Watsonville Sloughs Hydrology Study

Technical Advisory Committee Update

October 25, 2012

Balance Hydrologics, Inc.®

Environmental Data Solutions

and with assistance from Jonathan Lear, CHg

Meeting Agenda

- Review of additional monitoring data
- Summary of model build progress
- Discussion of model scenarios to be completed
- Wrap-up and next steps

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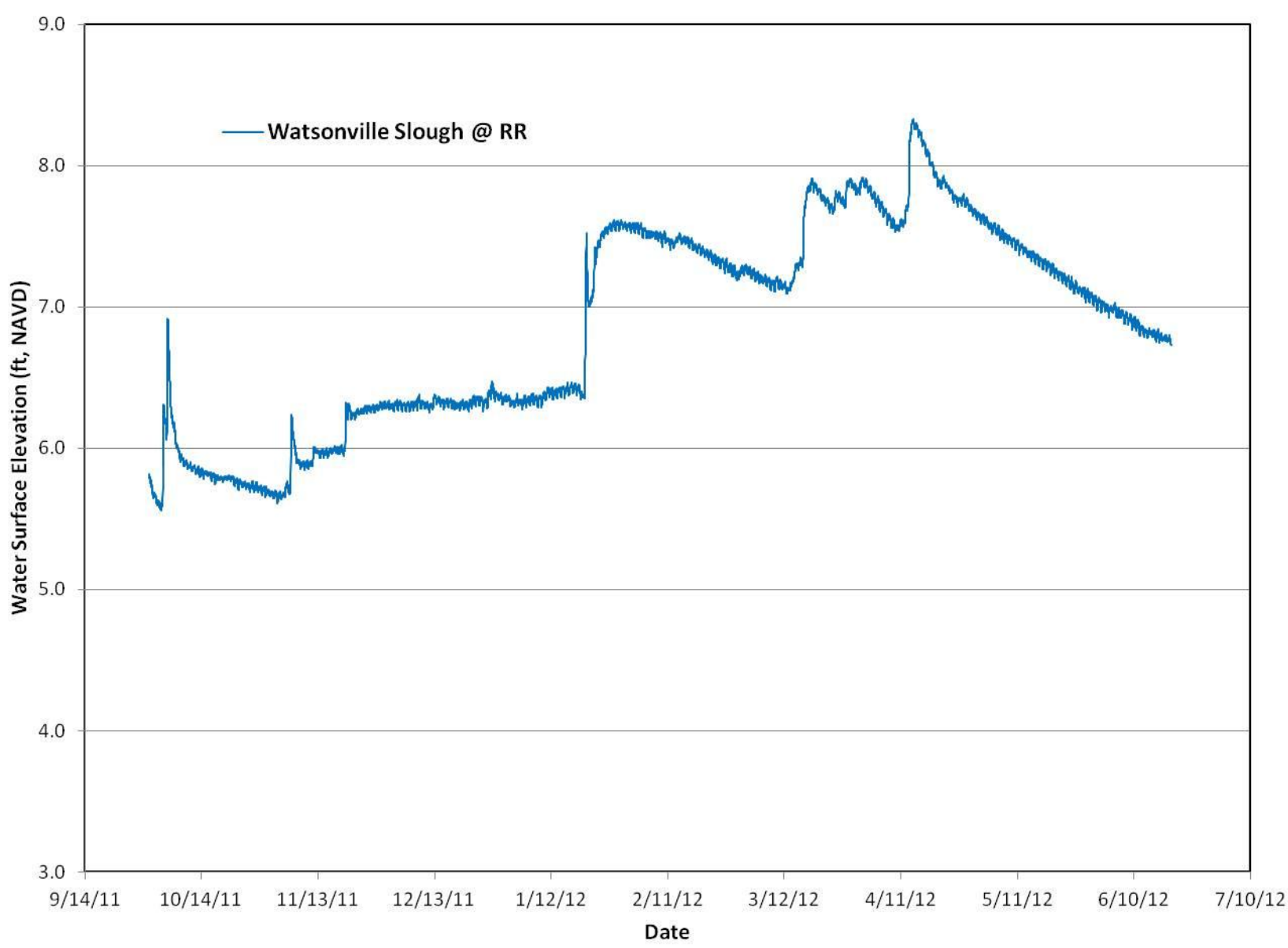
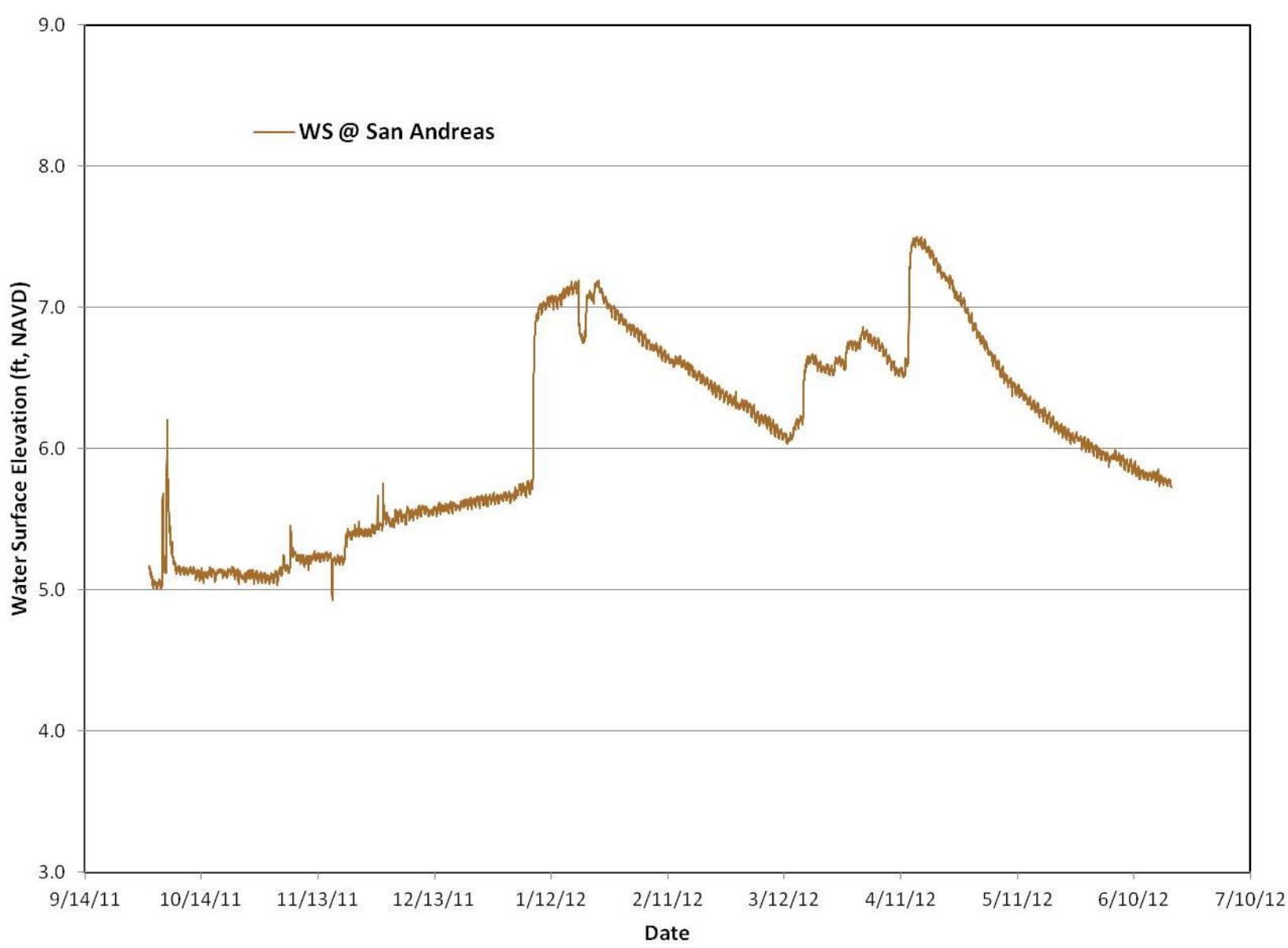
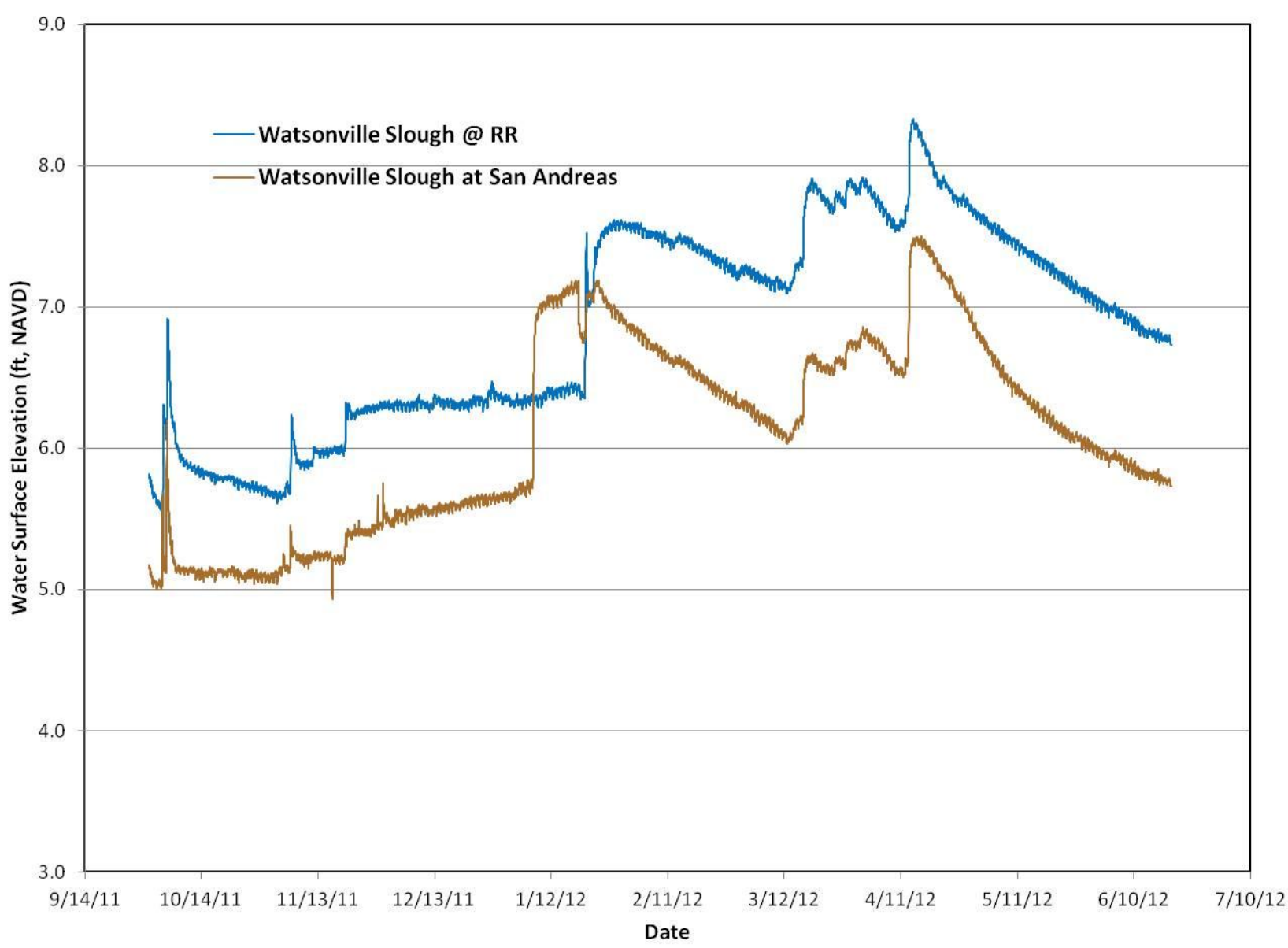
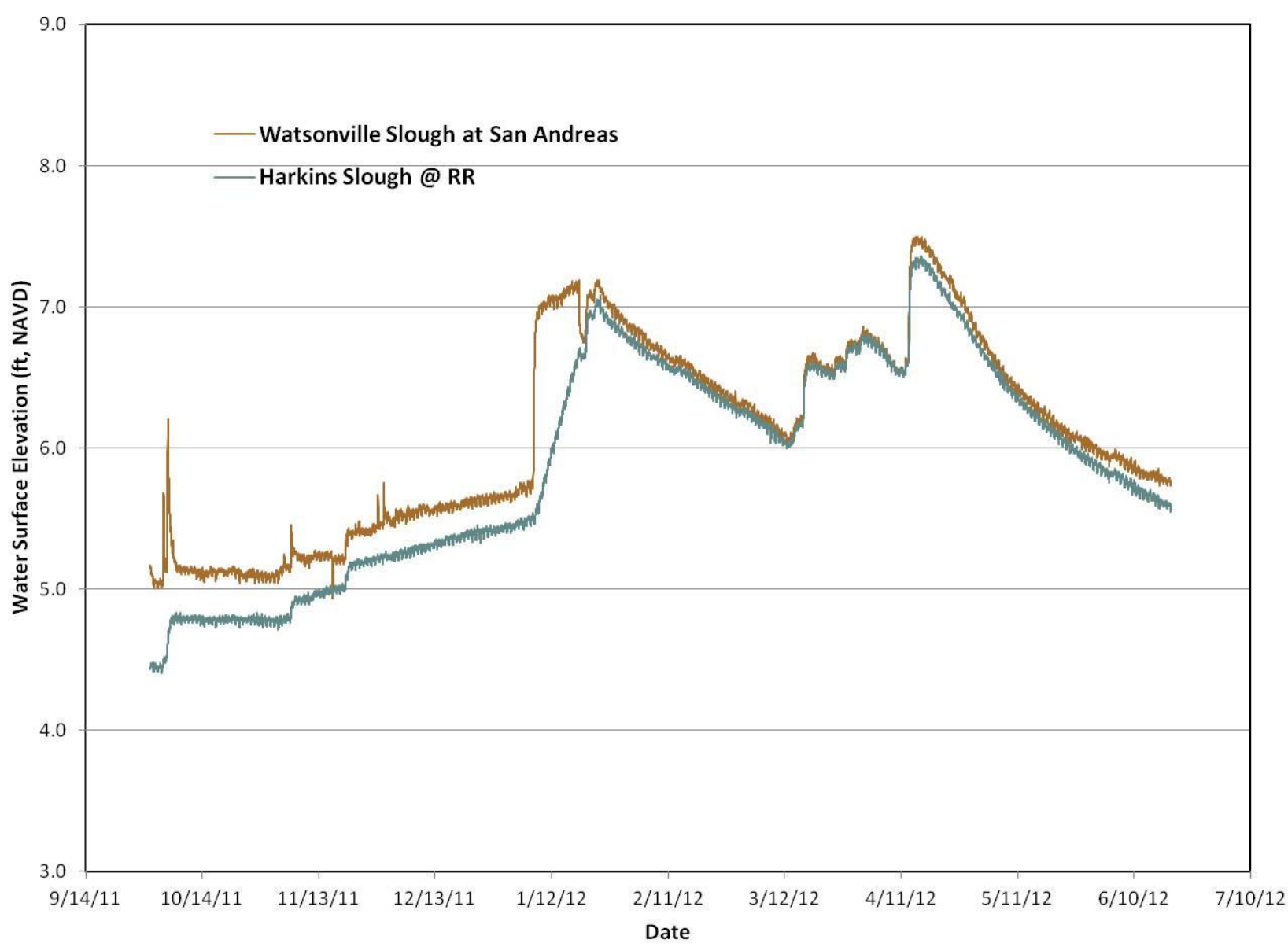
Monitoring Program Update

