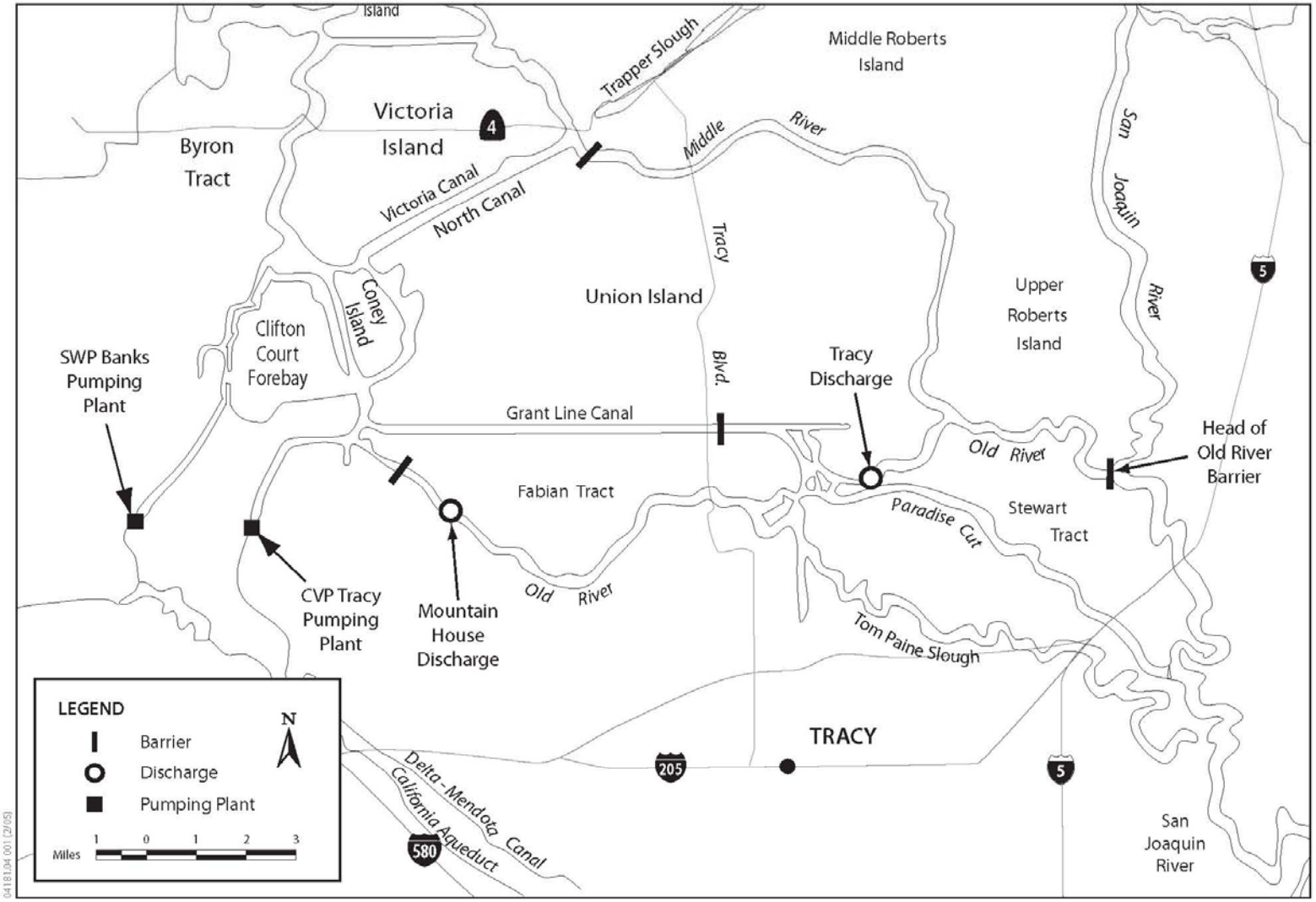
Evaluation of Mountain House Creek and Wastewater Discharge Using DSM2

DSM2 User's Group Meeting

April 26, 2005

Work done by Jones & Stokes for Pacific Advanced Civil Engineering, Inc.

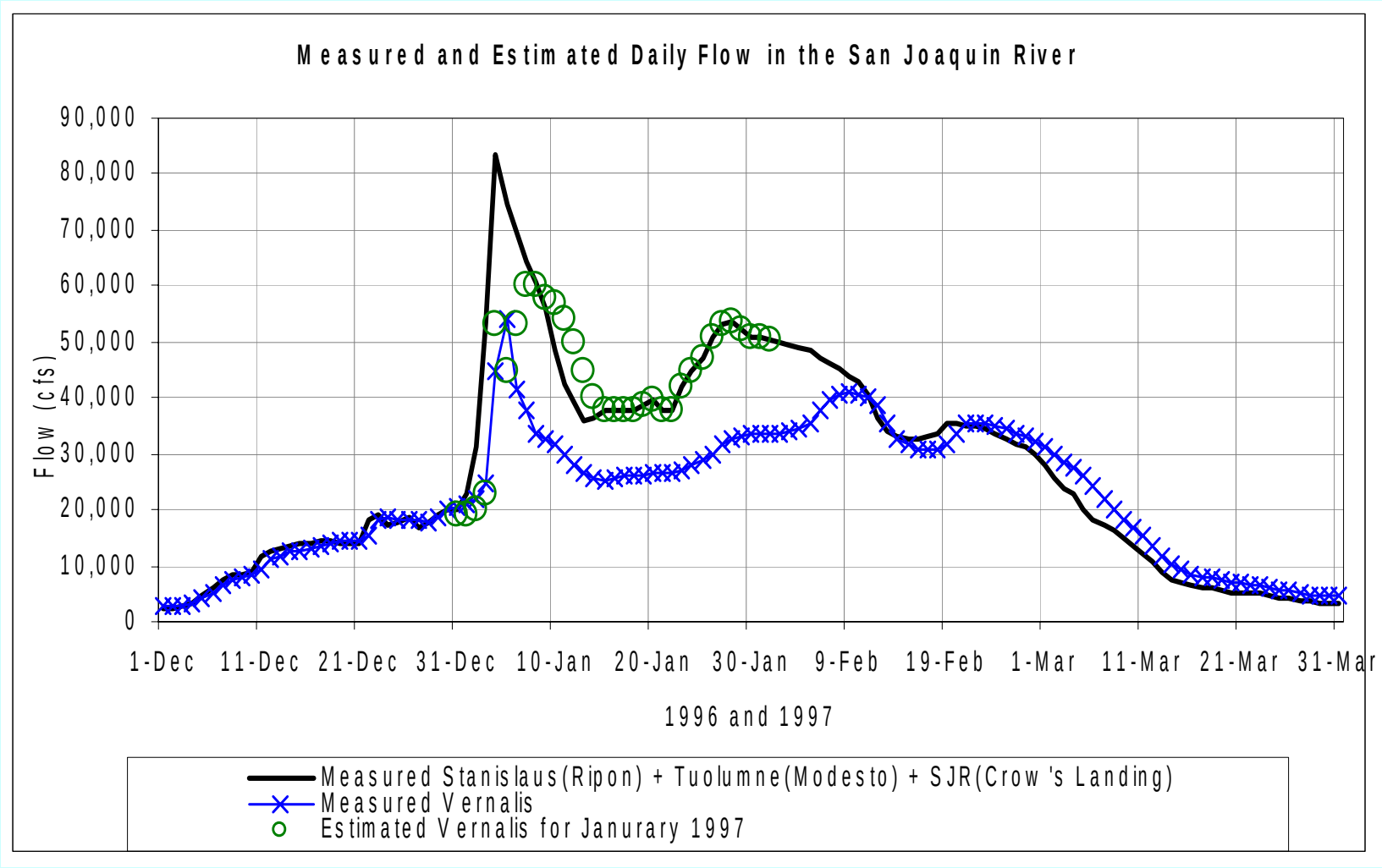


Jones & Stokes

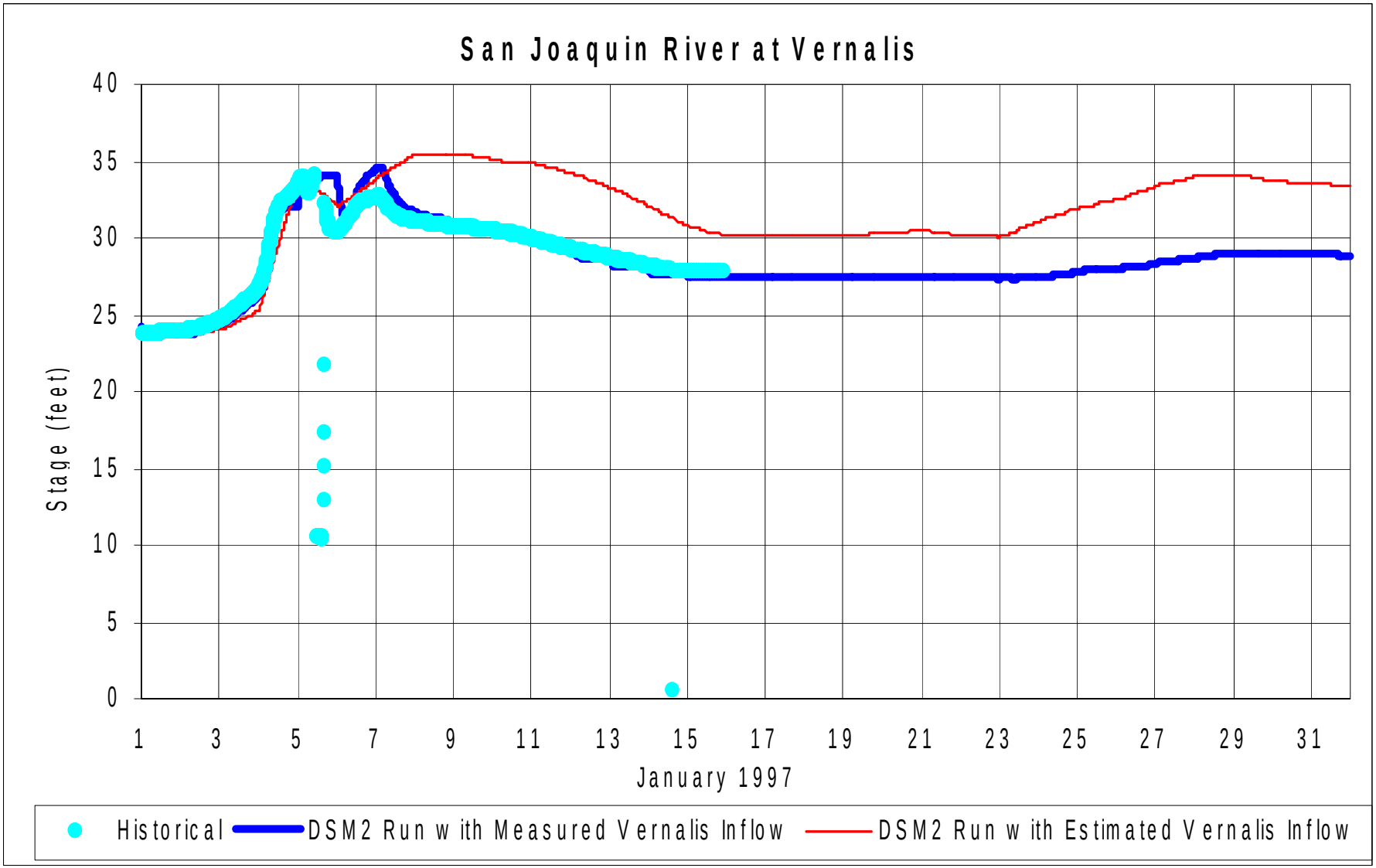
Figure 1
Map of the South Delta Channels

