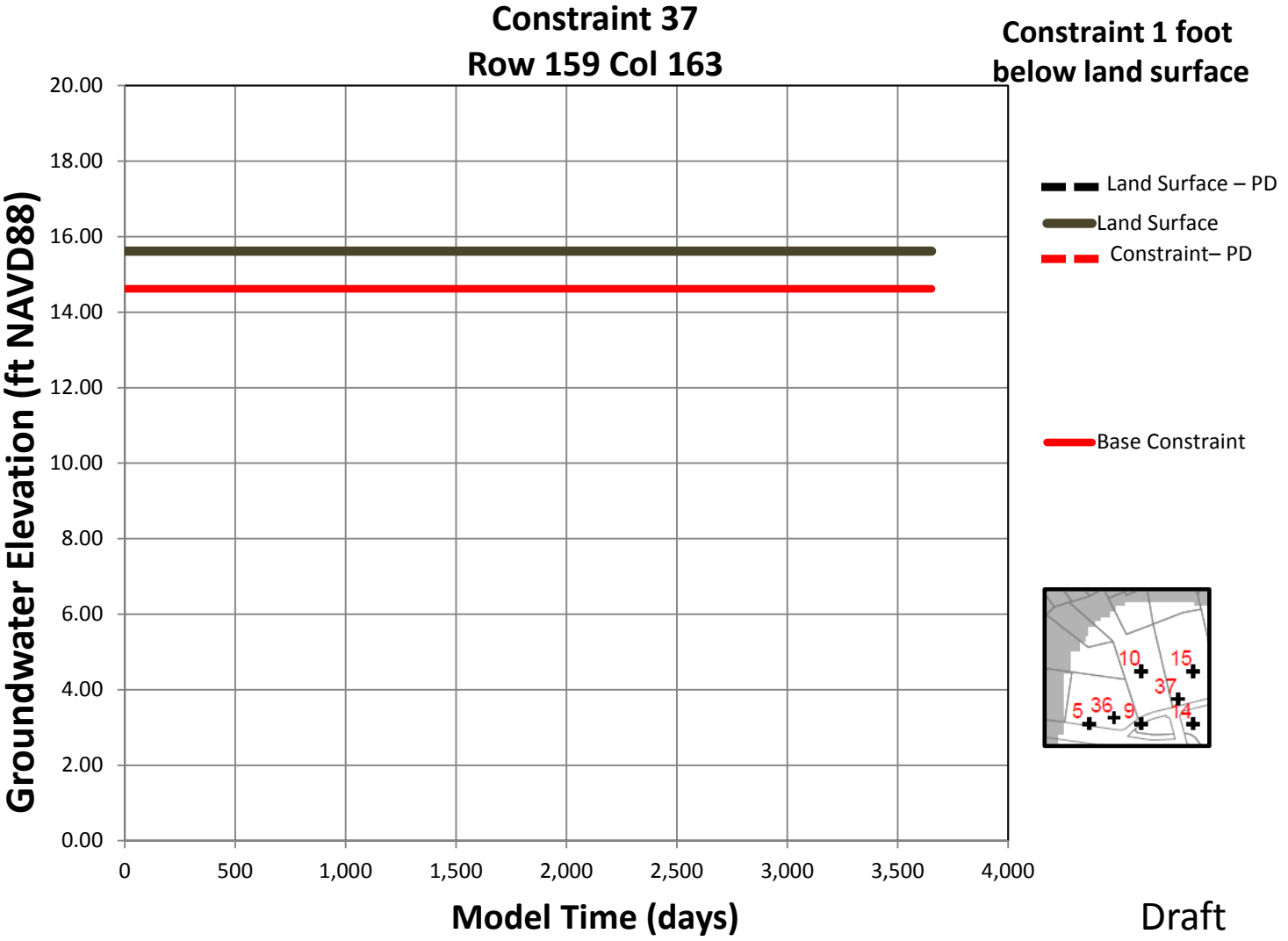
Land Surface at Limiting Location – Post Development



Mounding Analysis – Location 37

(Project lowers groundwater elevations)





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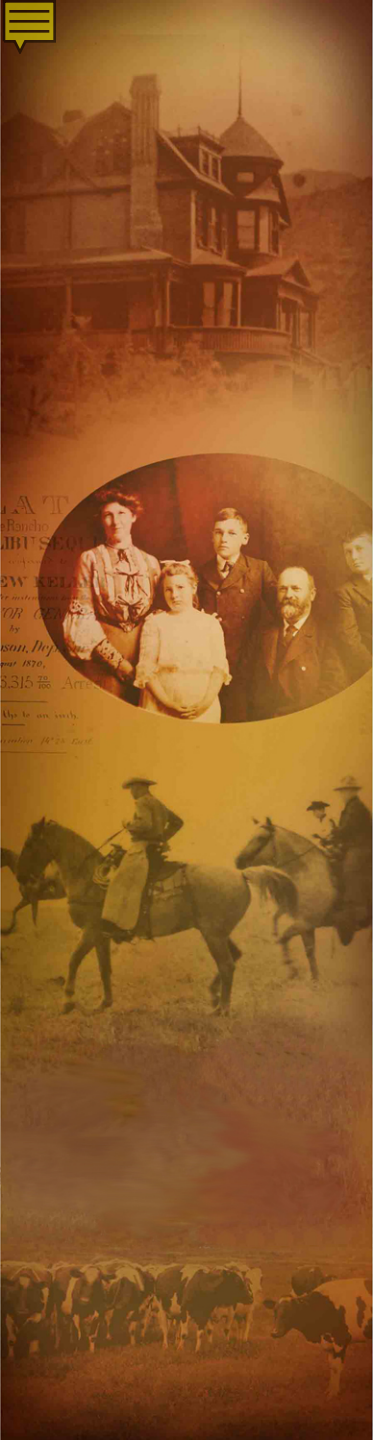
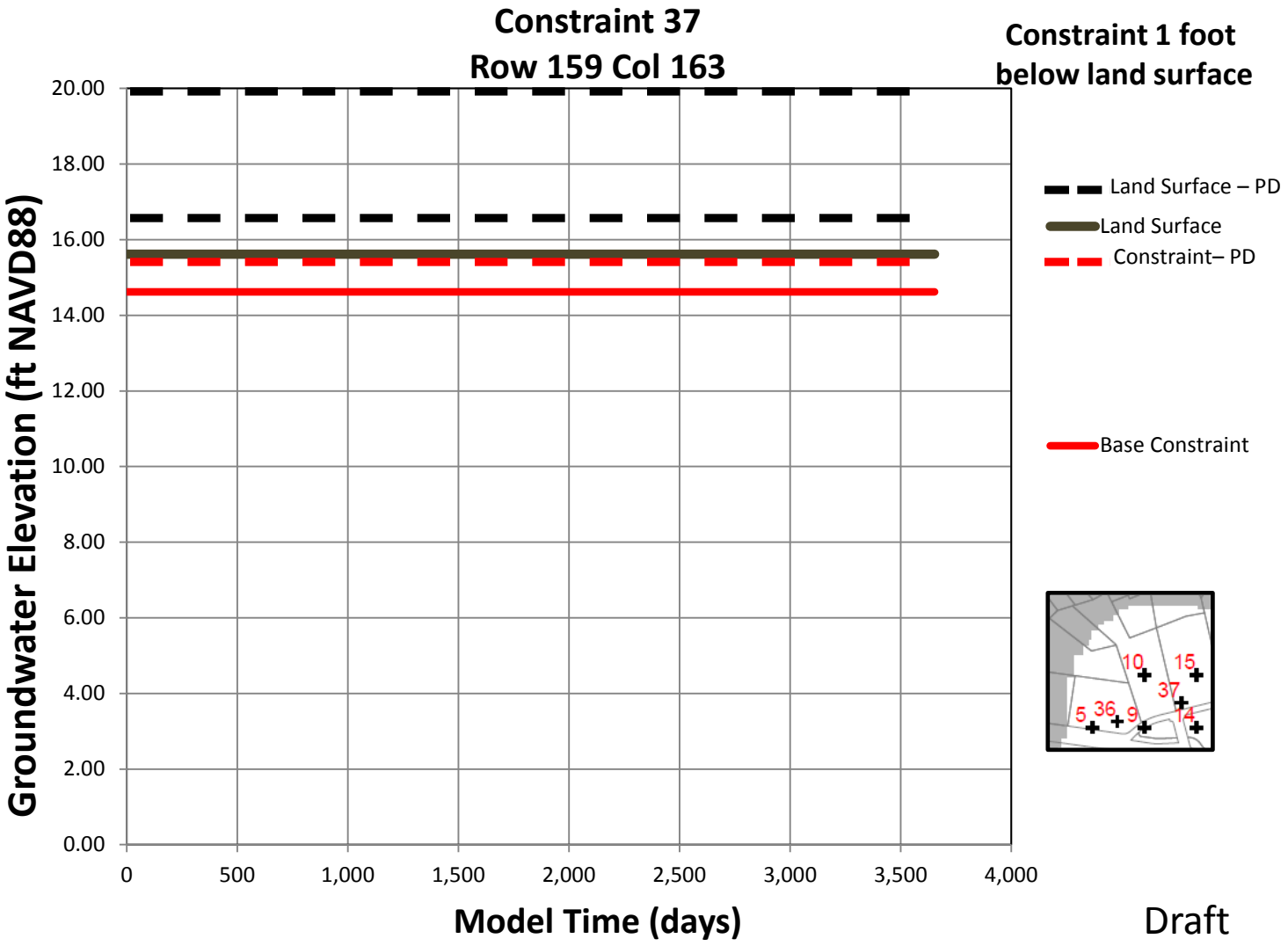
Mounding Analysis – Location 37

(Project lowers groundwater elevations)





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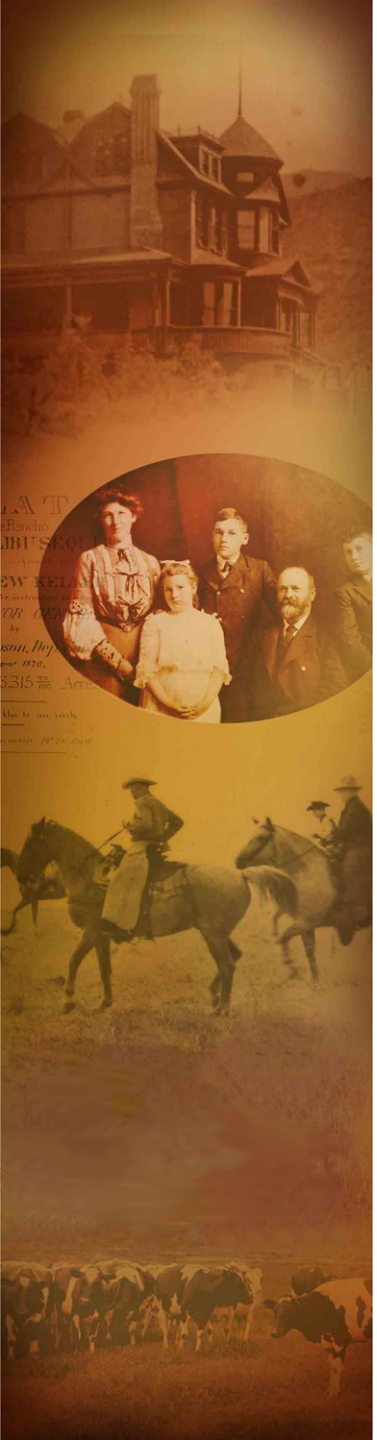
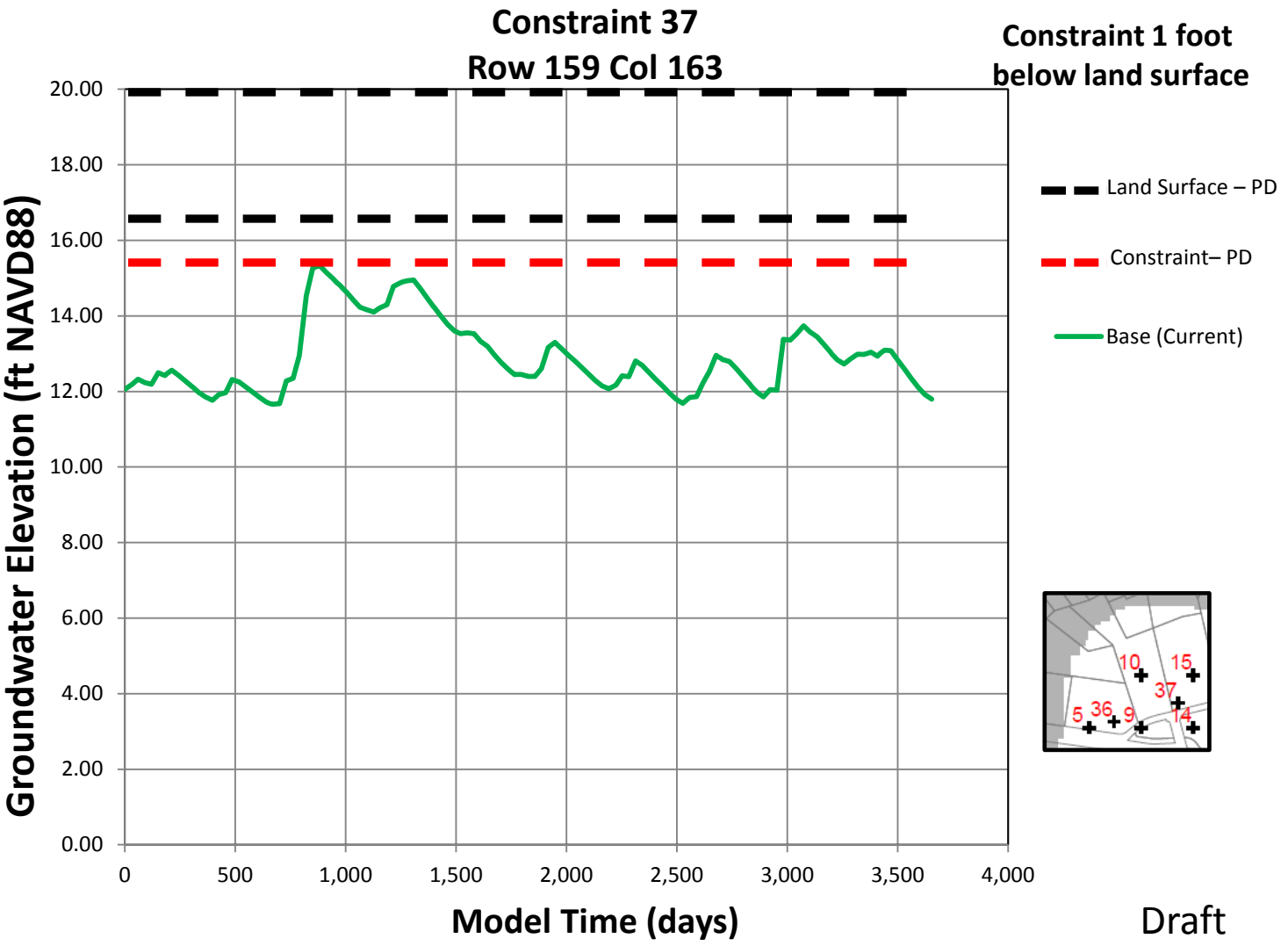


Mounding Analysis – Location 37

(Project lowers groundwater elevations)



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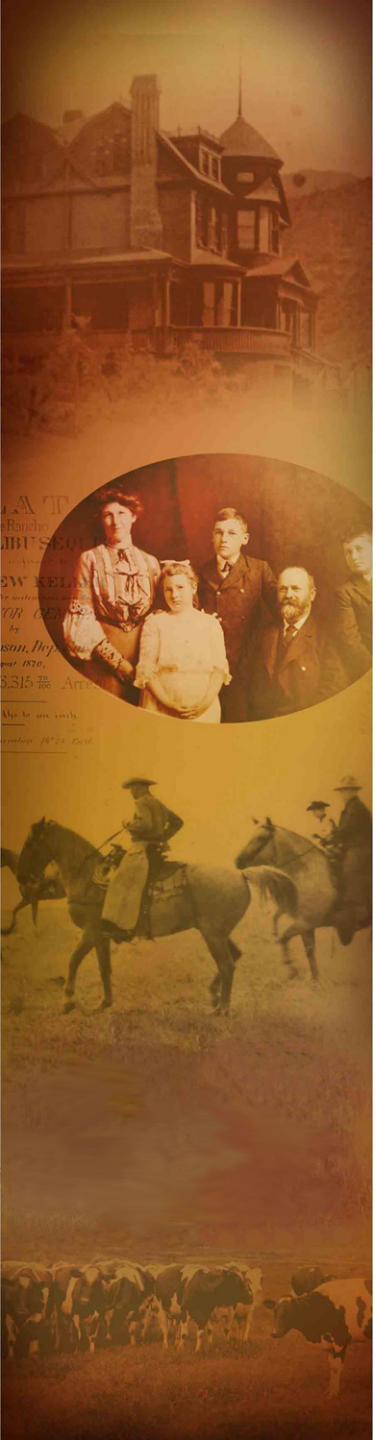
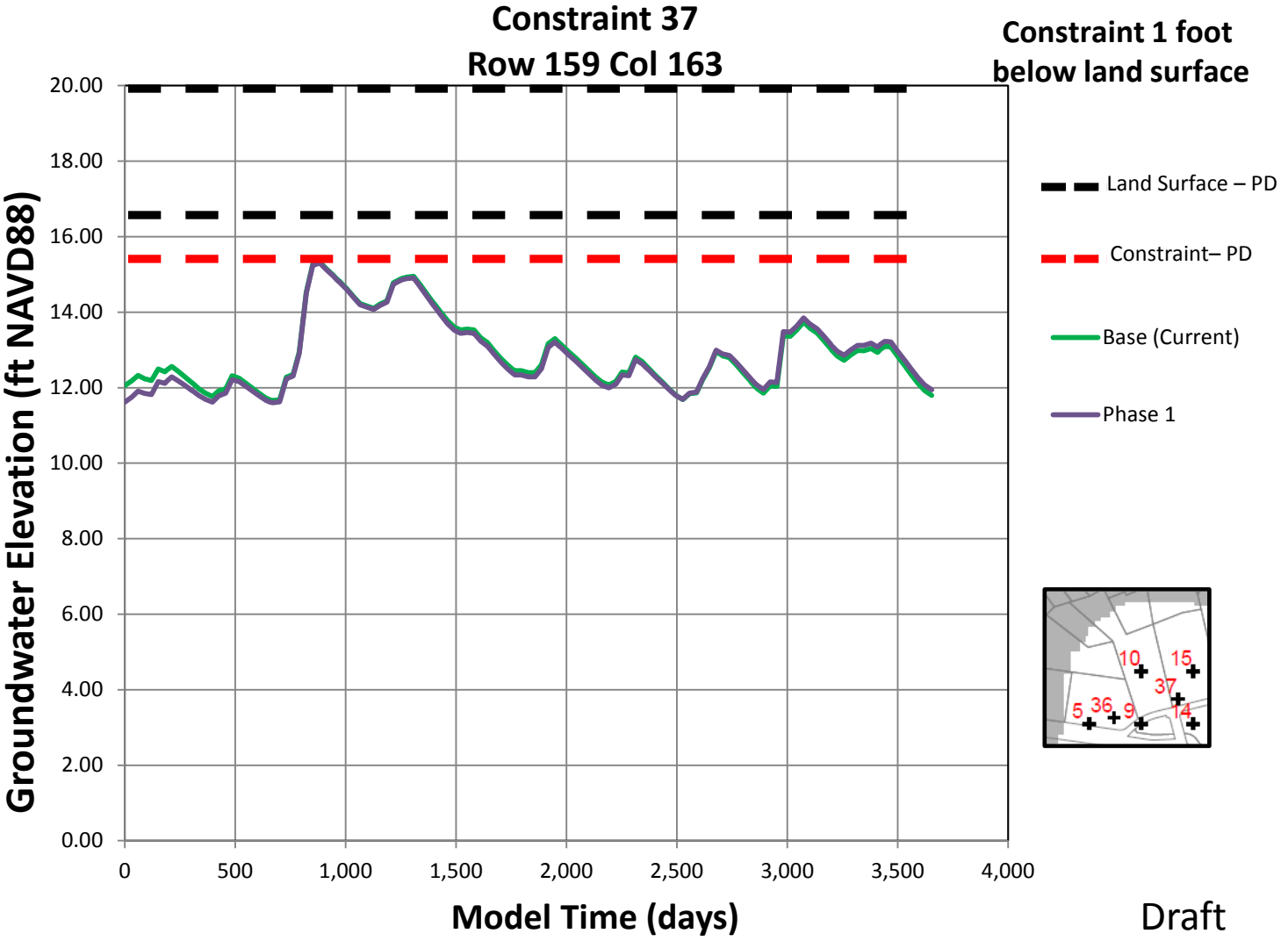
Mounding Analysis – Location 37

(Project lowers groundwater elevations)





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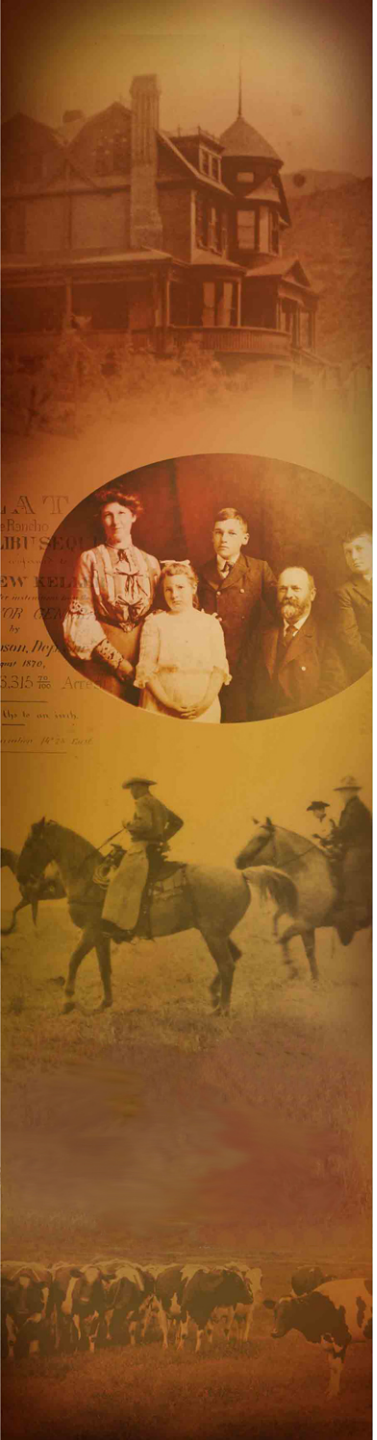
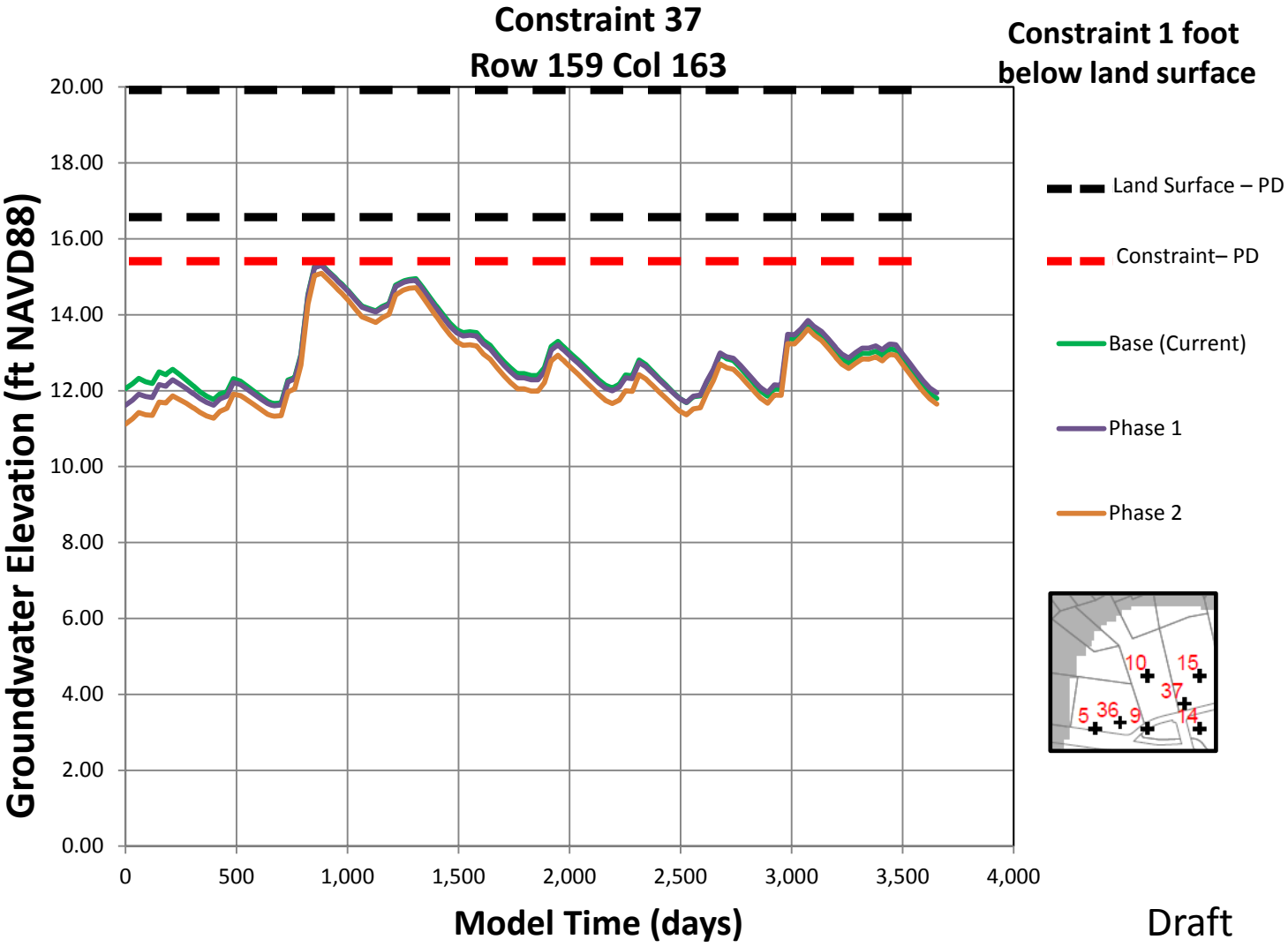
Mounding Analysis – Location 37

(Project lowers groundwater elevations)





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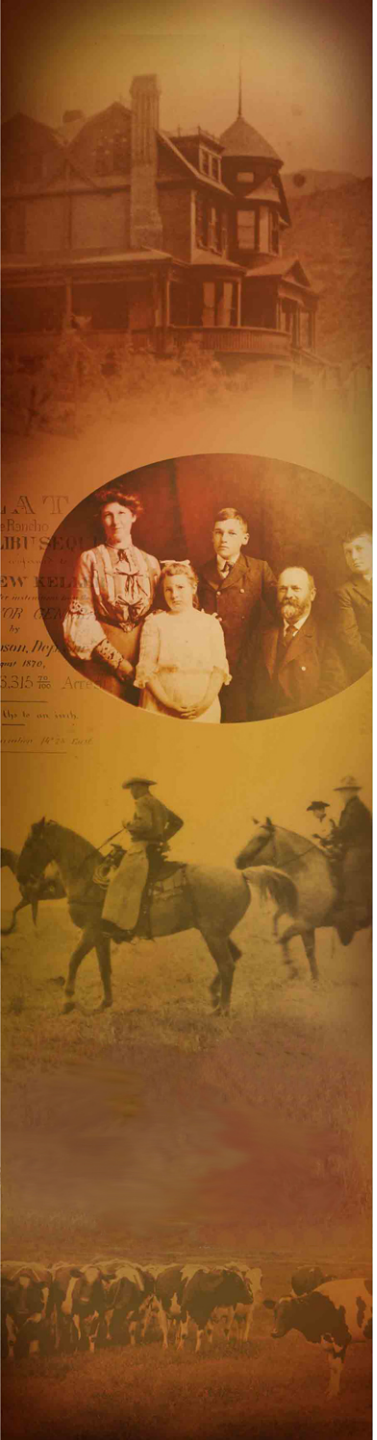
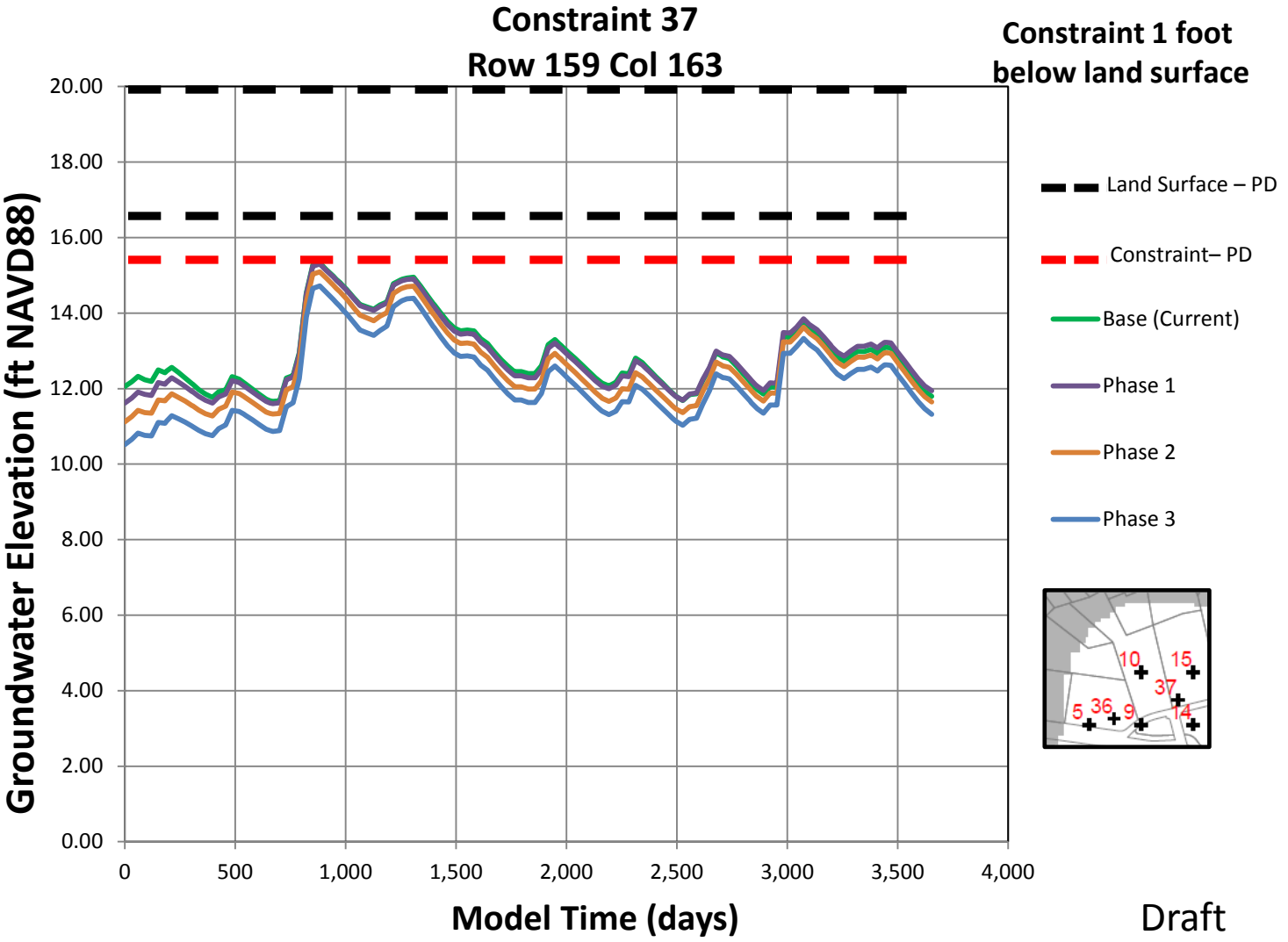
Mounding Analysis – Location 37