- Successfully tied all monitoring locations into the common survey datum
- Post-processing and QA/QC for monitoring data with special emphasis on stage record sites
- Sharing and post-processing of PVWMA data
- Calculations ongoing to extract water balance update parameters from the overall data set
- Routine maintenance and pre-winter preparations


Watsonville Slough @ RR
Water Surface Elevation (ft, NAVD)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
9/14/11
10/14/11
11/13/11
12/13/11
1/12/12
2/11/12
3/12/12
4/11/12
5/11/12
6/10/12
7/10/12
Date


WS @ San Andreas
Water Surface Elevation (ft, NAVD)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
9/14/11
10/14/11
11/13/11
12/13/11
1/12/12
2/11/12
3/12/12
4/11/12
5/11/12
6/10/12
7/10/12
Date


Watsonville Slough @ RR
Watsonville Slough at San Andreas
Water Surface Elevation (ft, NAVD)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
9/14/11
10/14/11
11/13/11
12/13/11
1/12/12
2/11/12
3/12/12
4/11/12
5/11/12
6/10/12
7/10/12
Date


Watsonville Slough at San Andreas
Harkins Slough @ RR
Water Surface Elevation (ft, NAVD)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
9/14/11
10/14/11
11/13/11
12/13/11
1/12/12
2/11/12
3/12/12
4/11/12
5/11/12
6/10/12
7/10/12
Date

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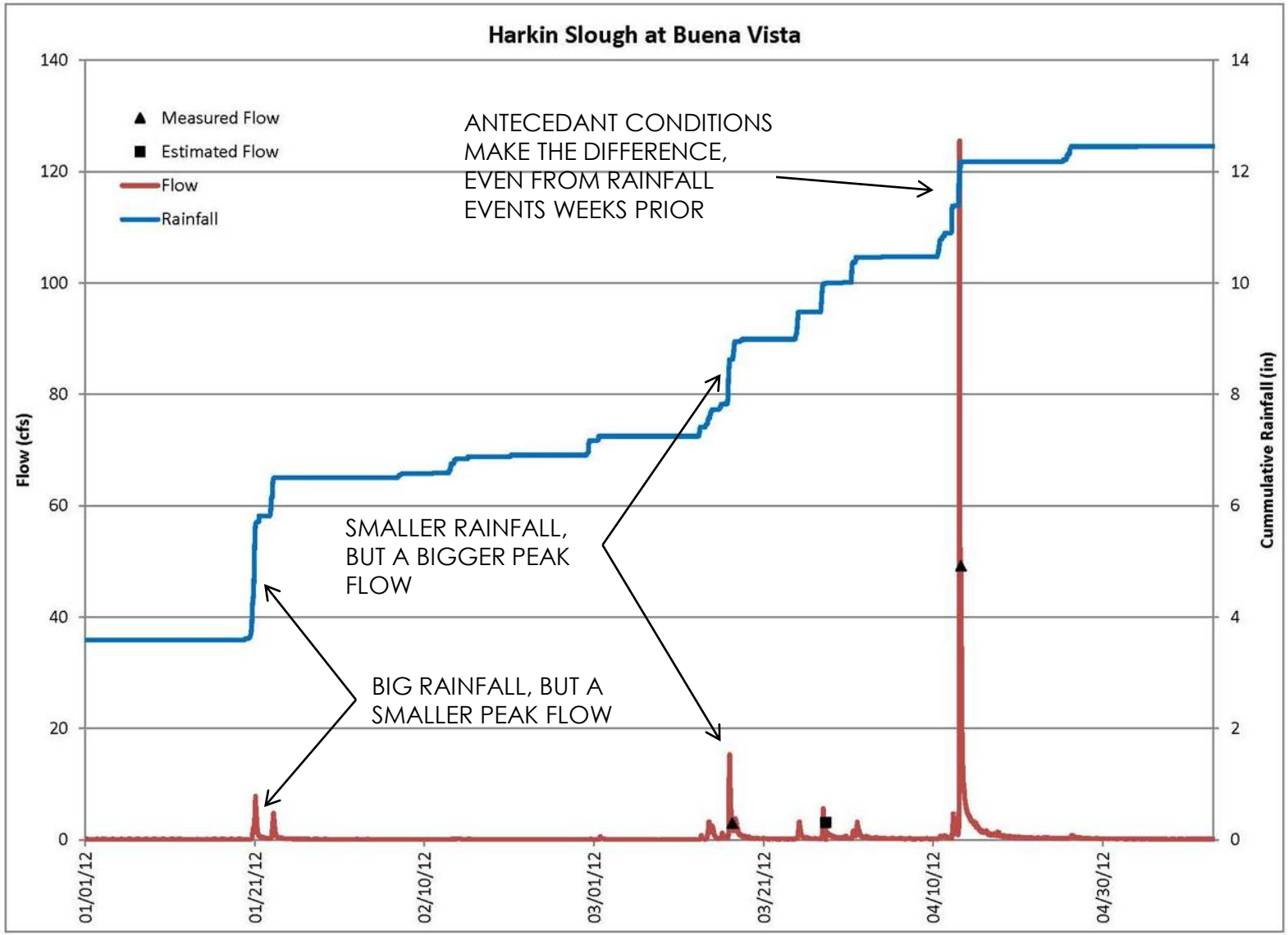
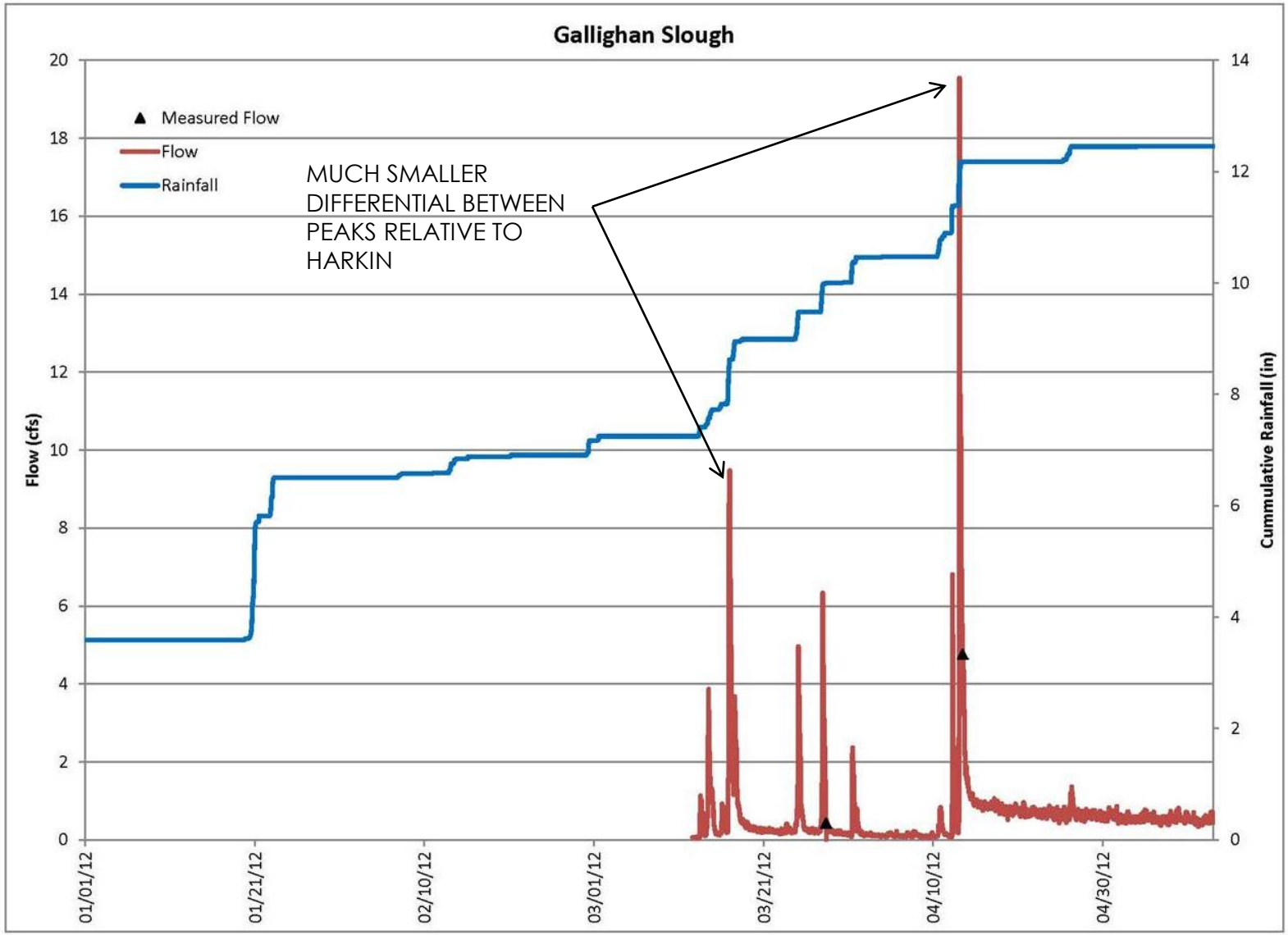
Summary of Model Build Progress