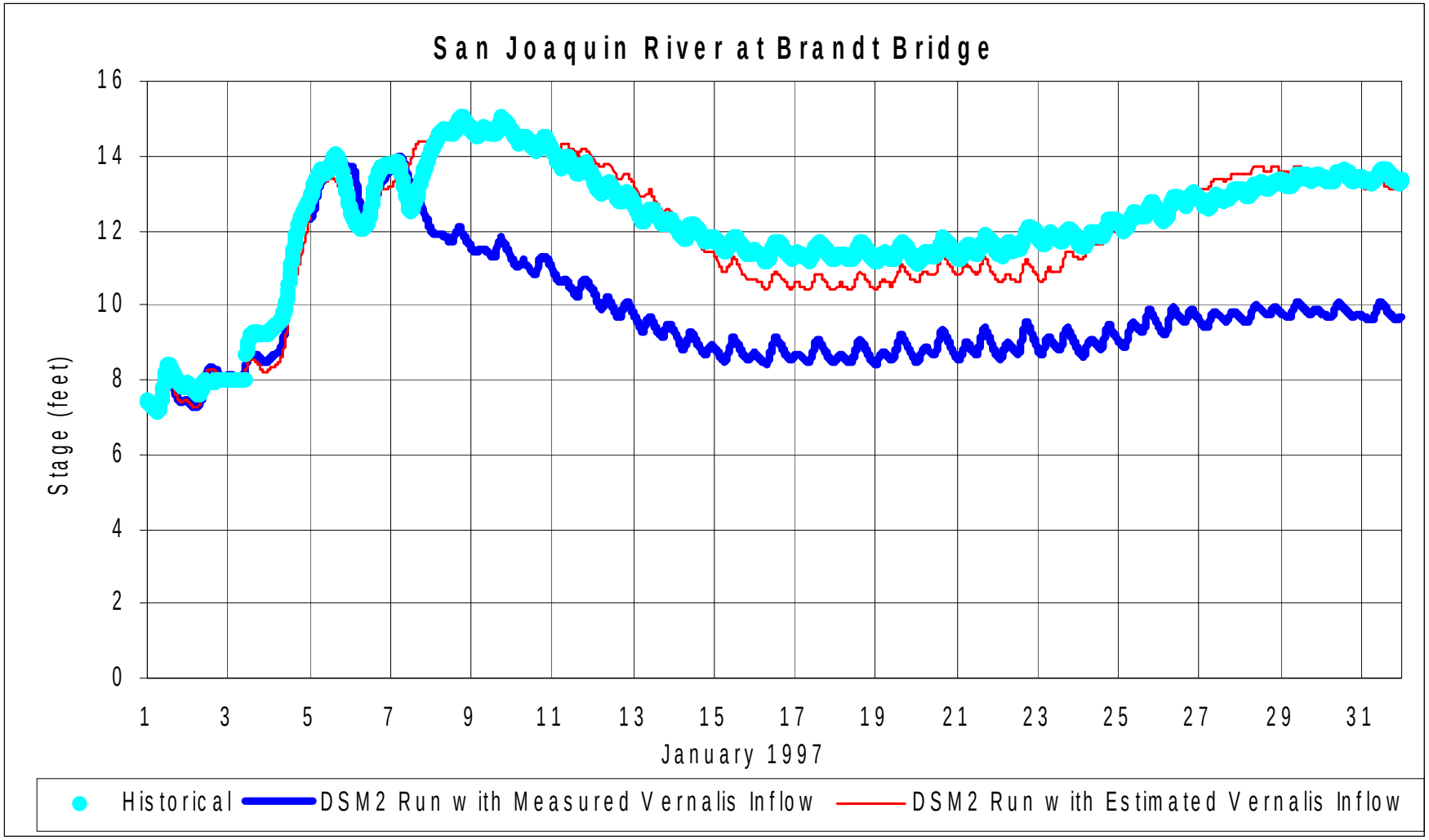
Mountain House Creek Flood Evaluation

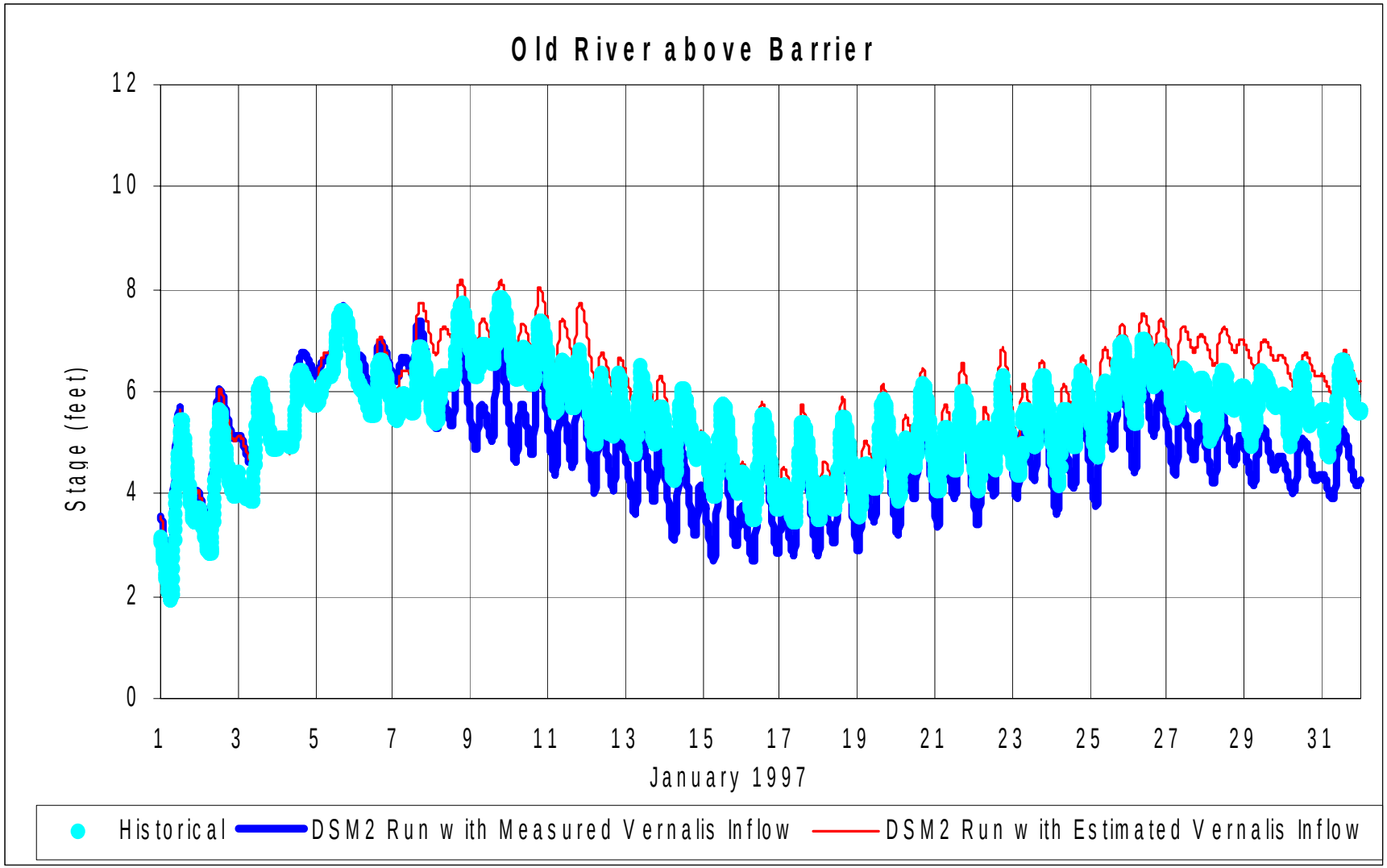
- Reconnect Mountain House Creek to Old River
- January 1997 – close to 100-year recurrence interval
- 100-year 24-hour rainfall event for Mountain House Creek

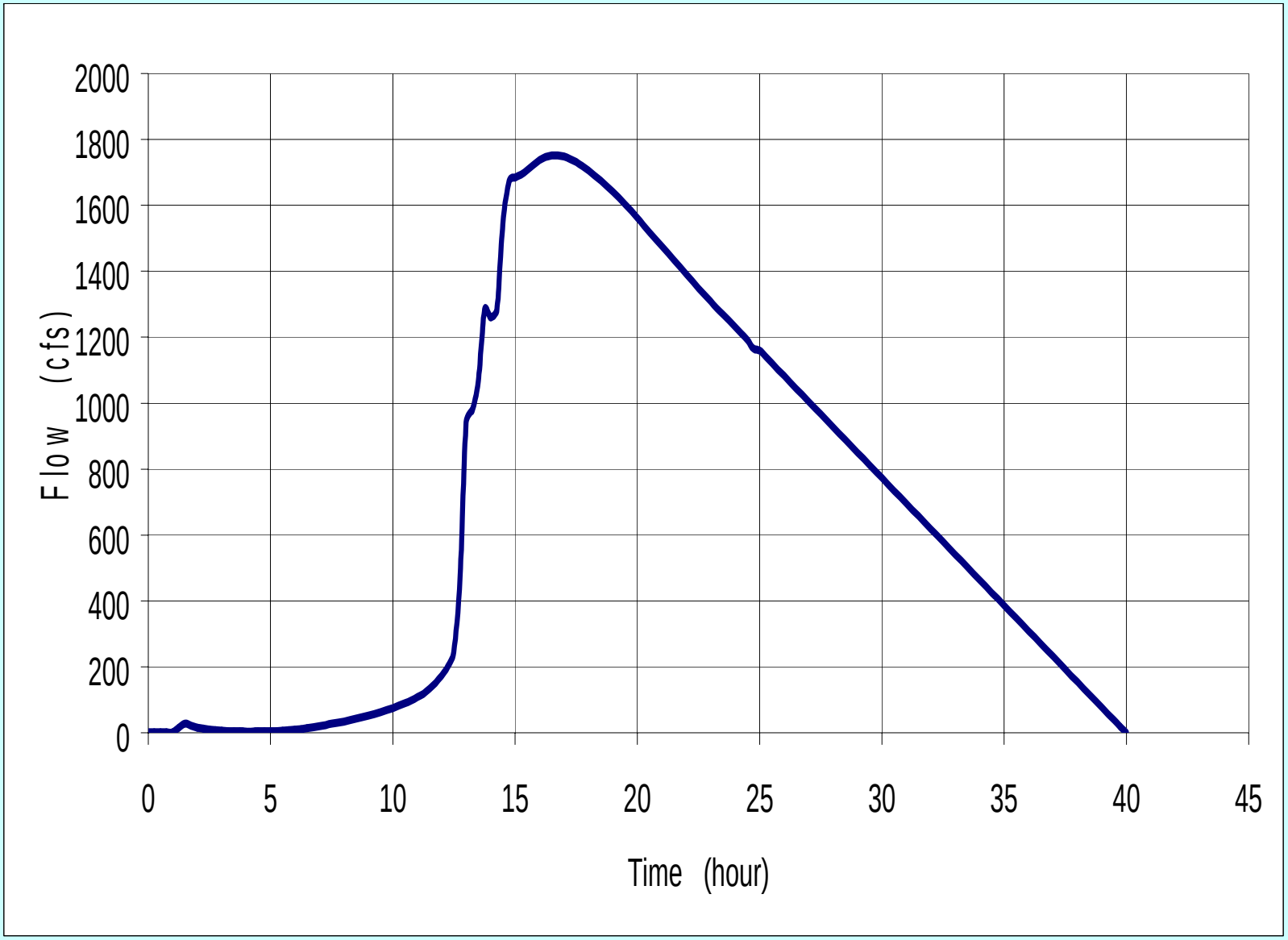


Measured and Estimated Daily Flows for the San Joaquin River

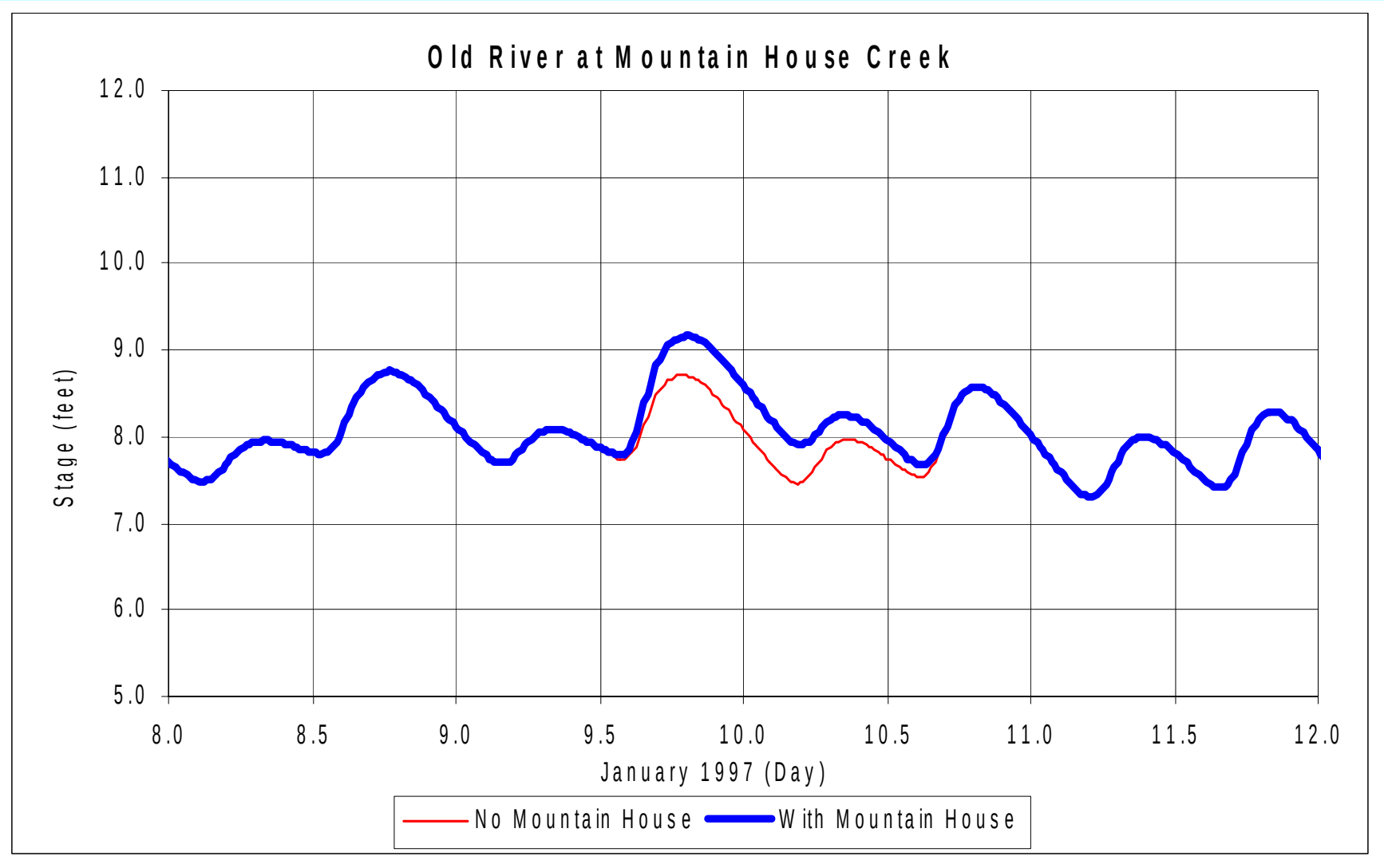

San Joaquin River at Vernalis
Stage (feet)
40
35
30
25
20
15
10
5
0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
January 1997
Historical
DSM2 Run with Measured Vernalis Inflow
DSM2 Run with Estimated Vernalis Inflow


San Joaquin River at Brandt Bridge
Stage (feet)
16
14
12
10
8
6
4
2
0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
January 1997
Historical
DSM2 Run with Measured Vernalis Inflow
DSM2 Run with Estimated Vernalis Inflow

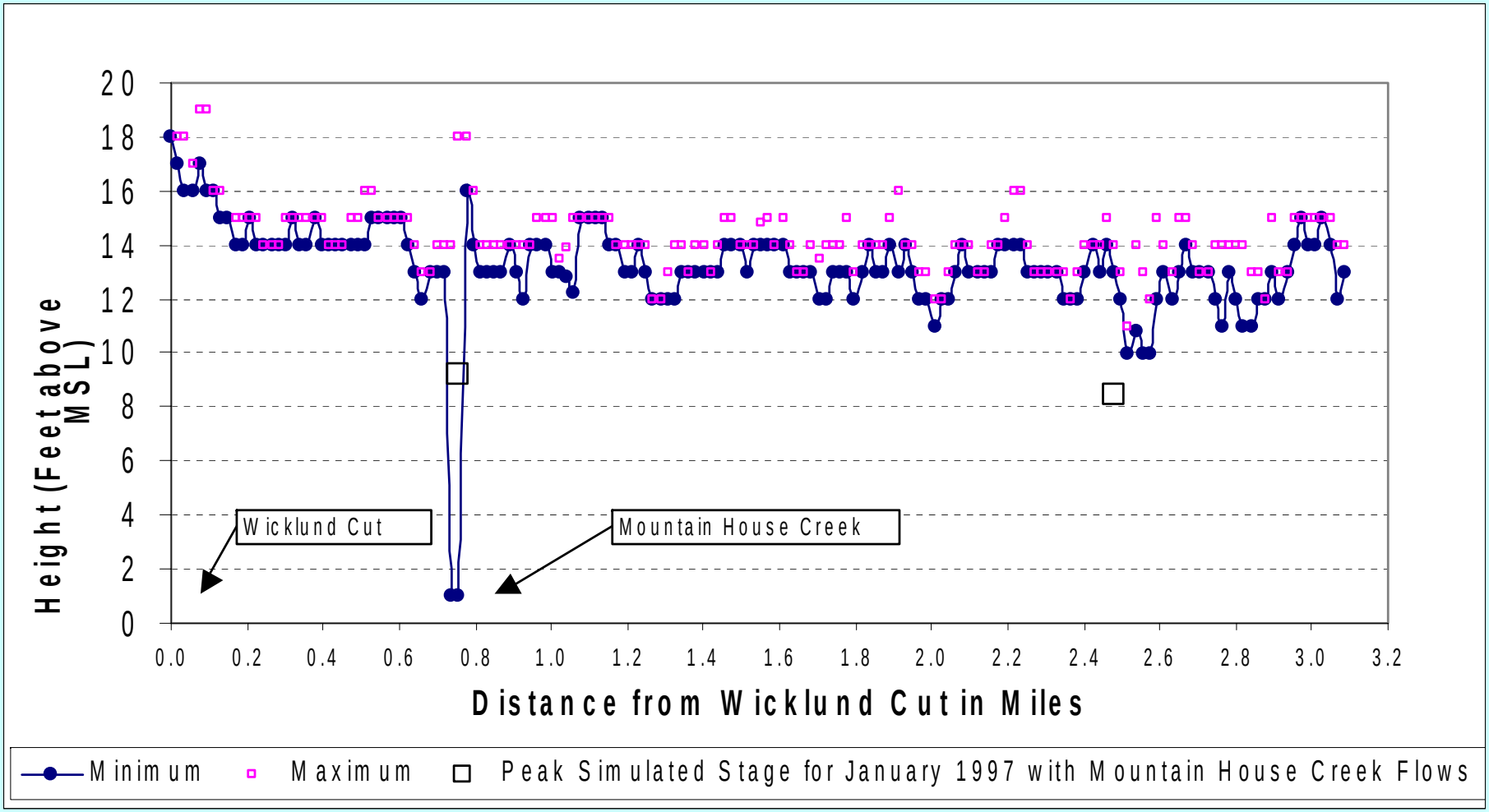

Old River above Barrier
Stage (feet)
12
10
8
6
4
2
0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
January 1997
Historical
DSM2 Run with Measured Vernalis Inflow
DSM2 Run with Estimated Vernalis Inflow



Flows in Mountain House Creek Simulated with a HEC-1 Model of a 100-Year Rainfall Event