(Project lowers groundwater elevations)





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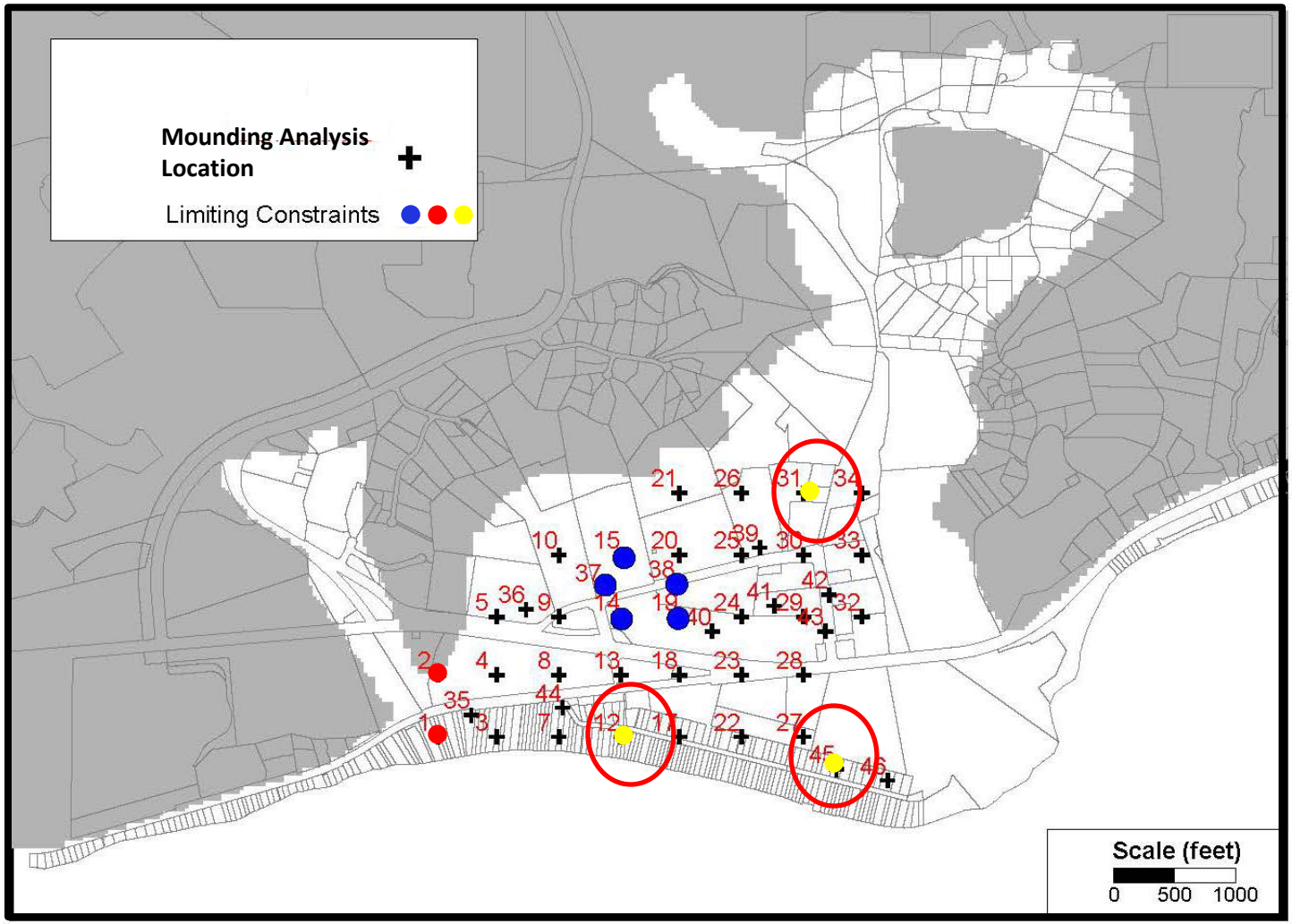
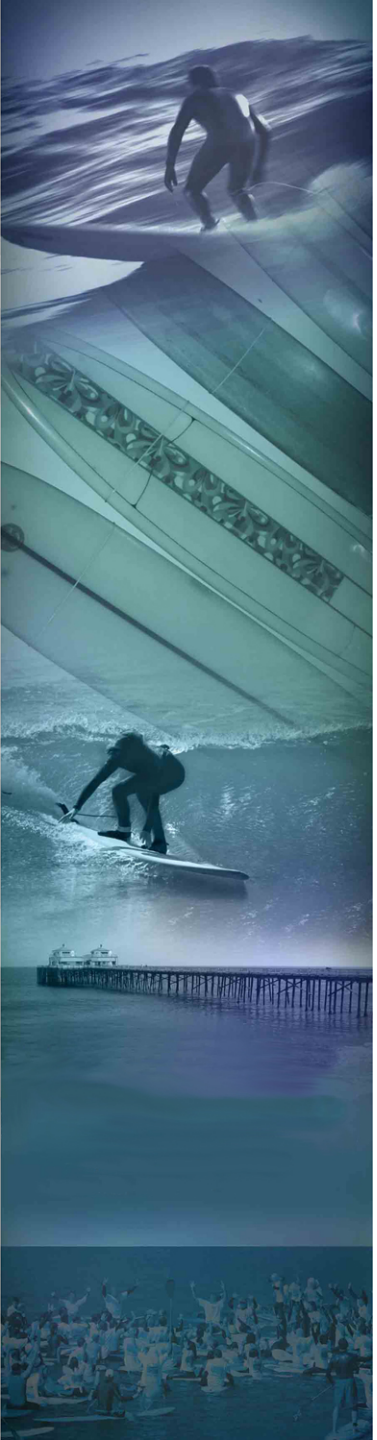
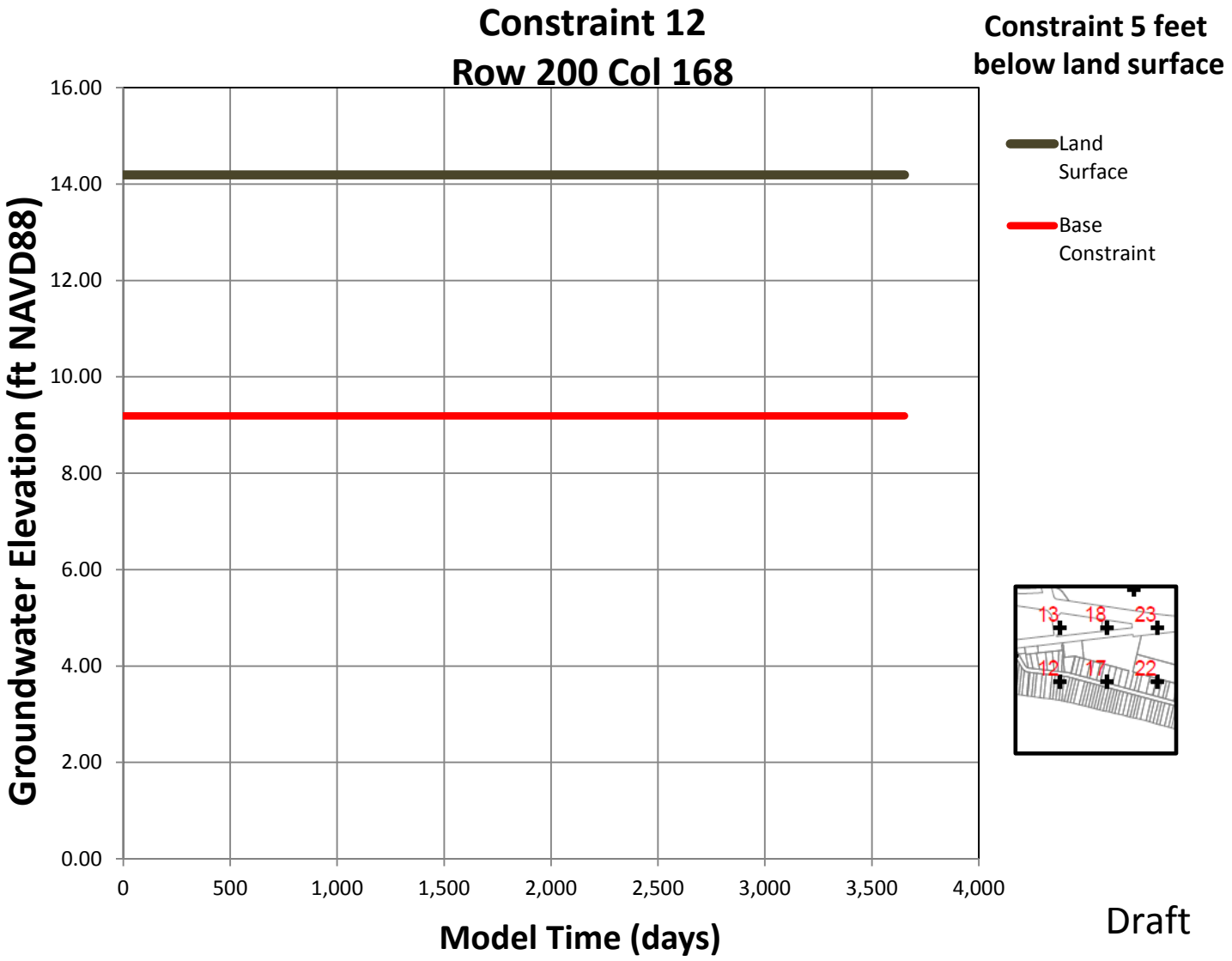
Groundwater Elevation Analysis Locations





Mounding Analysis – Location 12

(Project lowers groundwater elevations)



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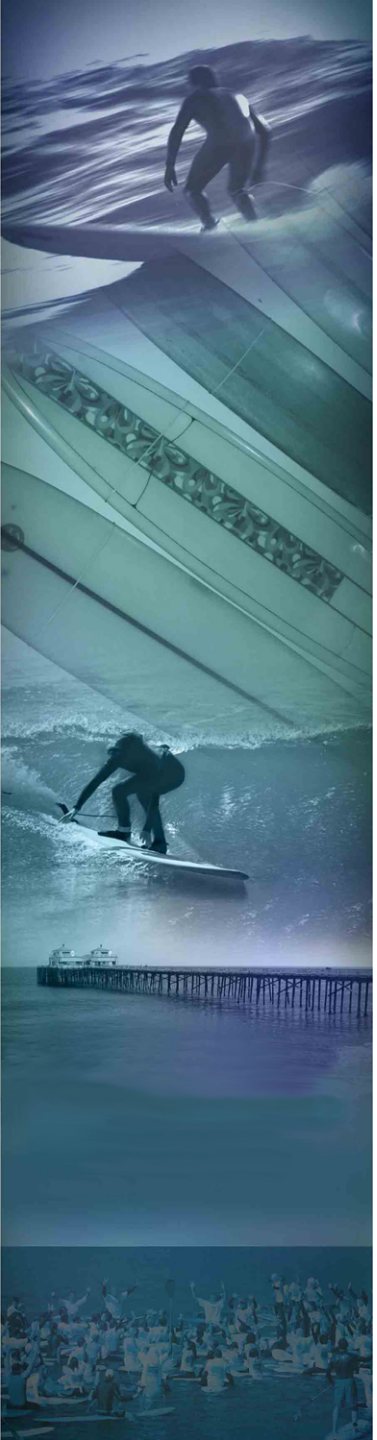
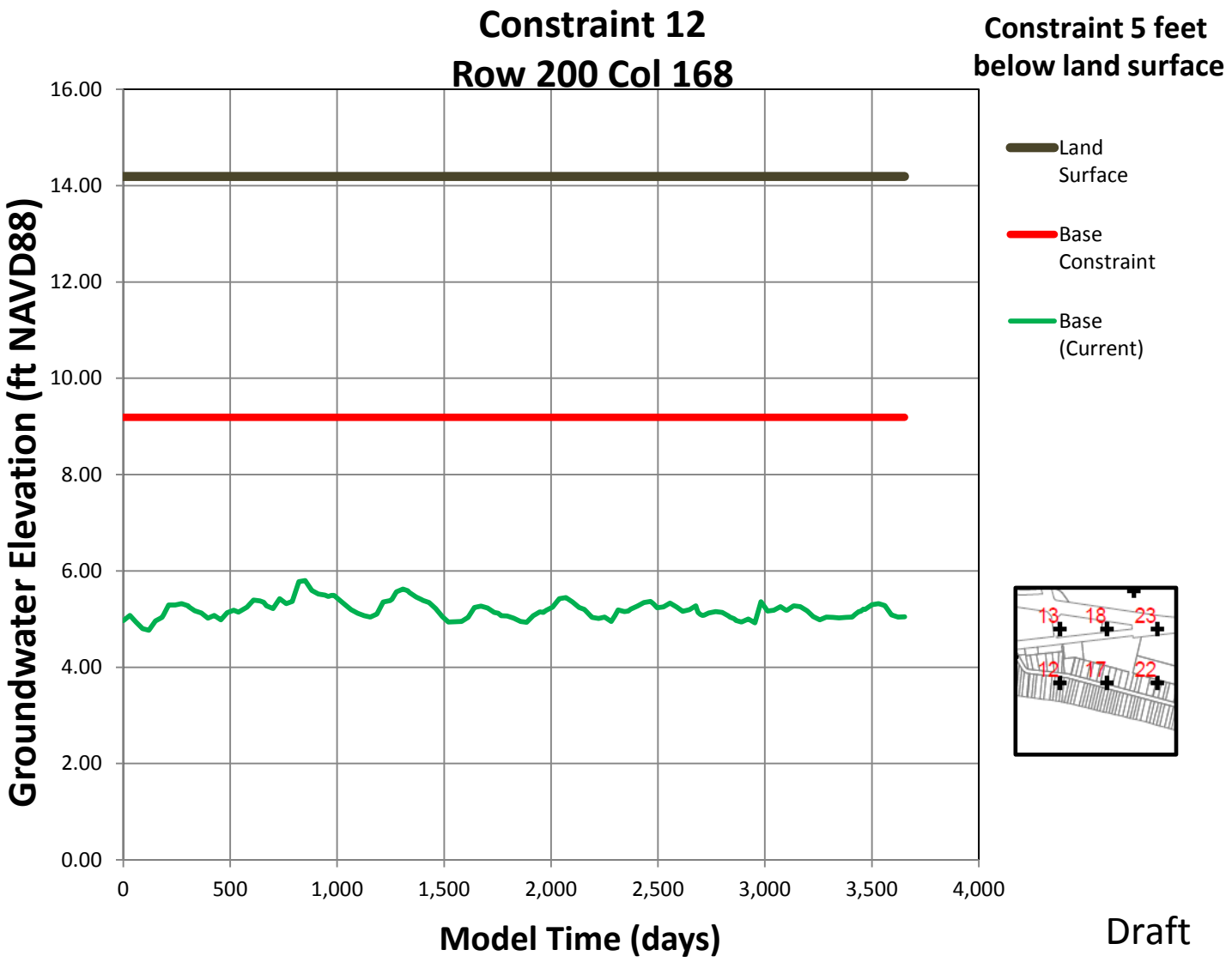


Mounding Analysis – Location 12

(Project lowers groundwater elevations)



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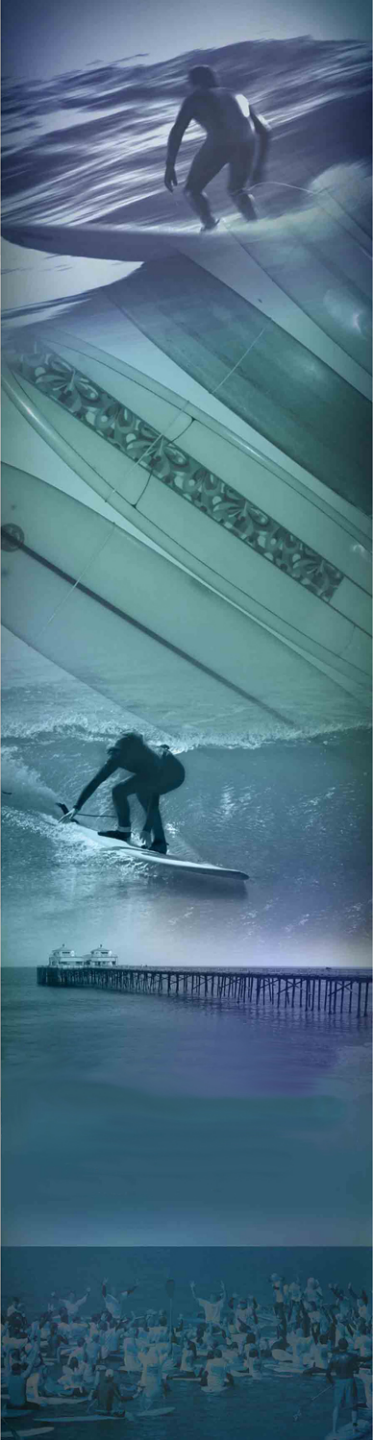
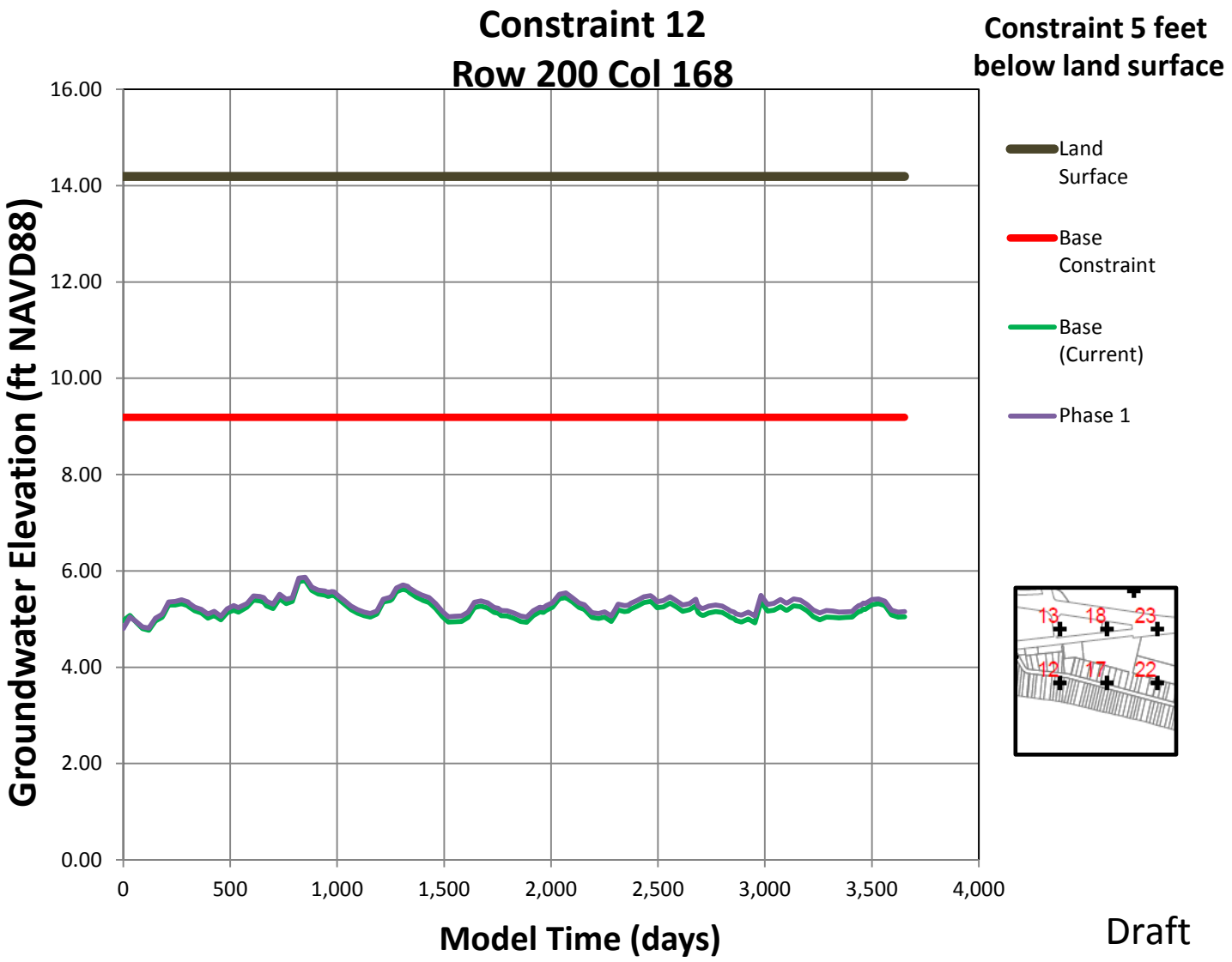


Mounding Analysis – Location 12

(Project lowers groundwater elevations)



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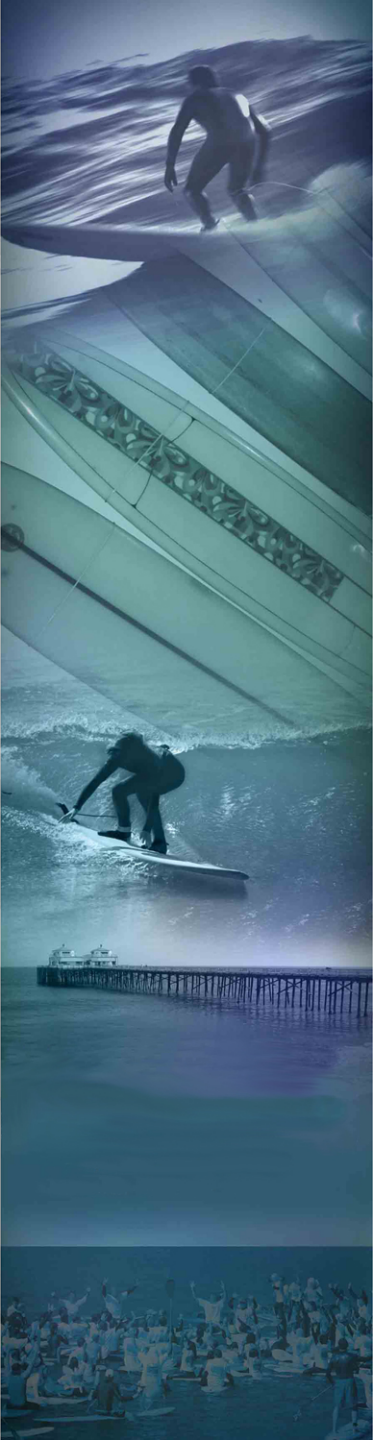

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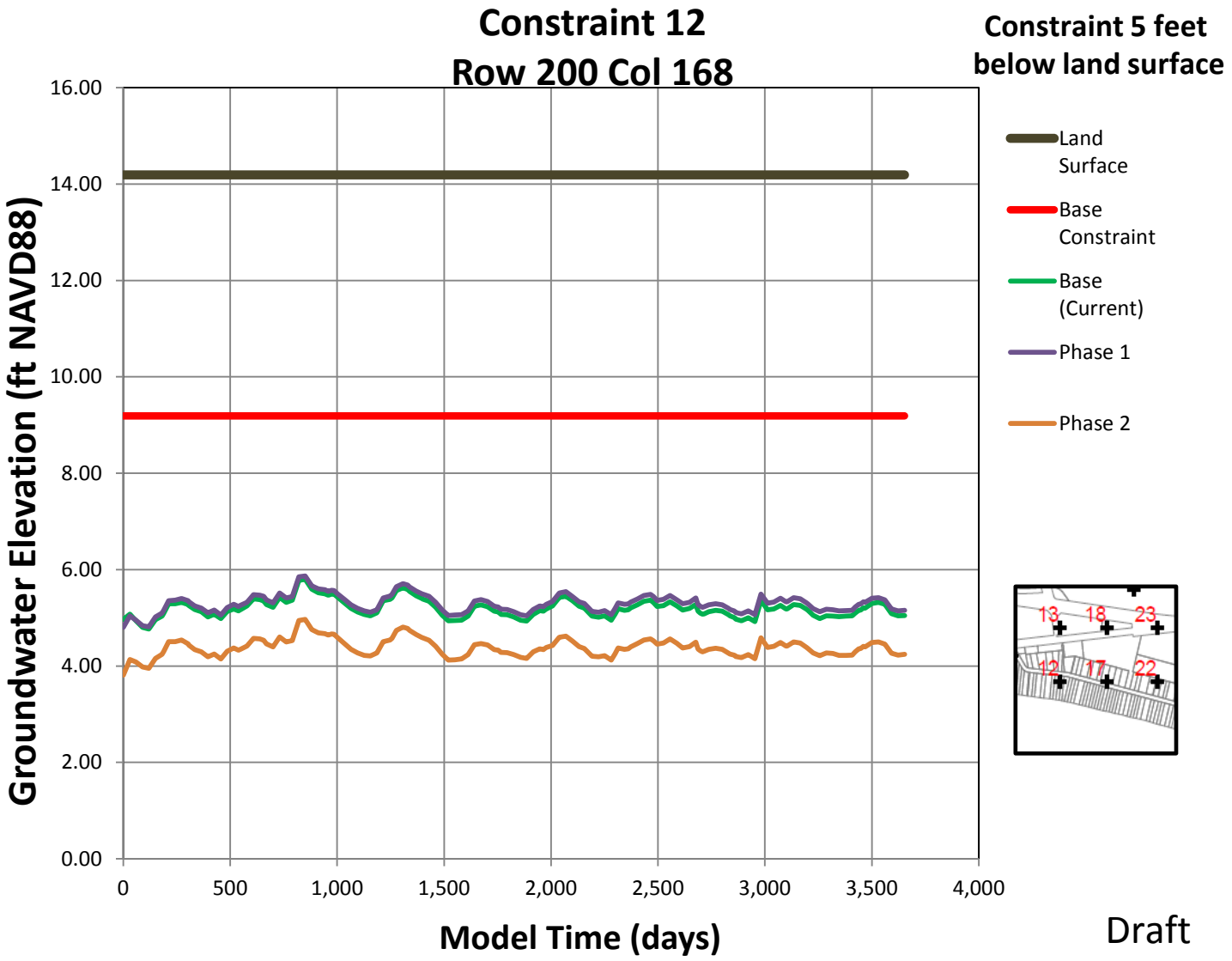
(Project lowers groundwater elevations)



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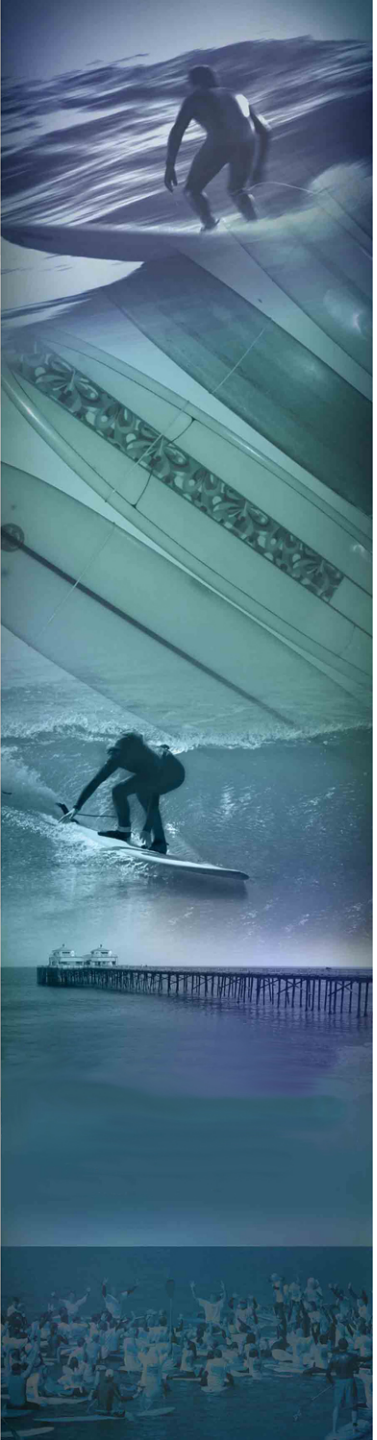
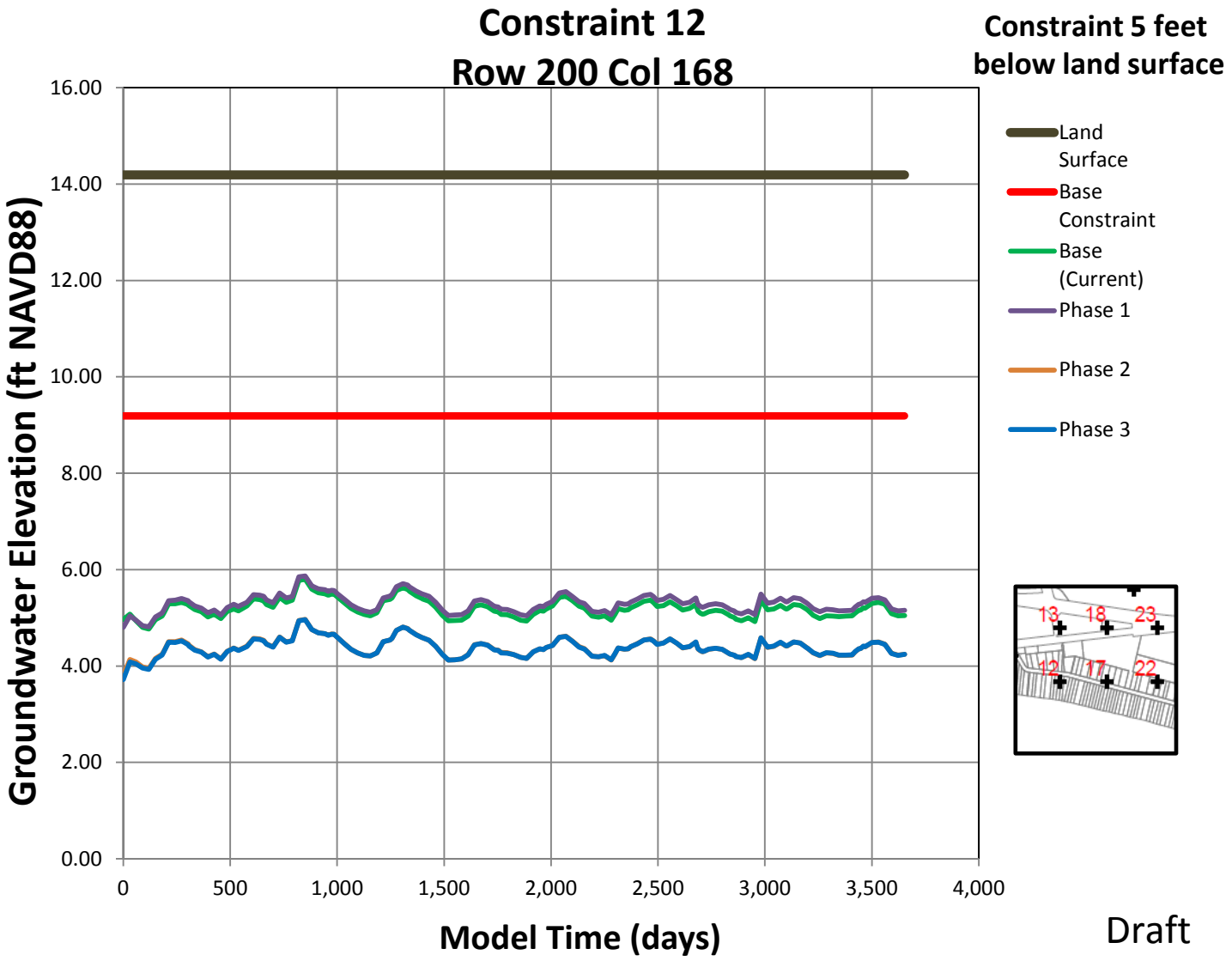