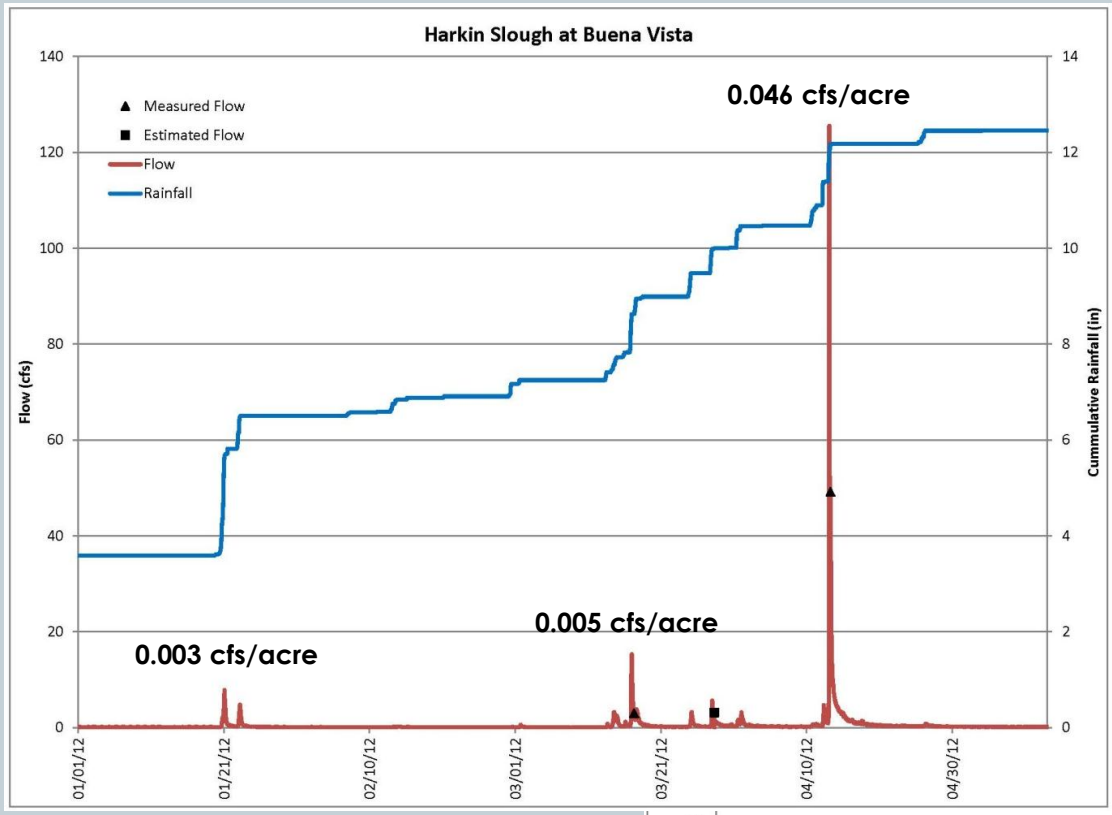
Summary of Model Build Progress

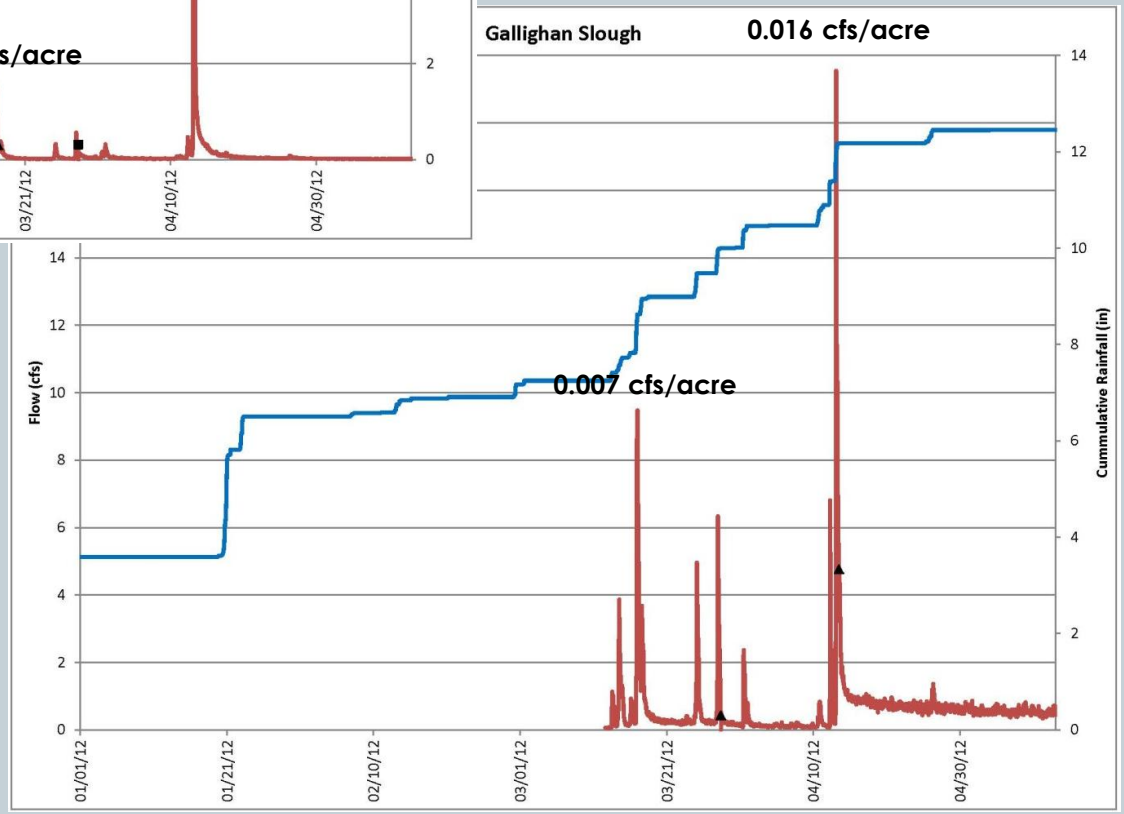
- Base hydrologic model (HEC-HMS) build completed
- Preliminary calibration efforts completed
- Calibration incomplete given concerns over limited data for inflow hydrographs
- Calibration on hold for more complete data from this rain season
- Base hydraulic model (HEC-RAS) build complete
- Preliminary hydraulic model calibration and optimization are currently underway
- Output of both models reviewed to inform monitoring efforts this year


Harkin Slough at Buena Vista
Measured Flow
Estimated Flow
Flow
Rainfall
ANTECEDANT CONDITIONS MAKE THE DIFFERENCE, EVEN FROM RAINFALL EVENTS WEEKS PRIOR
SMALLER RAINFALL, BUT A BIGGER PEAK FLOW
BIG RAINFALL, BUT A SMALLER PEAK FLOW
Flow (cfs)
Cummulative Rainfall (in)
0
20
40
60
80
100
120
140
0
2
4
6
8
10
12
14
01/01/12
01/21/12
02/10/12
03/01/12
03/21/12
04/10/12
04/30/12