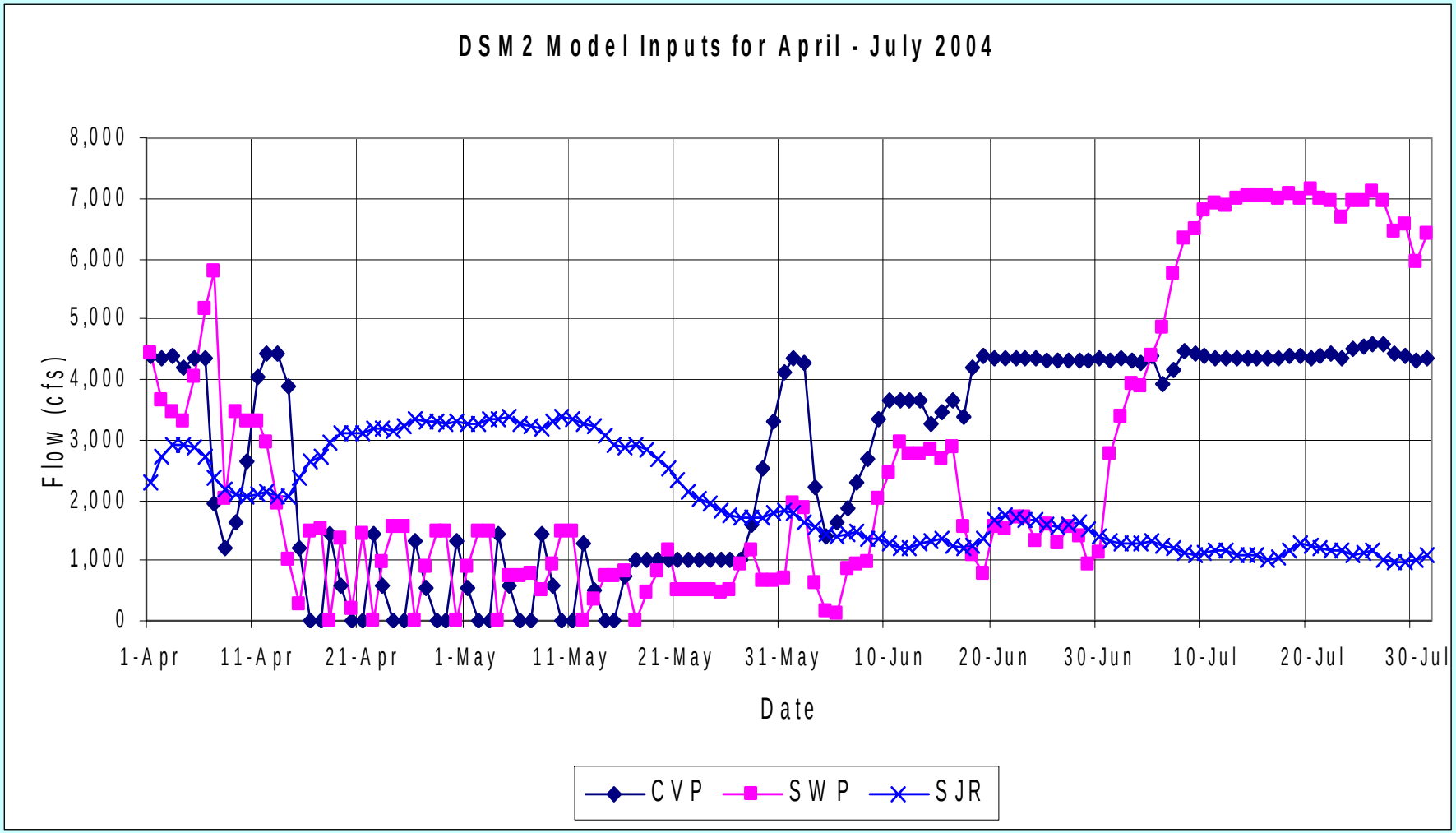
Simulated Effect of Mountain House Creek Flows on Stage in Old River at Mountain House Creek during January 1997

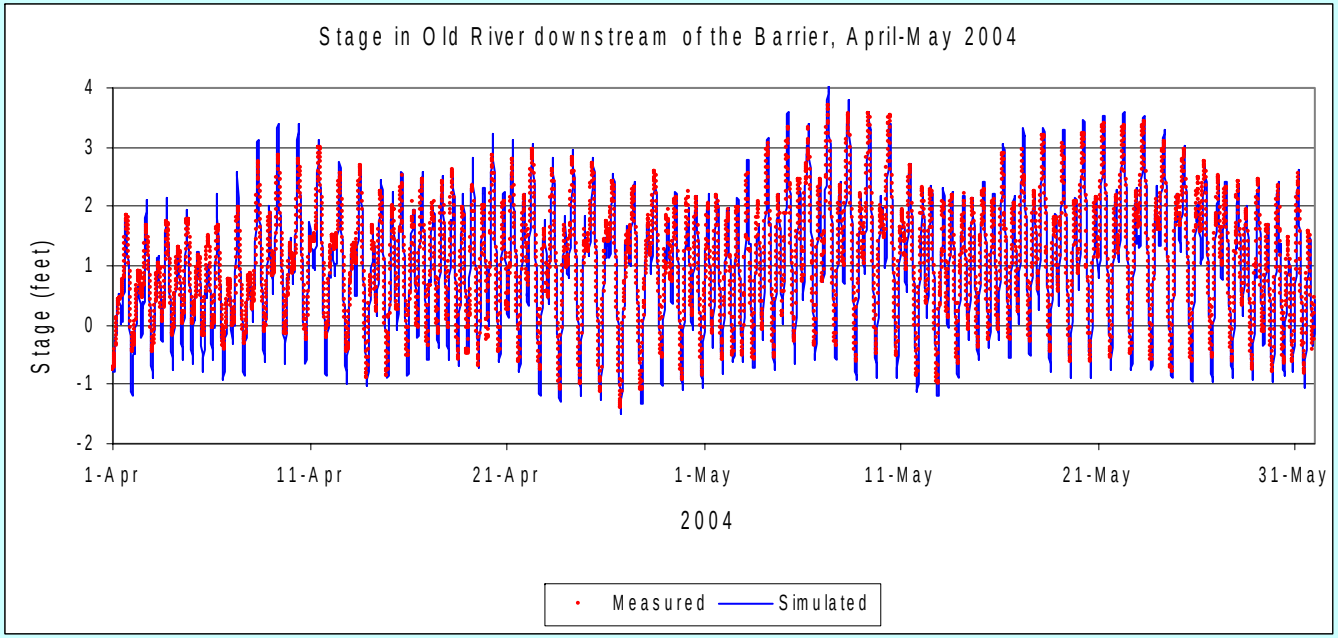


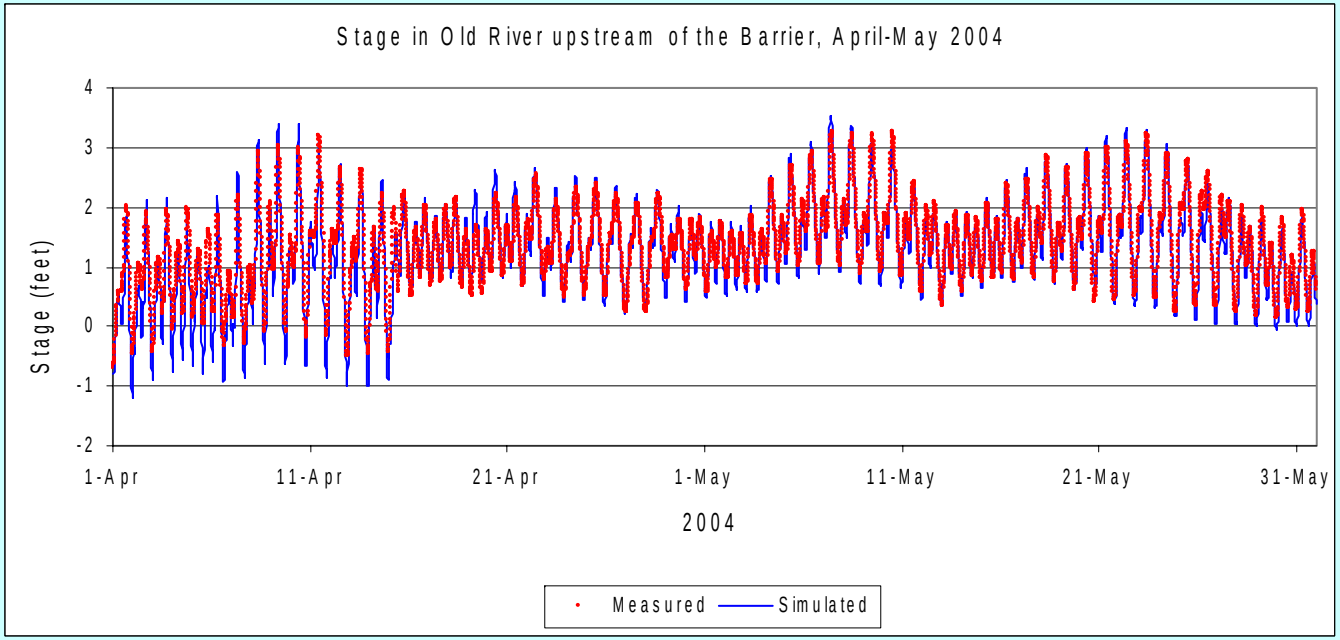
Minimum and Maximum Height of 100-Foot Sections of Levee on the South Side of Old River between Wicklund Cut and the Delta Mendota Canal

Mountain House Tidal Dilution Study

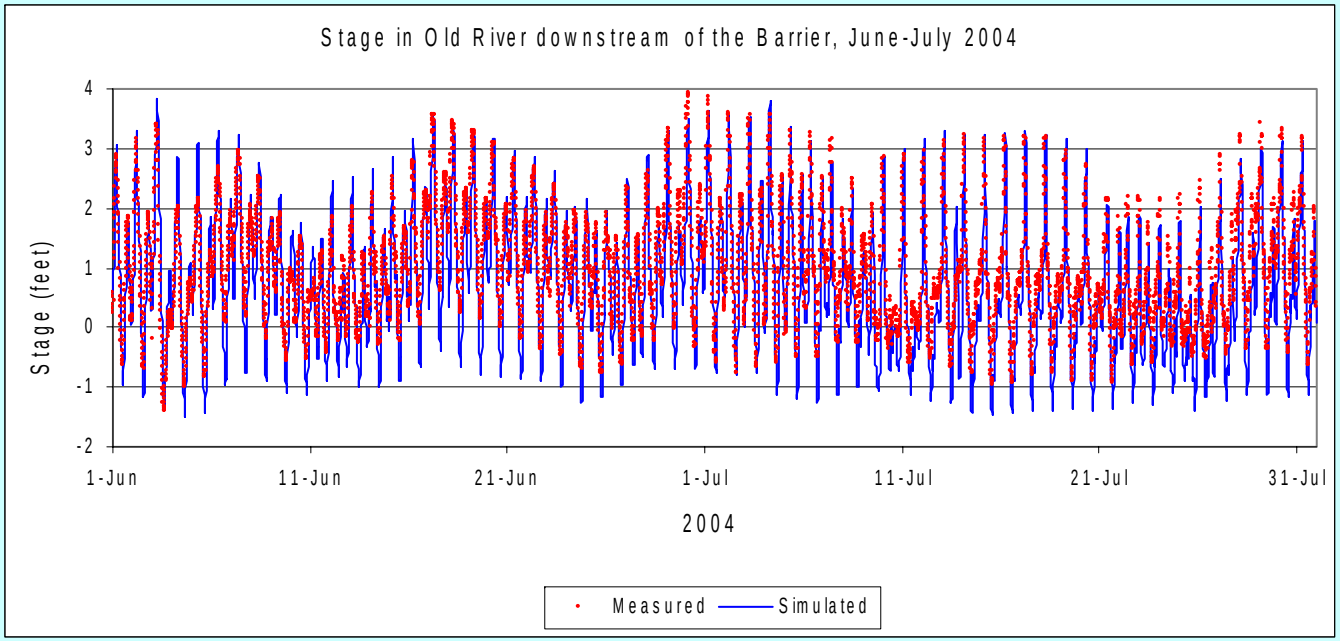
- April – July 2004 evaluation period
- May and June 2004 dye studies
- Simulated effect of 10 cfs wastewater discharge

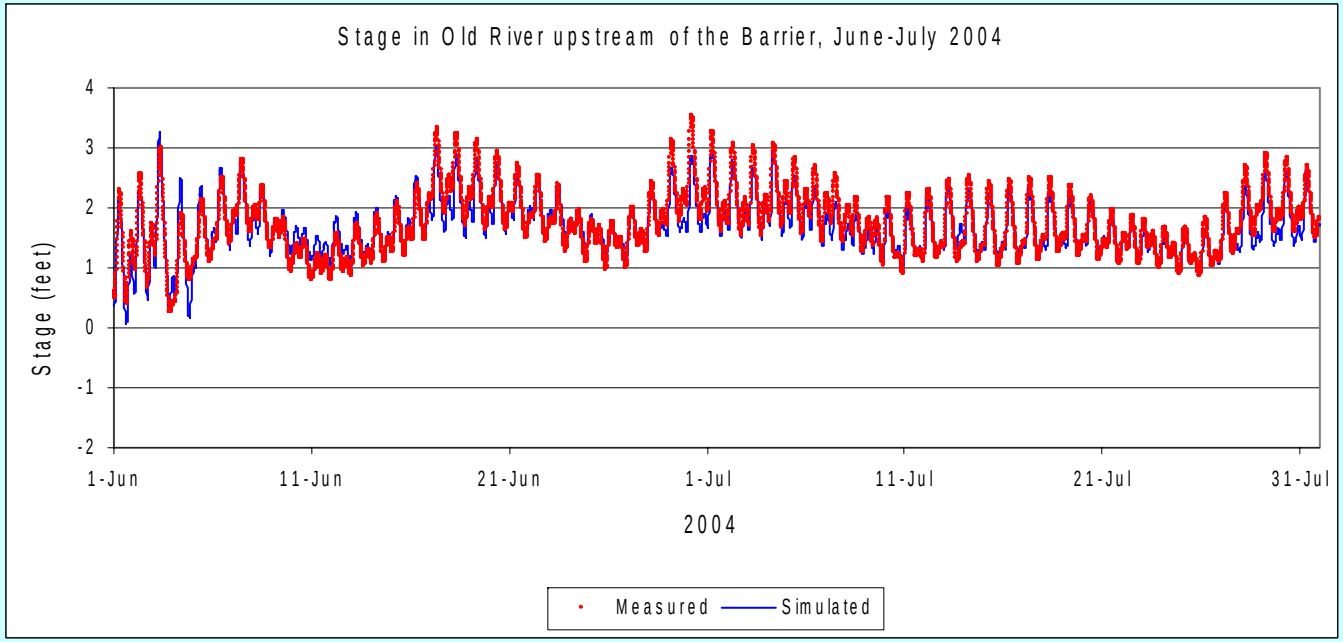

DSM2 Model Inputs for April - July 2004
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Flow (cfs)
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
Date
CVP
SWP
SJR