Mounding Analysis – Location 12

(Project lowers groundwater elevations)



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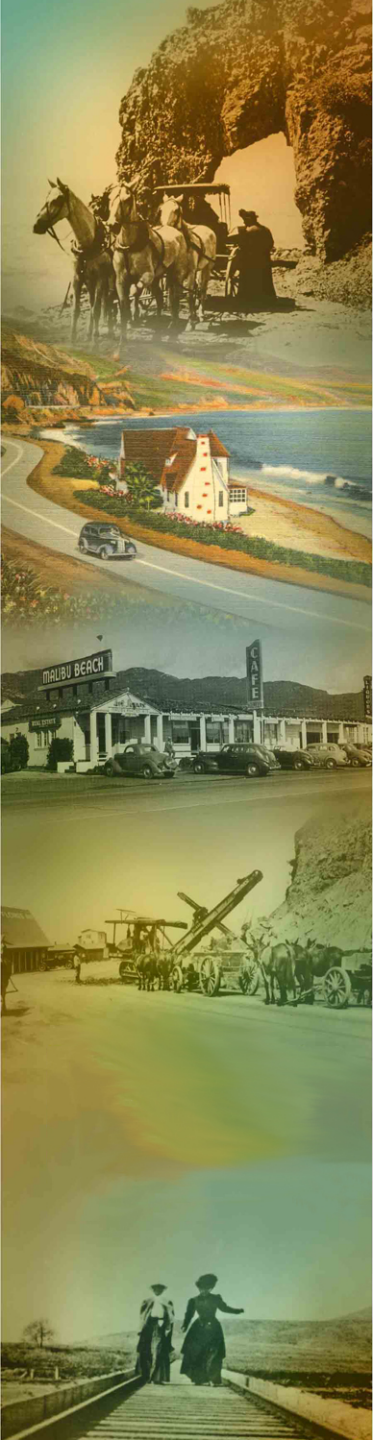
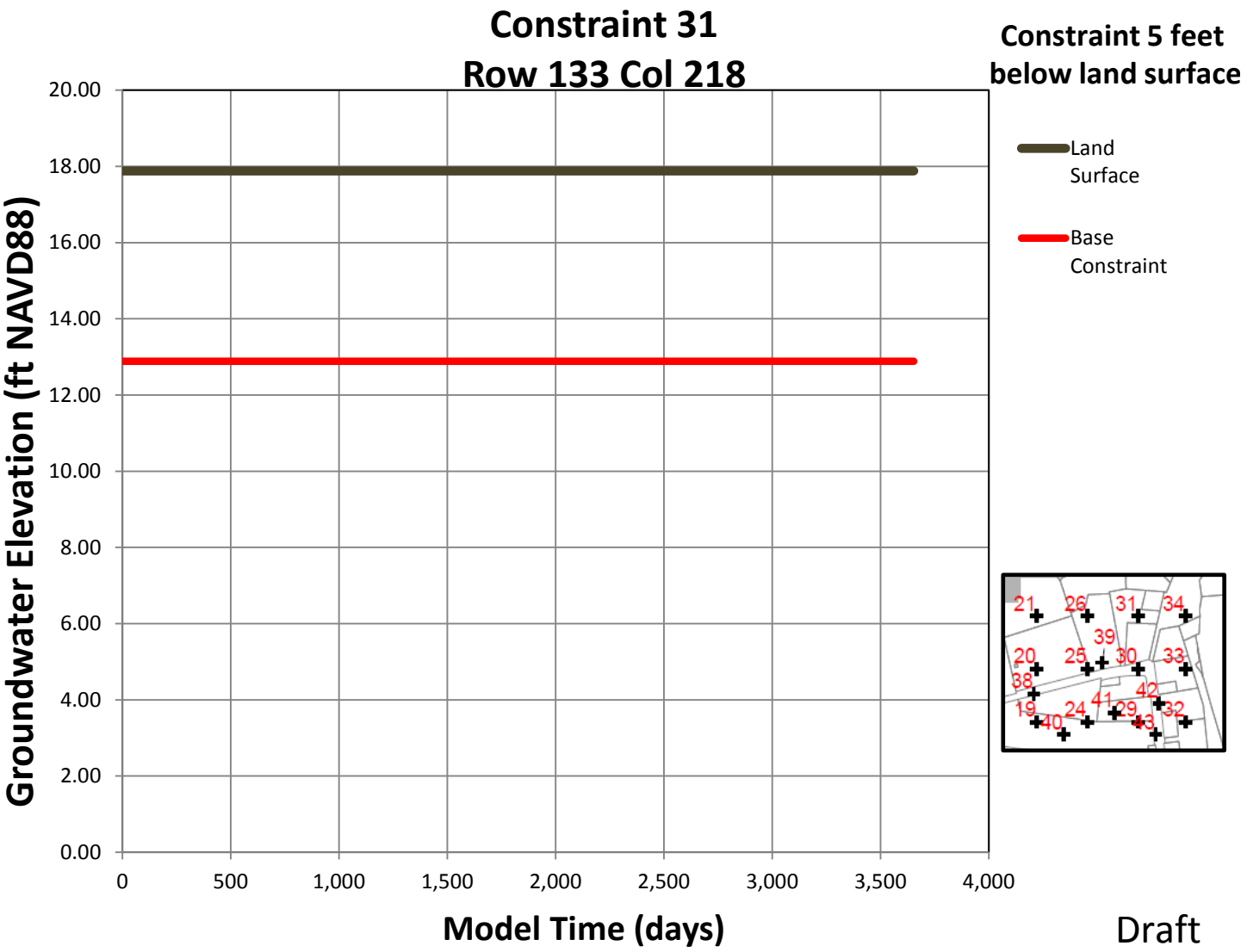


Mounding Analysis – Location 31



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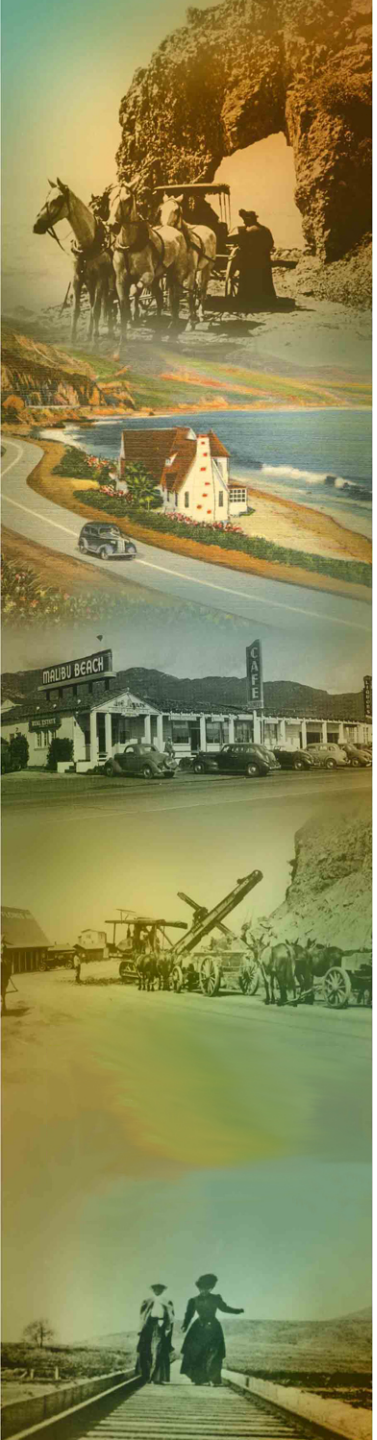
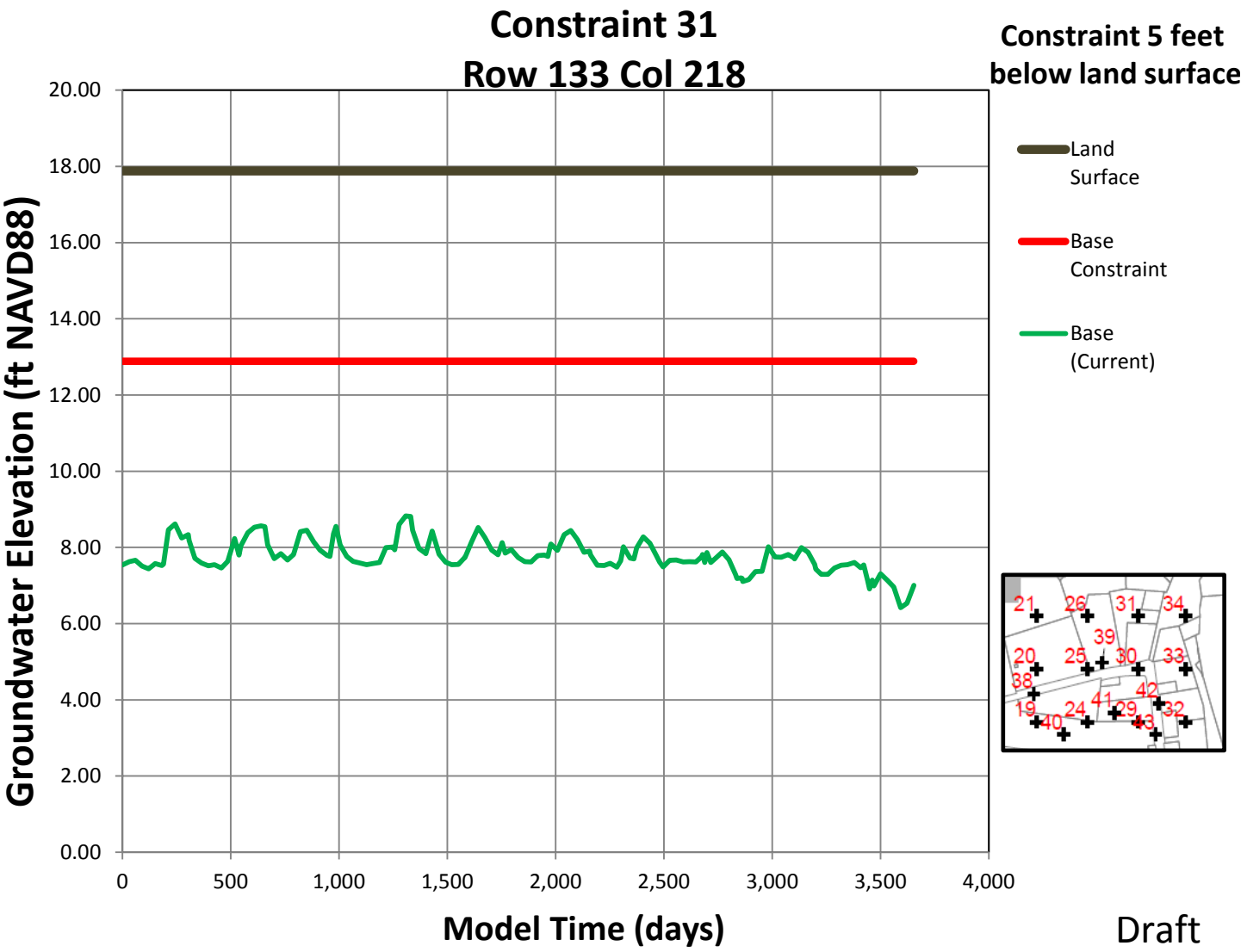


Mounding Analysis – Location 31



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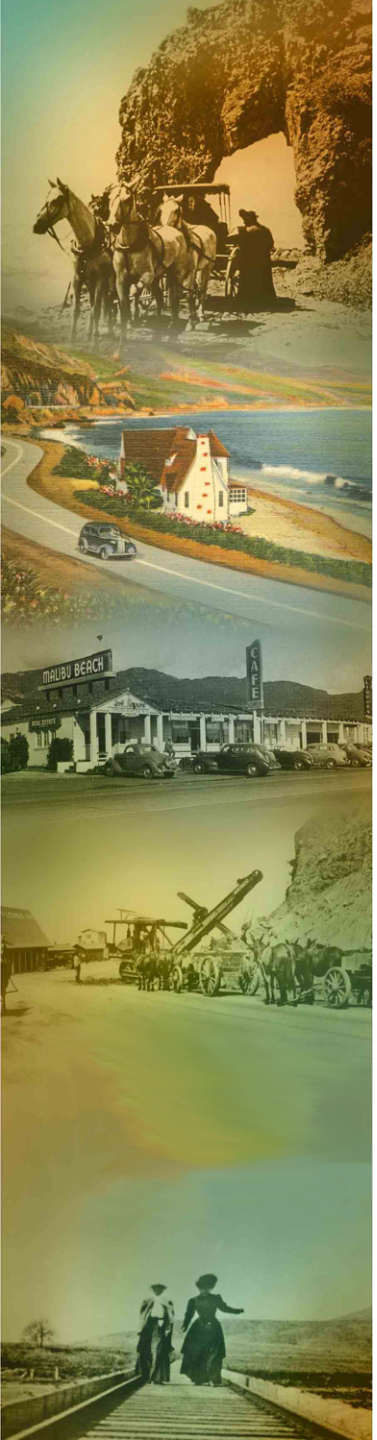
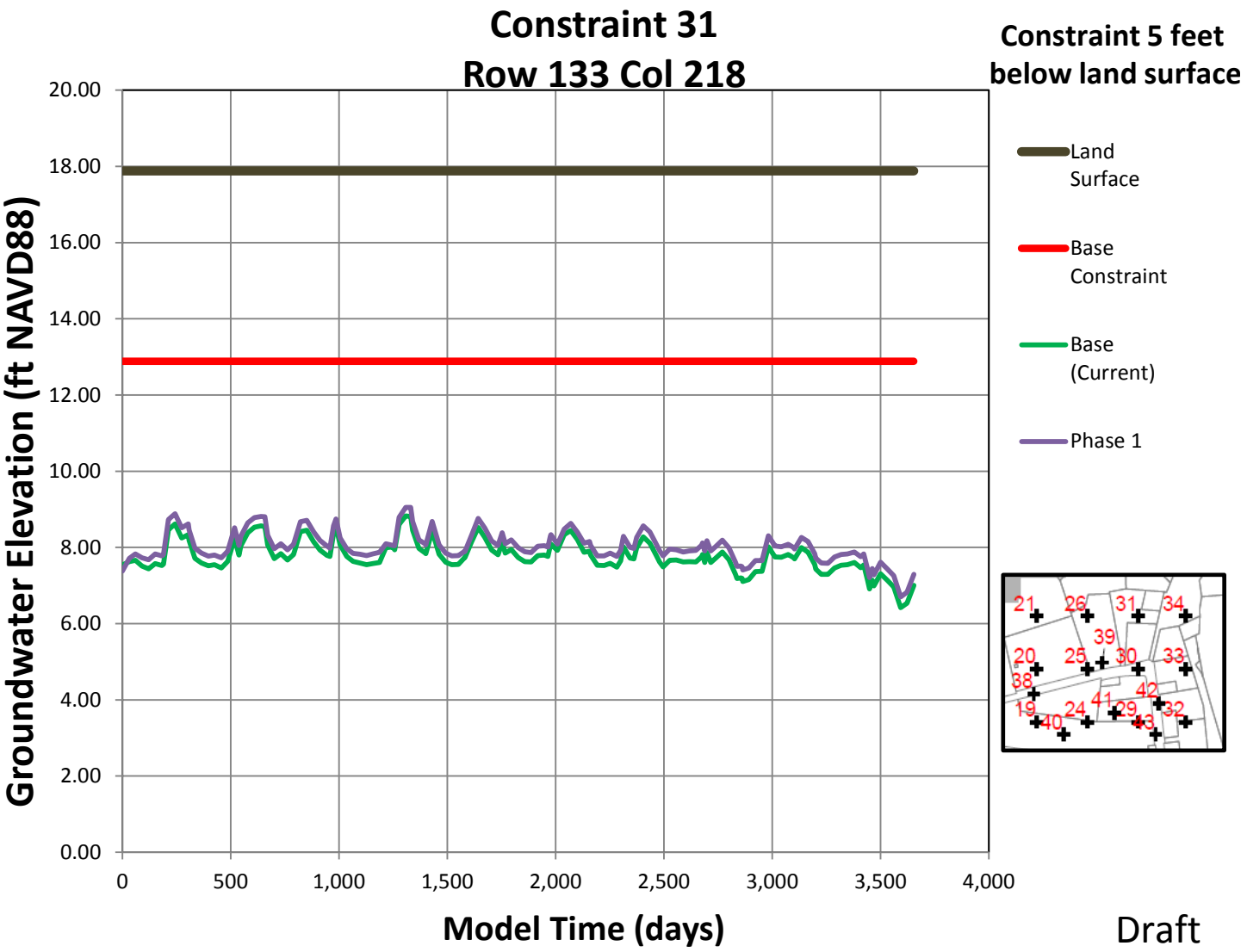


Mounding Analysis – Location 31



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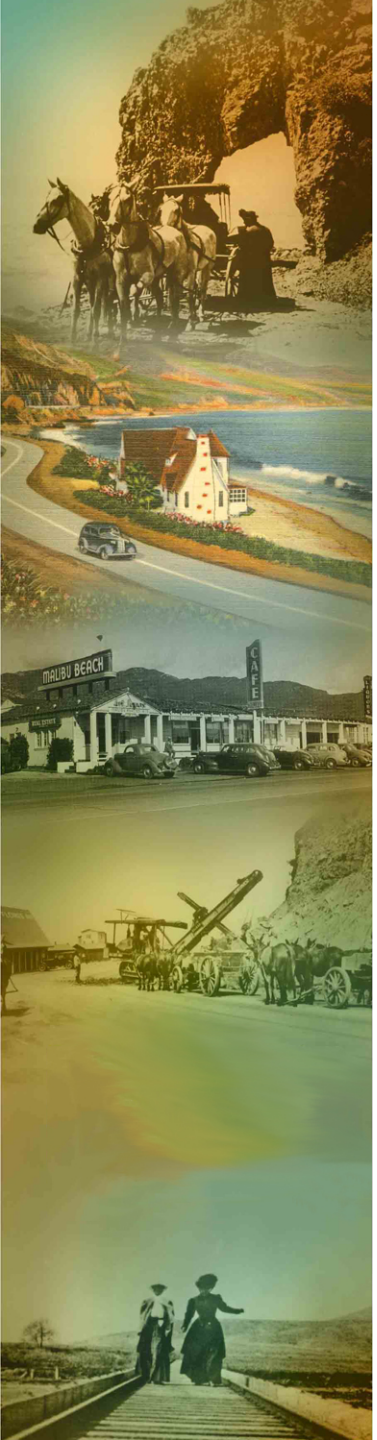

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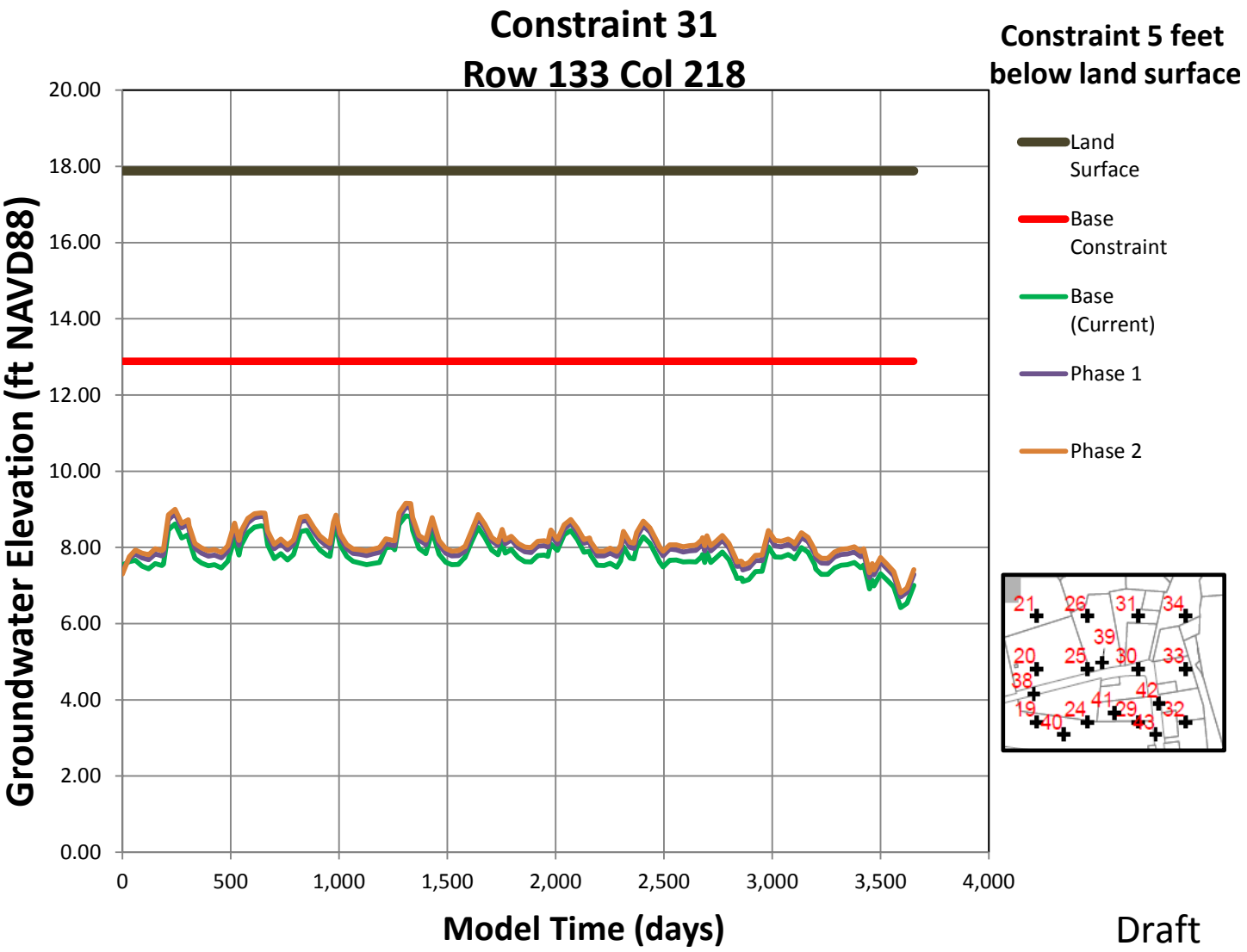

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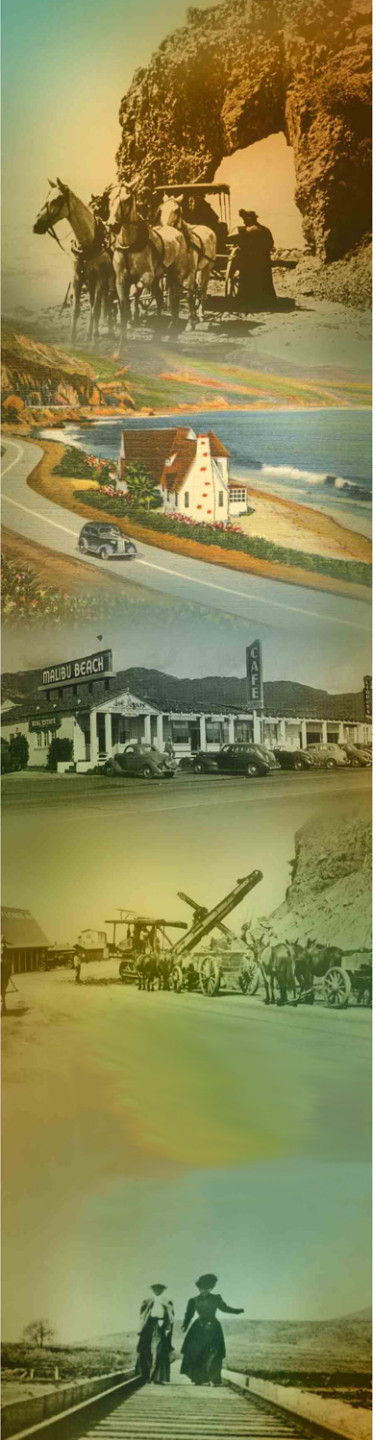
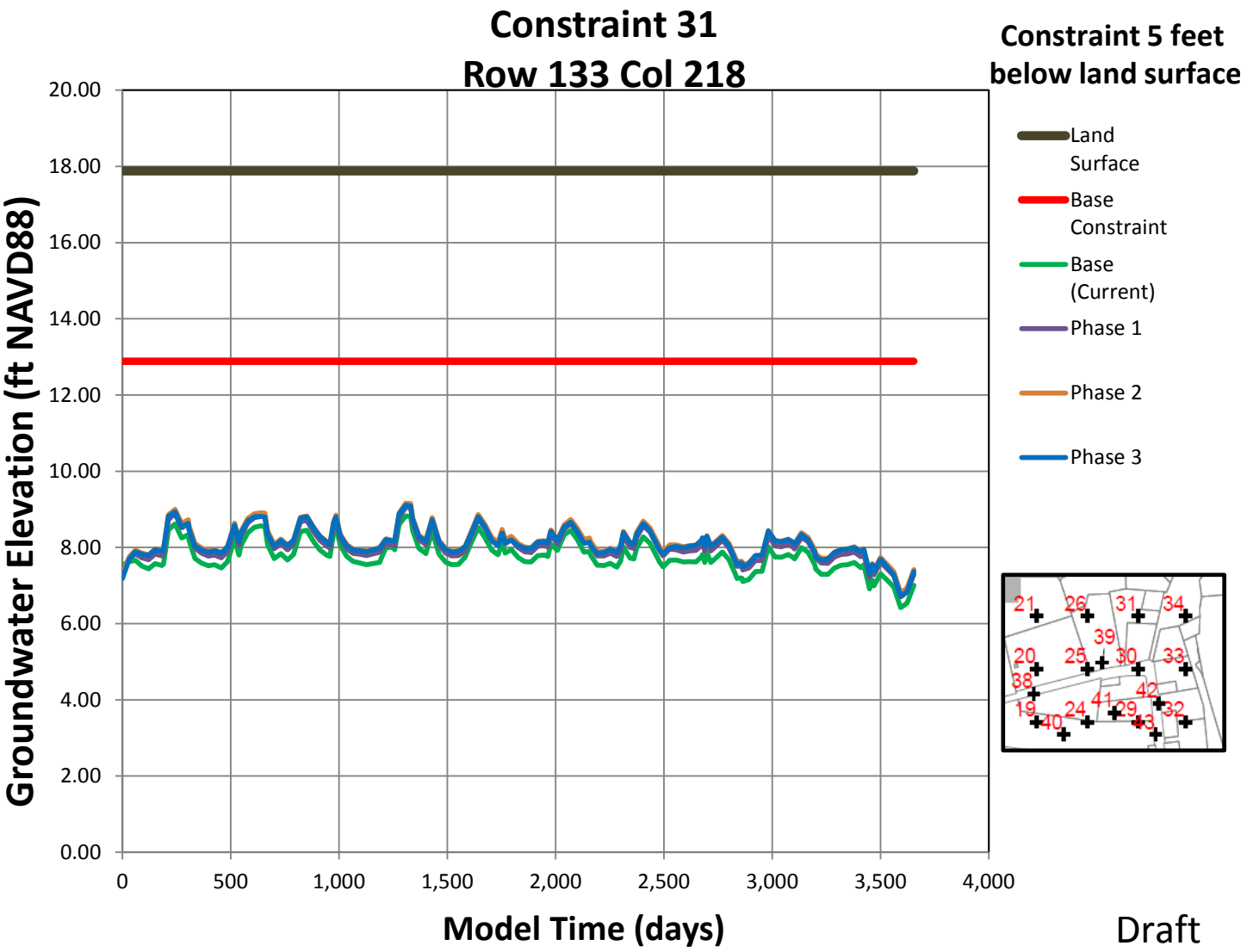


Mounding Analysis – Location 31



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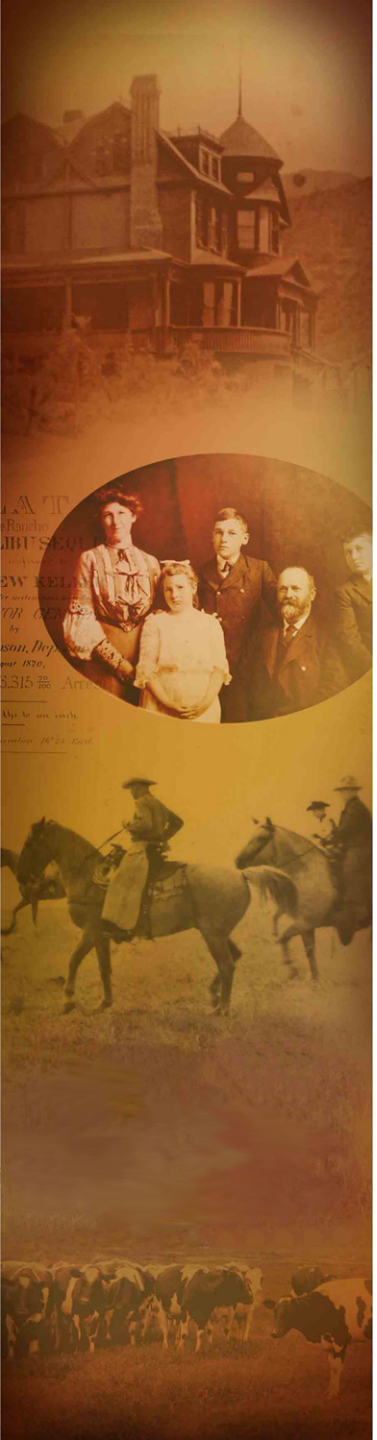
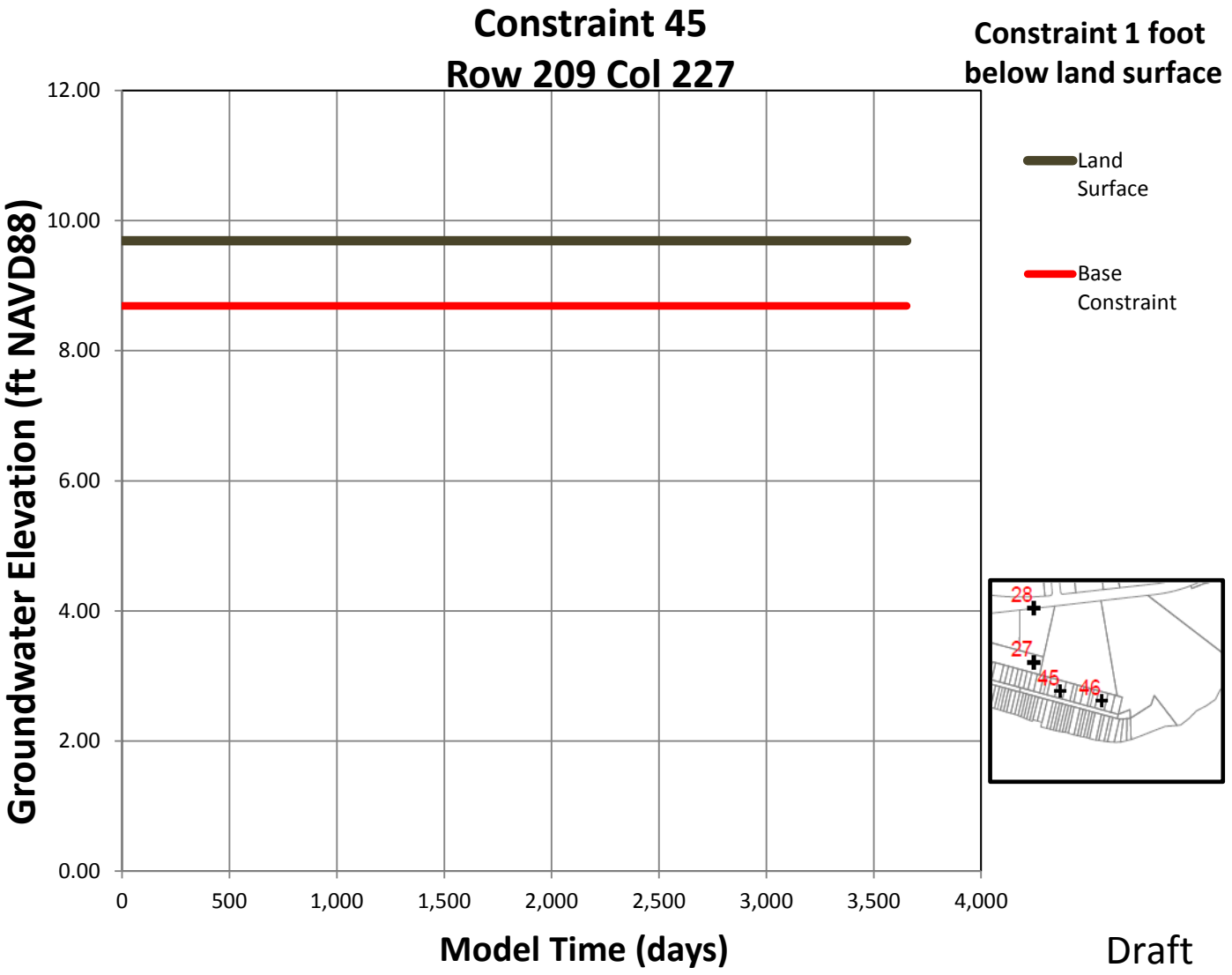
Mounding Analysis – Location 45