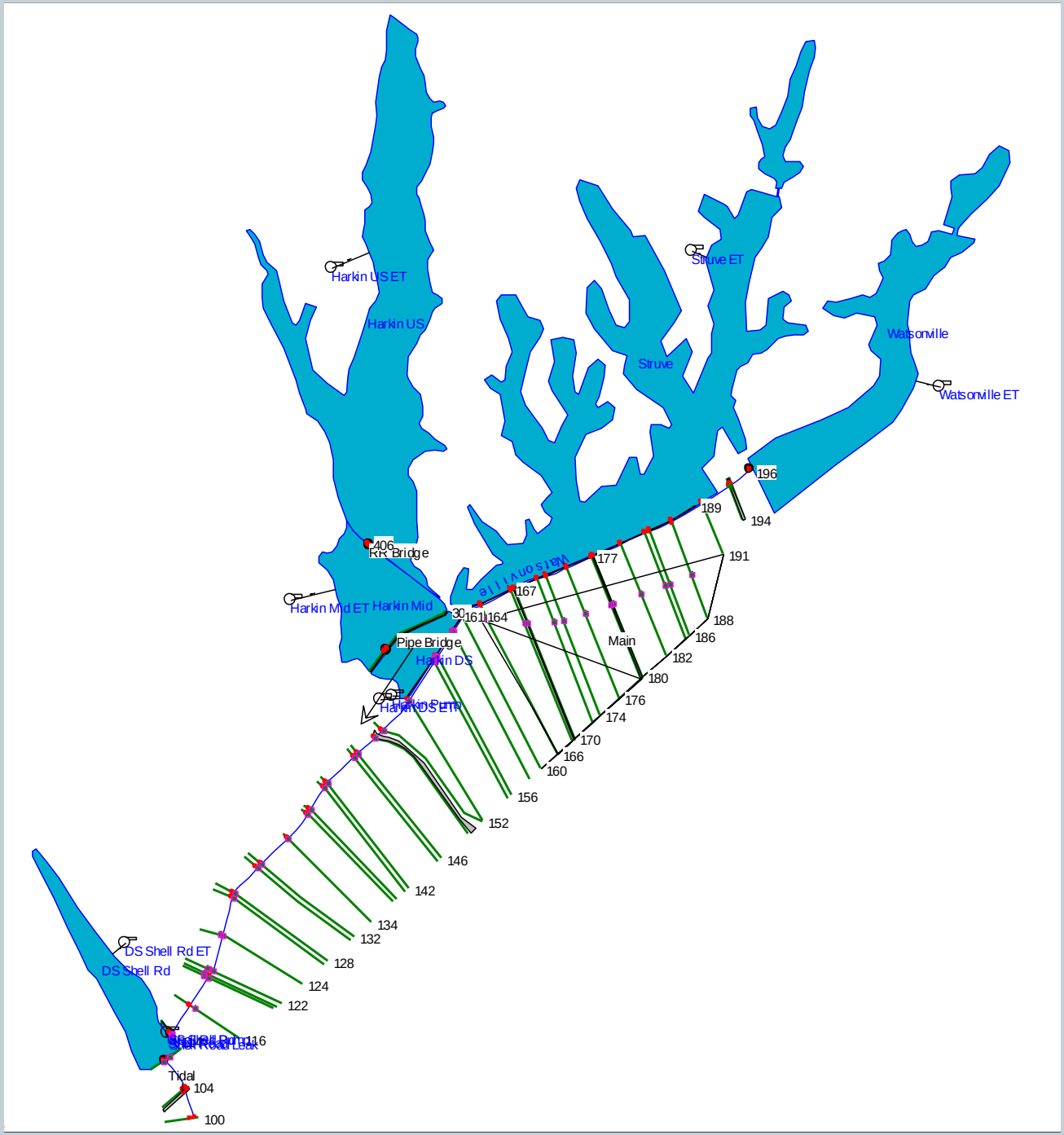

Gallighan Slough
Measured Flow
Flow
Rainfall
MUCH SMALLER DIFFERENTIAL BETWEEN PEAKS RELATIVE TO HARKIN
Flow (cfs)
Cummulative Rainfall (in)
0
2
4
6
8
10
12
14
16
18
20
01/01/12
01/21/12
02/10/12
03/01/12
03/21/12
04/10/12
04/30/12

Data Limitations for Hydrologic Calibration



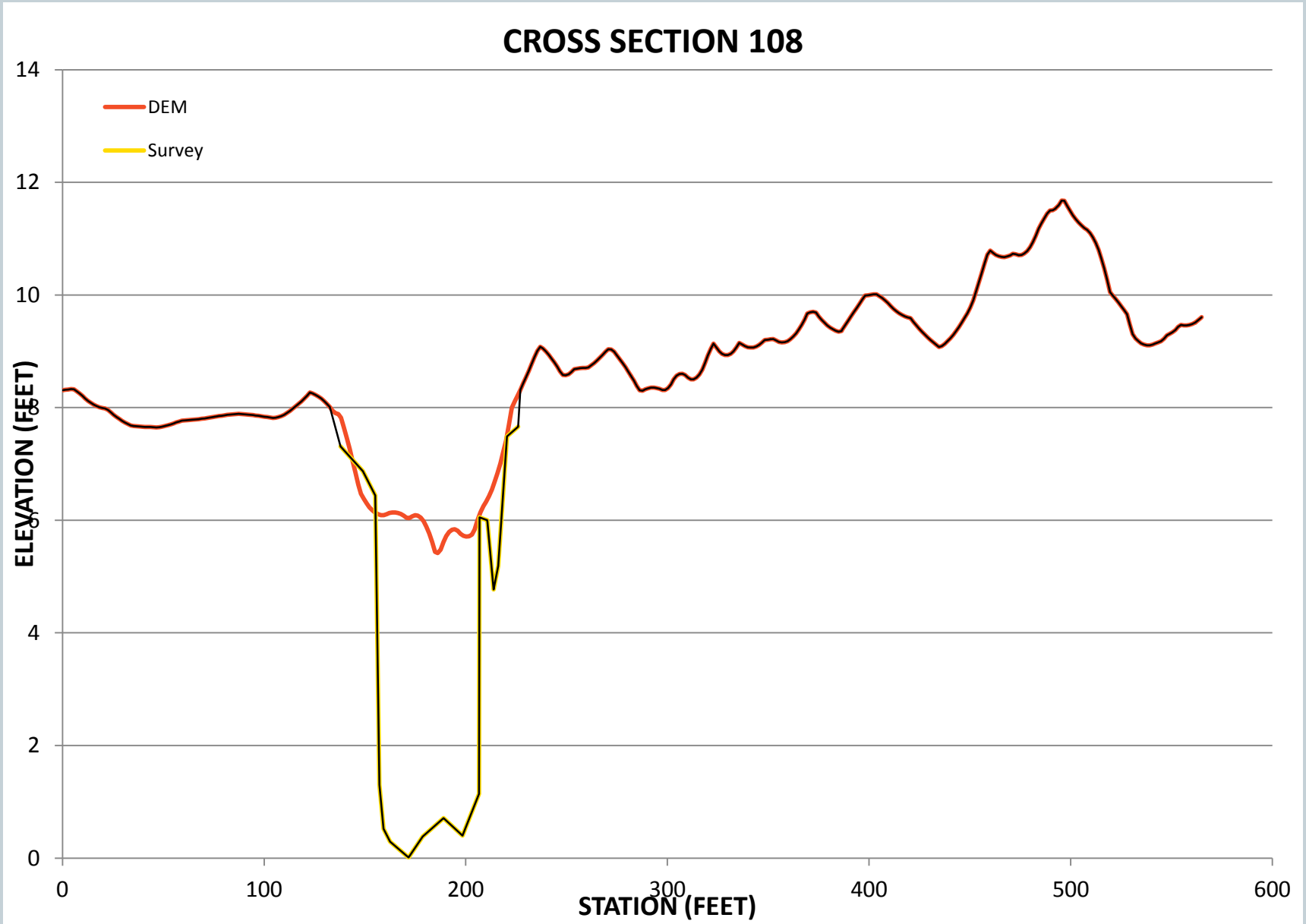


Hydraulic Model Overview



Hydraulic Model Overview

- 56 cross-sections, all georeferenced, no interpolated sections
- Average spacing = 300', maximum spacing = 900'
- 400 points per cross-section using DEM and detailed survey data
- Uniform spacing of points on the floodplain, custom spacing within channels
- Roughness set per field review and PVWMA photo archives, roughness varies with flow depth
- Levees included where identified and ineffective flow areas used where applicable