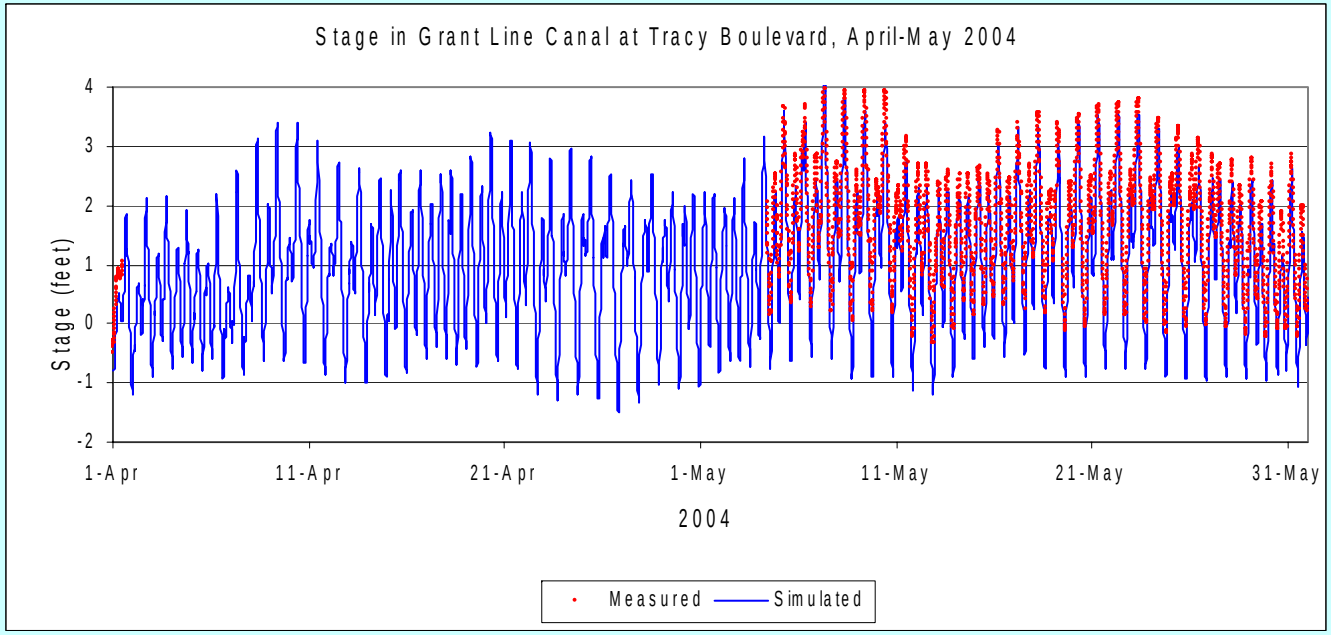


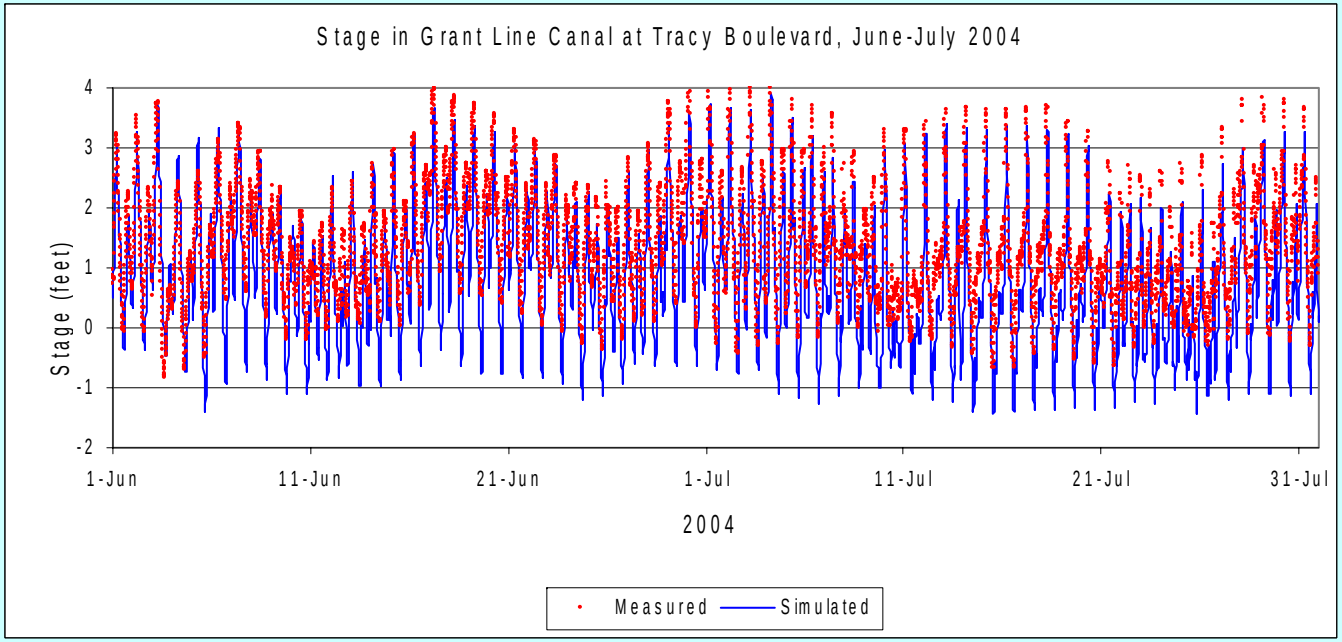
Old River barrier installed April 14



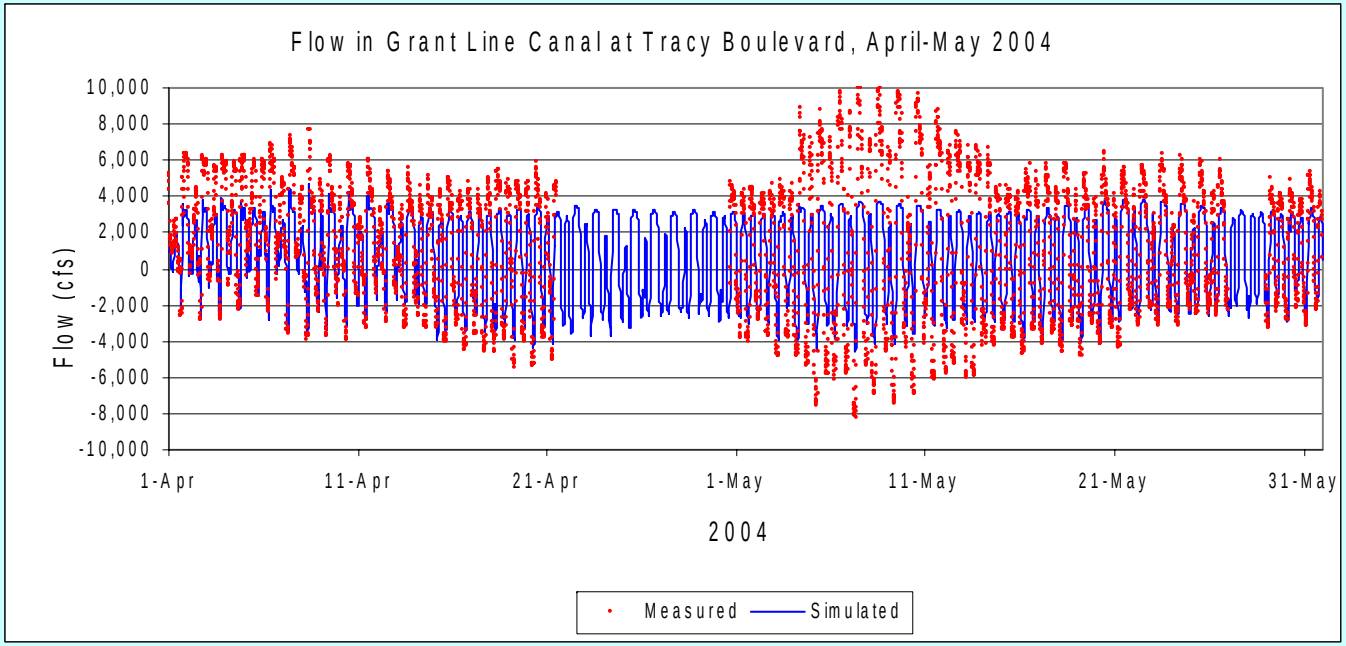


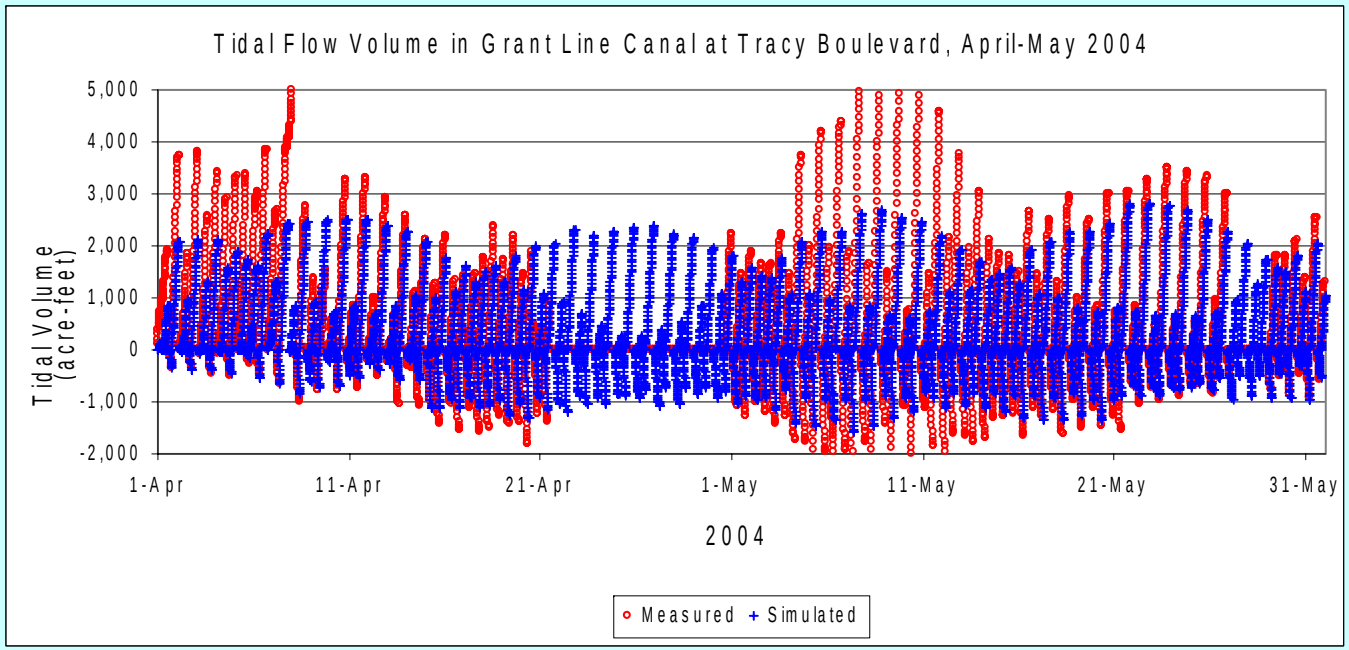
Middle notch of Grant Line Canal barrier filled June 4



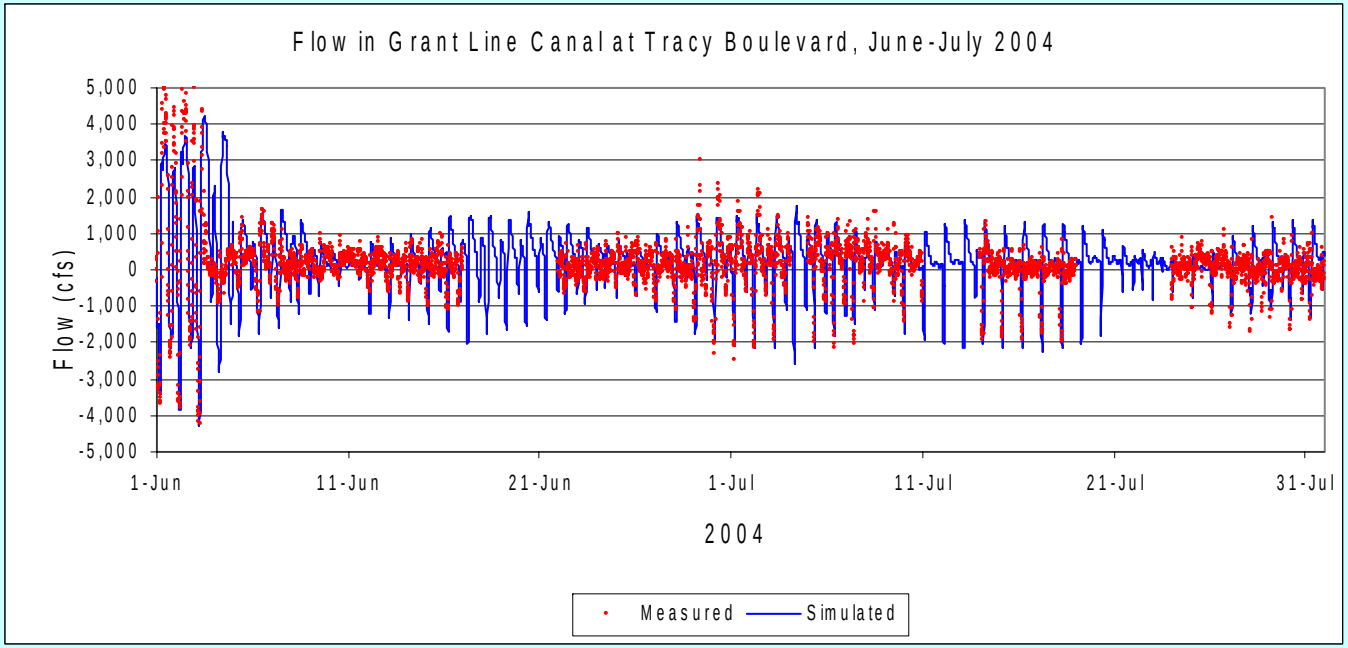


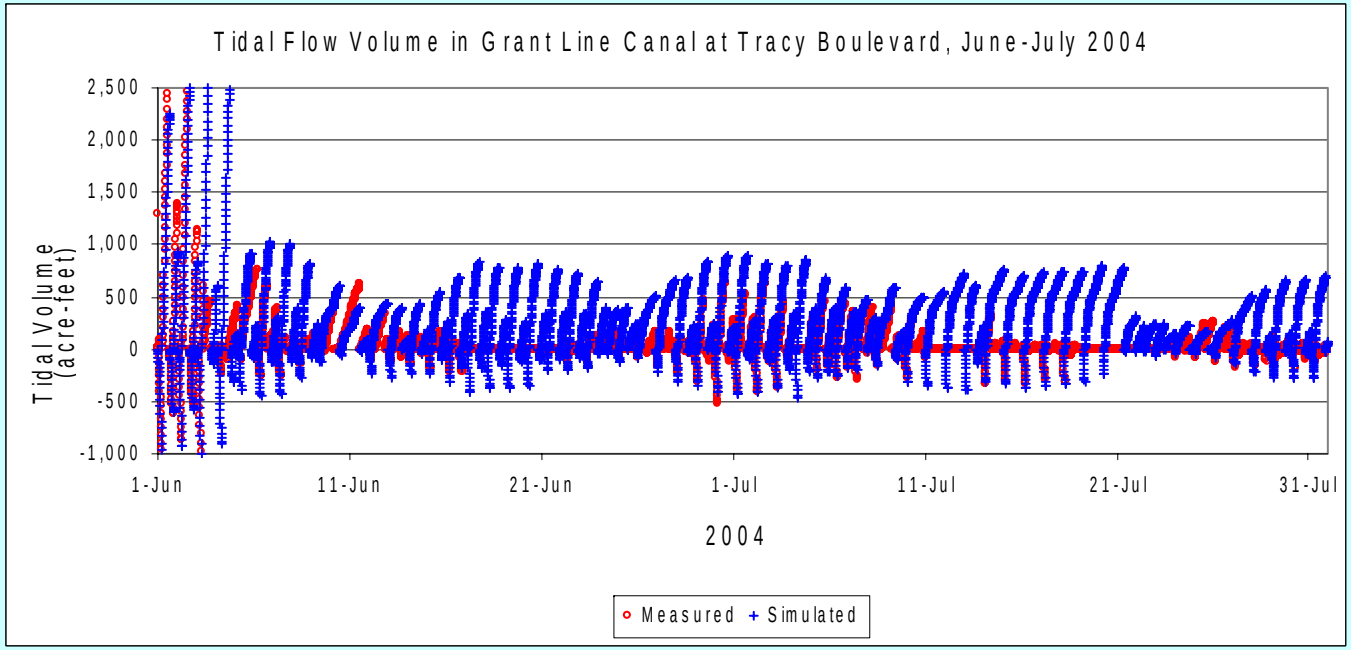
- Downstream of Grant Line Canal barrier
- No obvious effect of barrier operations