(Project lowers groundwater elevations)





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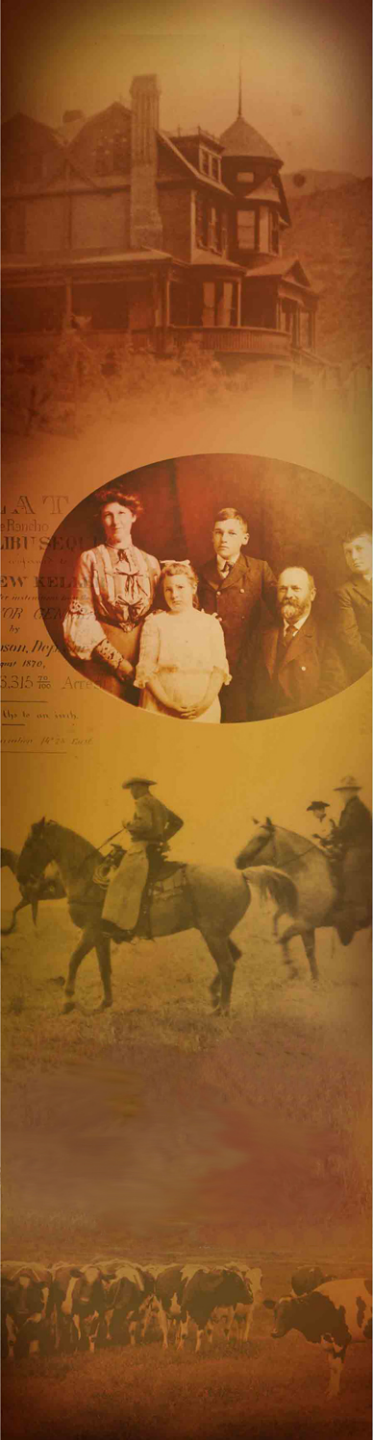
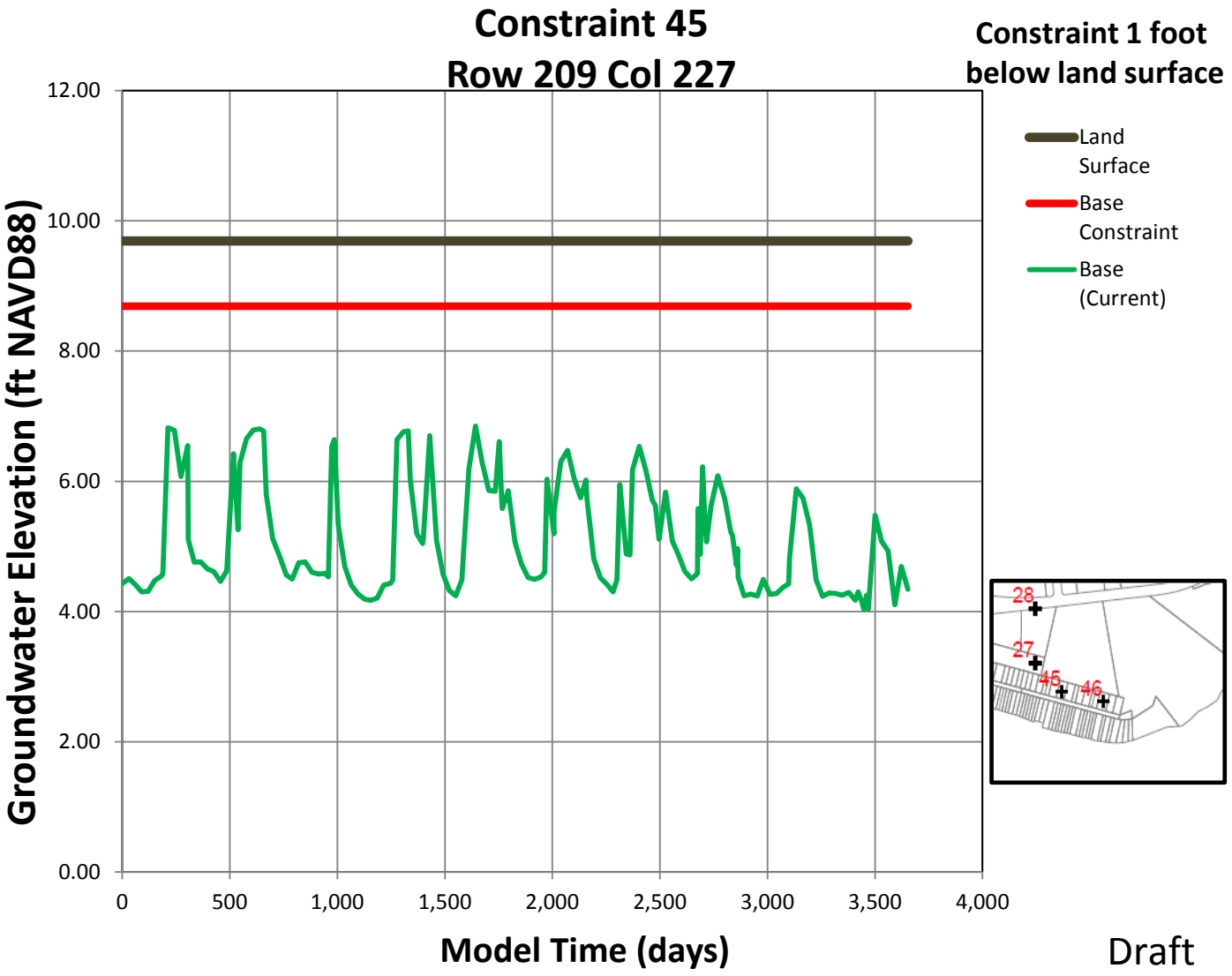
Mounding Analysis – Location 45

(Project lowers groundwater elevations)





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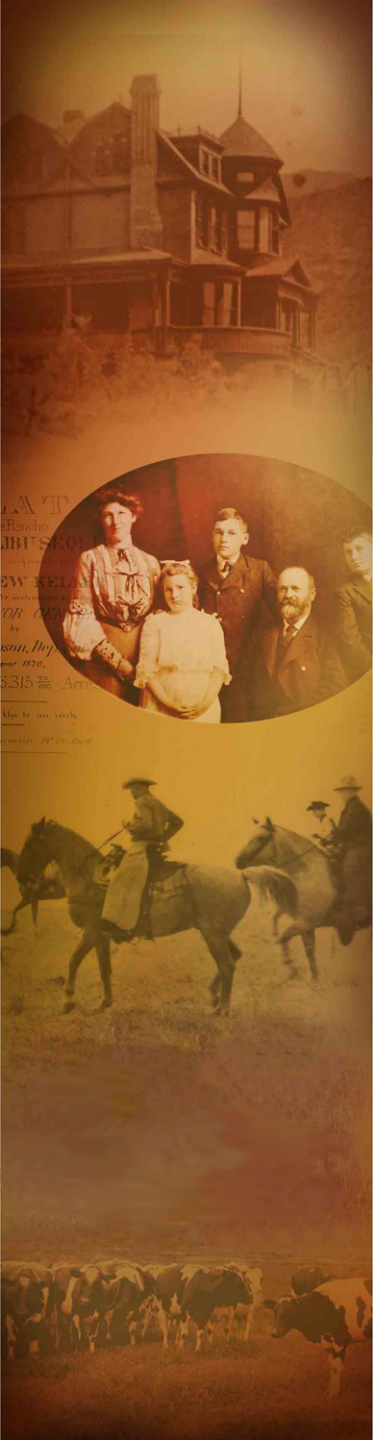
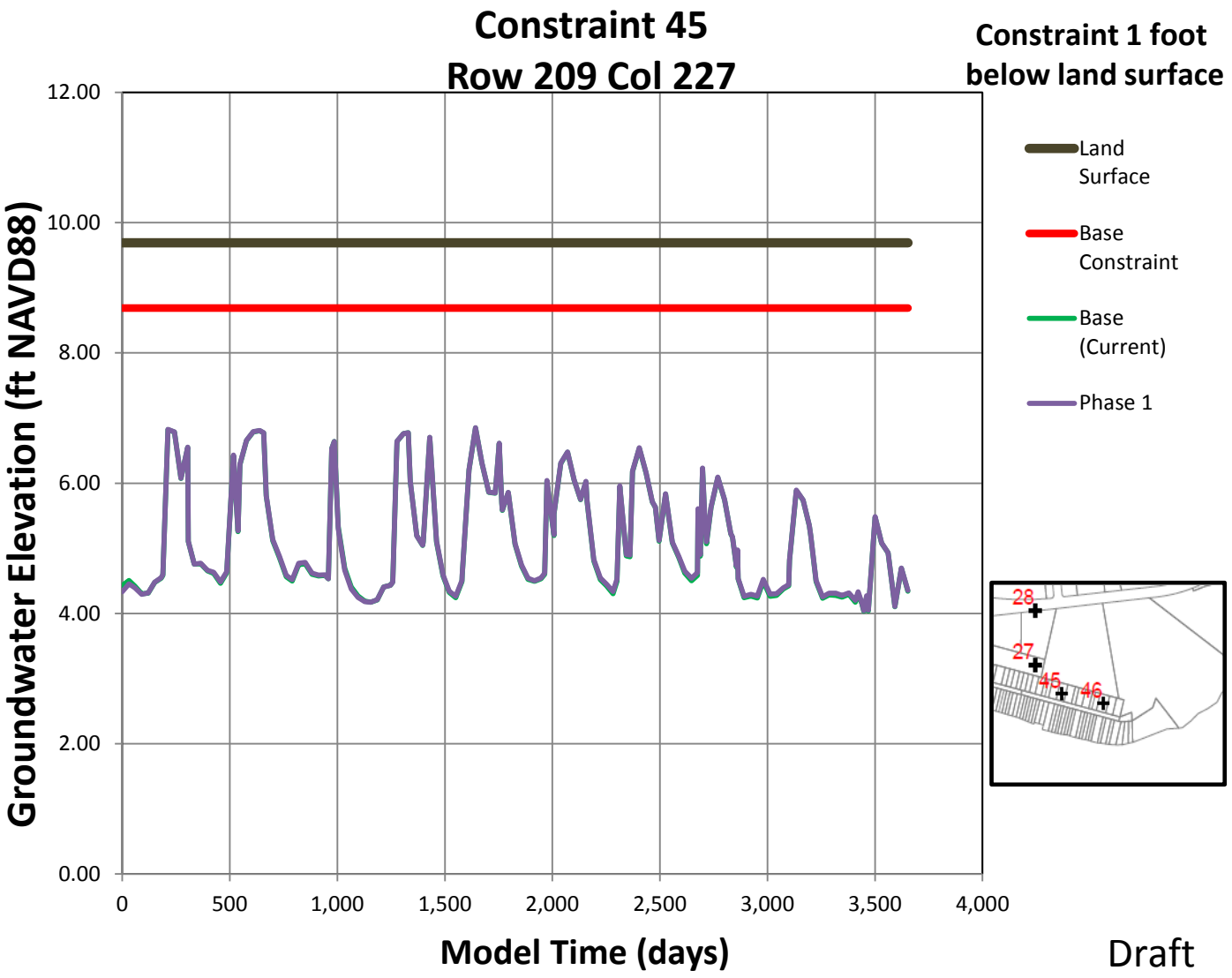


Mounding Analysis – Location 45

(Project lowers groundwater elevations)



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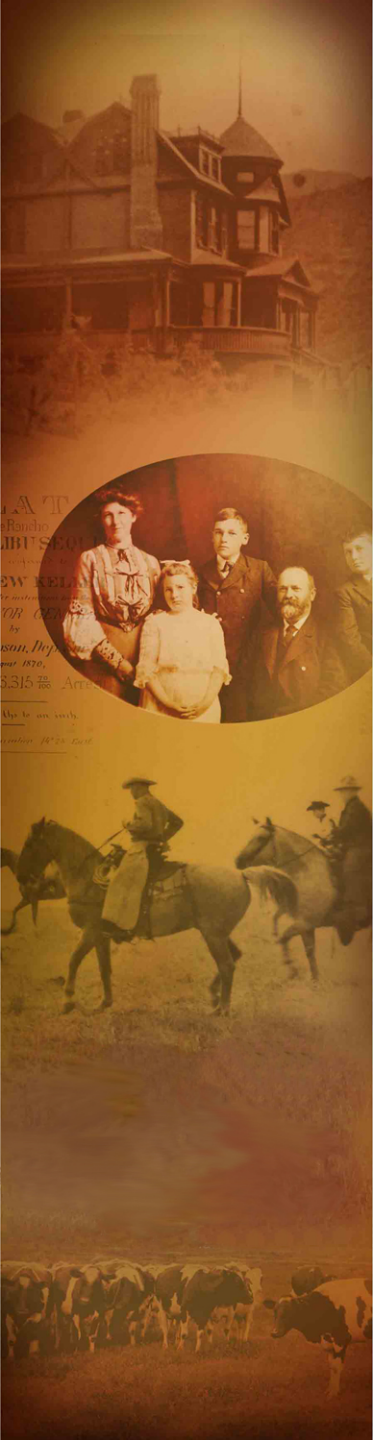
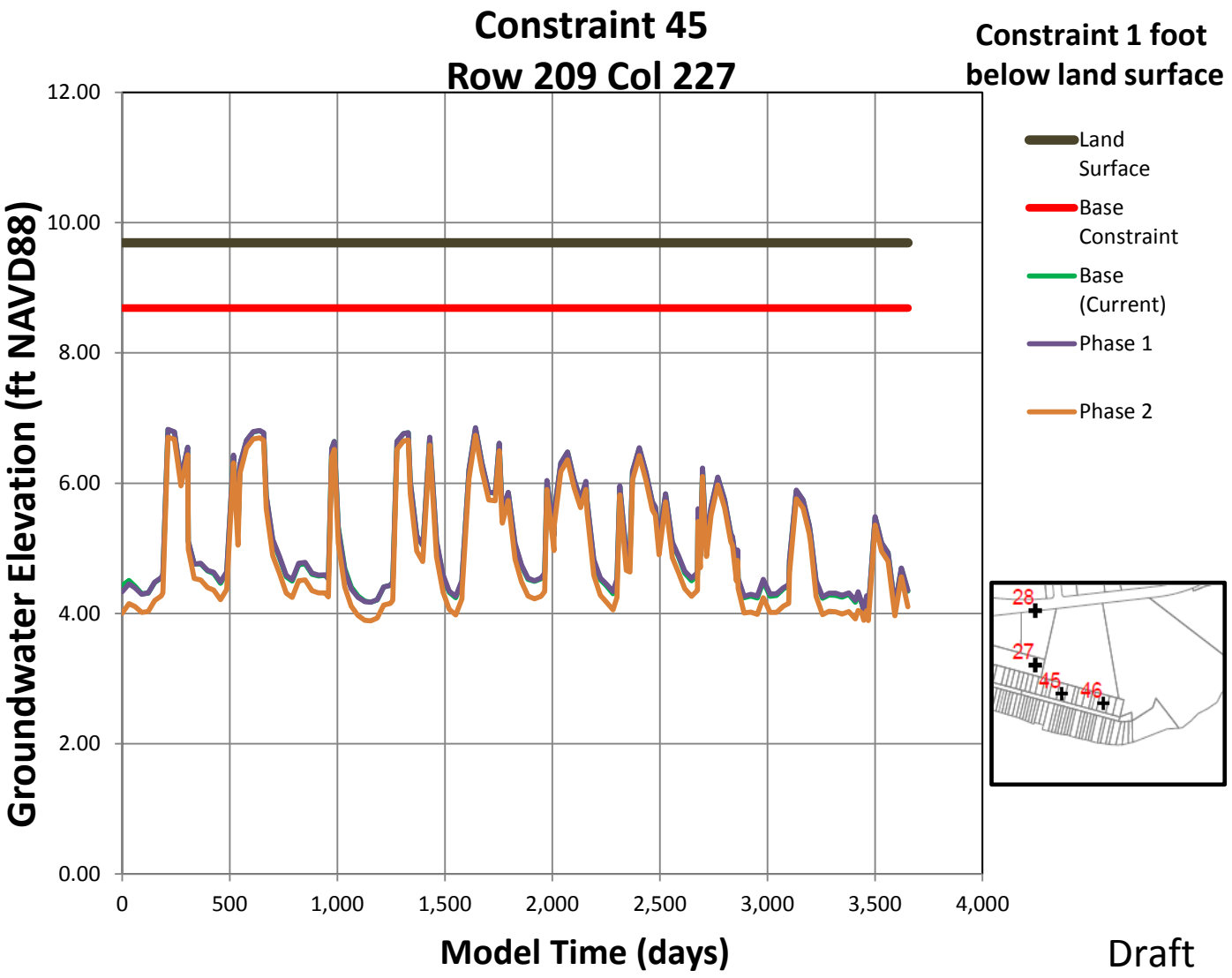
Mounding Analysis – Location 45

(Project lowers groundwater elevations)





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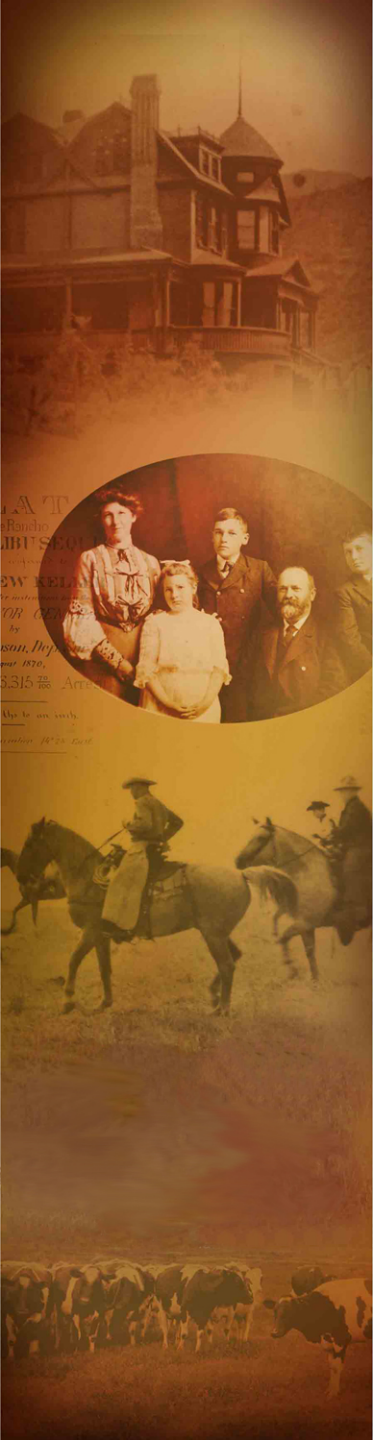
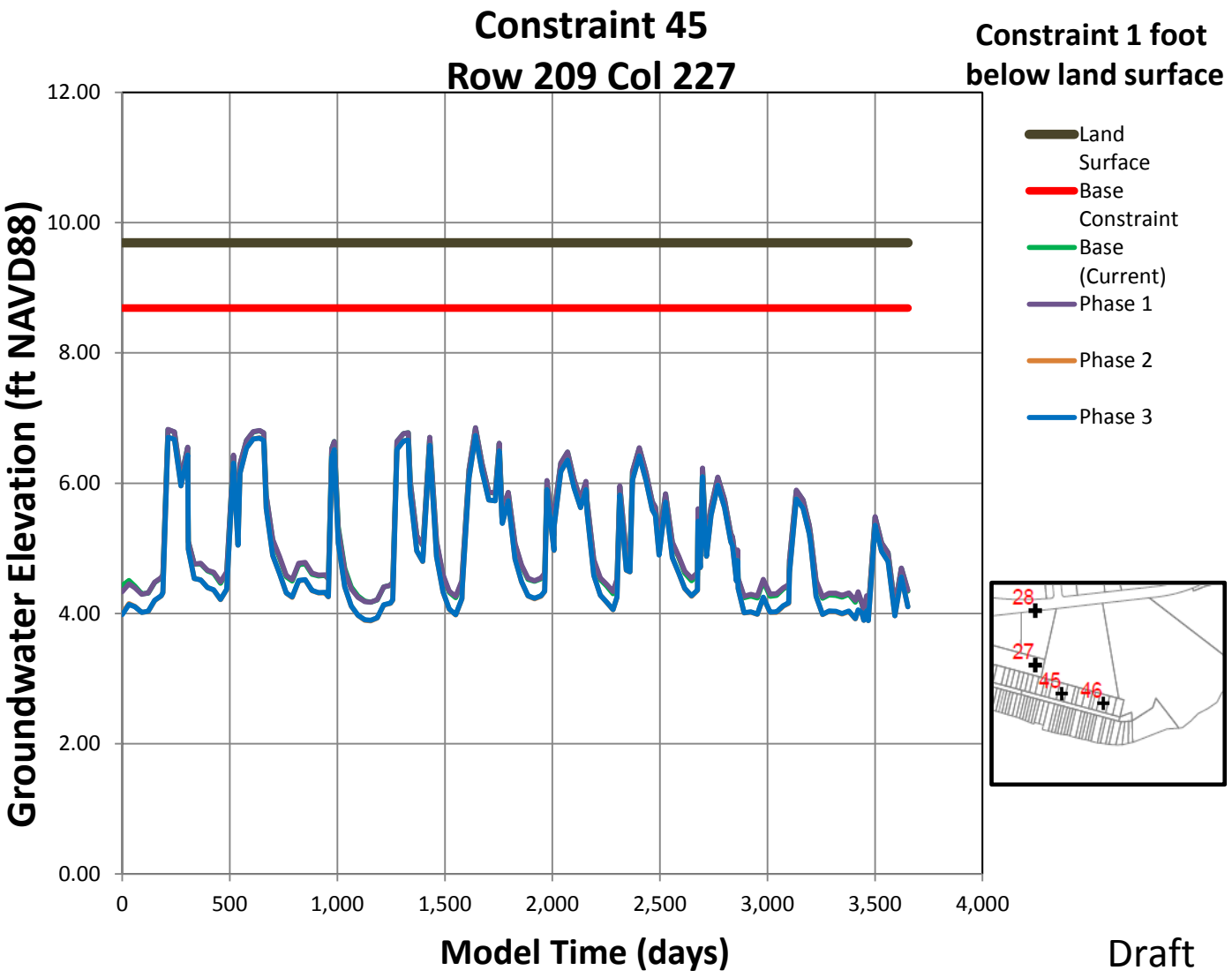
Mounding Analysis – Location 45

(Project lowers groundwater elevations)





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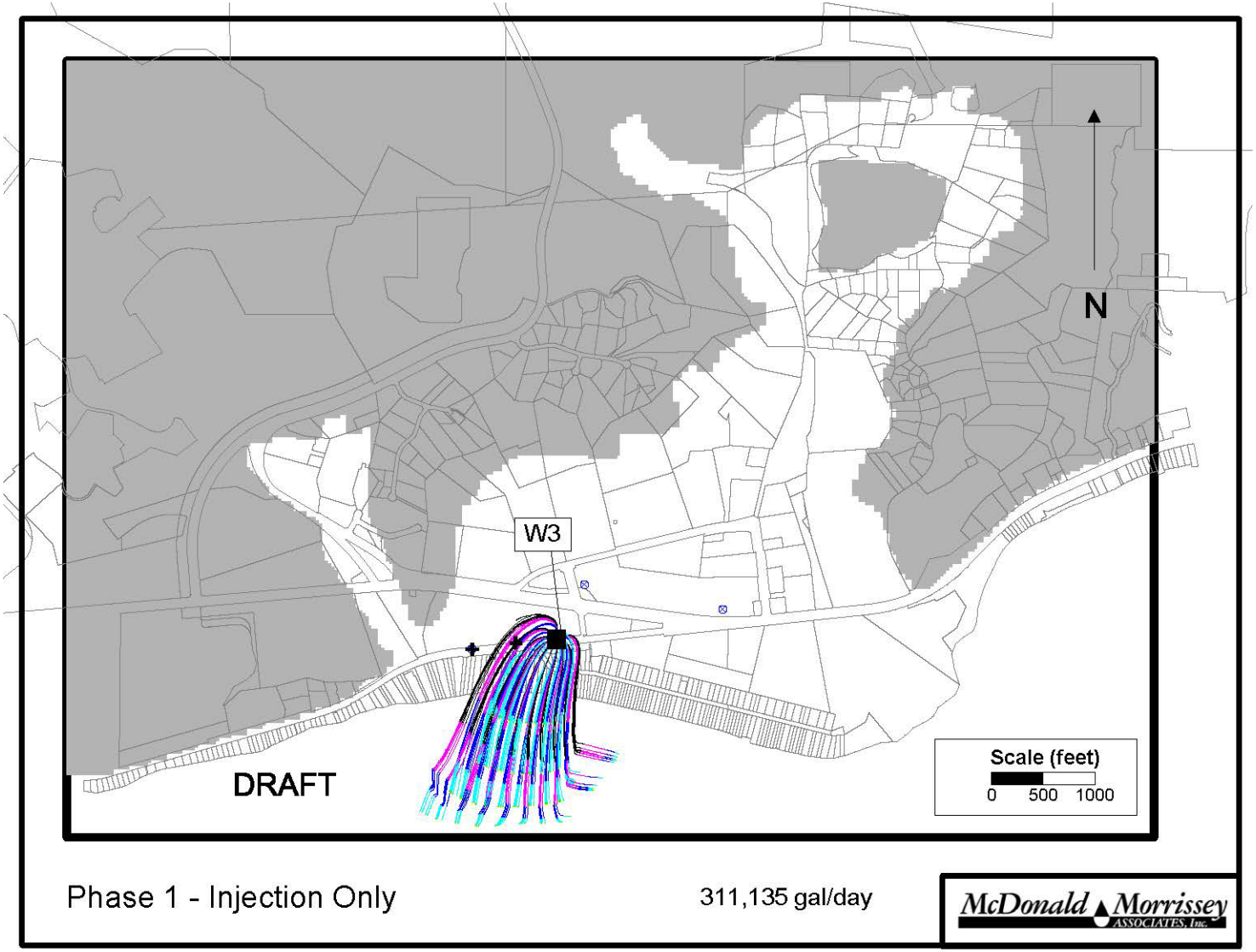
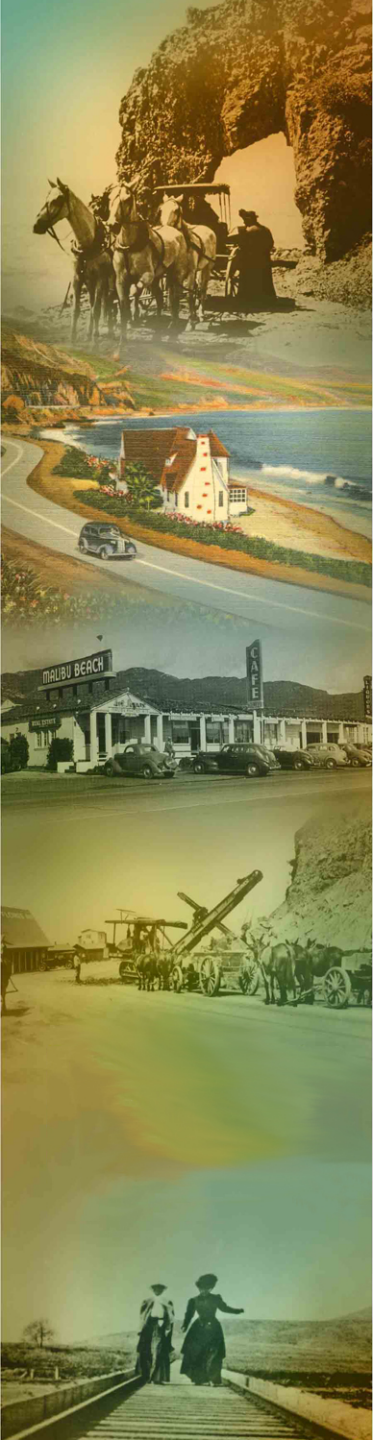
Flow Analysis – Where does the injected water go?