CROSS SECTION 108
DEM
Survey
ELEVATION (FEET)
STATION (FEET)
0
2
4
6
8
10
12
14
0
100
200
300
400
500
600

Hydraulic Model Overview

Cross Section Data - 10-23-12

Exit Edit Options Plot Help

River: Watsonville Apply Data Plot Options Keep Prev XS Plots Clear Prev

Reach: Tidal River Sta.: 106

Description

Del Row Ins Row

Cross Section Coordinates

	Station	Elevation
1	0	10.4
2	1.87	10.19
3	3.74	9.92
4	5.61	9.55
5	7.47	9.15
6	9.34	8.73
7	11.21	8.32
8	13.08	8.03
9	14.95	7.82
10	16.82	7.7
11	18.69	7.66
12	20.56	7.7
13	22.42	7.83
14	24.29	8.02
15	26.16	8.2
16	28.03	8.35
17	29.9	8.48
18	31.77	8.59
19	33.64	8.68
20	35.5	8.74
21	37.37	8.78
22	39.24	8.8
23	41.11	8.81
24	42.98	8.81
25	44.85	8.82
26	46.72	8.81
27	48.58	8.79
28	50.45	8.76
29	52.32	8.72
30	54.19	8.68
31	56.06	8.64
32	57.93	8.6
33	59.8	8.53
34	61.66	8.43
35	63.53	8.34
36	65.4	8.25
37	67.27	8.17
38	69.14	8.09
39	71.01	8.01
40	72.88	7.92
41	74.74	7.83
42	76.61	7.74
43	78.48	7.66
44	80.35	7.57
45	82.22	7.48
46	84.09	7.4
47	85.96	7.31
48	87.83	7.22
49	89.69	7.12
50	91.56	7.01
51	93.43	6.88

Downstream Reach Lengths

LOB	Channel	ROB
699	699	699

Manning's n Values

LOB	Channel	ROB
0.07	0.04	0.07

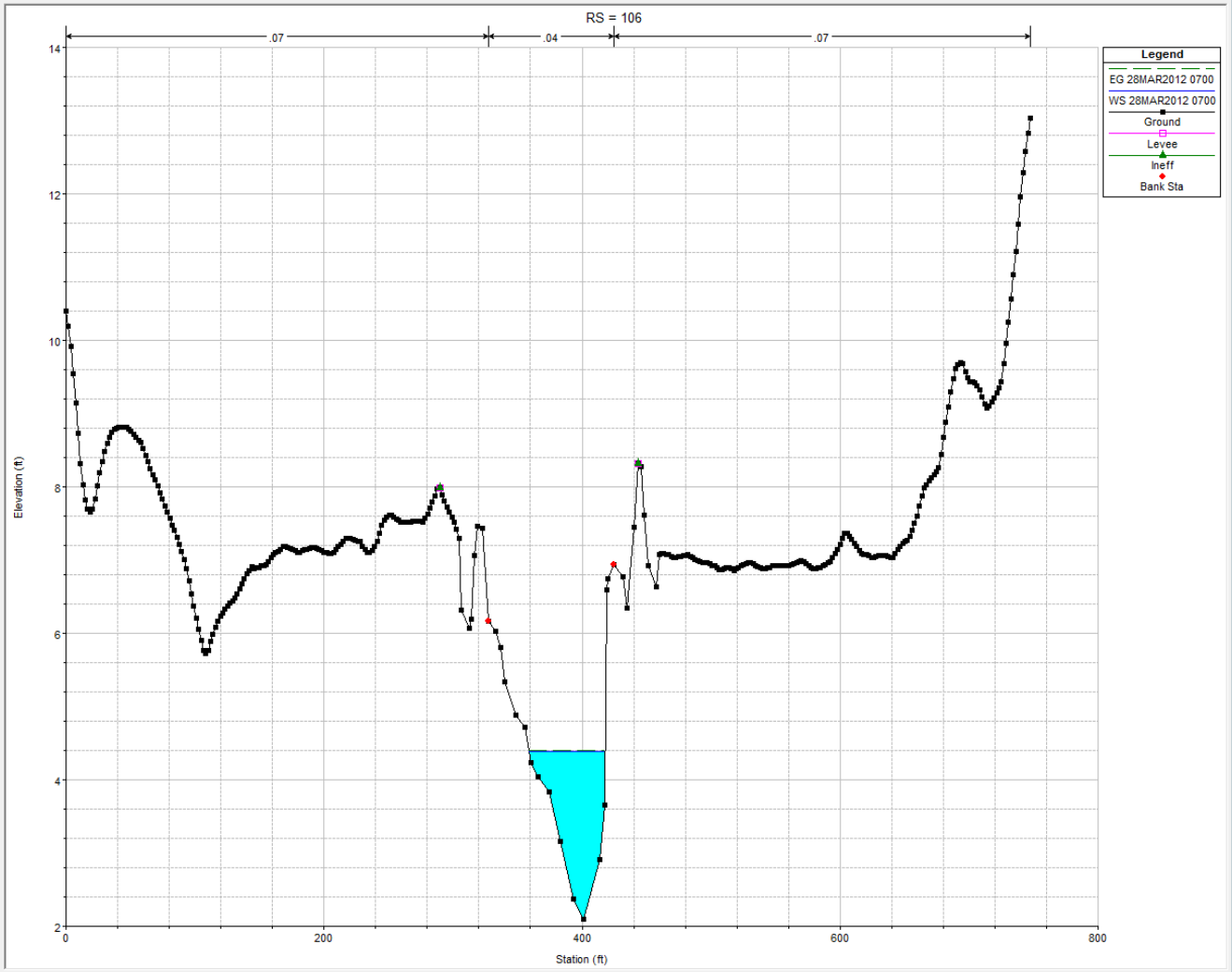
Main Channel Bank Stations

Left Bank	Right Bank
327.24	424.99

Cont\Exp Coefficient (Steady Flow)