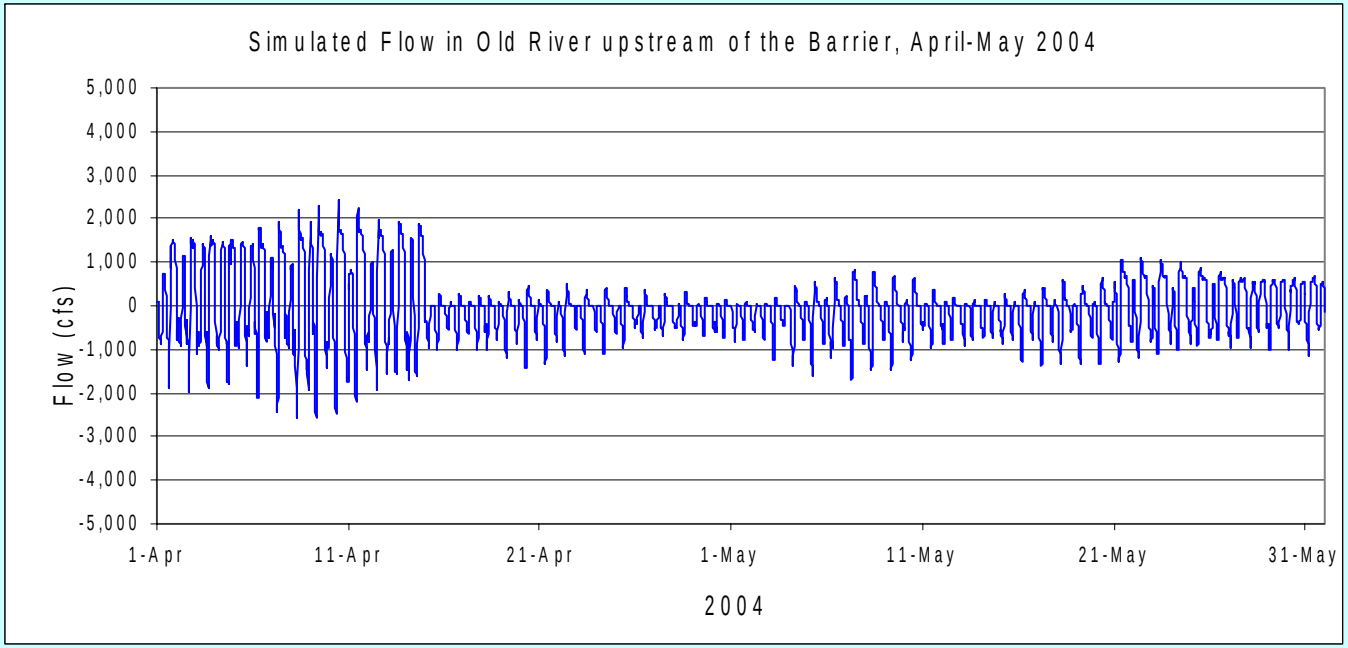


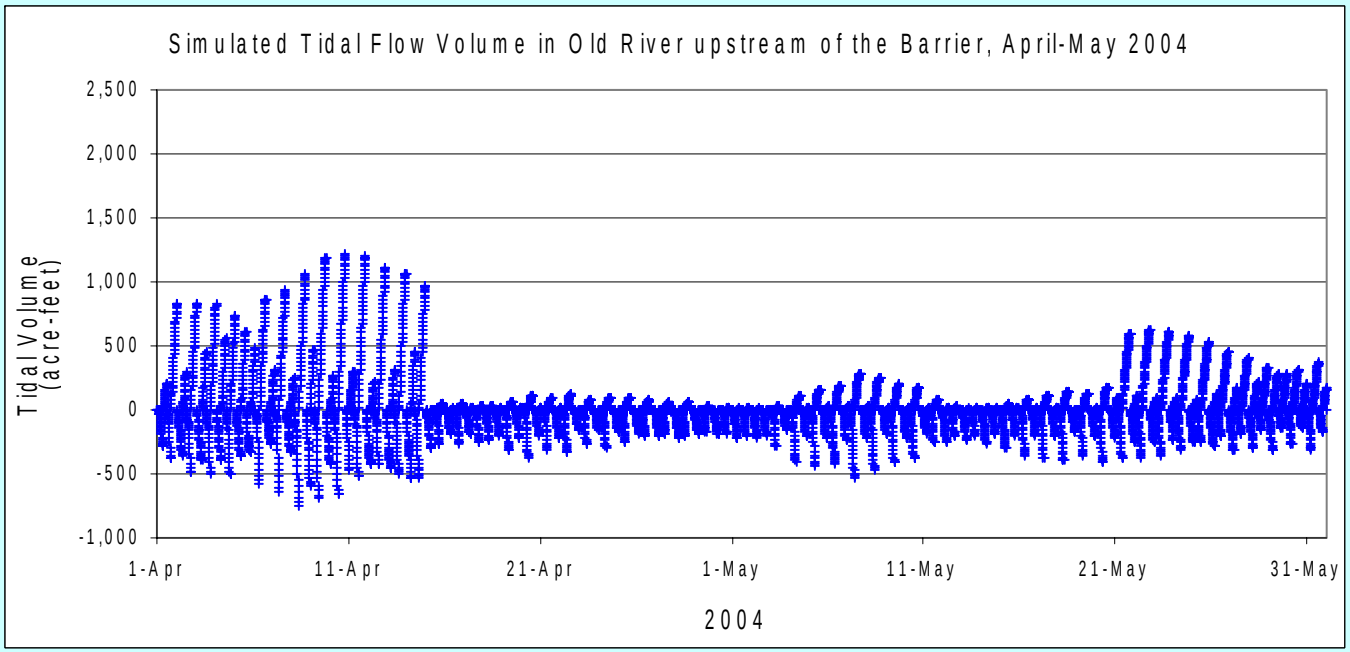


"Tidal Tracks"

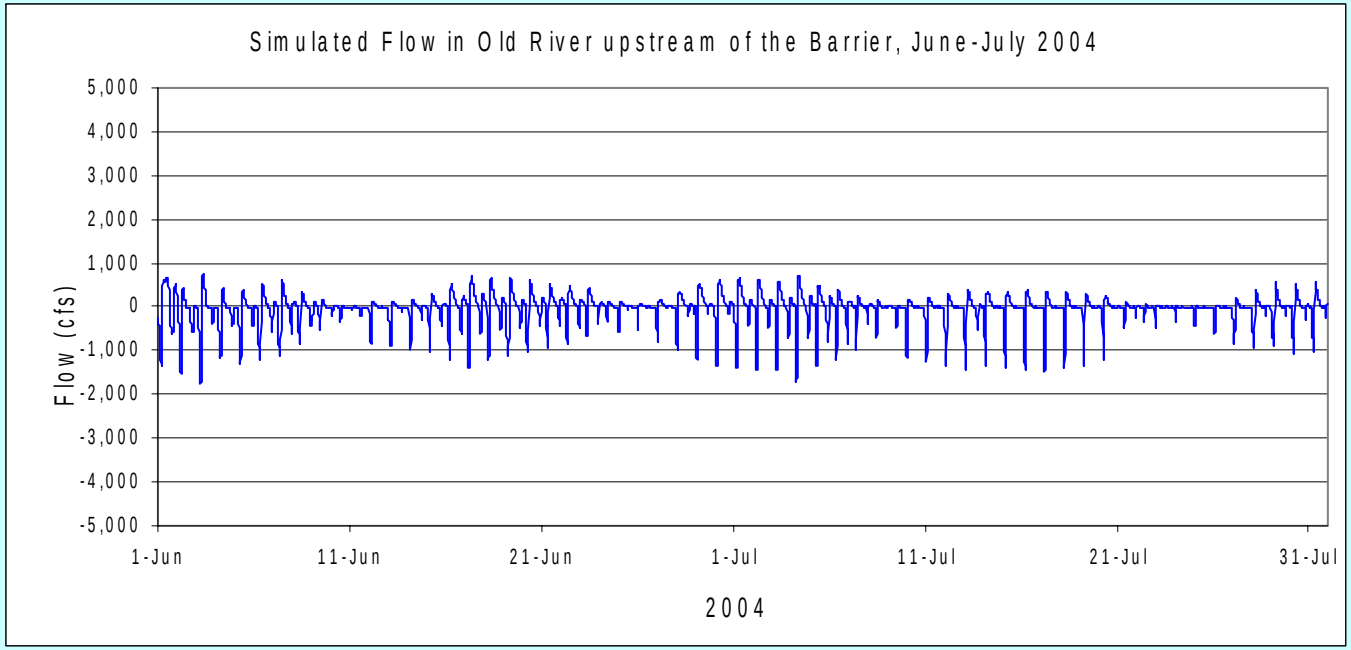

Flow in Grant Line Canal at Tracy Boulevard, June-July 2004
5,000
4,000
3,000
2,000
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
Flow (cfs)
1-Jun
11-Jun
21-Jun
1-Jul
11-Jul
21-Jul
31-Jul
2004
Measured
Simulated

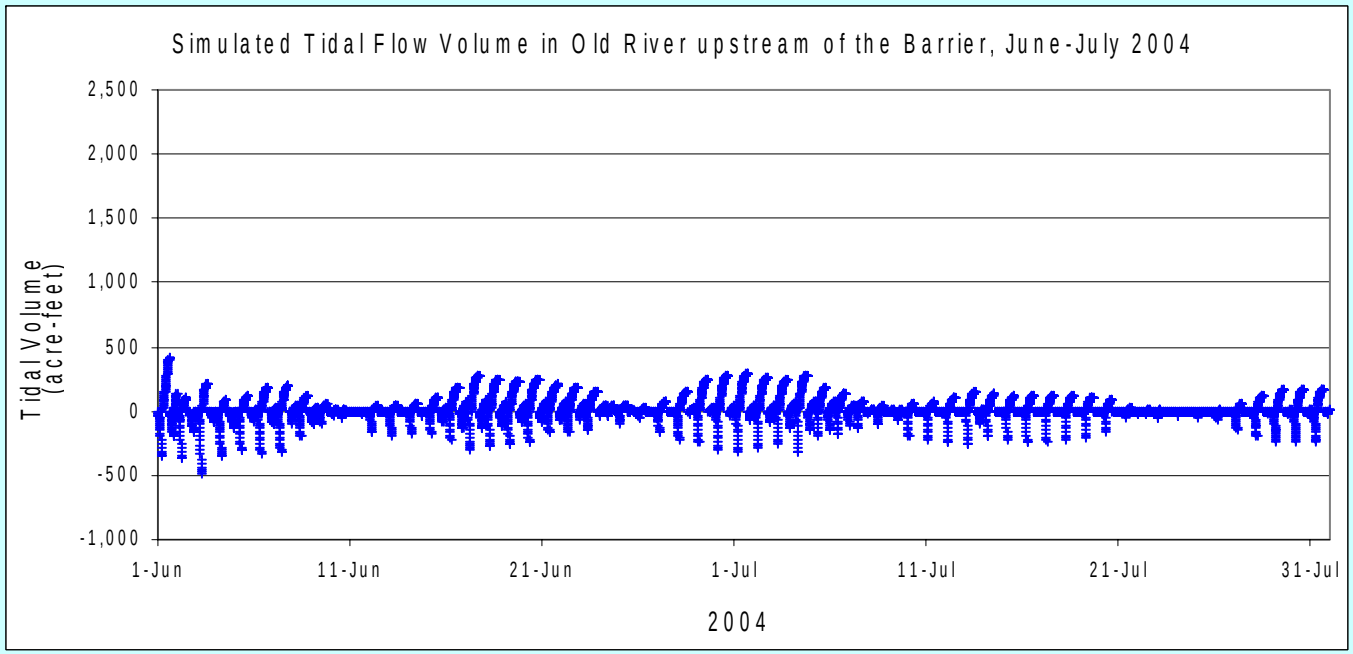

Tidal Flow Volume in Grant Line Canal at Tracy Boulevard, June-July 2004
2,500
2,000
1,500
1,000
500
0
-500
-1,000
Tidal Volume (acre-feet)
1-Jun
11-Jun
21-Jun
1-Jul
11-Jul
21-Jul
31-Jul
2004
Measured
Simulated