- Used MODPATH6 for particle tracking
- Simulated flow paths of injected water
- Used MODFLOW results as basis

Phase 1 – Flow Location

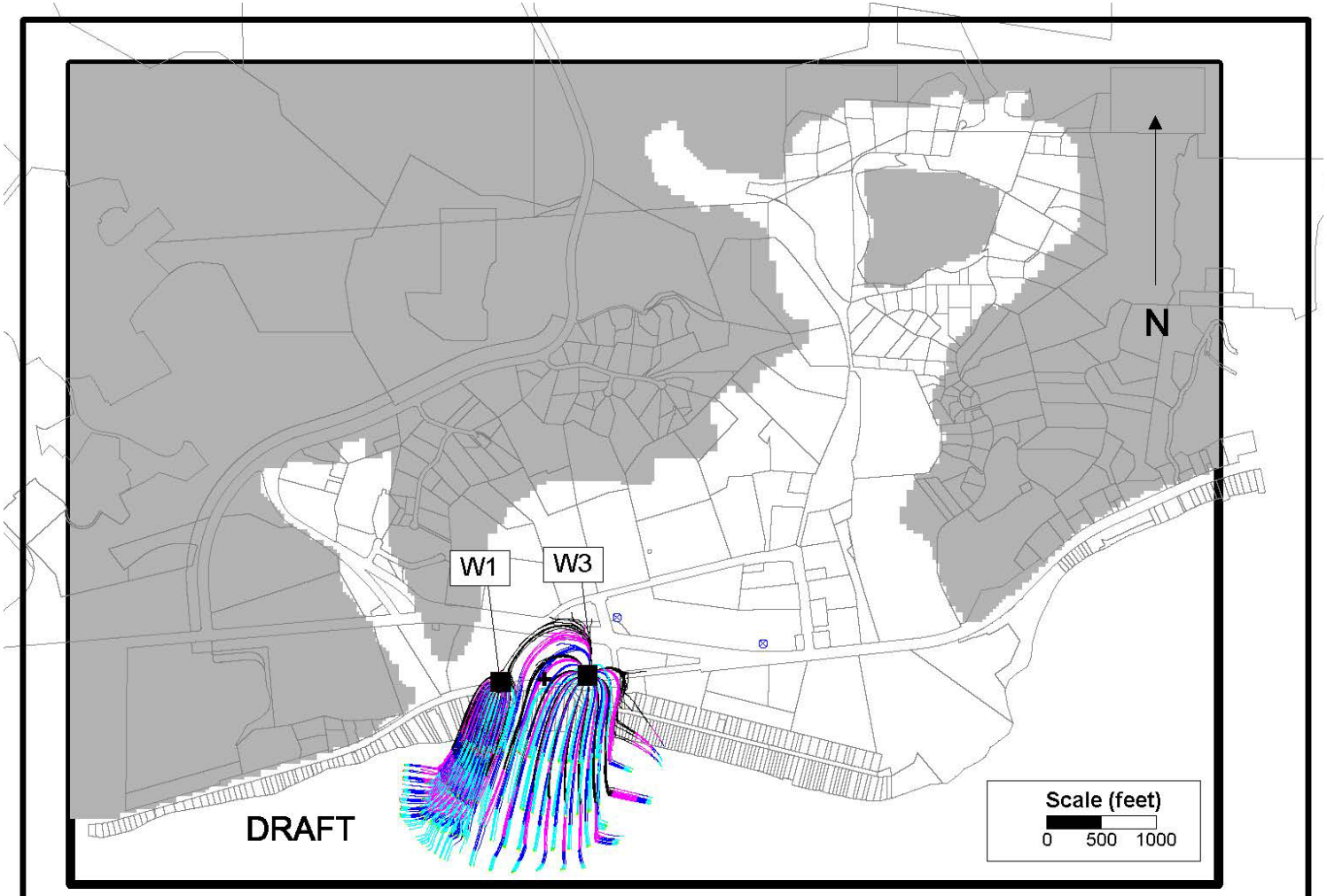
(no flow to Lagoon or Creek)





Phase 2 – Flow Location

(no flow to Lagoon or Creek)



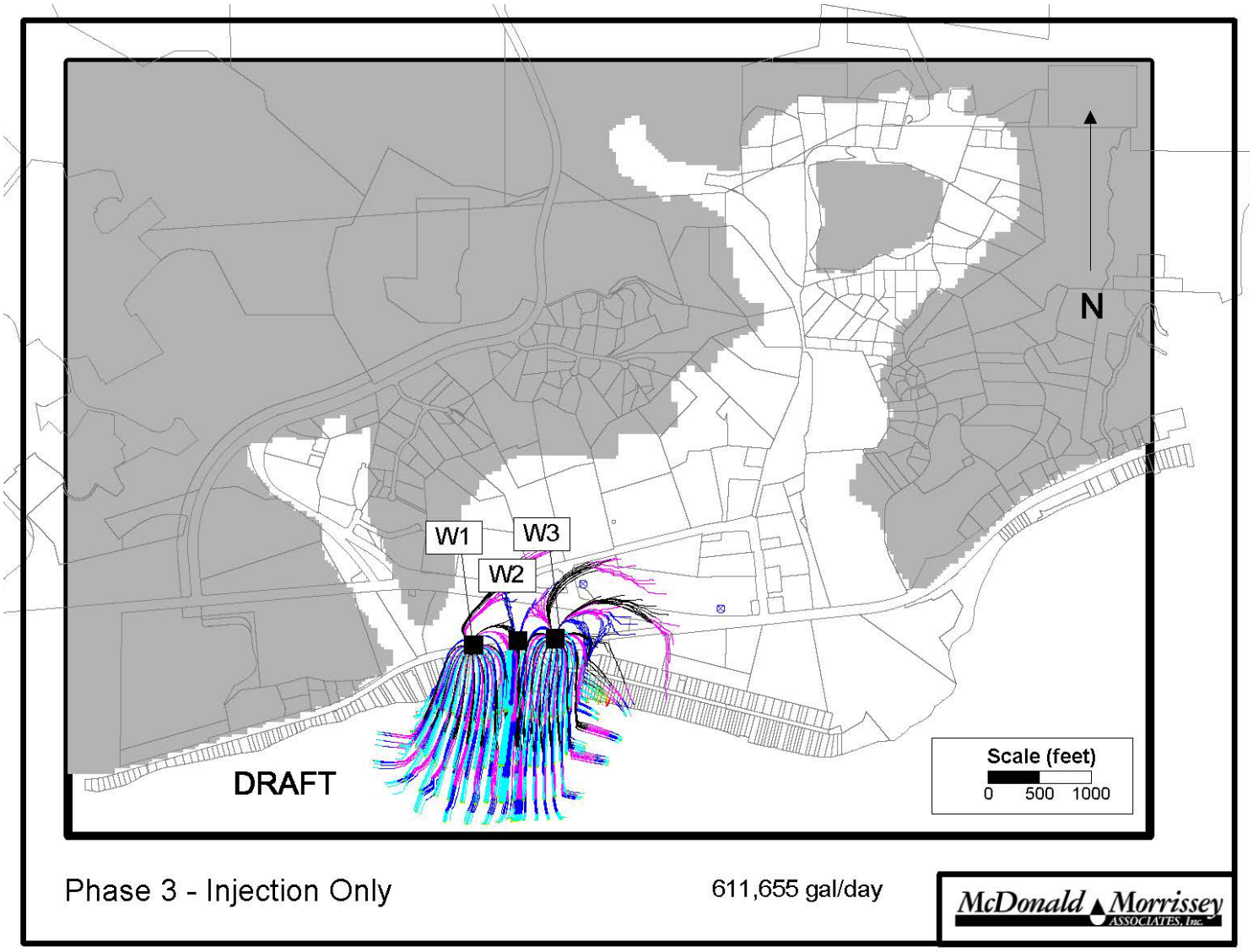
Phase 2 - Injection Only

497,642 gal/day

McDonald Morrissey ASSOCIATES, Inc.

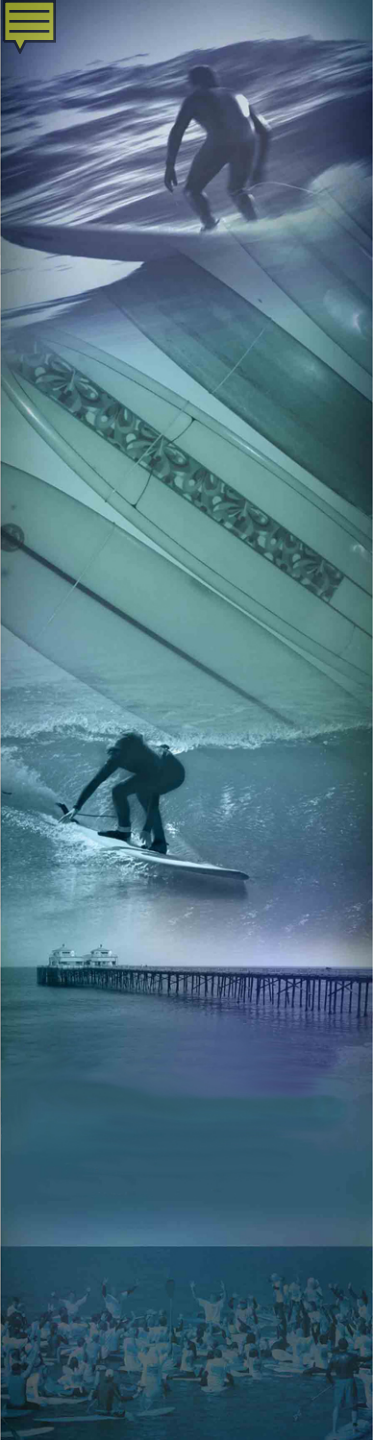
Phase 3 – Flow Location

(no flow to Lagoon or Creek)



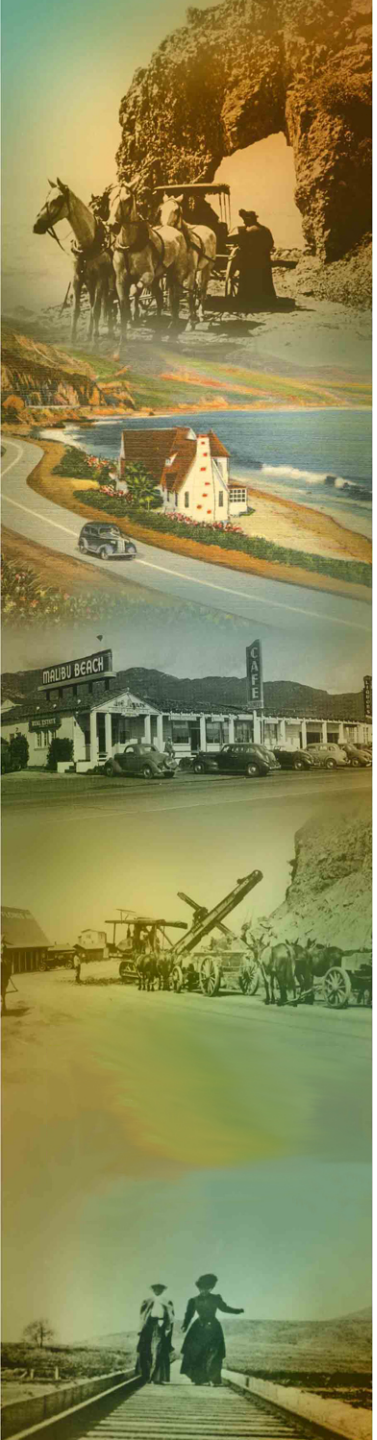
Winter Canyon Percolation Modeling Goals

- Evaluate the impacts of percolation in Winter Canyon while injecting in Civic Center
- Focus on potential mounding effects at base of Canyon (mounding analysis locations 1 and 2)
- Goal is to determine if Winter Canyon percolation can be conducted jointly with injection or as back-up



Winter Canyon Percolation Modeling Results

- Winter Canyon percolation is backup to Civic Center injection
- Can percolate 50,000 gpd in Phase 1
- Can percolate 100,000 gpd in Phases 2 and 3



Groundwater Model Conclusions

- Groundwater Basin has sufficient injection capacity for all project phases
- Injection capacity has large safety factor
- Groundwater levels are presently close to land surface elevations in several locations
- Project will lower groundwater levels

Next Steps in Groundwater Modeling

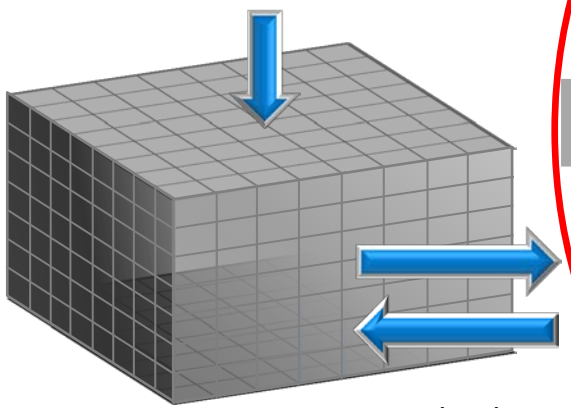
- Sensitivity Analysis
  - Lower hydraulic conductivity and storage coefficient for Civic Center Gravels
  - Higher hydraulic conductivity for Low Permeability Layer
- Sea Level Rise Evaluation

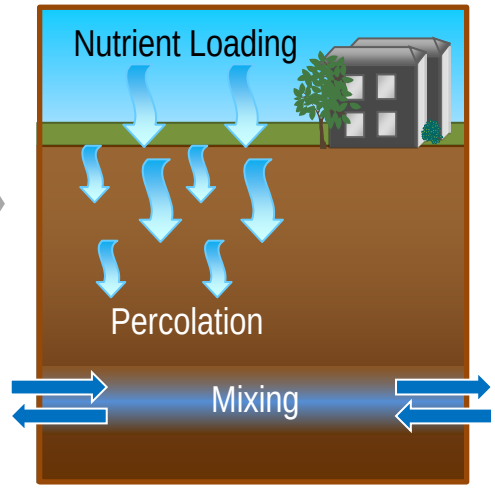
Model Strategy to Support Design and Analysis

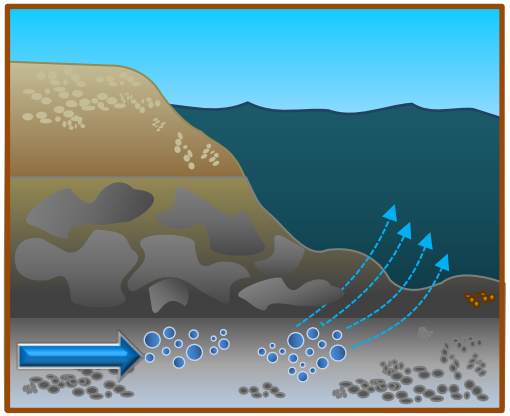
Groundwater Injection Analysis (MODFLOW)

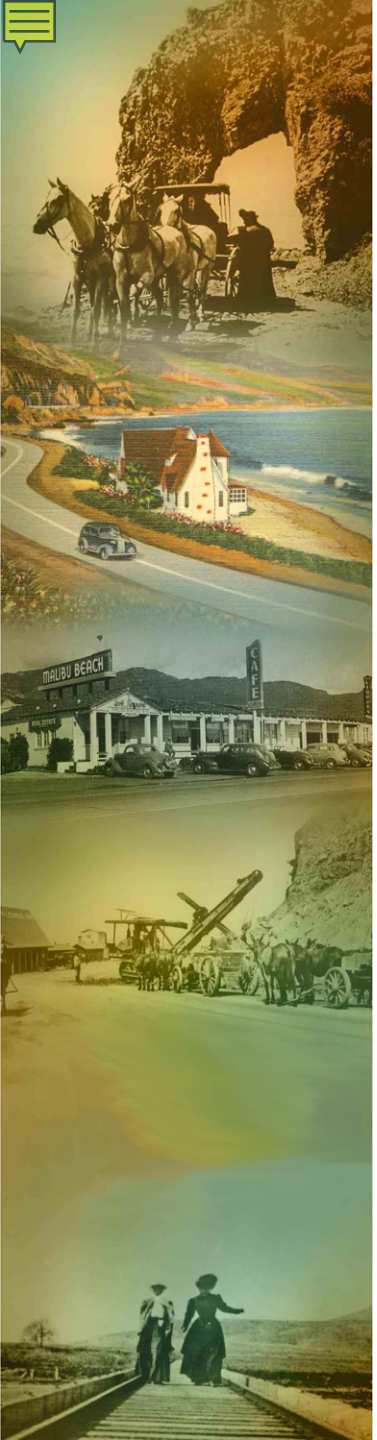
Salt-Nutrient Loading and Mixing Models

Analytical Ocean Diffusion Analysis









Salt-Nutrient Loading and Mixing Models

- Allows for estimate of assimilative capacity used by Project
- Results feed into ocean water quality analysis
- Utilizes water balance components from MODFLOW model
- Being conducted ‘as we speak’
- Results will simulate changes in groundwater quality

Loading Approach Uses Land Use and Applied Water

List of Land Uses

Loading Landuse

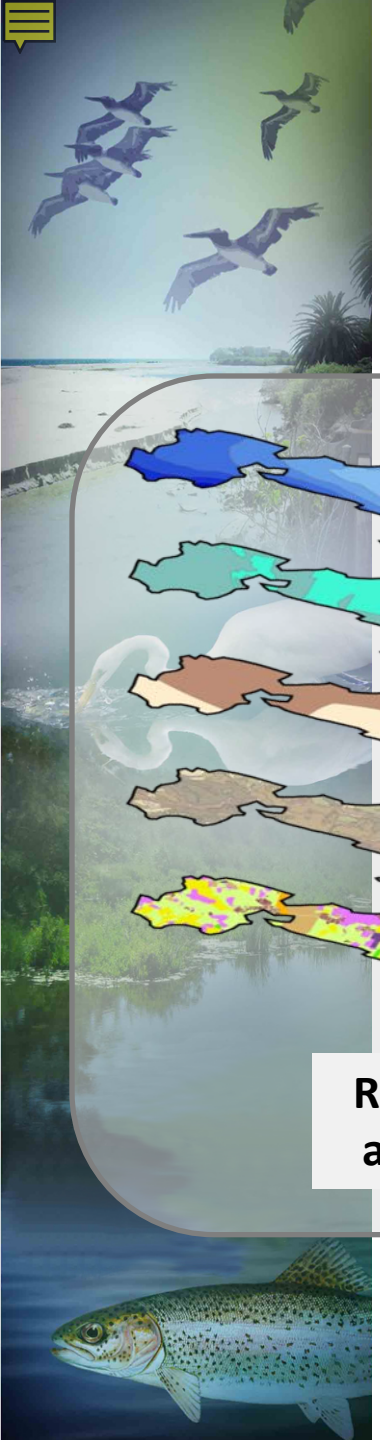
- Dairy
- Golf
- Irrigated Agriculture
- Irrigated Vine
- Non-Residential Urban
- Non-irrigated Agriculture
- Parks and Camps
- Residential
- Rural Residential
- Schools
- Vacant Commercial/Industrial
- Vacant Residential
- Water

Landuse Factors

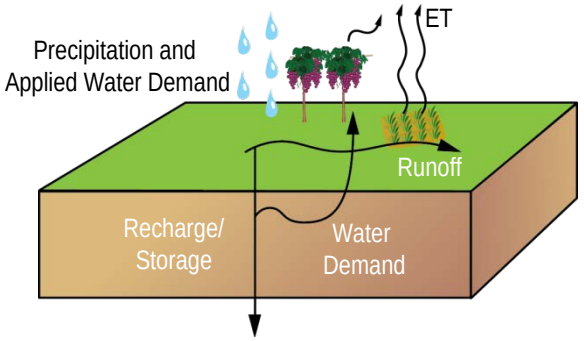
- Crop Coefficient
- Irrigation
- Fertilizer/Amendment (Salts)
- Livestock (Salts)
- Fertilizer/Amendment (Nutrients)
- Livestock (Nutrients)
- Uptake/Offtake (Nutrients)
- Other losses (Nutrients)
- Municipal Inputs (Salts)
- Municipal Inputs (Nutrients)

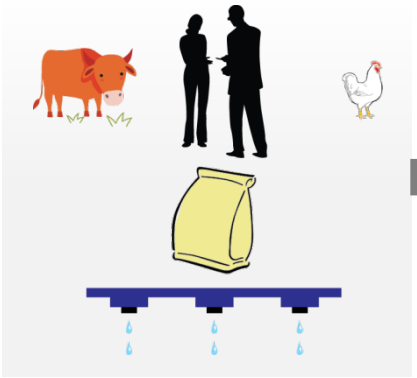
- Agricultural Commodities
- Apartments
- Mineral Processing
- Miscellaneous Commercial Spaces
- Miscellaneous Industrial
- Motels
- Non-irrigated Vineyards
- Nurseries
- Office Buildings
- Orchards
- Orphanages
- Outdoor Recreational Facilities (Private)
- Park (Private)
- Park/Other Recreational Facility (City)
- Three and Four Unit Complexes
- Tidelands
- Transitional Use
- Utilities
- Vacant Commercial Land
- Vacant Industrial Land
- Vacant Residential Land
- Volunteer Fire Departments
- Warehouses
- Wastelands
- Water Sources

Basin Characteristics are Analyzed to Yield Load Estimates

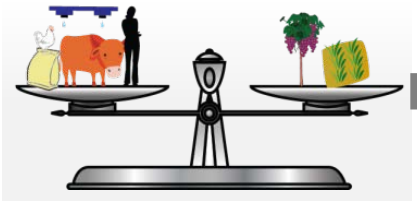


Related Factors and Attributes



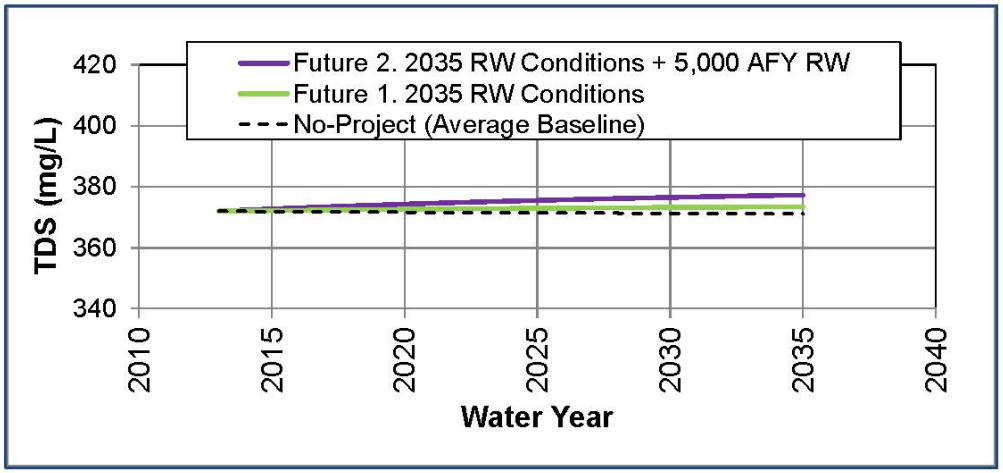


Salt Load

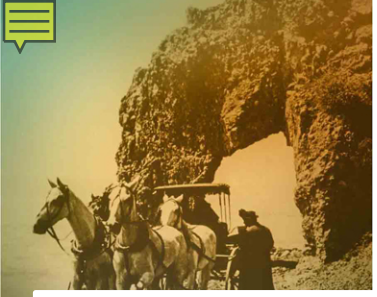


Nutrient Load

Mixing Modeling Results - Example



- Evaluate future scenario based on projected land and water use
- Compare projected future concentrations to Water Quality Objectives

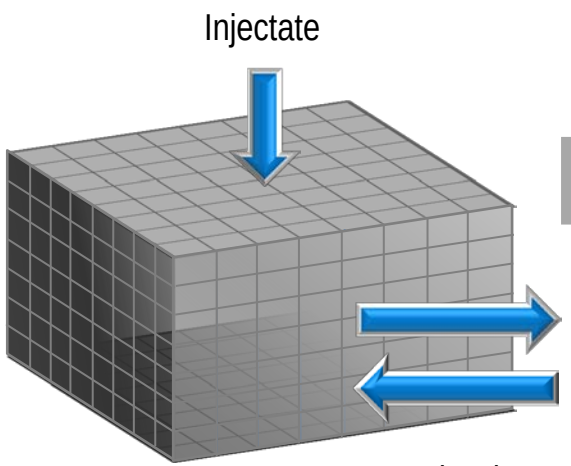


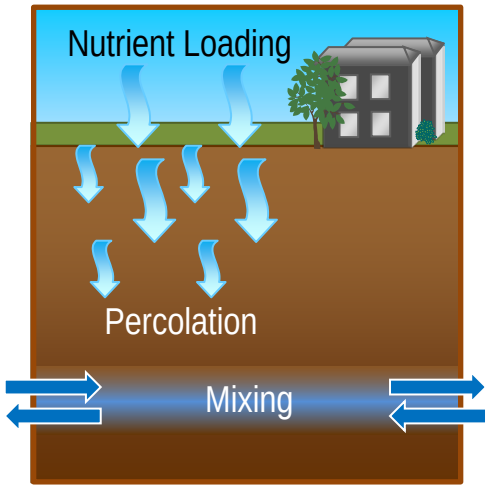
Model Strategy to Support Design and Analysis

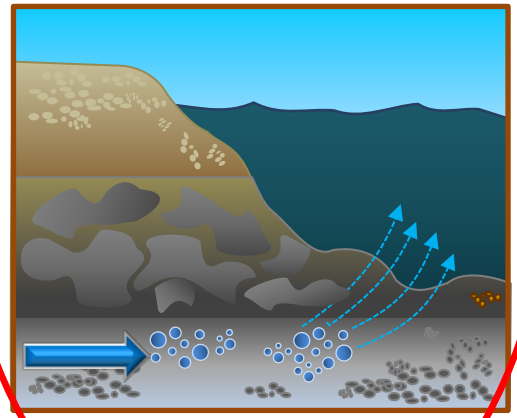
Groundwater Injection Analysis (MODFLOW)

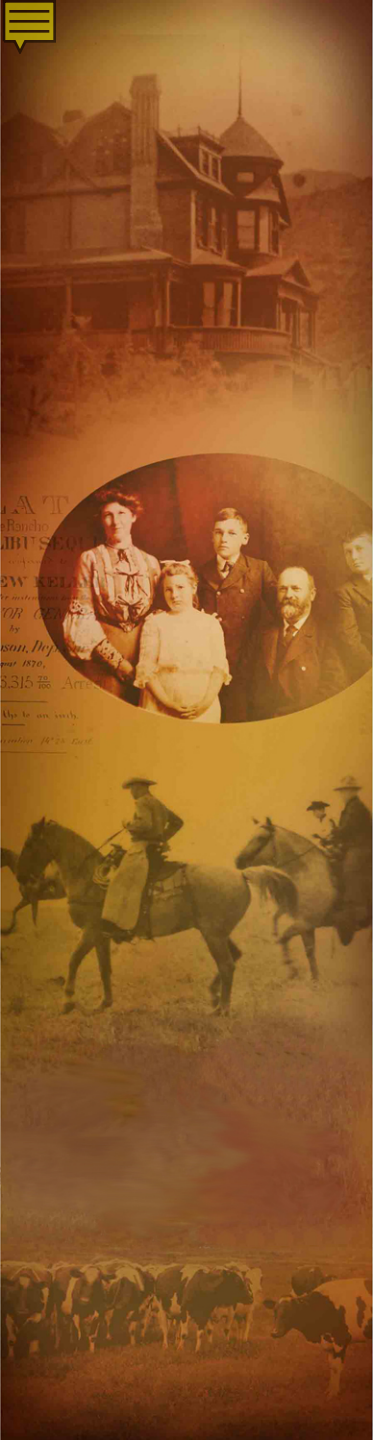
Salt-Nutrient Loading and Mixing Models

Analytical Ocean Diffusion Analysis







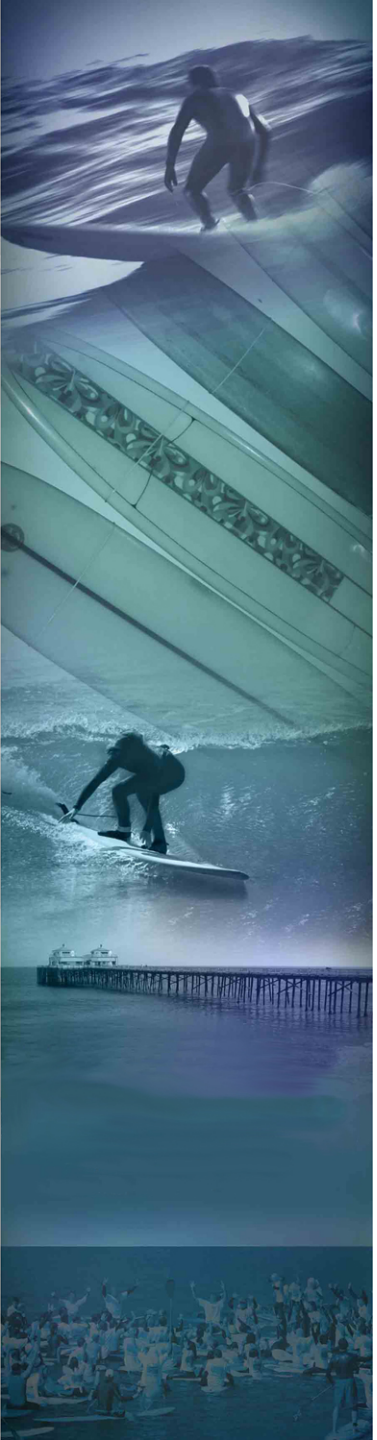


Ocean Water Quality Analysis

- Compare nitrate load from groundwater basin with Project to that from Hyperion
- Consider Ocean Plan water quality objectives

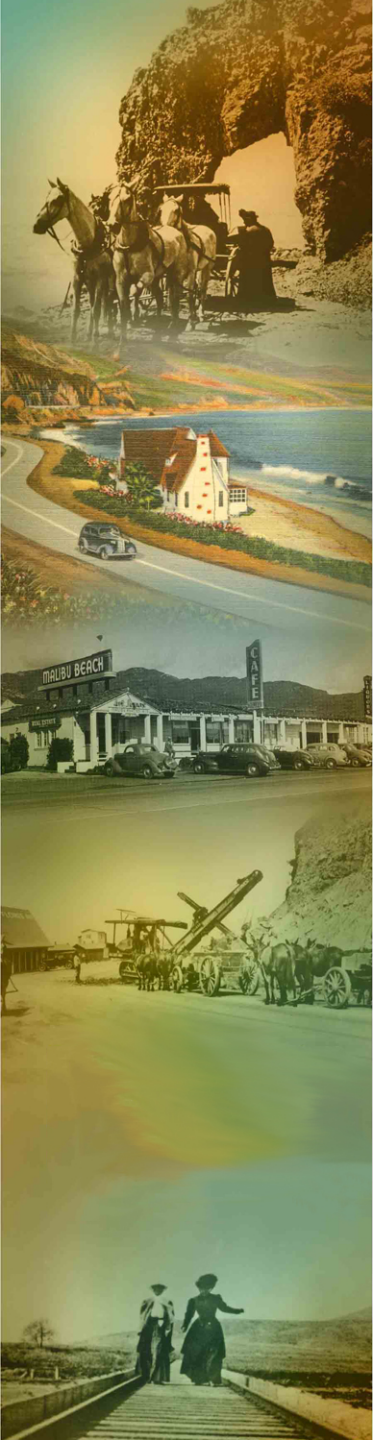
Meeting Agenda

I. Introductions
II. Project Implementation
III. Groundwater Injection Studies and Findings
    - Model Update
    - Salt and Nutrient Management Plan
    - Ocean Water Quality Analysis
IV. CEQA/EIR Analysis
V. Conclusions



EIR Status

- Biology/Habitat, Tree and Cultural Surveys completed
- Presently completing impacts analysis
- Work on design aspects of project – architecture and landscape architecture
- Anticipated release date for Draft EIR – April 14, 2014



Plant Site View Perspectives

View 1 – Plant Site as seen from Condos

View 2 – Plant Site as seen from Pacific Coast Highway (PCH)