Contraction	Expansion
0.1	0.3

Normal Ineffective Flow Areas
Levee on left and right sides

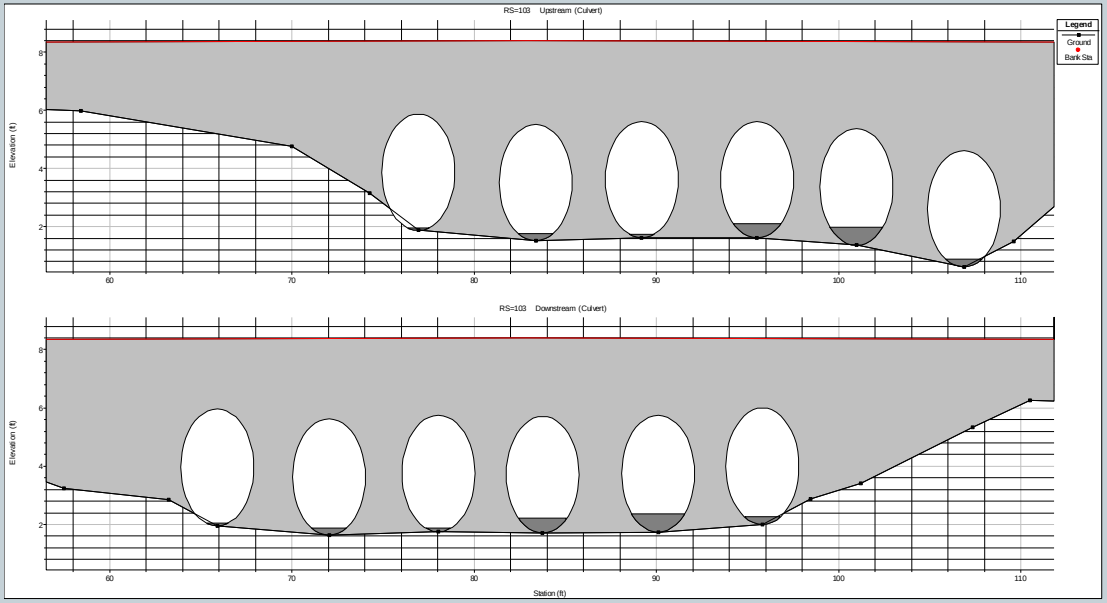


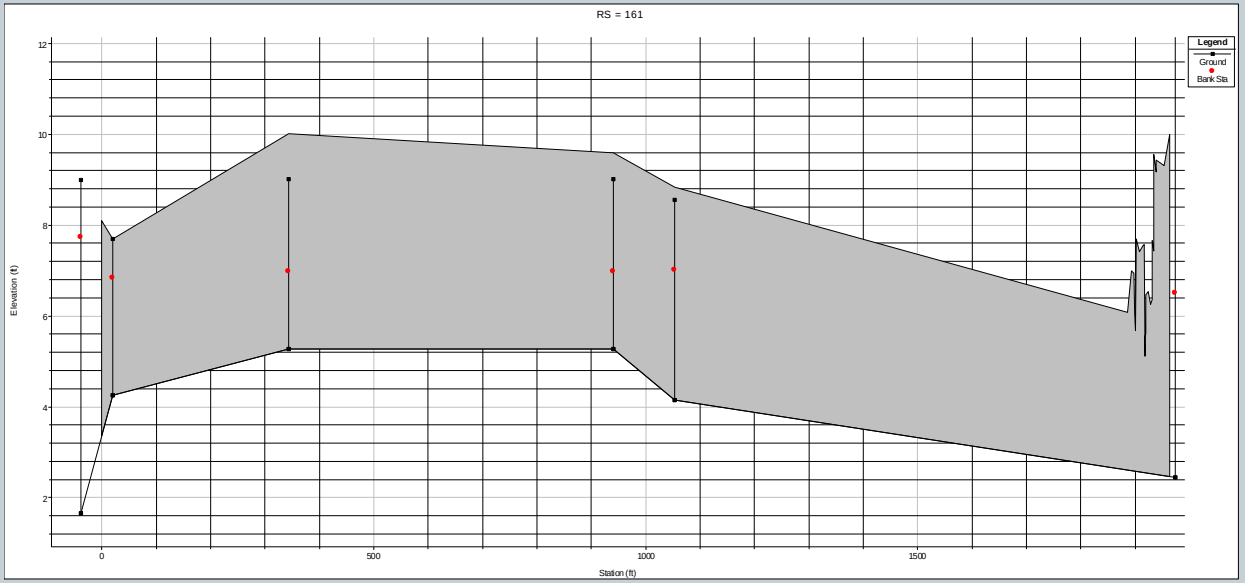
Select Reach for cross section editing

Hydraulic Model Overview

- 7 major storage areas defined by stage-storage relationships
- 11 channel crossings/structures
- Includes bridges, inline weirs, culverts, flapgates
- 7 lateral weirs connecting storage areas
- Lateral weirs allow for 2-D effects to be approximated in a 1-D model
- 2 pump stations (Shell Road, Harkin Slough)
- ET and potential seepage losses emulated using specially defined pump elements

Hydraulic Model Overview





- Boundary conditions
  - 12 inflow hydrographs
  - 1downstream stage hydrograph
  - Observed data from monitoring loaded into model for ready comparison of output
- Currently running at 30-second time step with 2-hour run times for last year's data
- Will be extended to 10-year data set with corresponding increases in run time

Hydraulic Model Overview

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Selection of Modeling Scenarios

- Well-defined change in only a few (e.g. one) input parameters to either the hydrologic or hydraulic models
- Clearly defined output metrics to avoid post-processing overload
- Grounded in understanding that baseline datasets are historical (e.g. from the last 10 years)

Potential Scenarios

- Sea level rise
- Land use changes
- Channel modifications
- Extension of berms
- Changes in pumping regimes
- Climate change (e.g. changes in precipitation)
- Others?

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Next Steps

Next Steps:

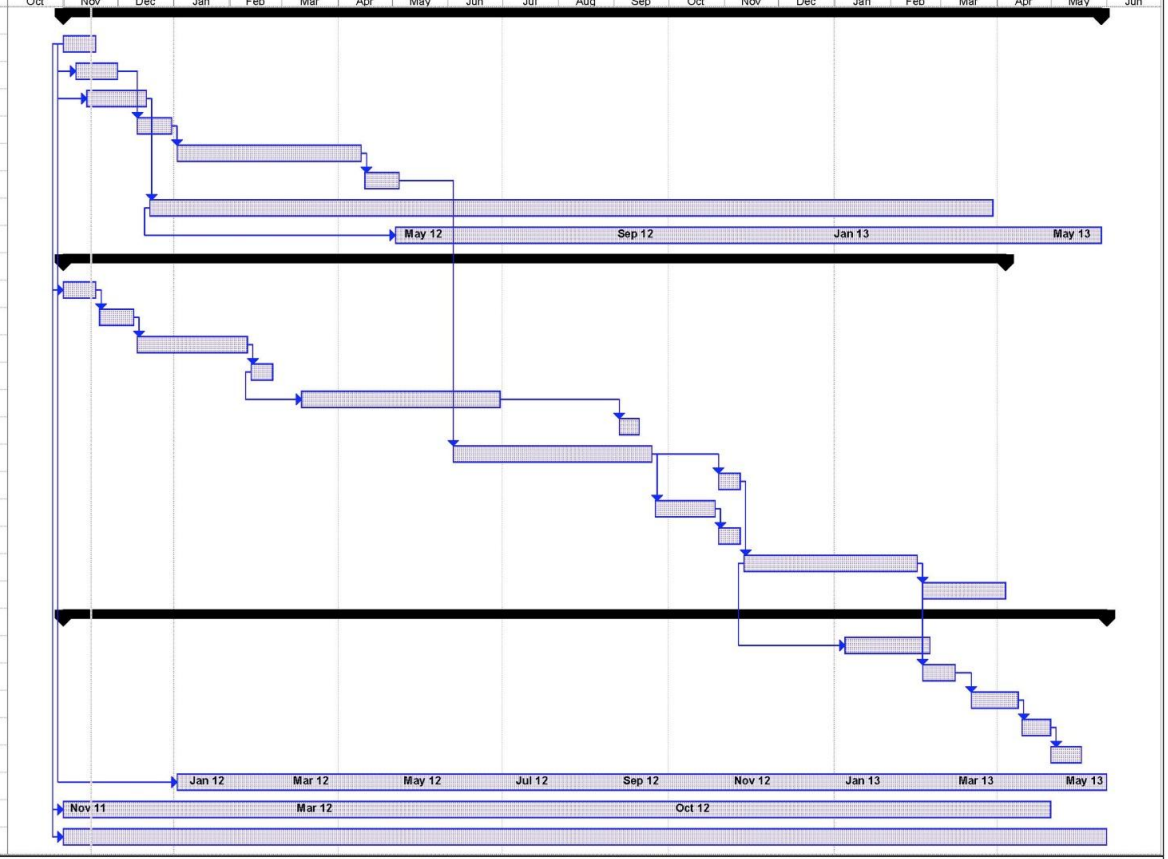
- Continue field monitoring program with emphasis on identified critical data gaps
- Expedite reduction and QA/QC of field data
- Complete hydrologic and hydraulic model calibrations
- Run selected scenarios
- Modify model for transport analyses
- Compile final report and documentation

Next Steps and Schedule

Figure 2: Project Schedule - Watsonville Sloughs Hydrologic Assessment

Balance Hydrologics, Inc.

ID	Task Name
1	**Task 1. Data Collection**
2	1.1 Compile and review data from previous monitoring
3	1.2 Develop Data Collection Plan
4	1.3 Purchase, calibrate and install equipment
5	1.4 Compile LiDAR information, identify data gaps
6	1.5 Complete supplemental topographic and bathymetry surveys
7	1.6 Compile project work maps
8	1.7 Monitoring, maintenance and ongoing calibration (2 years)
9	1.8 Data reduction and archiving
10	**Task 2. Hydrologic and Hydraulic Modeling**
11	2.1 Compile and review information from past modeling efforts
12	2.2 Develop modeling protocols and standards
13	2.3 Compile input datasets (rainfall, ET, irrigation, etc.)
14	2.4 Prepare preliminary revised water budget
15	2.5 Construct hydrologic model
16	2.6 QA/QC for hydrologic modeling
17	2.7 Construct hydraulic model
18	2.8 QA/QC for hydraulic modeling
19	2.9 Coupled model runs for verification/calibration
20	2.10 Prepare final revised water budget
21	2.11 Coupled model runs for climate change scenarios
22	2.12 Final model runs and scenario analyses
23	**Task 3. Analysis and Reporting**
24	3.1 Assemble and review monitoring and modeling results
25	3.2 Identify key recommendations for future management
26	3.3 Prepare and circulate draft Hydrologic Study Report
27	3.4 Collect comments and feedback on draft report
28	3.5 Prepare and distribute final Hydrologic Study Report
29	3.6 Bi-monthly progress updates (9)
30	3.7 Meetings with key staff, steering committee, TAC (4 total)
31	3.8 Contract management and invoicing



Project: 211131 Project schedule
Date: Wed 11/16/11

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary | Deadline

Page 1

Next Steps and Schedule

PHOTOS – WATSONVILLE SLOUGH D/S FROM SAN ANDREAS

- Overview of preliminary data by station

- Watershed areas at selected stations:
  - Harkins Slough at Buena Vista 2,720 acres
  - Watsonville Slough at Highway 1 1,470 acres
  - Gallighan Slough 1,240 acres
  - East Struve at Main 840 acres
  - West Struve at High School 380 acres
  - Harkins Slough Tributary at Manfre 250 acres