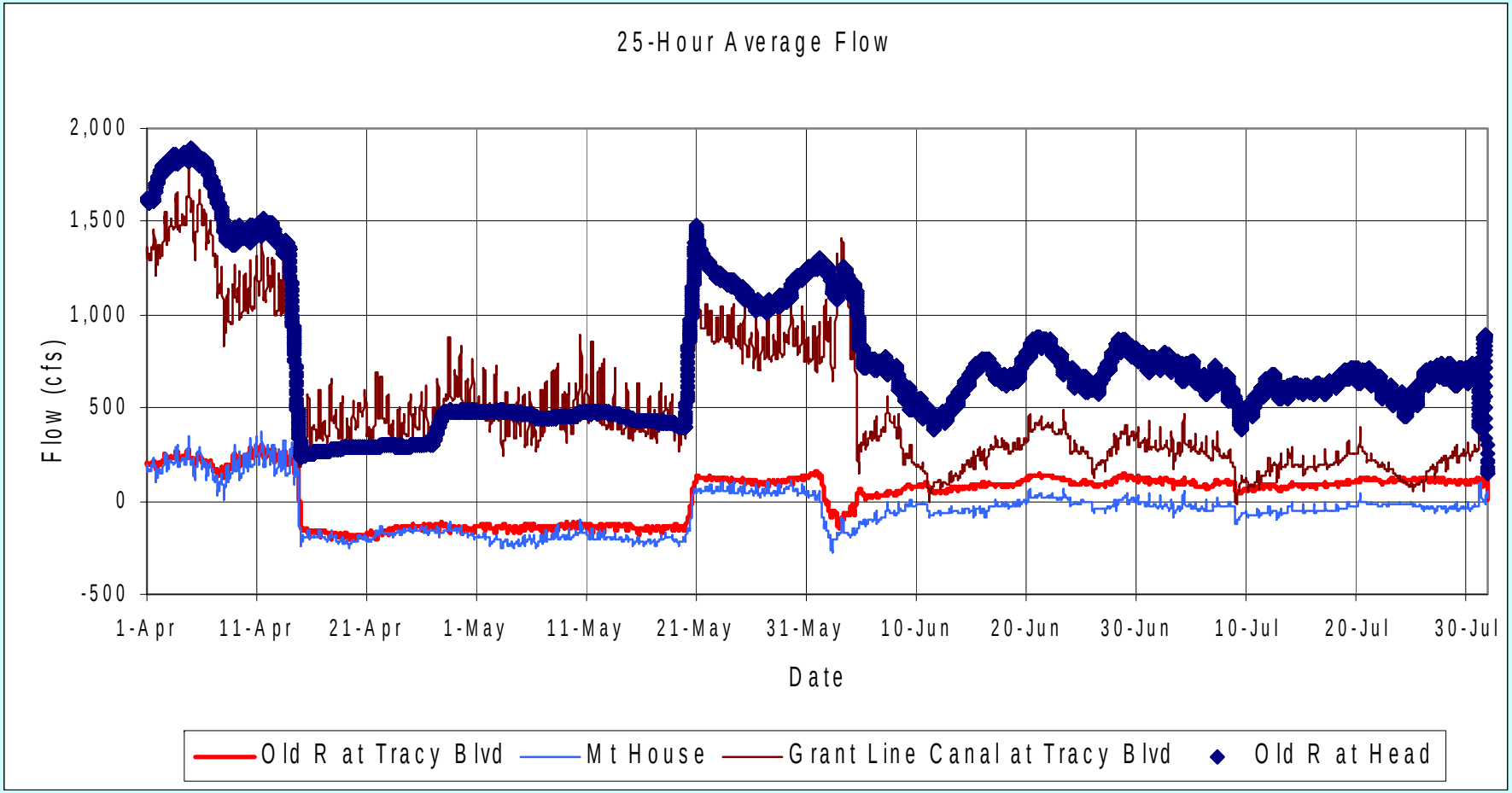




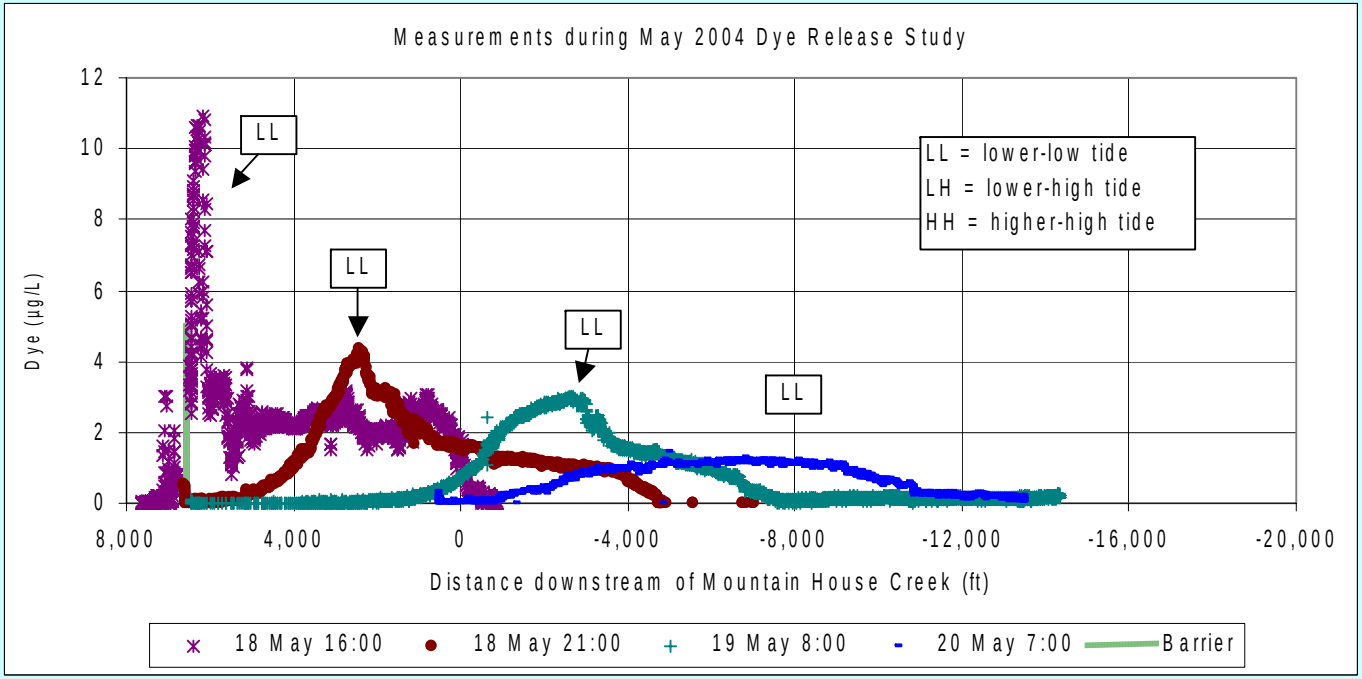
Old River has much less flow than Grant Line Canal

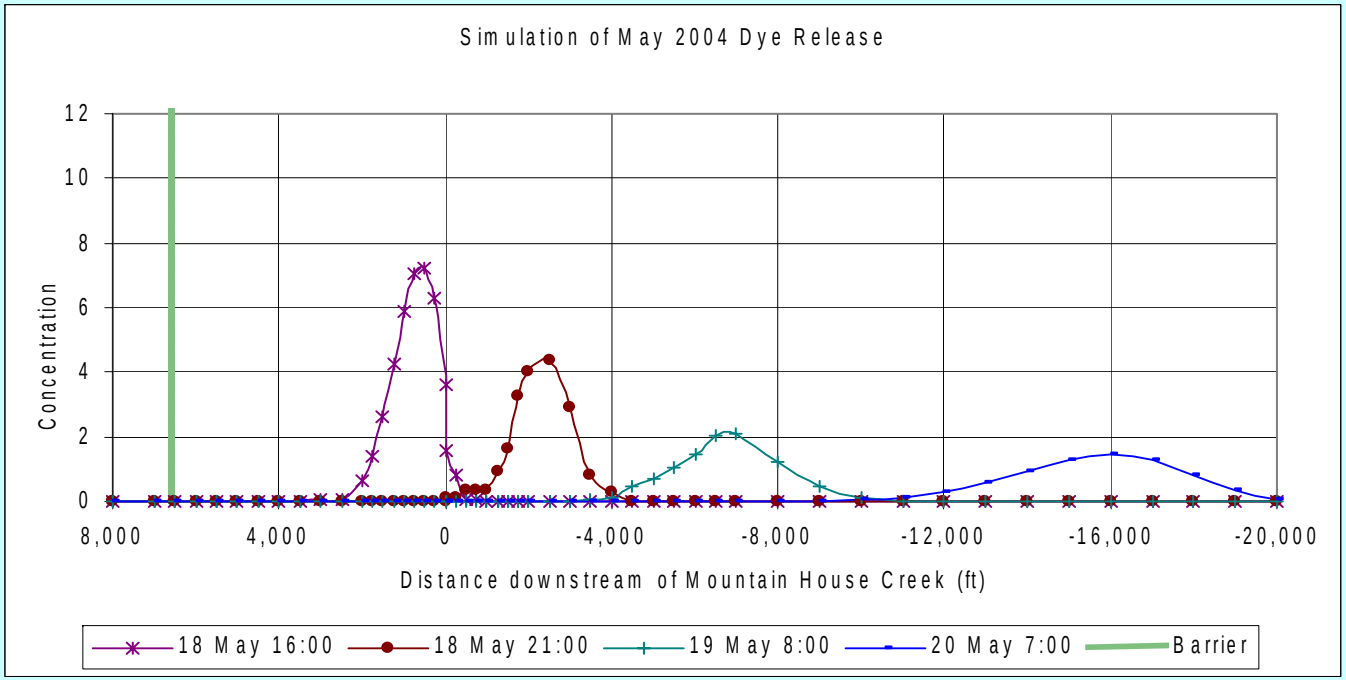

Simulated Flow in Old River upstream of the Barrier, June-July 2004
Flow (cfs)
5,000
4,000
3,000
2,000
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
1-Jun
11-Jun
21-Jun
1-Jul
11-Jul
21-Jul
31-Jul
2004

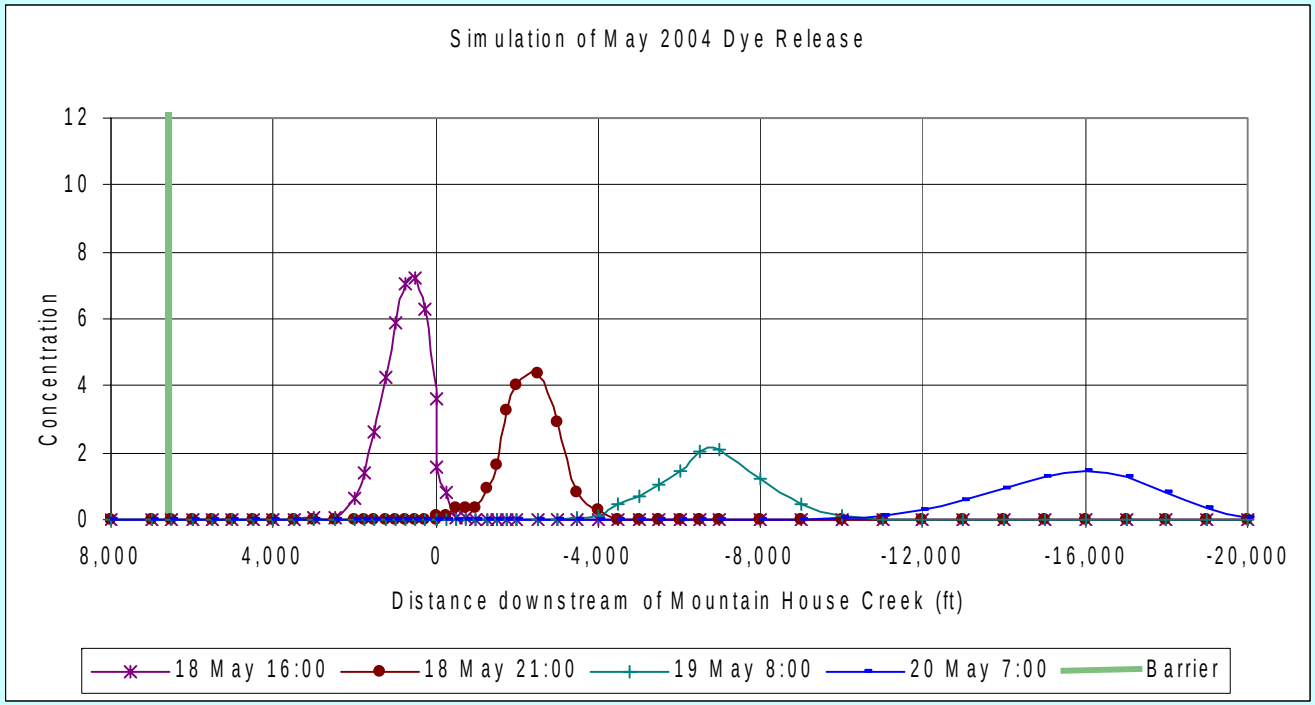

Simulated Tidal Flow Volume in Old River upstream of the Barrier, June-July 2004
Tidal Volume (acre-feet)
2,500
2,000
1,500
1,000
500
0
-500
-1,000
1-Jun
11-Jun
21-Jun
1-Jul
11-Jul
21-Jul
31-Jul
2004



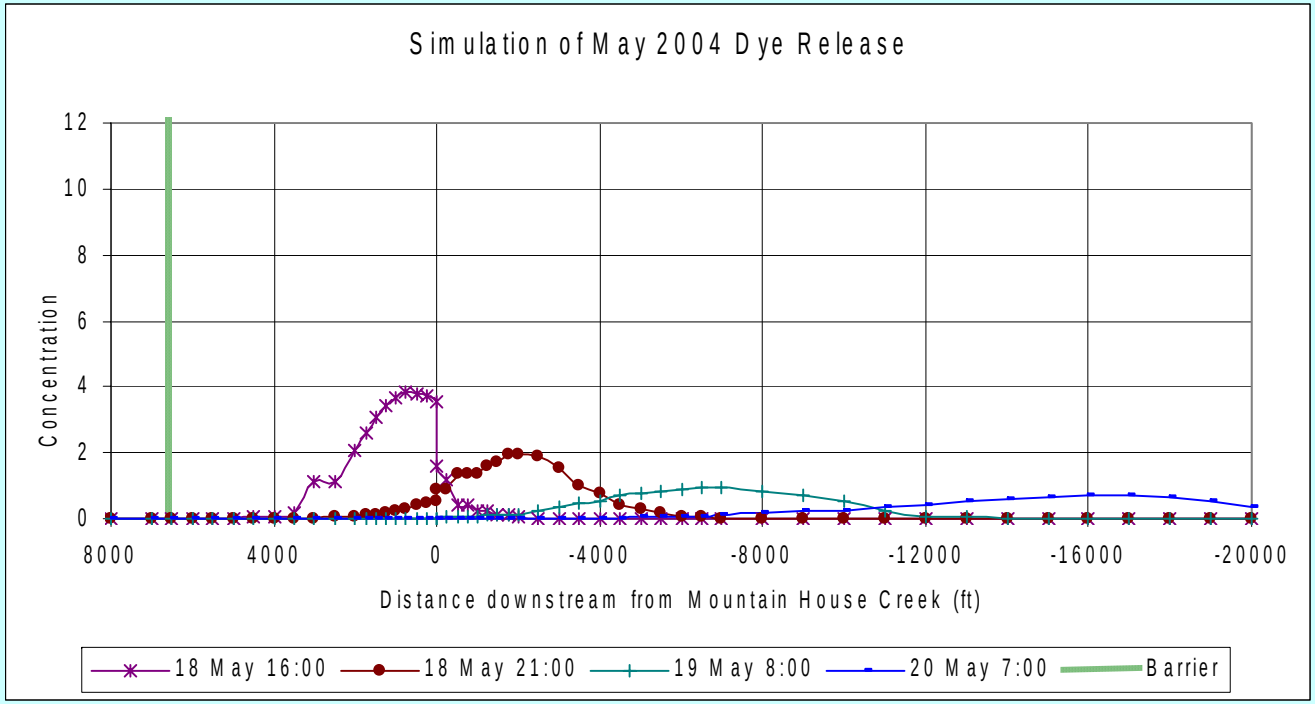
Almost no net flow in Old River near Mountain House Creek during June and July 2004


Measurements during May 2004 Dye Release Study
Dye (µg/L)
12
10
8
6
4
2
0
LL
LL
LL
LL
LL = lower-low tide
LH = lower-high tide
HH = higher-high tide
8,000
4,000
0
-4,000
-8,000
-12,000
-16,000
-20,000
Distance downstream of Mountain House Creek (ft)
18 May 16:00
18 May 21:00
19 May 8:00
20 May 7:00
Barrier

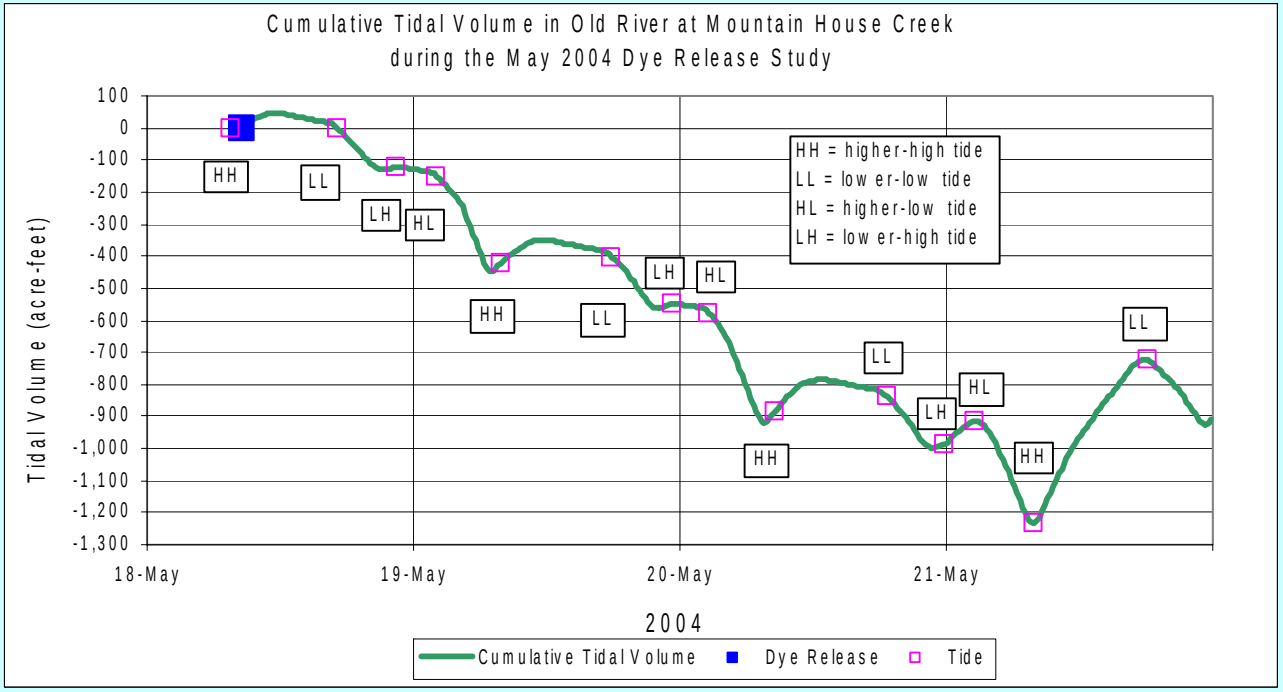

Simulation of May 2004 Dye Release
Concentration
12
10
8
6
4
2
0
8,000
4,000
0
-4,000
-8,000
-12,000
-16,000
-20,000
Distance downstream of Mountain House Creek (ft)
18 May 16:00
18 May 21:00
19 May 8:00
20 May 7:00
Barrier