View 3 – Plant Site as seen from PCH and Civic Center Way

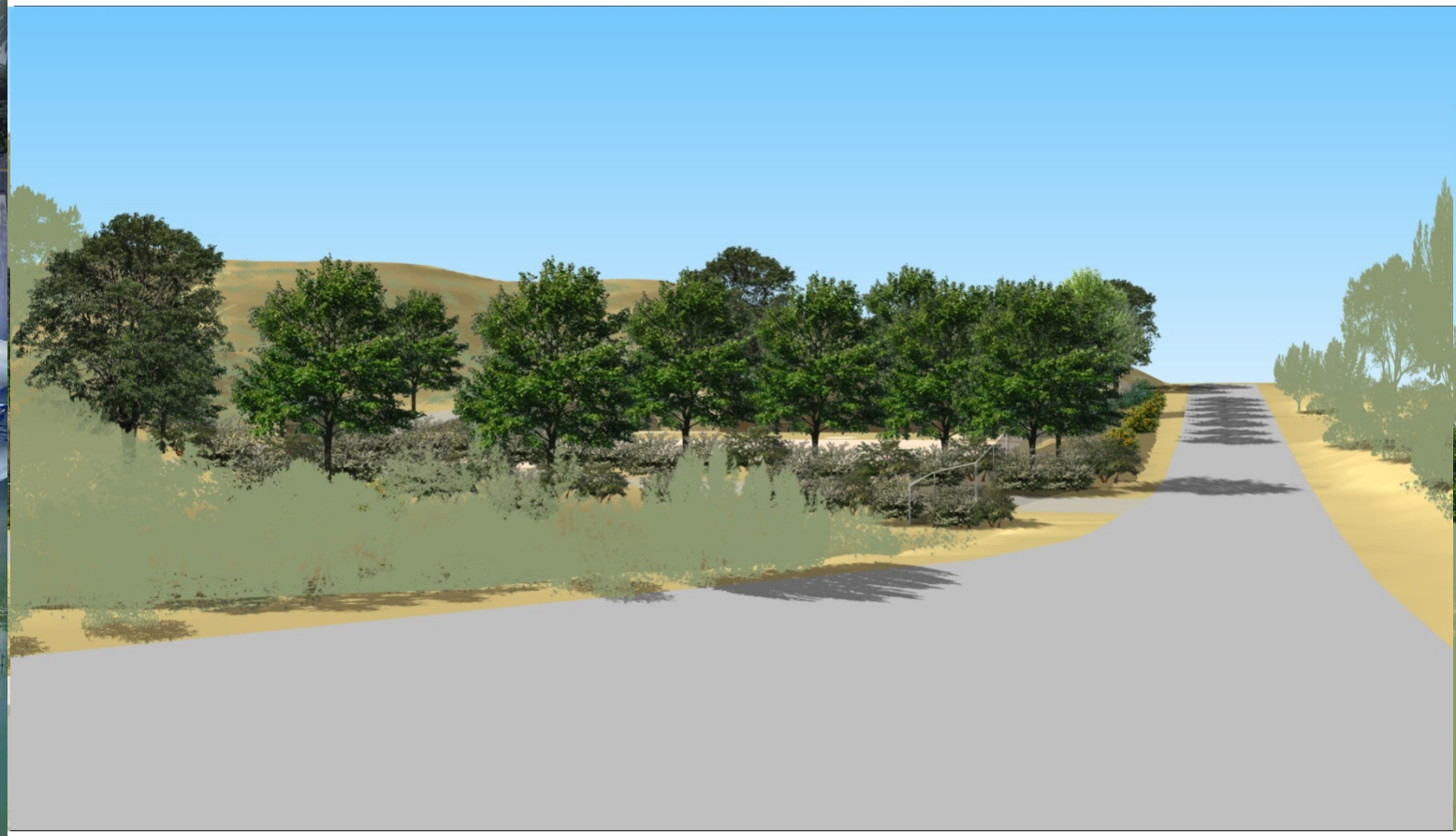
Plant Site – 5-years Post-Construction

View 2 – Plant Site as seen from Pacific Coast Highway (PCH)

View 1 – Plant Site as seen from Condos in section of PCH and Civic Center Way

Draft

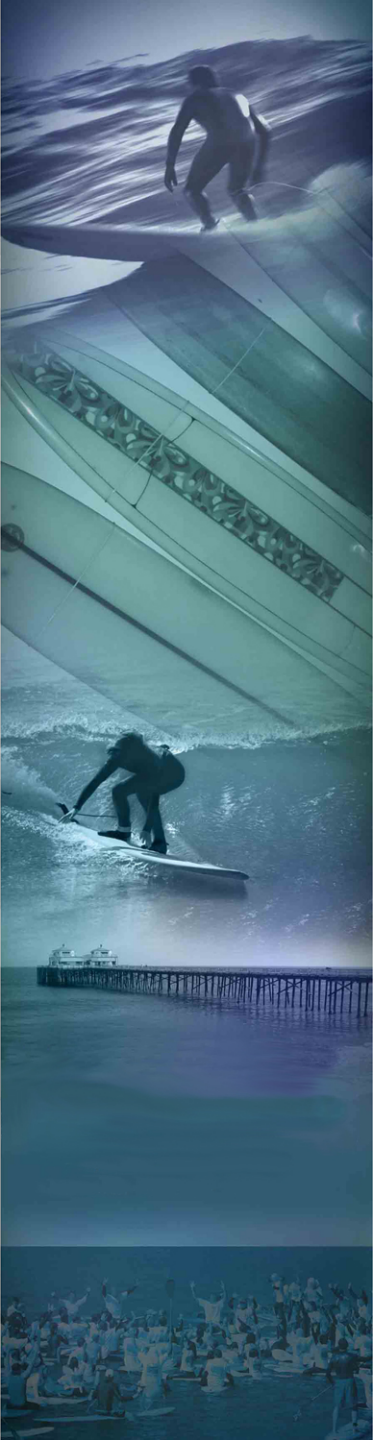
Plant Site – Landscape at Maturity



View 2 – Plant Site as seen from Pacific Coast Highway (PCH)

View 1 – Plant Site as seen from Condos on PCH and Civic Center Way

Draft



Meeting Agenda

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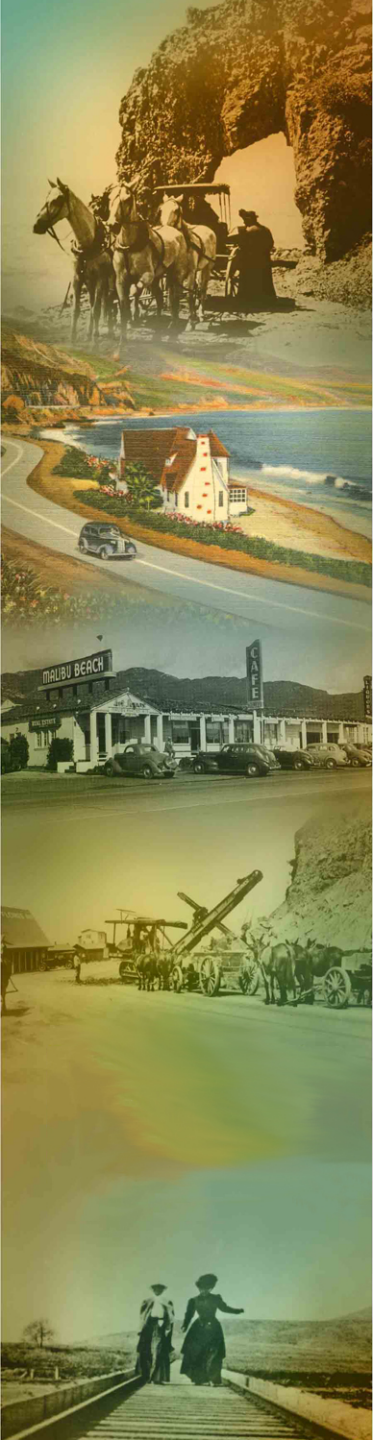
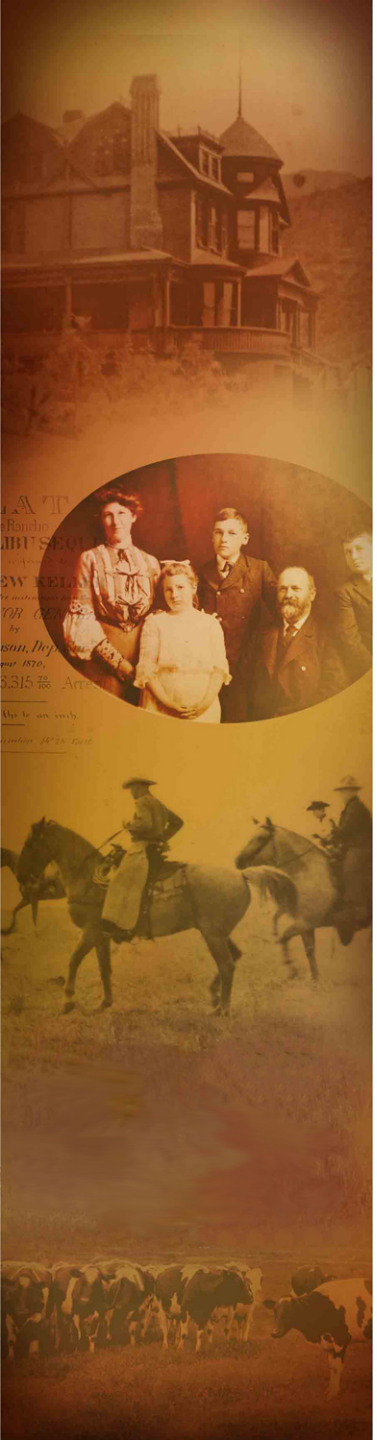


Checkpoints to Project Implementation

Checkpoint	Yes	No
1. Has recycled water reuse been maximized?	✓	
2. Is there sufficient groundwater injection capacity?	✓	
3. Will injected water flow to Malibu Creek and/or Lagoon?		✓
4. Will groundwater quality be impacted by the injection?	●	
5. Will there be ocean water quality impacts?	?	
6. Is the project permittable?	●	

● - in progress



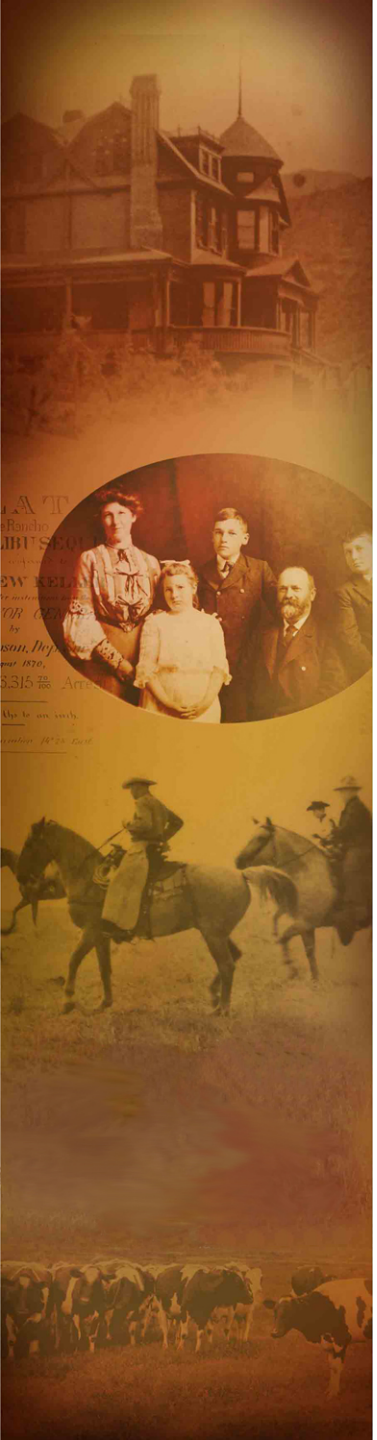
Questions?

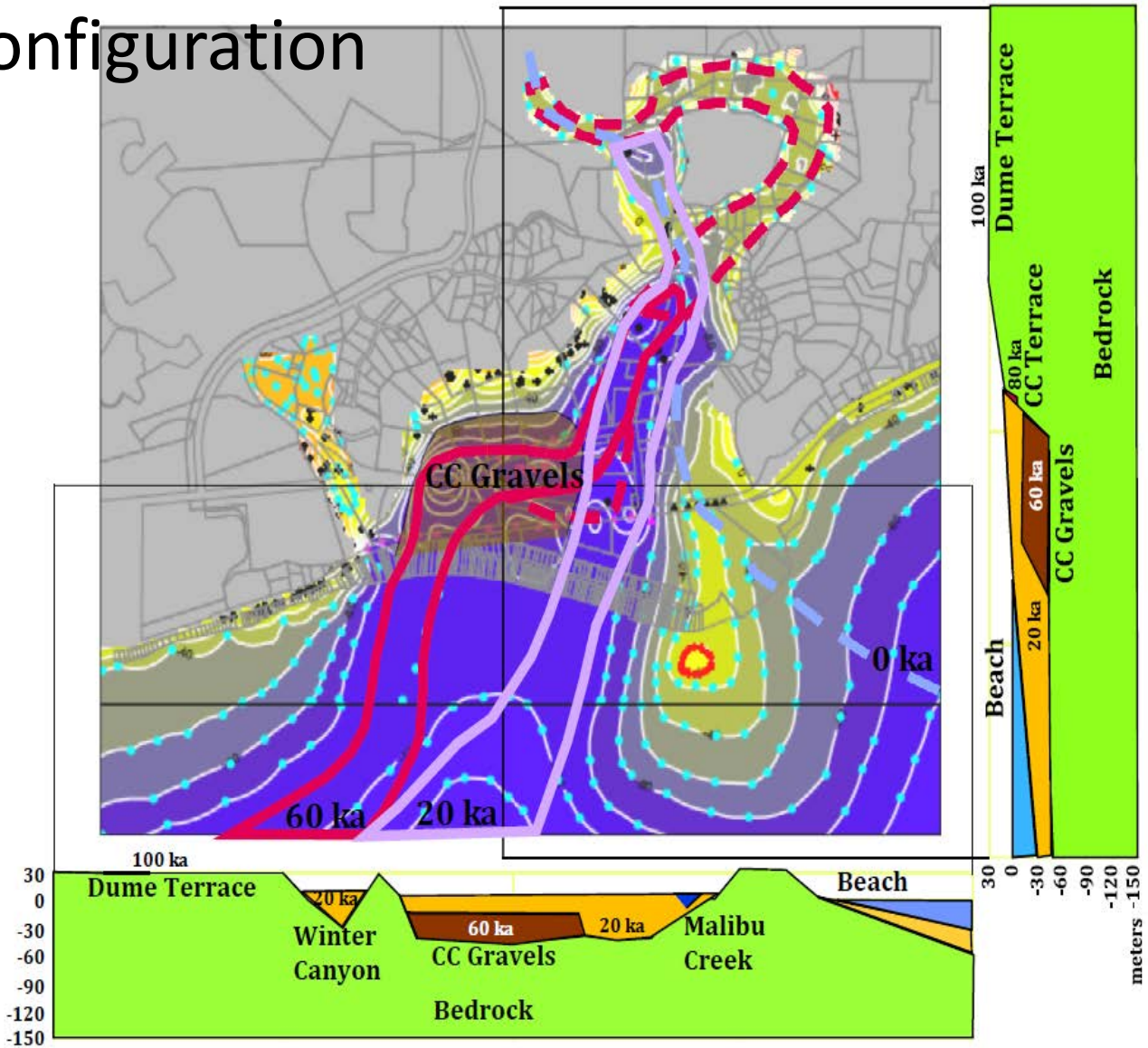
Stakeholder Meeting

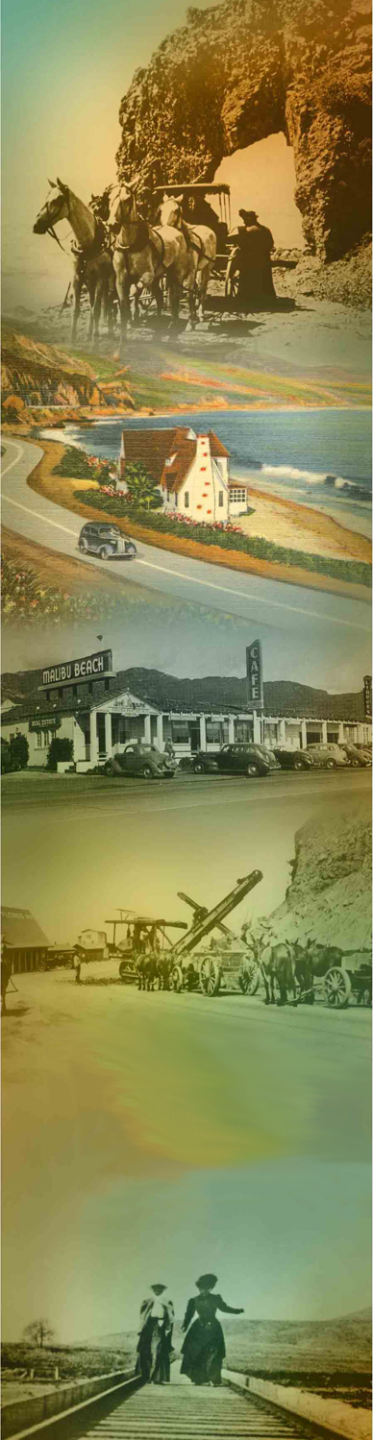
Civic Center Wastewater Treatment Facility

February 27, 2014

Malibu Fluvial history - old bedrock configuration



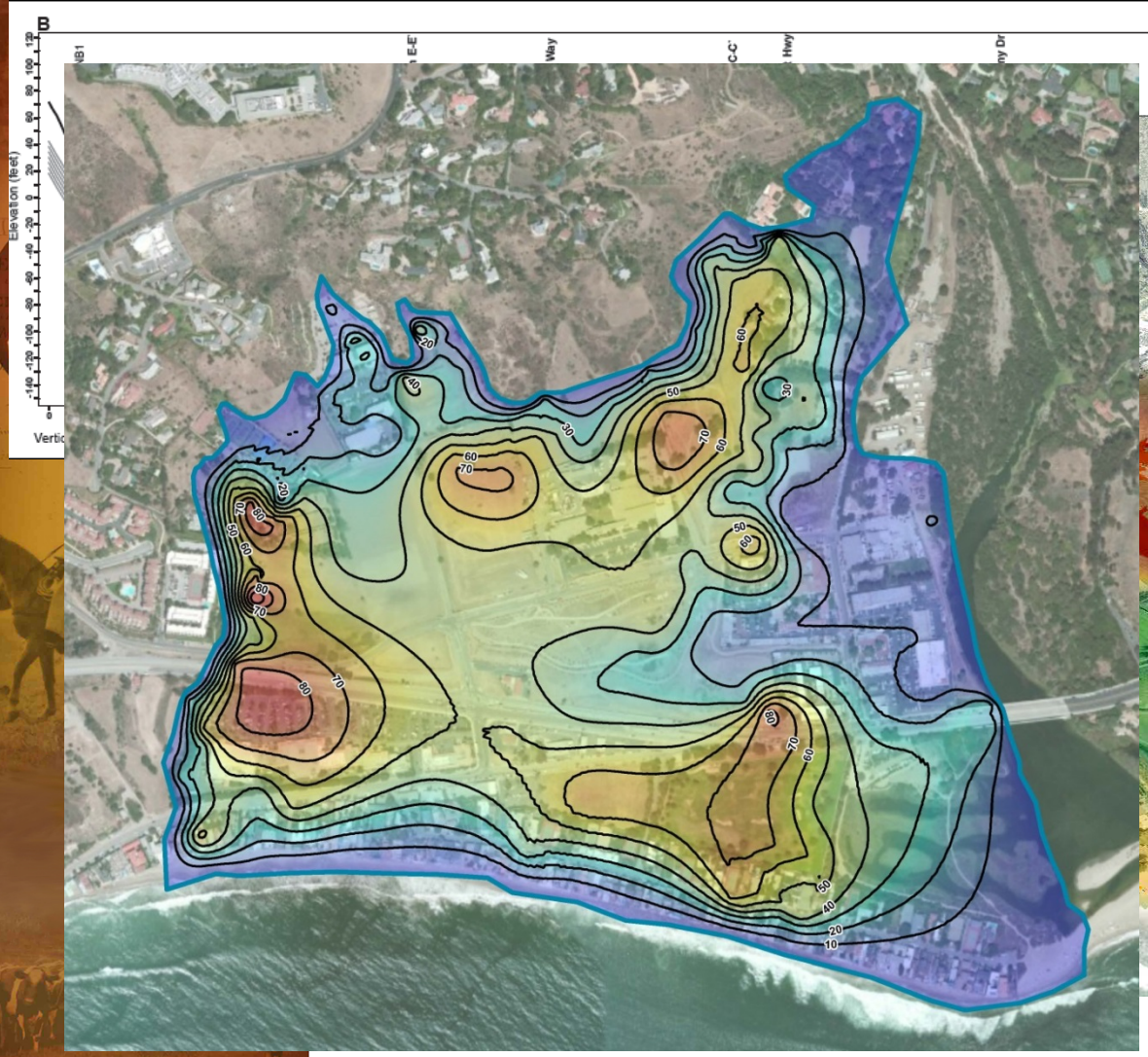


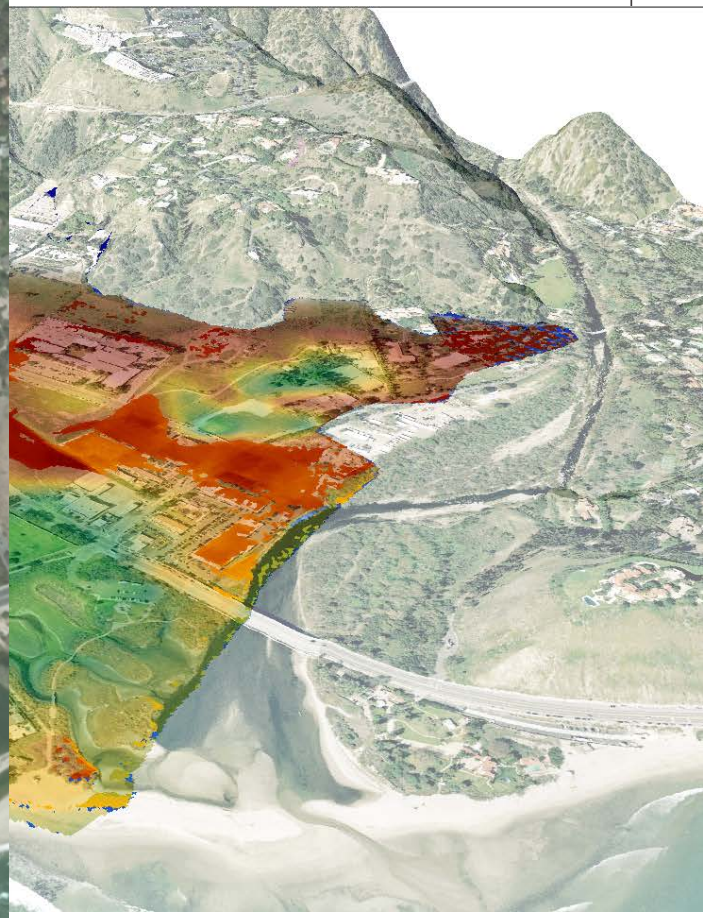


Data Analysis Activities

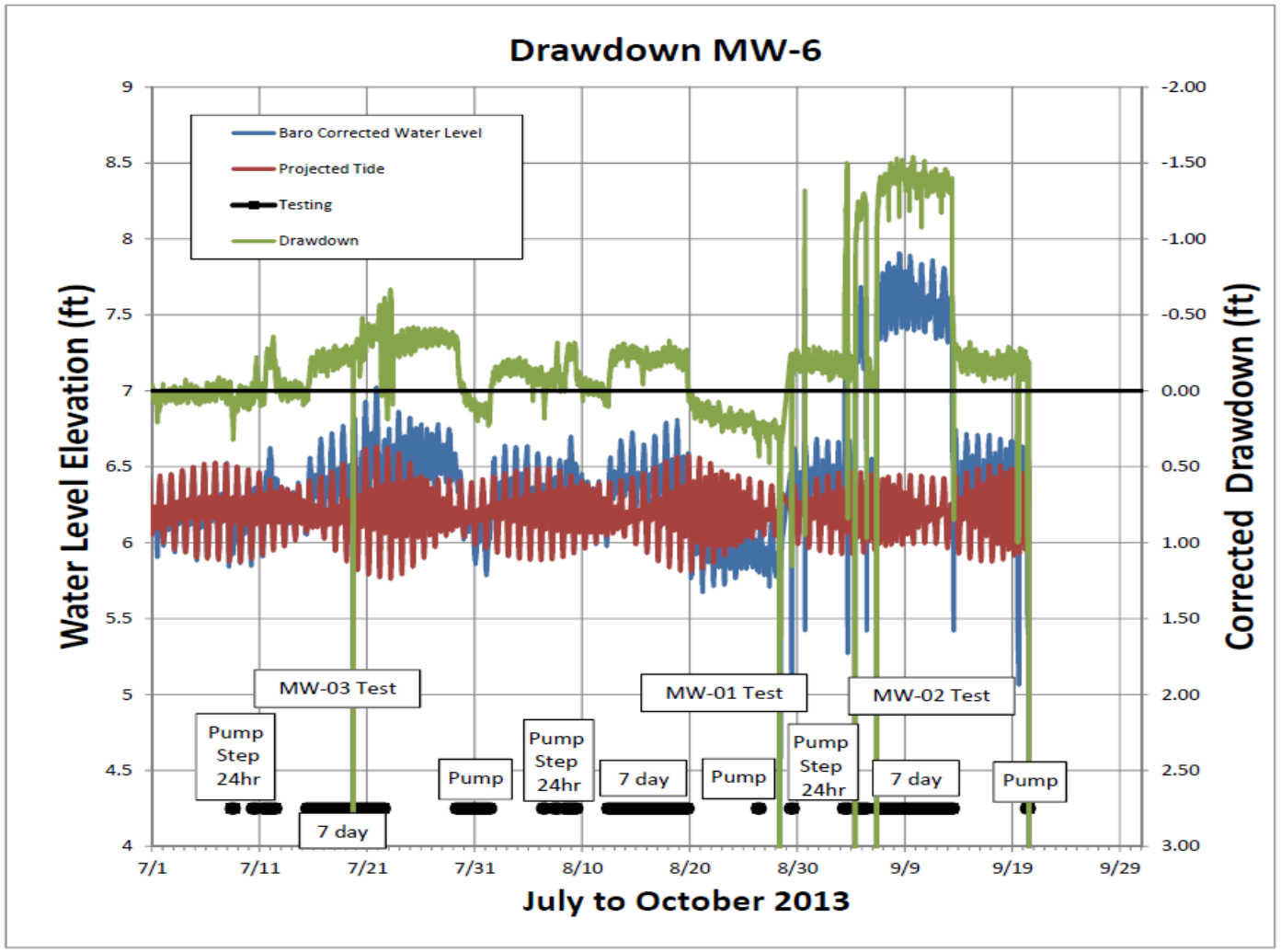
- Hydrostratigraphy analysis
- Groundwater level data compilation and analysis
- Hydraulic testing data evaluation
- Data collection and analysis for model input

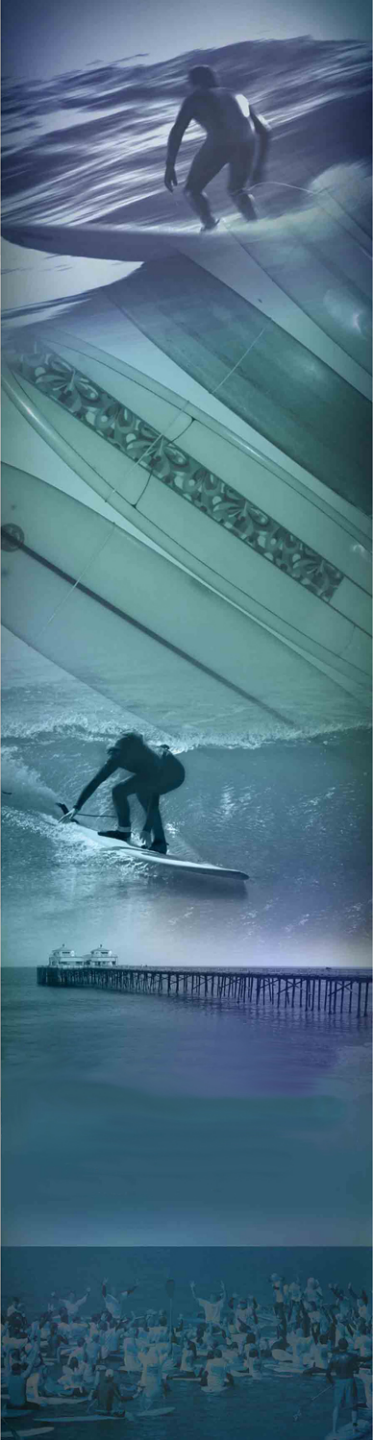
Hydrostratigraphy Update





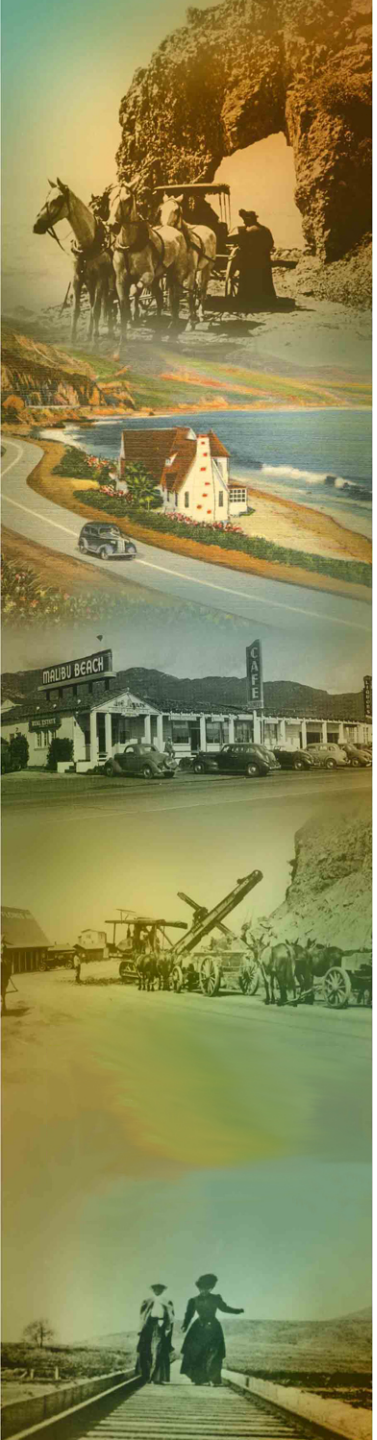
Groundwater Level Data Analysis





Model File Update

- Water Use
- Lagoon Stage and Creek Flows
- Groundwater Elevation
- Bedrock Depth and Stratigraphy
- Other (ET, precipitation, etc.)