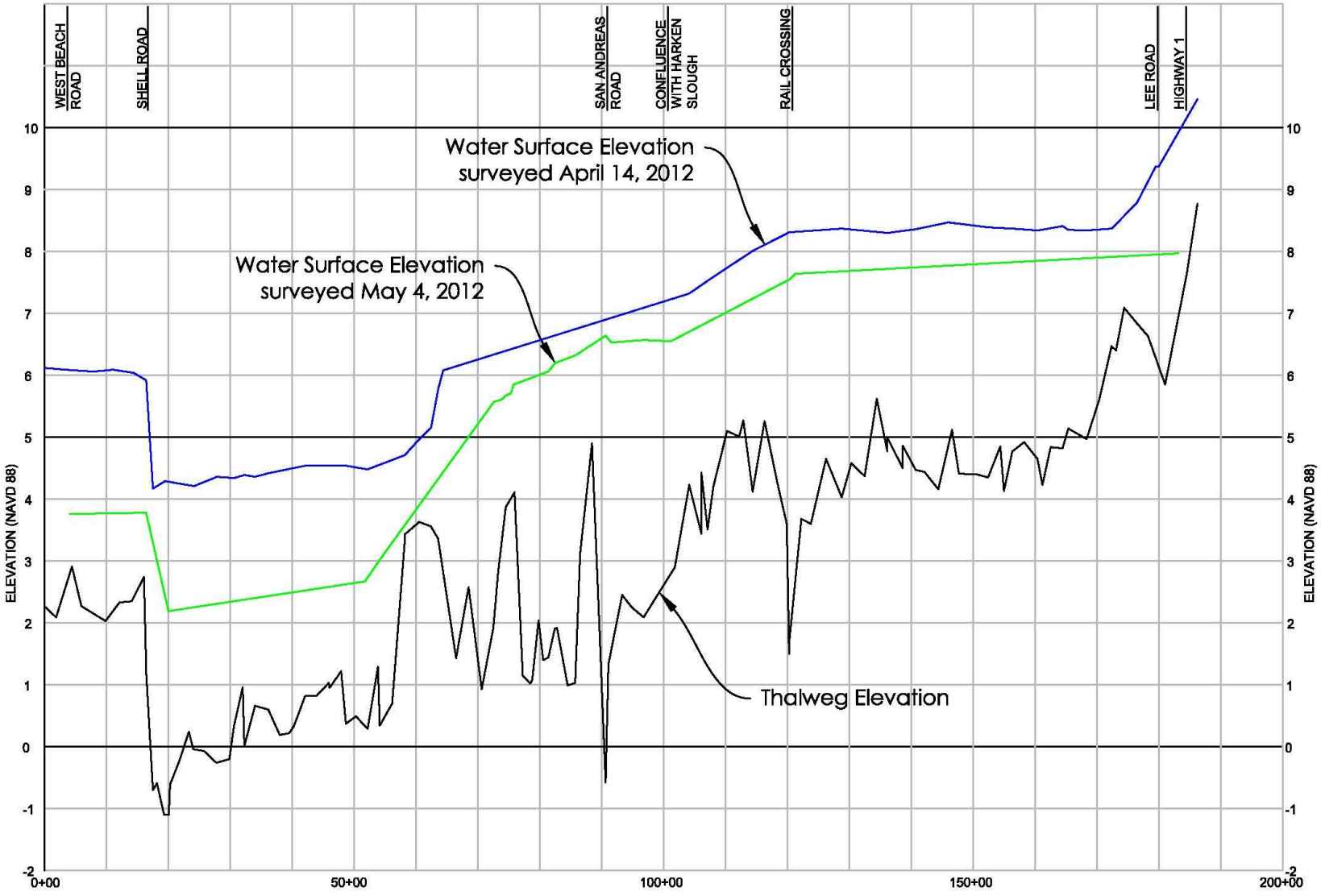


Figure 4: Watsonville Slough Profile

SCALE: 1" = 2000' VERTICAL: X1000

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W:\CADPROJECTS\211131 WATSONVILLE SLOUGH\211131 PROFILE 5-16-12.DWG

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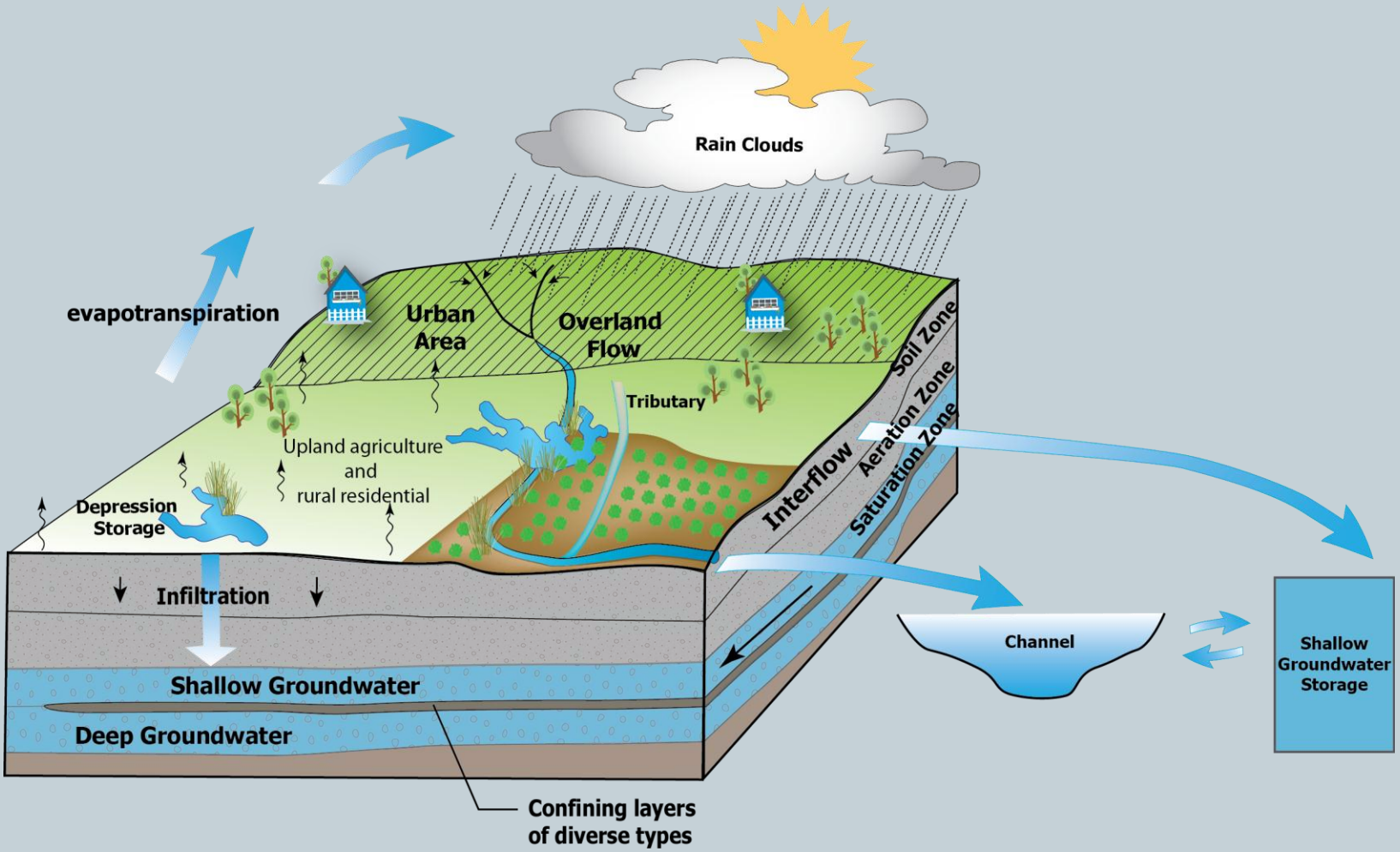
PHOTOS – WATSONVILLE SLOUGH D/S FROM R.R.

Hydrologic Modeling Overview



The Bigger Picture