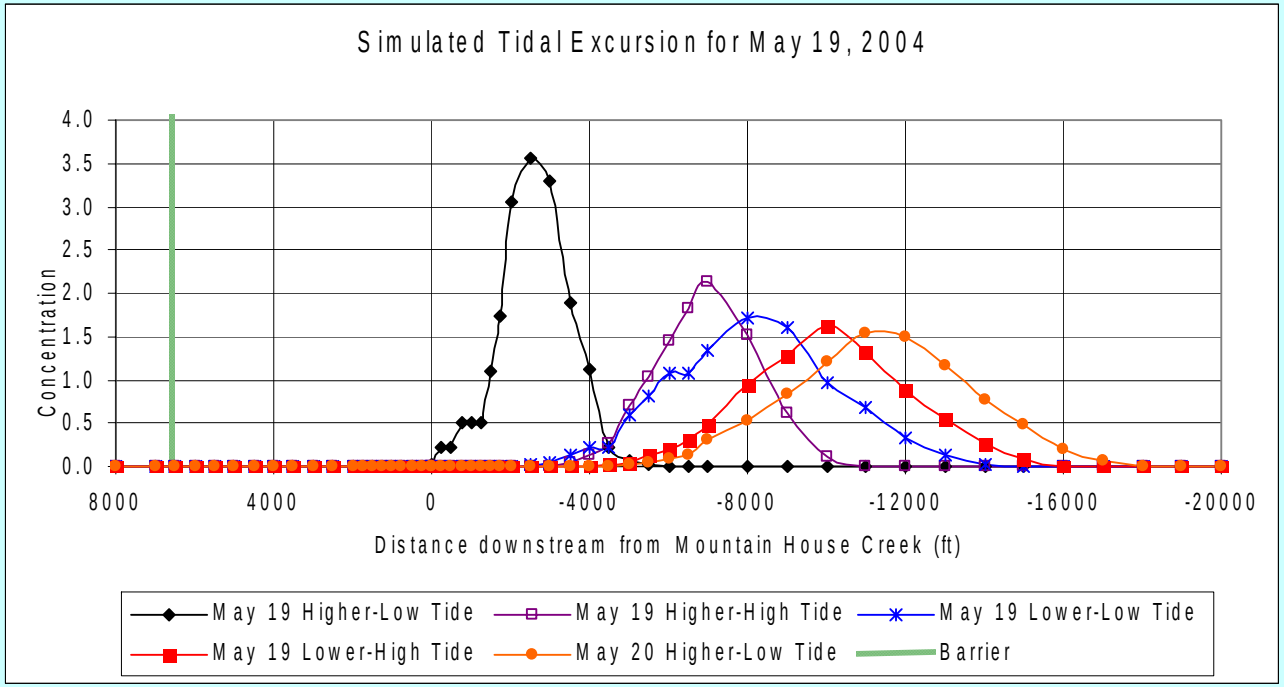


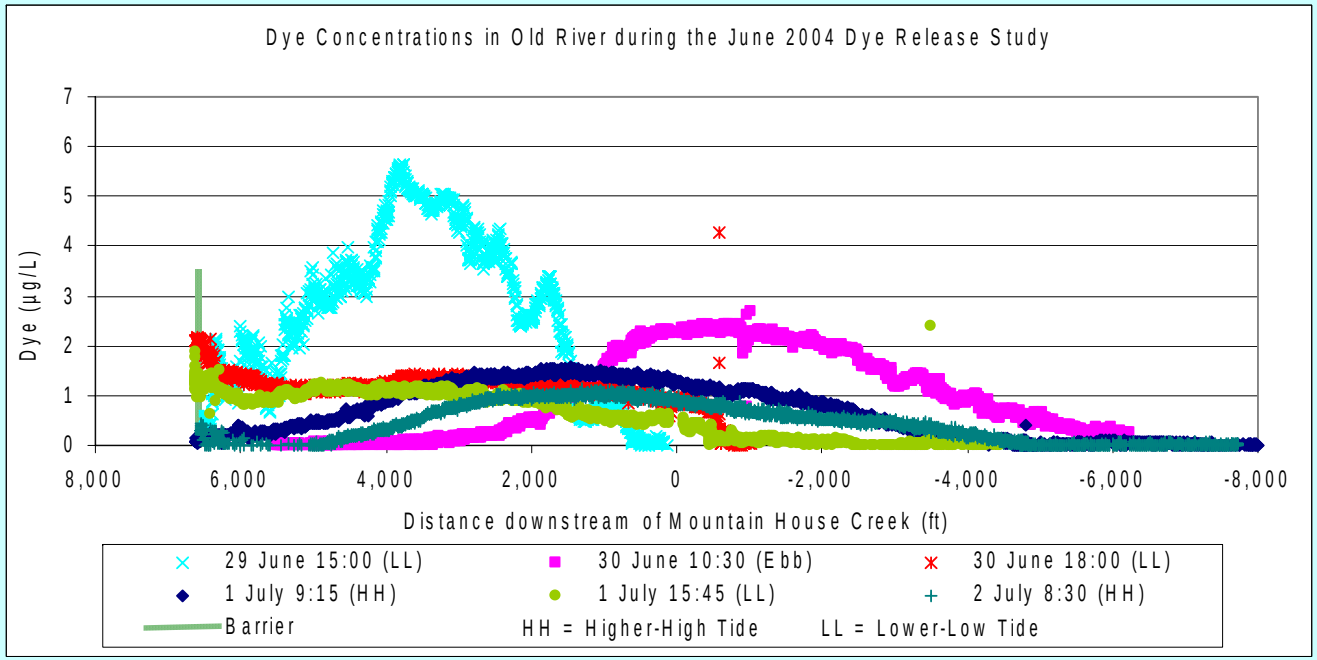
Dispersion Coefficient = 0.3

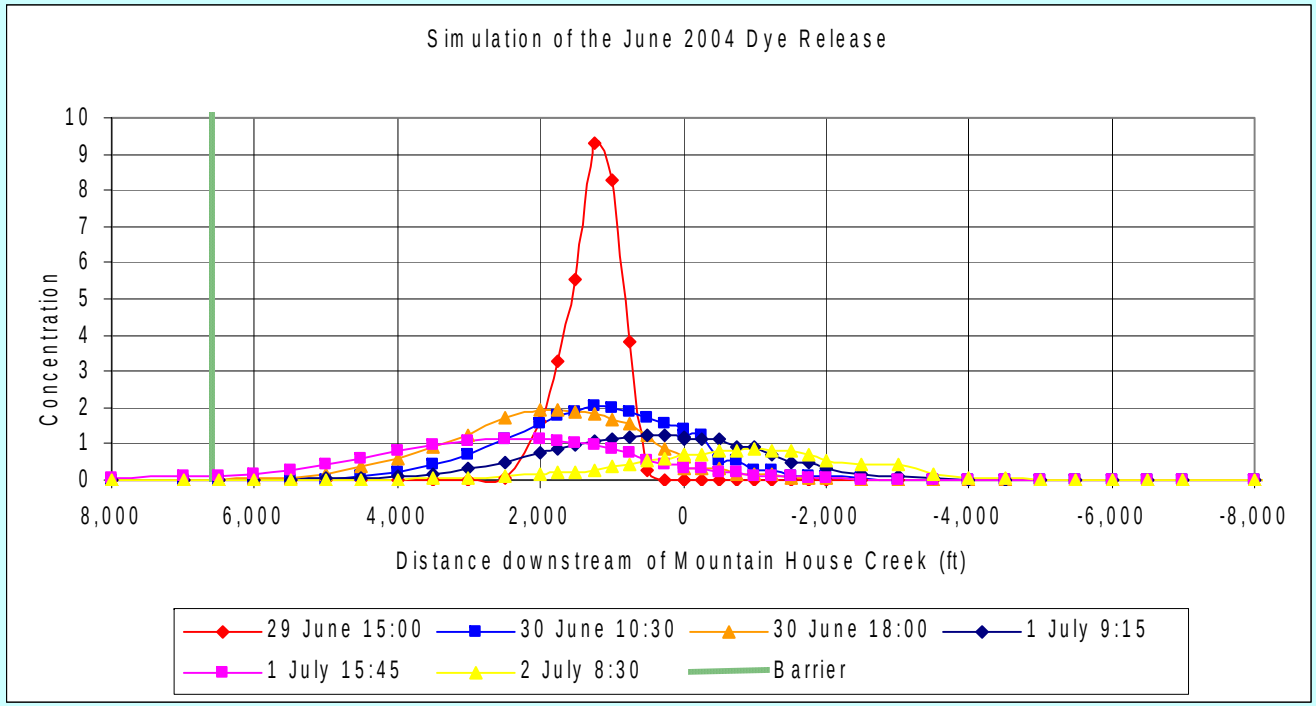


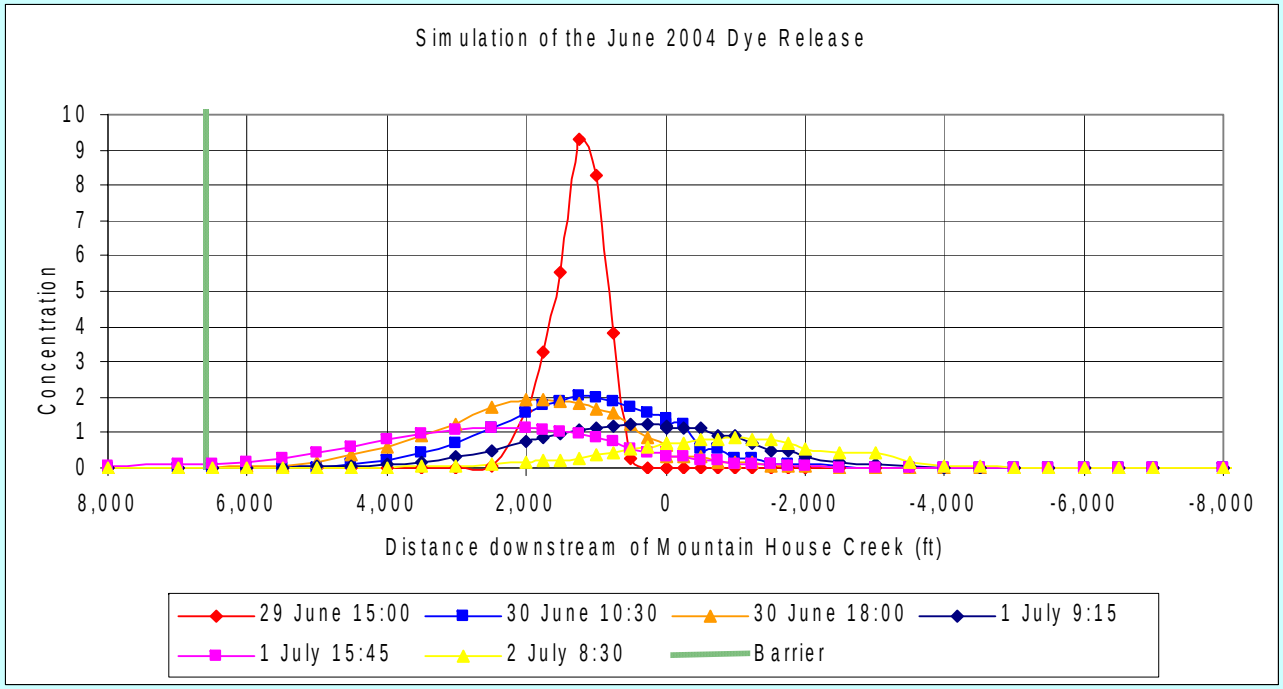
Dispersion Coefficient = 1.5


Cumulative Tidal Volume in Old River at Mountain House Creek
during the May 2004 Dye Release Study
Tidal Volume (acre-feet)
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
-1,000
-1,100
-1,200
-1,300
18-May
19-May
20-May
21-May
2004
HH = higher-high tide
LL = lower-low tide
HL = higher-low tide
LH = lower-high tide
HH
LL
LH
HL
HH
LL
LH
HL
HH
LL
LH
HL
HH
LL
Cumulative Tidal Volume
Dye Release
Tide

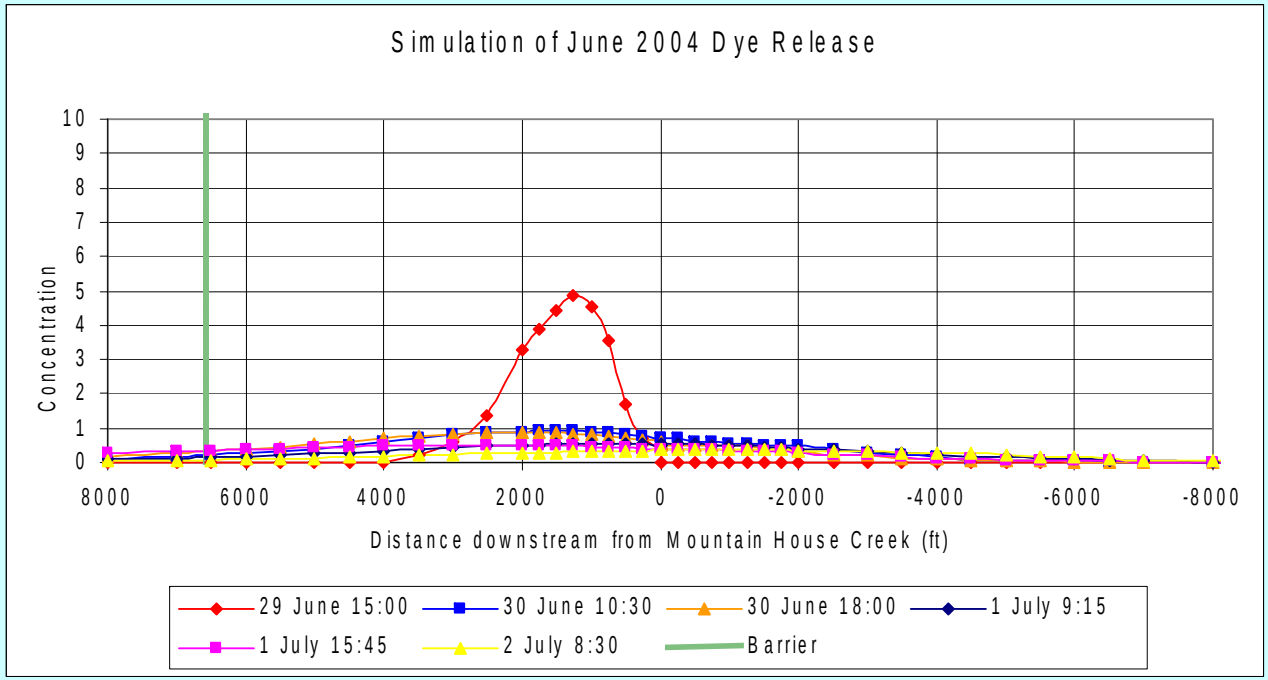

Simulated Tidal Excursion for May 19, 2004
Concentration
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
8000
4000
0
-4000
-8000
-12000
-16000
-20000
Distance downstream from Mountain House Creek (ft)
May 19 Higher-Low Tide
May 19 Higher-High Tide
May 19 Lower-Low Tide
May 19 Lower-High Tide
May 20 Higher-Low Tide
Barrier