Basin Water Use

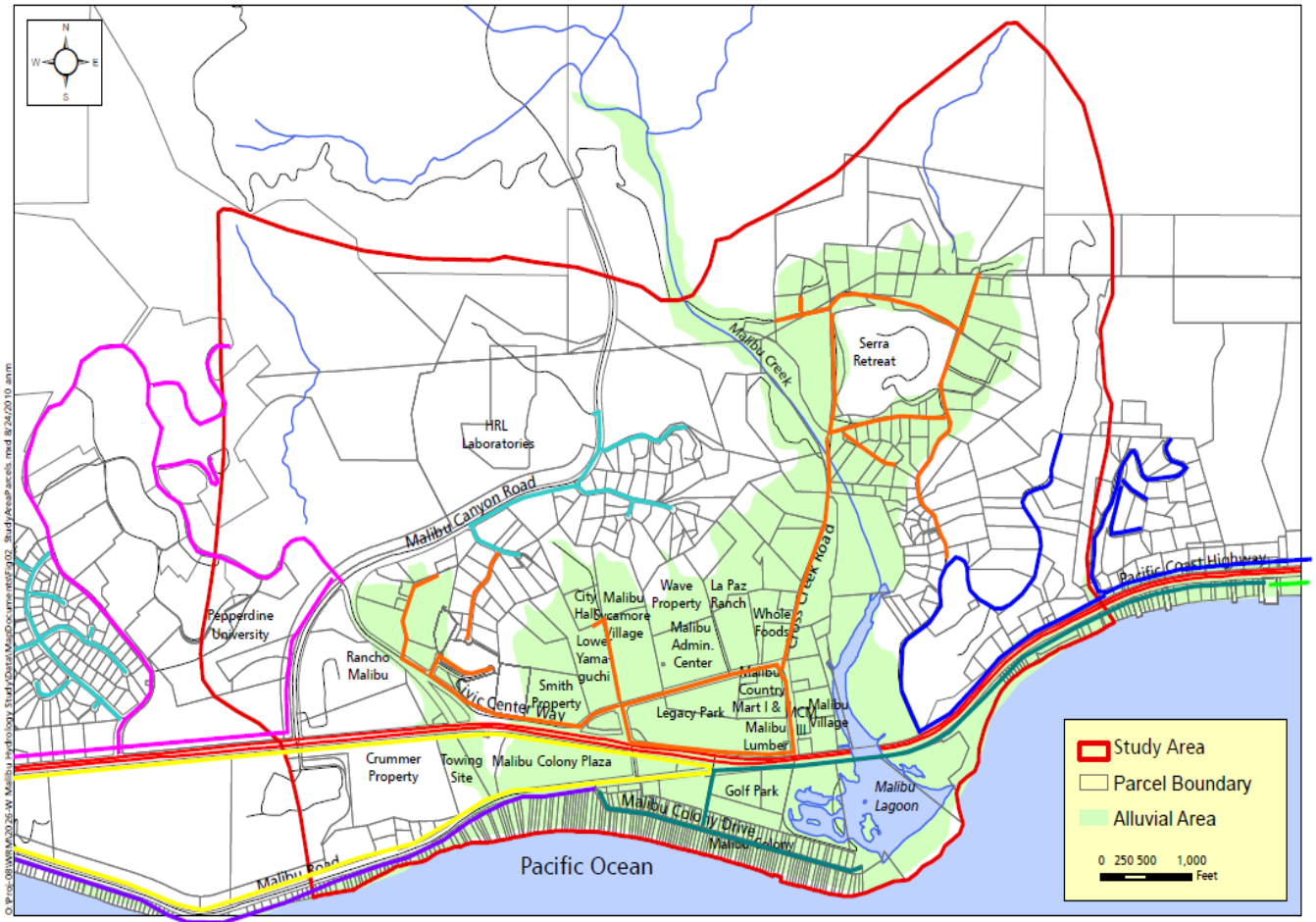


Figure 2: Study Area Parcels and Landmarks

Hydrology Study of Cumulative Impacts for the Civic Center Area
City of Malibu, California

Sources: Roads, StreetMap Pro; Streams and Lagoon, digitized by Stone from Ditigal Elevation Model, Infotech Enterprises America, 2007; Parcel Boundaries, Los Angeles County Assessor; Active Model Extent, McDonald Morrissey Assoc., Alluvial Area and Study Area, Stone.

302
306
308
310
311
333
334
336

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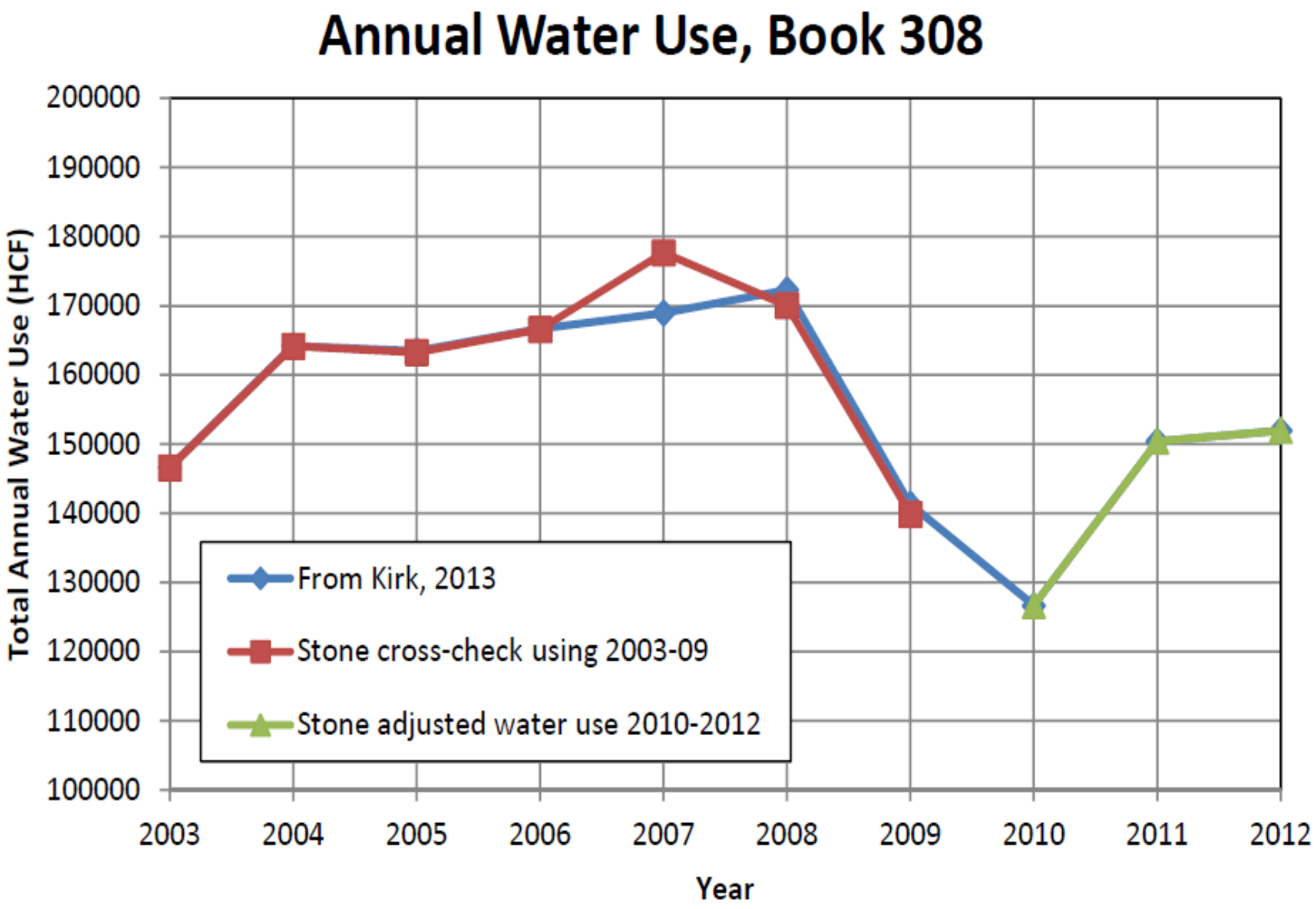
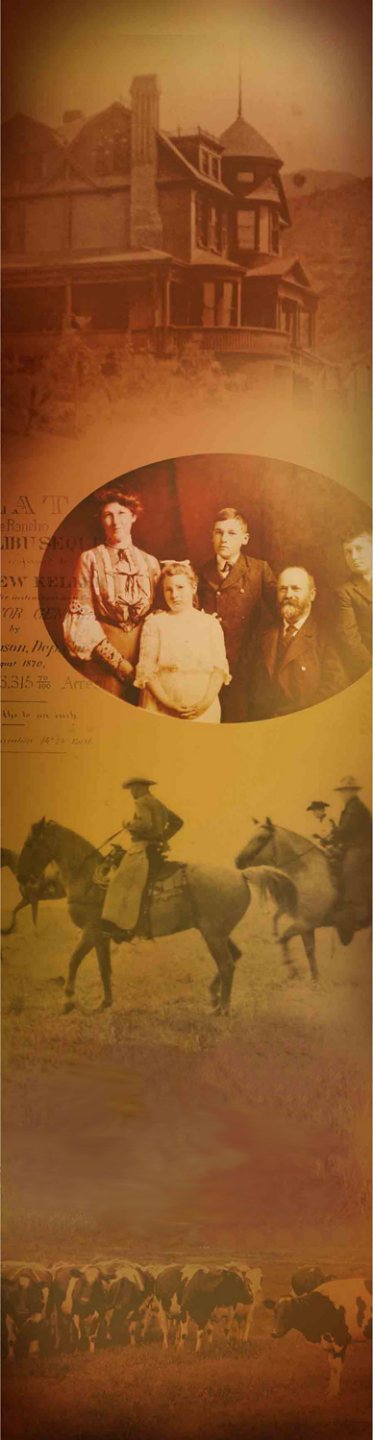

Annual Water Use, Book 308
Total Annual Water Use (HCF)
200000
190000
180000
170000
160000
150000
140000
130000
120000
110000
100000
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year
From Kirk, 2013
Stone cross-check using 2003-09
Stone adjusted water use 2010-2012



Lagoon Stage

January 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1			1	2	3	4	5
2	6	7	8	9	10	11	12
3	13	14	15	16	17	18	19
4	20	21	22	23	24	25	26
5	27	28	29	30	31		

February 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
5						1	2
6	3	4	5	6	7	8	9
7	10	11	12	13	14	15	16
8	17	18	19	20	21	22	23
9	24	25	26	27	28		

March 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
9						1	2
10	3	4	5	6	7	8	9
11	10	11	12	13	14	15	16
12	17	18	19	20	21	22	23
13	24	25	26	27	28	29	30
14	31						

April 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
14		1	2	3	4	5	6
15	7	8	9	10	11	12	13
16	14	15	16	17	18	19	20
17	21	22	23	24	25	26	27
18	28	29	30				

May 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
18				1	2	3	4
19	5	6	7	8	9	10	11
20	12	13	14	15	16	17	18
21	19	20	21	22	23	24	25
22	26	27	28	29	30	31	

June 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
22							1
23	2	3	4	5	6	7	8
24	9	10	11	12	13	14	15
25	16	17	18	19	20	21	22
26	23	24	25	26	27	28	29
27	30						

July 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
27		1	2	3	4	5	6
28	7	8	9	10	11	12	13
29	14	15	16	17	18	19	20
30	21	22	23	24	25	26	27
31	28	29	30	31			

August 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
31					1	2	3
32	4	5	6	7	8	9	10
33	11	12	13	14	15	16	17
34	18	19	20	21	22	23	24
35	25	26	27	28	29	30	31

September 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
36	1	2	3	4	5	6	7
37	8	9	10	11	12	13	14
38	15	16	17	18	19	20	21
39	22	23	24	25	26	27	28
40	29	30					

October 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
40			1	2	3	4	5
41	6	7	8	9	10	11	12
42	13	14	15	16	17	18	19
43	20	21	22	23	24	25	26
44	27	28	29	30	31		

November 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
44						1	2
45	3	4	5	6	7	8	9
46	10	11	12	13	14	15	16
47	17	18	19	20	21	22	23
48	24	25	26	27	28	29	30

December 2013

Wk	Sun	Mon	Tue	Wed	Thu	Fri	Sat
49	1	2	3	4	5	6	7
50	8	9	10	11	12	13	14
51	15	16	17	18	19	20	21
52	22	23	24	25	26	27	28
1	29	30	31				

1 Jan	New Year's Day	17 Mar	St. Patrick's Day	18 May	Armed Forces Day	2 Sep	Labor Day	31 Oct	Halloween
21 Jan	Martin Luther King Day	29 Mar	Good Friday	19 May	Pentecost	11 Sep	September 11th	3 Nov	Daylight Saving (End)
12 Feb	Lincoln's Birthday	31 Mar	Easter	20 May	Pentecost Monday	17 Sep	Citizenship Day	11 Nov	Veterans' Day
12 Feb	Mardi Gras Carnival	1 Apr	April Fool's Day	27 May	Memorial Day	27 Sep	Native American Day	28 Nov	Thanksgiving
14 Feb	Valentine's Day	1 Apr	Easter Monday	14 Jun	Flag Day	14 Oct	Columbus Day	7 Dec	Pearl Harbor
18 Feb	Presidents Day	5 May	Cinco de Mayo	16 Jun	Father's Day	16 Oct	Boss's Day	25 Dec	Christmas Day
10 Mar	Daylight Saving (Start)	12 May	Mother's Day	4 Jul	Independence Day	19 Oct	Sweetest Day	31 Dec	New Year's Eve

Calendar & Holidays

2013

Calendar-365.com

Creek Open + Closed = Ø Creek Open = O Creek Closed = /

Malibu Groundwater Injection Feasibility, Phase 3
City of Malibu, California
Summary of Malibu Lagoon Barrier Beach Conditions by Year

Year	Barrier Beach Breached, Creek Open	Barrier Beach Intact, Creek Closed
2003	January 1-July 9; November 4-December 31	July 10-November 3
2004	January 1-May 1; June 3-June 21; October 19-December 31	May 2-June 2; June 22-October 18
2005	January 1-August 15; September 13-December 31	August 16-September 12
2006	January 1-June 10; August 23-October 28; November 30-December 31	June 11-August 22; October 29-November 29
2007	January 1-April 28; October 20-November 2; December 2-December 31	April 29-October 19; November 3-December 1
2008	January 1-May 17; May 29-June 29; November 26-December 31	May 18-May 28; June 30-November 25
2009	January 1-April 18; May 2-June 18; October 15-November 1; December 2-December 31	April 19-May 1; June 19-October 14; November 2-December 1
2010	January 1-April 27; May 5-May 11; May 22-June 8; October 8-October 26; November 3-December 31	April 28-May 4; May 12-May 21; June 9-October 7; October 27-November 2
2011	January 1-June 26; October 7-December 31	June 27-October 6
2012	January 1-May 14; June 10-June 22, December 2-December 31	May 15-June 9; June 23-December 1
2013 (to 9/30)	January 1-February 28, March 8-March 20; March 27-April 8; May 17-June 17	March 21-March 26; April 9-May 16; June 18-September 30

Source: LA County lifeguard daily records, 2003-September 2013.

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Path: O:\Proj-12\WRM\2012-007 Malibu Deep Inj Support\Data\Lagoon Breach-Flood Dates\Lagoon Open-Closed Dates.xls

Date: 10/2/2013 anm

Groundwater Elevation

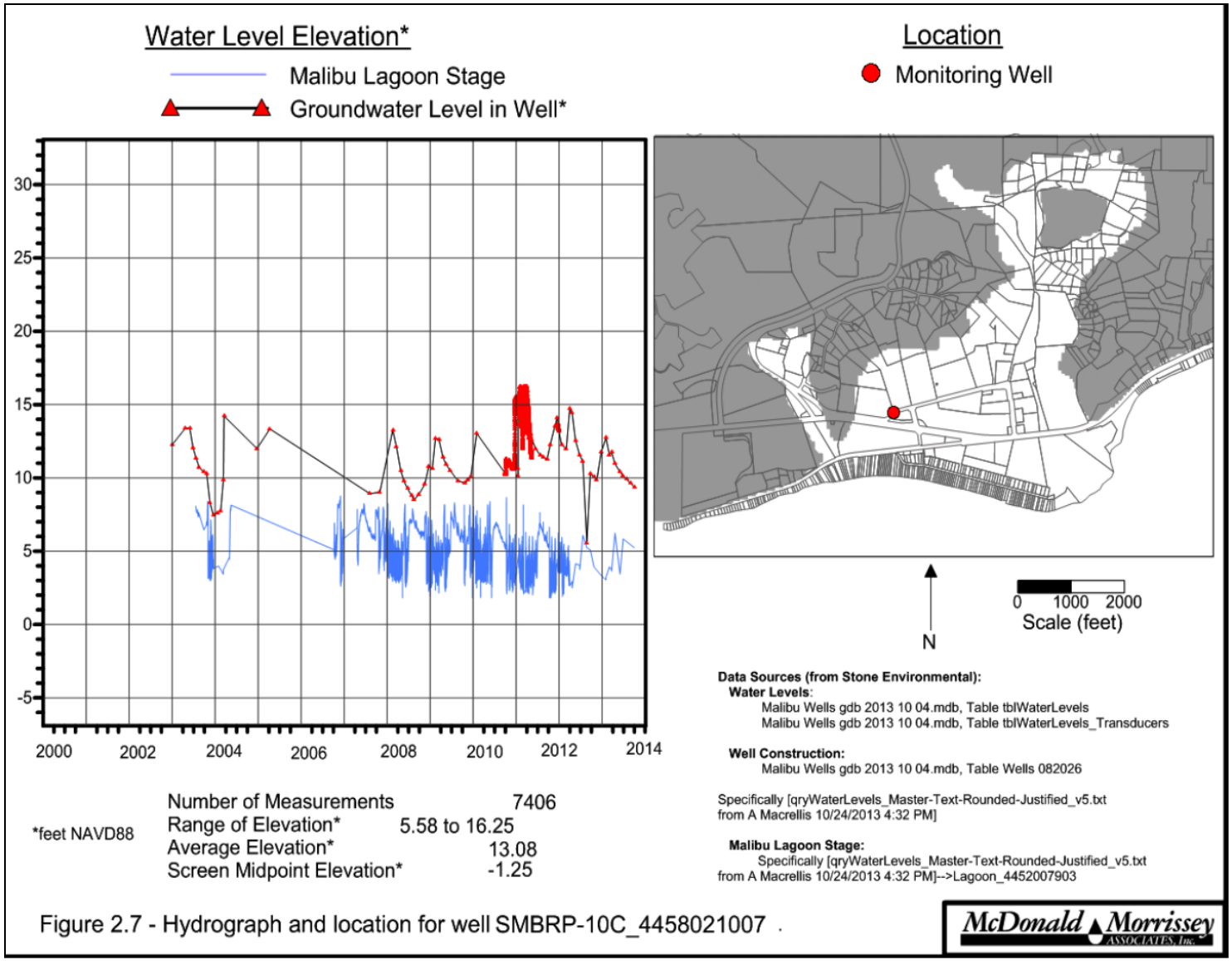


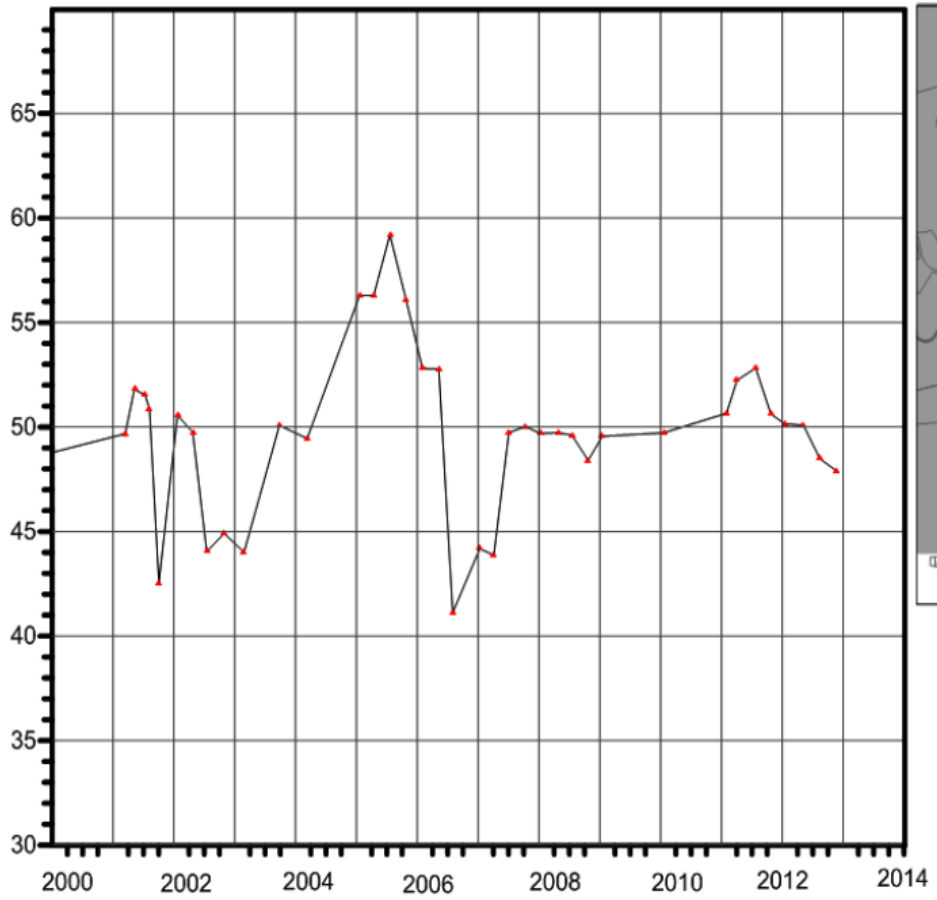
Figure 2.7 - Hydrograph and location for well SMBRP-10C_4458021007 .

McDonald Morrissey ASSOCIATES, Inc.

Water Level Elevation*

Malibu Lagoon Stage

Groundwater Level in Well*



Number of Measurements	44
Range of Elevation*	41.12 to 59.2
Average Elevation*	49.97
Screen Midpoint Elevation*	40.17

*feet NAVD88

Location

Monitoring Well

N

0 1000 2000

Scale (feet)

Data Sources (from Stone Environmental):

Water Levels:

Malibu Wells gdb 2013 10 04.mdb, Table tblWaterLevels

Malibu Wells gdb 2013 10 04.mdb, Table tblWaterLevels_Transducers

Well Construction:

Malibu Wells gdb 2013 10 04.mdb, Table Wells 082026

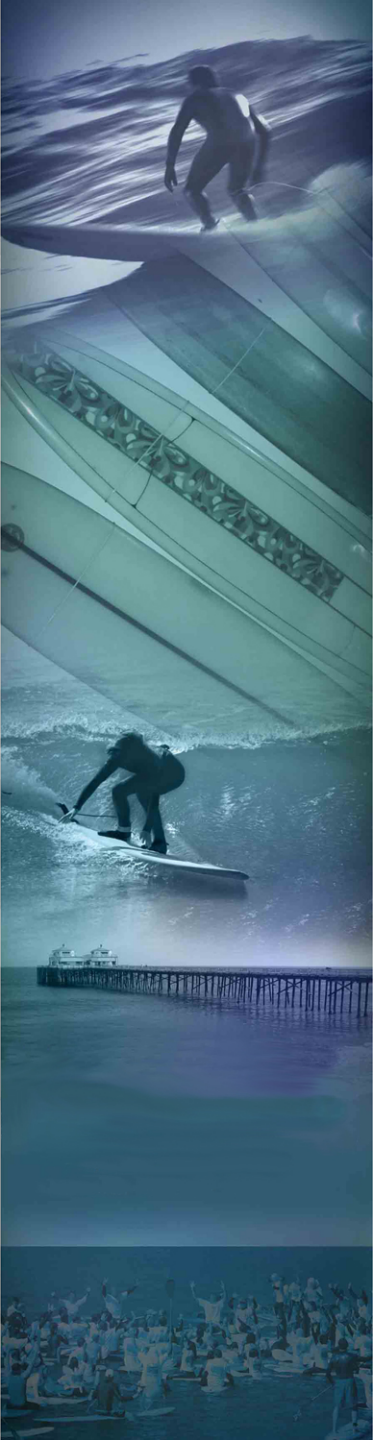
Specifically [qryWaterLevels_Master-Text-Rounded-Justified_v5.txt from A Macrellis 10/24/2013 4:32 PM]

Malibu Lagoon Stage:

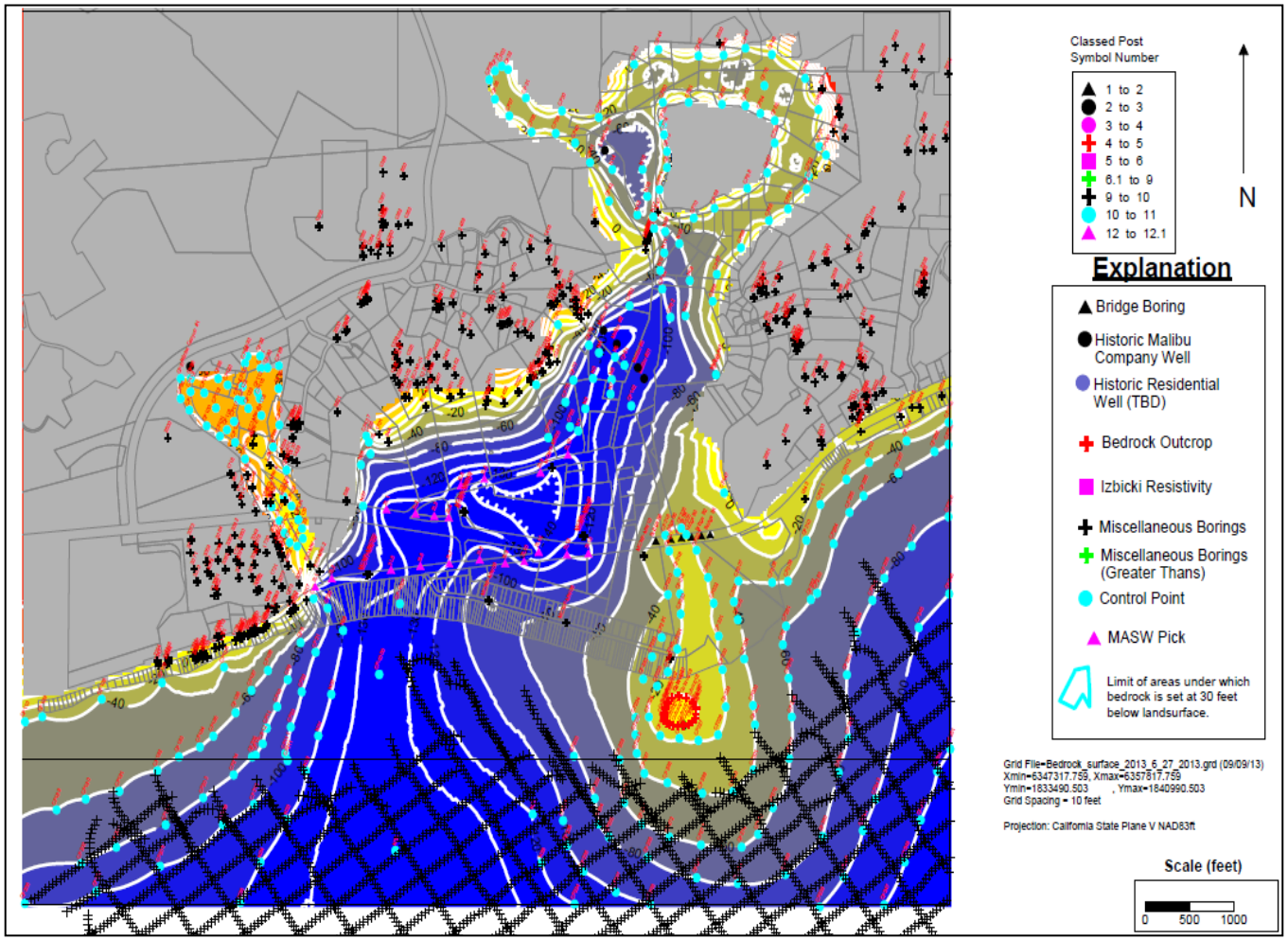
Specifically [qryWaterLevels_Master-Text-Rounded-Justified_v5.txt from A Macrellis 10/24/2013 4:32 PM]-->Lagoon_4452007903

Figure 2.7 - Hydrograph and location for well LAMW-3_4458021013

McDonald Morrissey ASSOCIATES, Inc.



Bedrock and Hydrostratigraphic Mapping



Numerical Codes

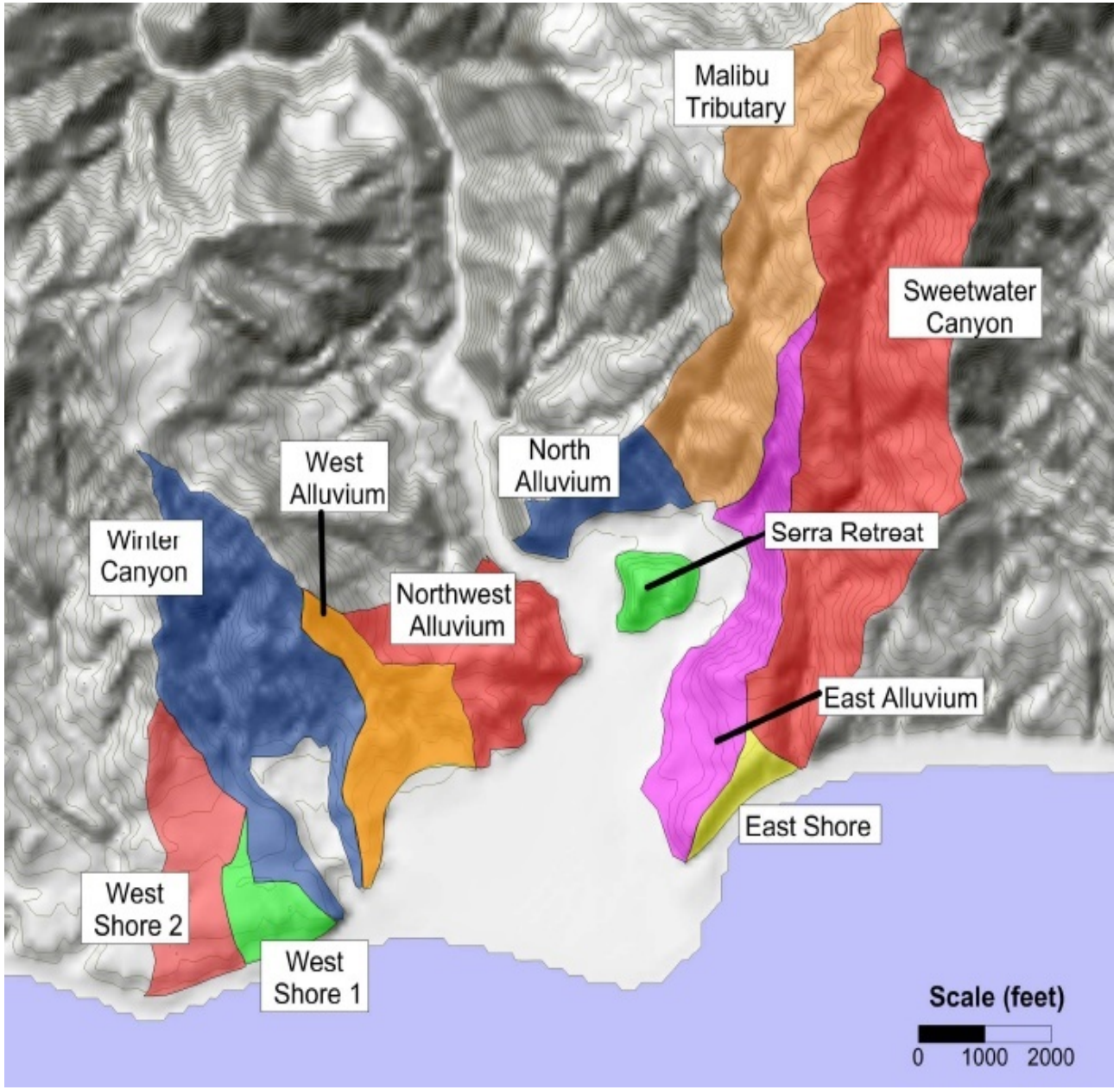
-MODFLOW-2005 USGS code for simulation of 3-D groundwater flow

-MODPATH6 USGS code for particle tracking

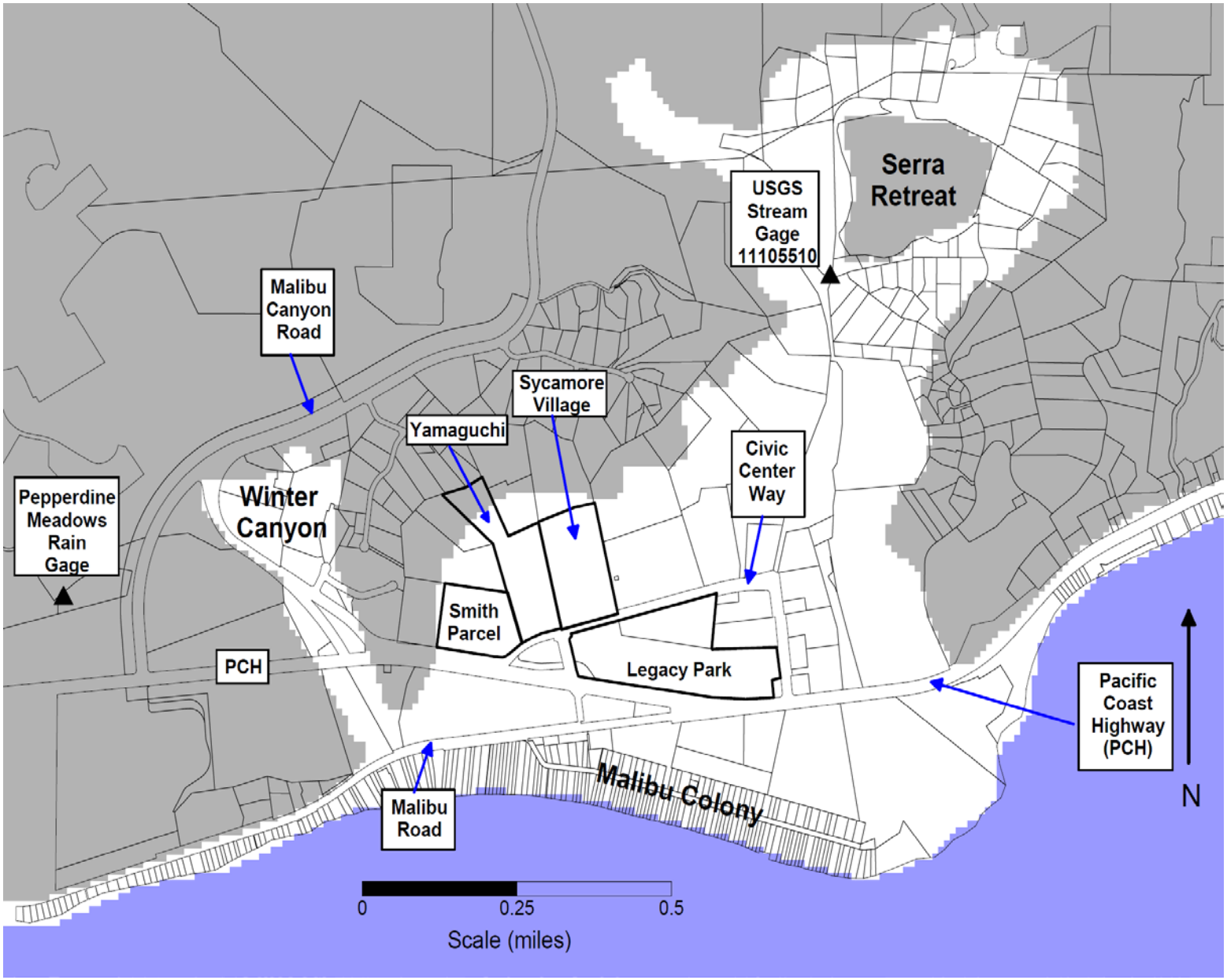
-SEAWAT USGS code for simulation of salt/fresh water interface

-GMW-2005 USGS code for groundwater management using optimization

-PEST Numerical code for parameter estimation and sensitivity analysis



Upland Runoff Recharge -- Map showing extent of contributing upland areas



Selected locations within the study area

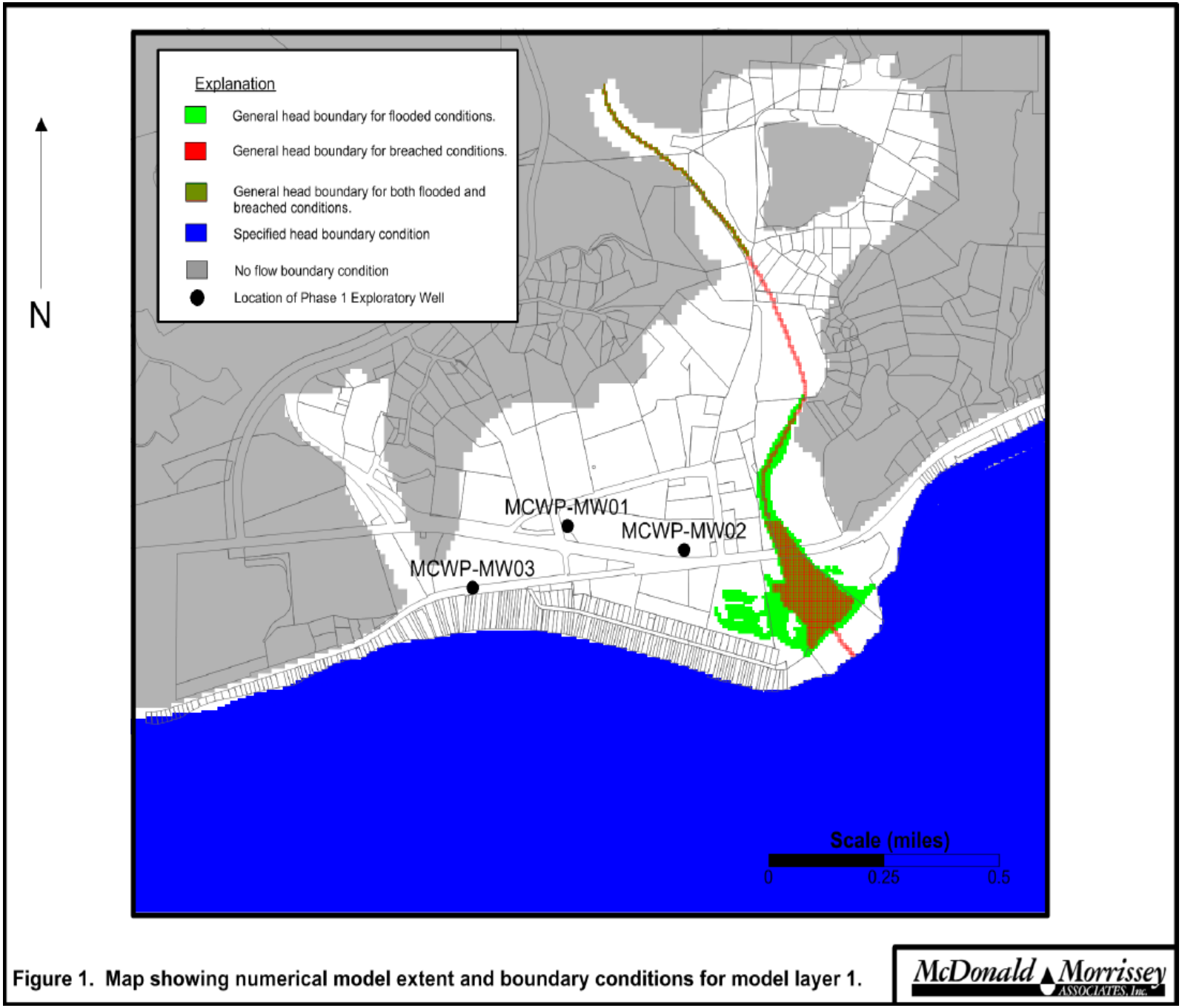


Figure 1. Map showing numerical model extent and boundary conditions for model layer 1.

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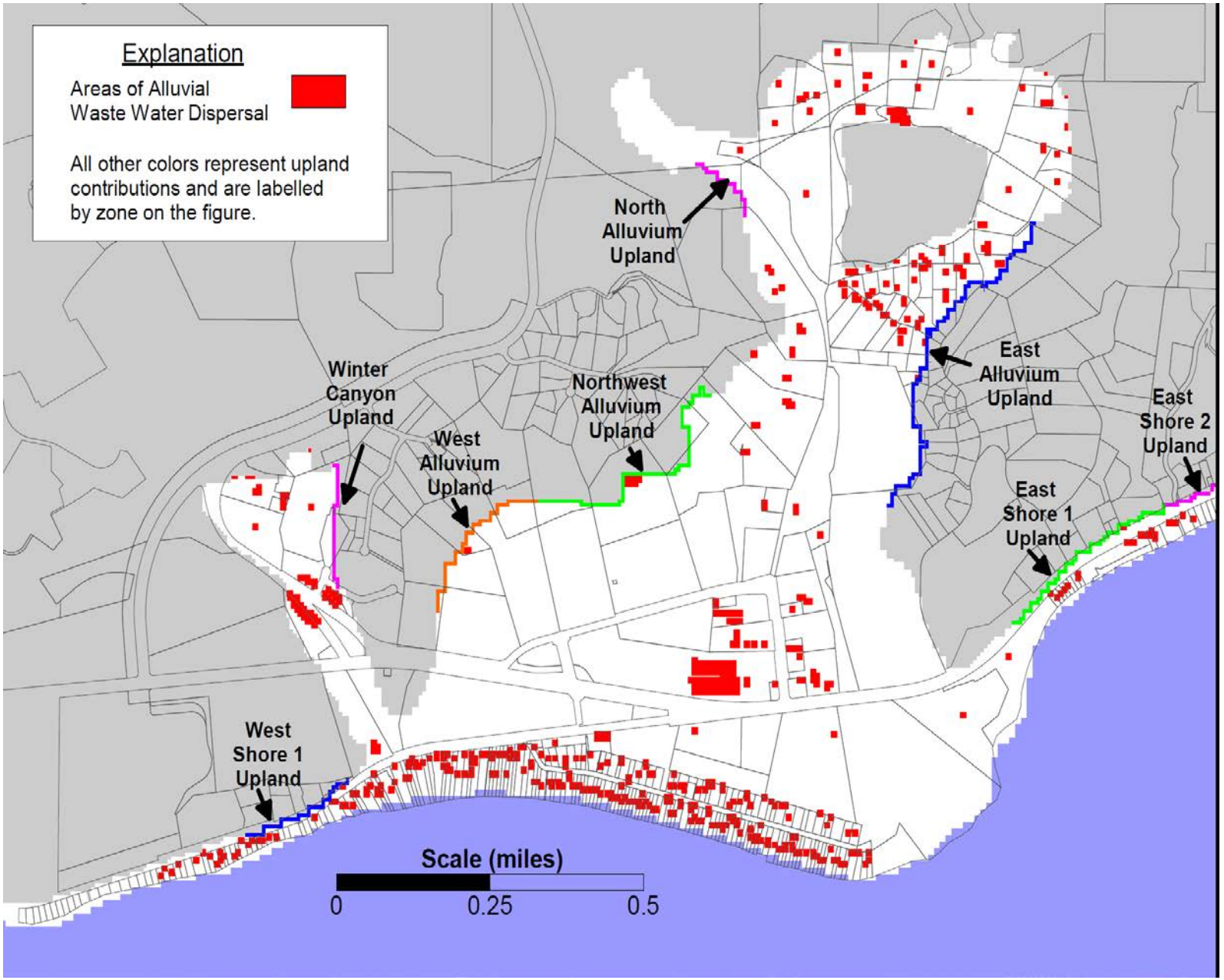
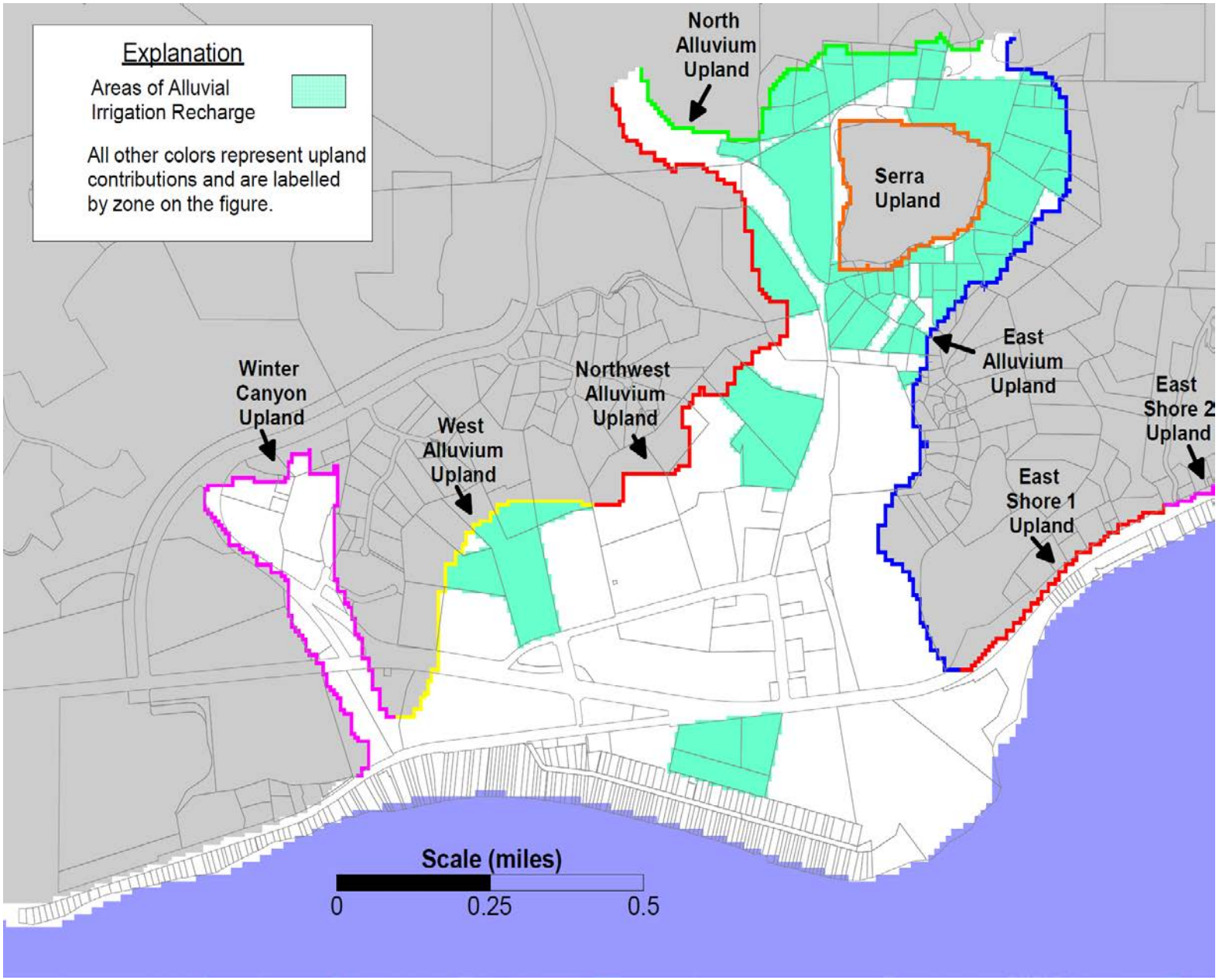
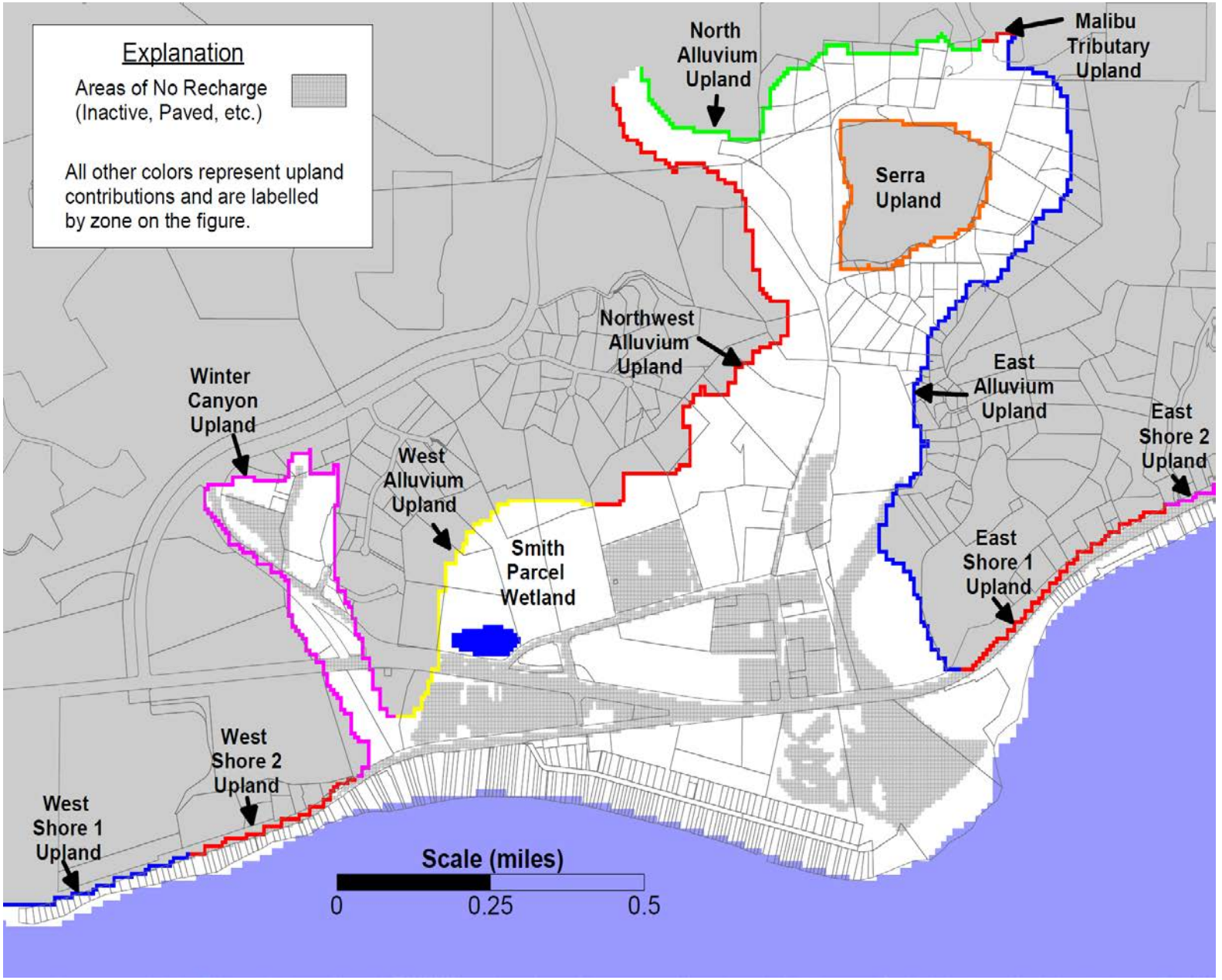


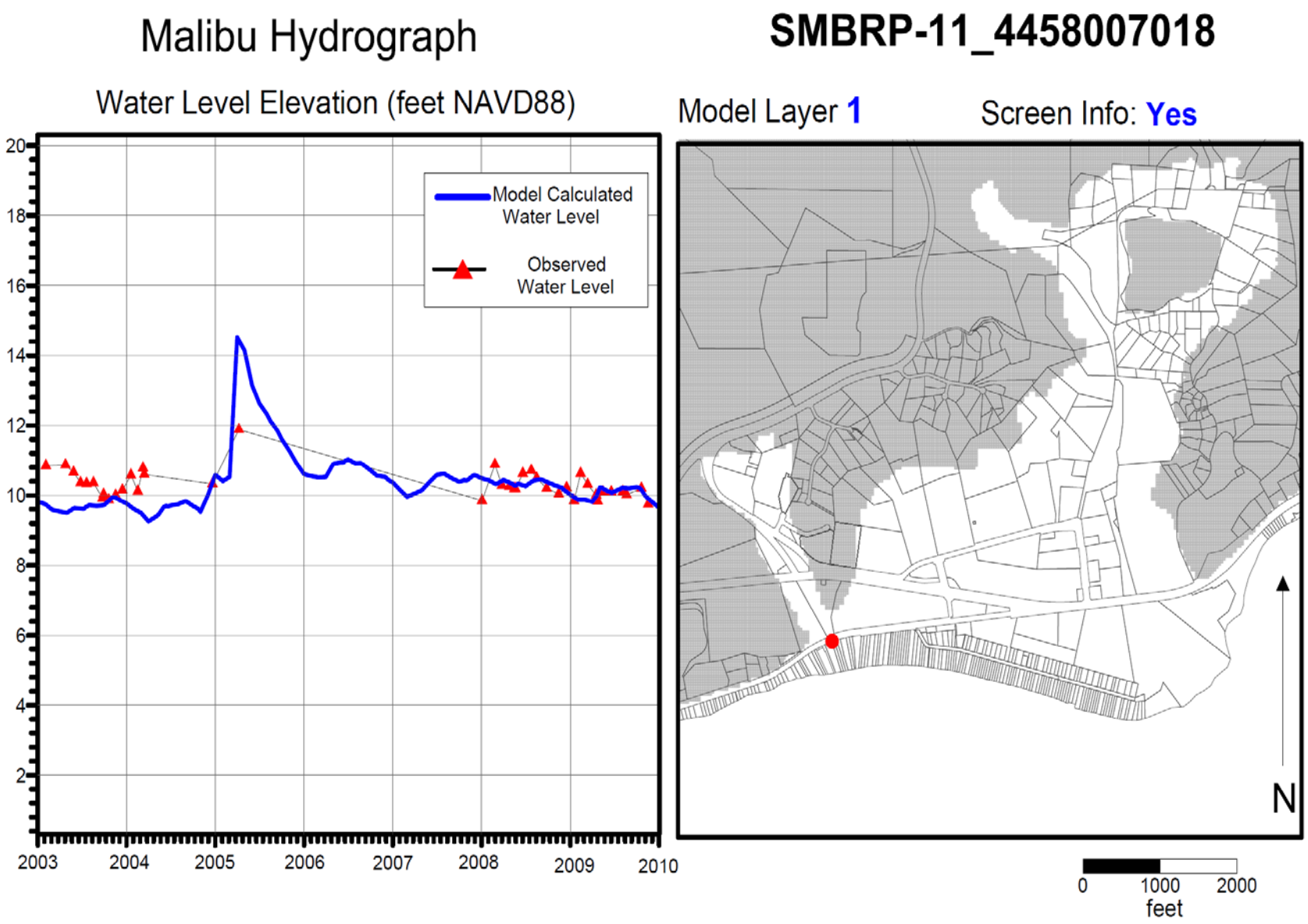
Recharge from onsite waste dispersal



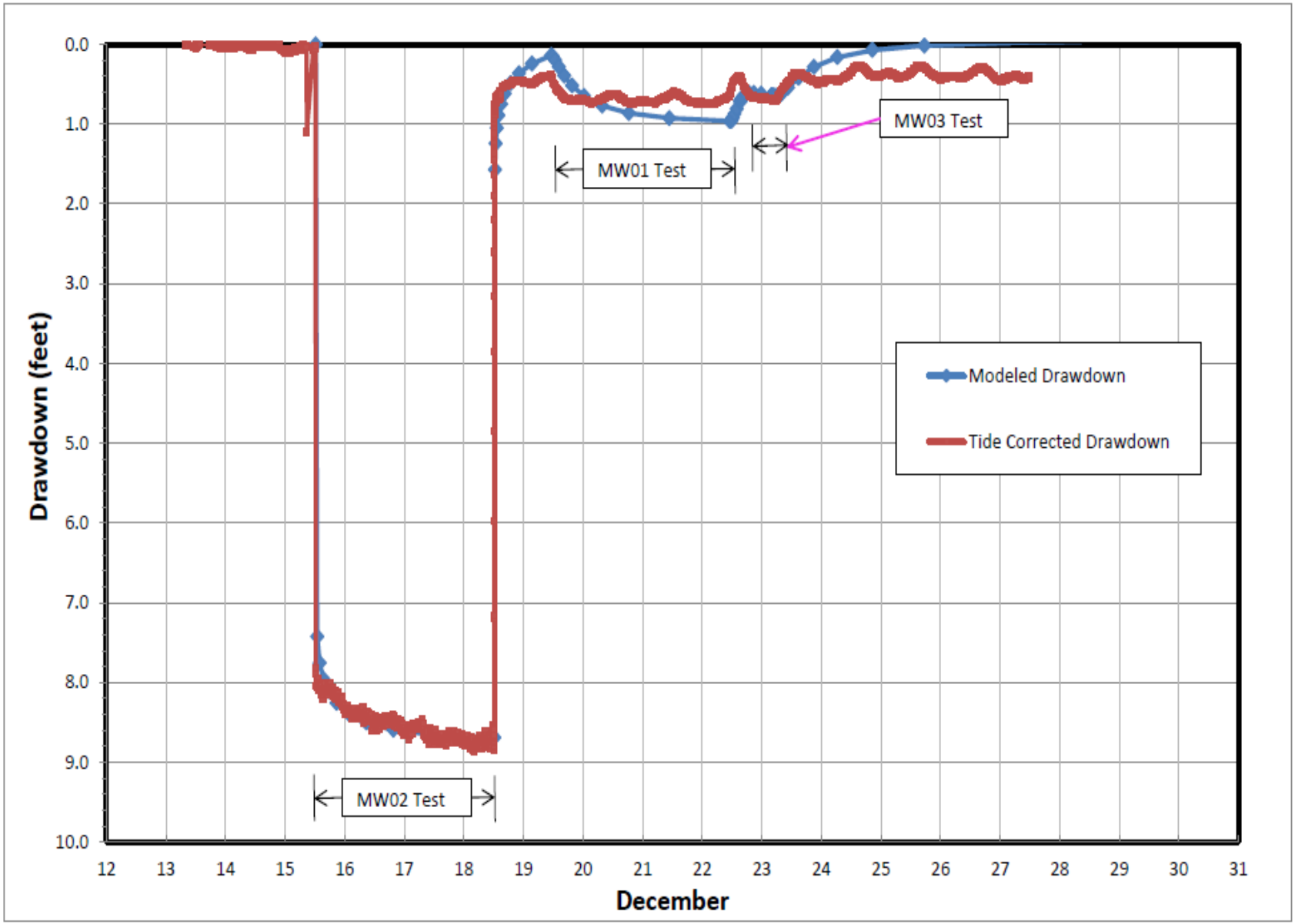
Recharge from excess irrigation

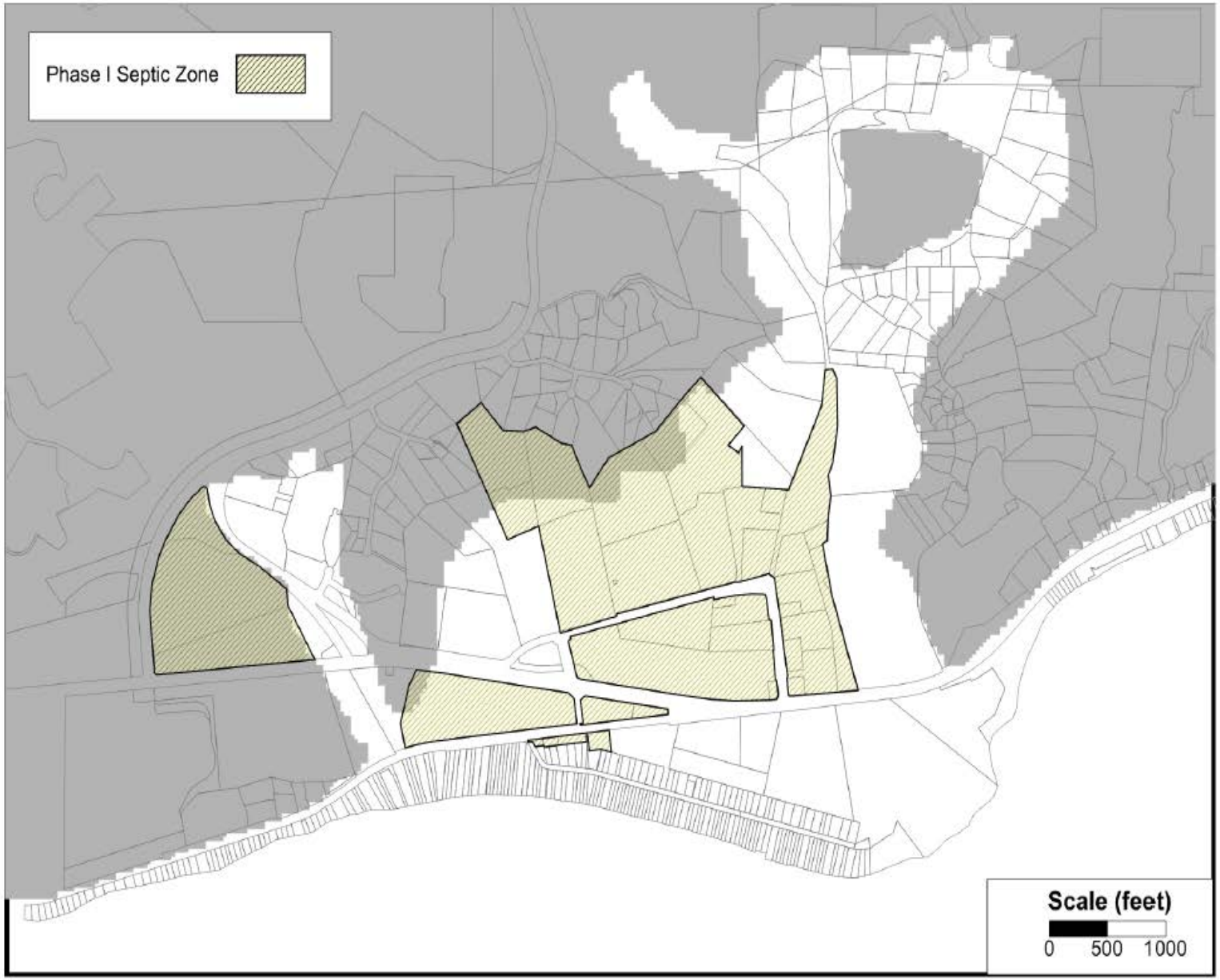


Model recharge from precipitation and upland runoff



Calculated vs. observed water level at SMBRP-11 for the period 2003-2009


Drawdown (feet)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
December
MW01 Test
MW02 Test
MW03 Test
Modeled Drawdown
Tide Corrected Drawdown



Collection system service area Phase 1