Dye Concentrations in Old River during the June 2004 Dye Release Study
Dye (µg/L)
7
6
5
4
3
2
1
0
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
Distance downstream of Mountain House Creek (ft)
29 June 15:00 (LL)
30 June 10:30 (Ebb)
30 June 18:00 (LL)
1 July 9:15 (HH)
1 July 15:45 (LL)
2 July 8:30 (HH)
Barrier
HH = Higher-High Tide
LL = Lower-Low Tide

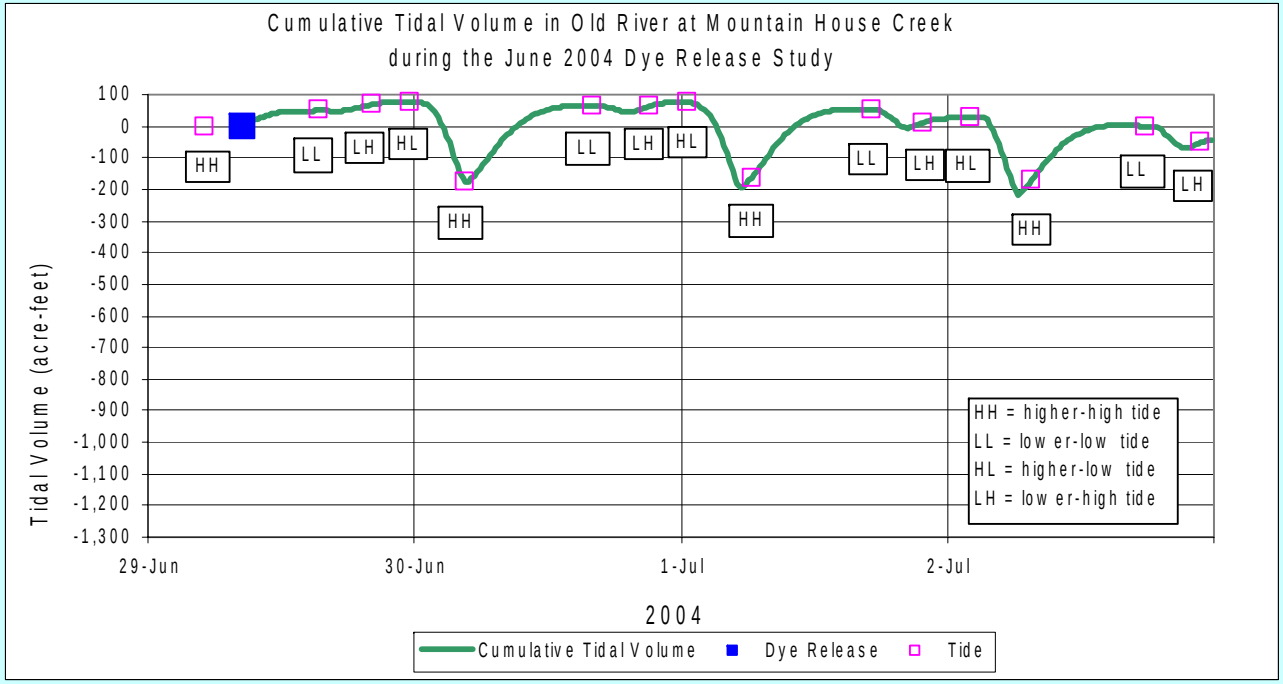

Simulation of the June 2004 Dye Release
Concentration
10
9
8
7
6
5
4
3
2
1
0
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
Distance downstream of Mountain House Creek (ft)
29 June 15:00
30 June 10:30
30 June 18:00
1 July 9:15
1 July 15:45
2 July 8:30
Barrier

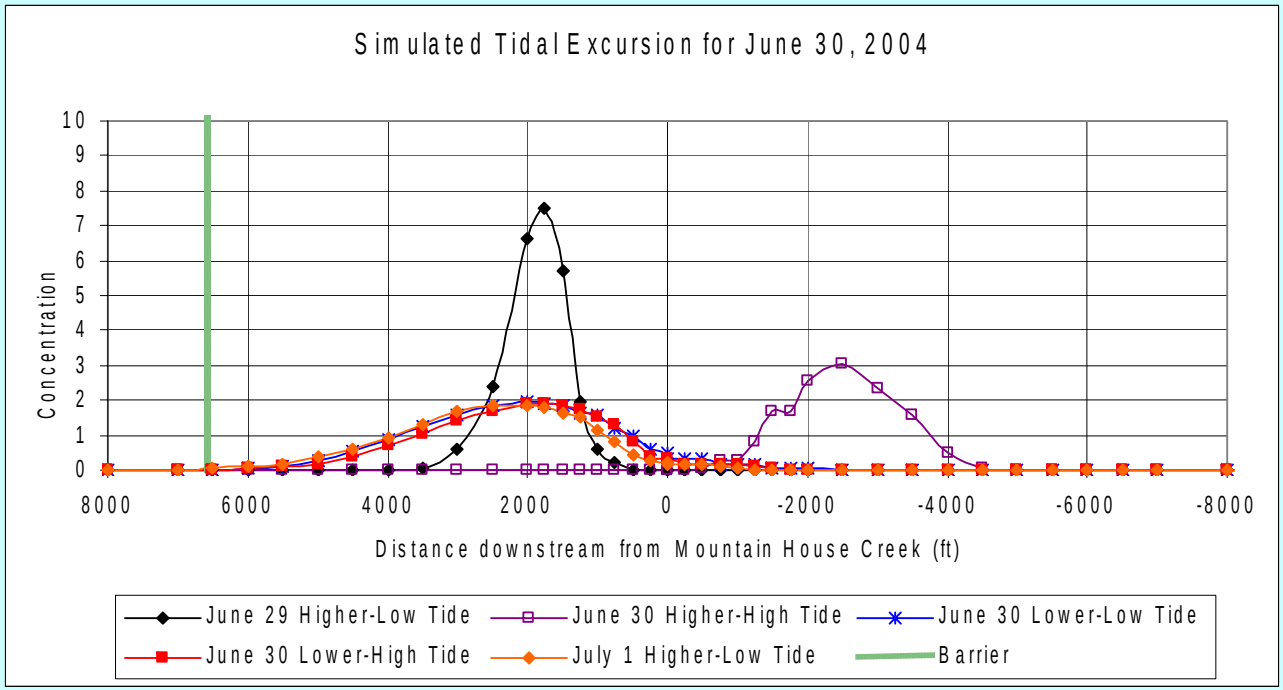


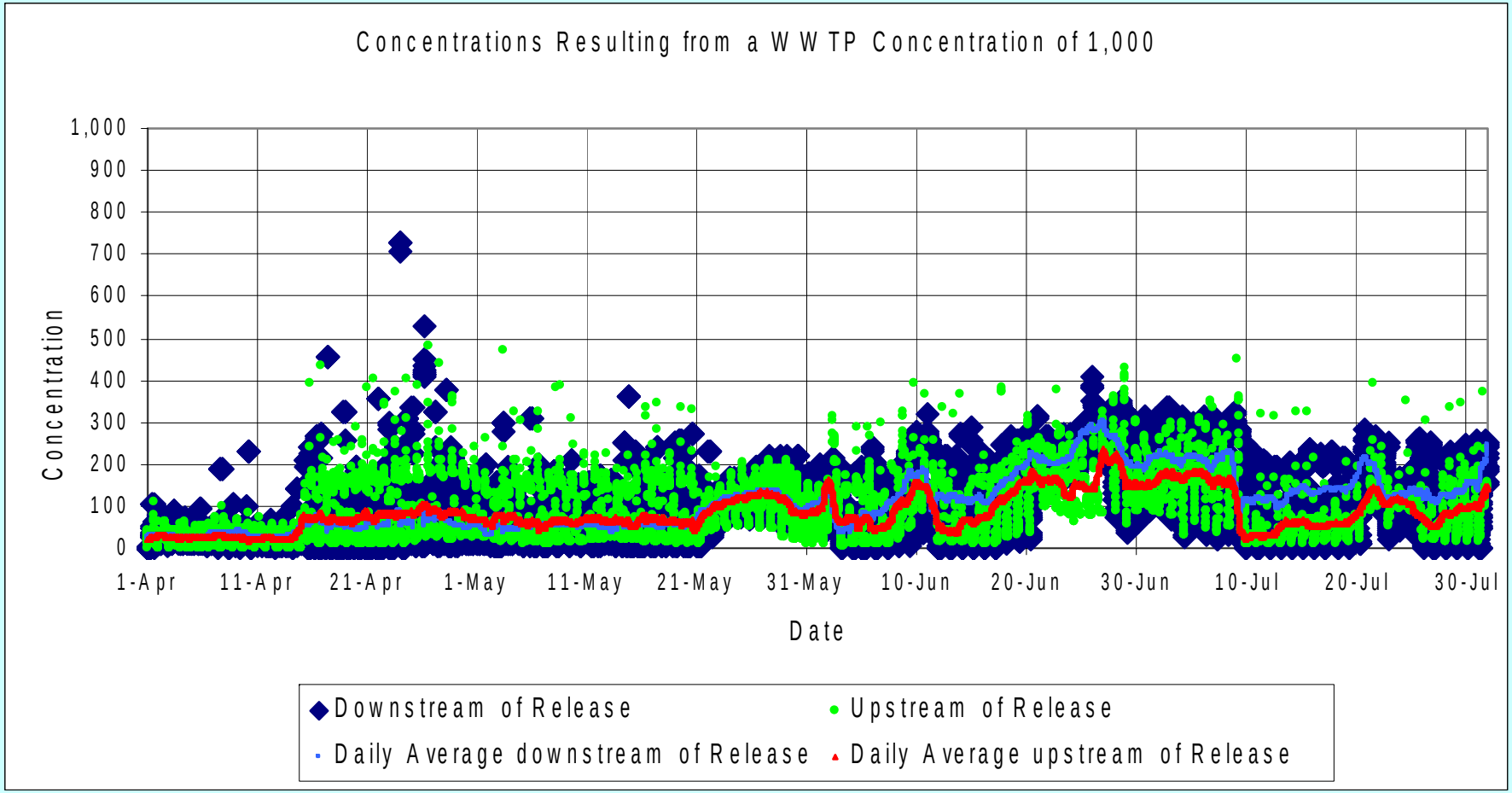
Dispersion Coefficient = 0.3

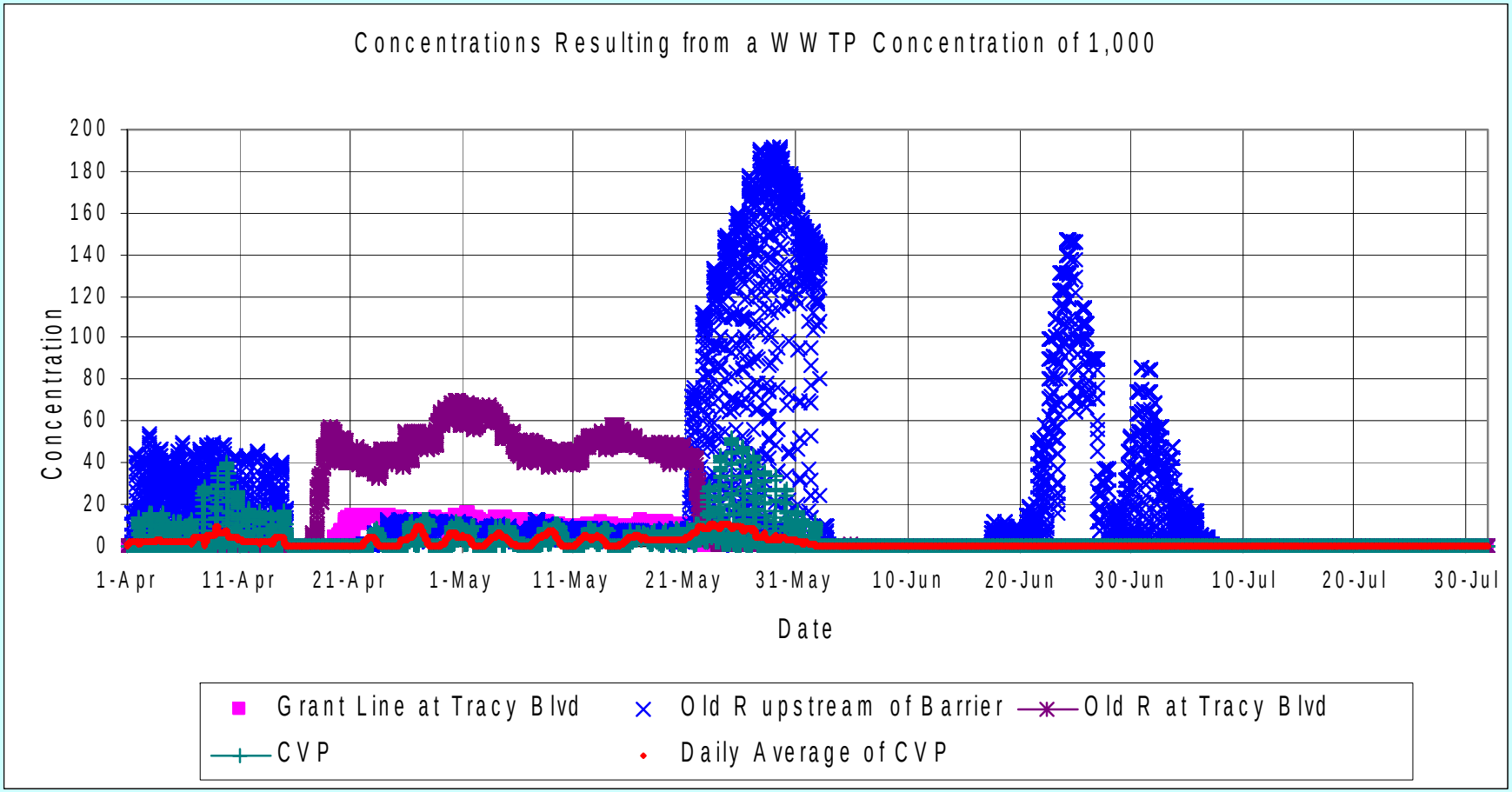


Dispersion Coefficient = 1.5


Cumulative Tidal Volume in Old River at Mountain House Creek
during the June 2004 Dye Release Study
Tidal Volume (acre-feet)
100
0
-100
-200
-300
-400
-500
-600
-700
-800
-900
-1,000
-1,100
-1,200
-1,300
29-Jun
30-Jun
1-Jul
2-Jul
2004
HH
LL
LH
HL
HH = higher-high tide
LL = lower-low tide
HL = higher-low tide
LH = lower-high tide
Cumulative Tidal Volume
Dye Release
Tide


Simulated Tidal Excursion for June 30, 2004
Concentration
10
9
8
7
6
5
4
3
2
1
0
8000
6000
4000
2000
0
-2000
-4000
-6000
-8000
Distance downstream from Mountain House Creek (ft)
June 29 Higher-Low Tide
June 30 Higher-High Tide
June 30 Lower-Low Tide
June 30 Lower-High Tide
July 1 Higher-Low Tide
Barrier


Concentrations Resulting from a WWTP Concentration of 1,000
1,000
900
800
700
600
500
400
300
200
100
0
Concentration
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
Date
Downstream of Release
Upstream of Release
Daily Average downstream of Release
Daily Average upstream of Release


Concentrations Resulting from a WWTP Concentration of 1,000
Concentration
200
180
160
140
120
100
80
60
40
20
0
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
Date
Grant Line at Tracy Blvd
Old R upstream of Barrier
Old R at Tracy Blvd
CVP
Daily Average of CVP