Appendix M

2006-2023 Herbicide Residue Data

2006-2011 Beaver Dam Lake Herbicide Residue Monitoring Results: 2,4-D

Location: West of Eagle Point Boat Launch in West Beaver Dam Lake

Year	Treatment Polygon ID	Treatment Area (acres)	Herbicide Residue Concentration (µg/L)		
			1 Day After Treatment	2 Days After Treatment	7 Days After Treatment
2006	Area 7	29	38.7	17.9	61.4
			28.8	39.6	52.9
2007	26/27	10.32	19.9	13.1	15.8
			9.2	11.0	16.6
2008 (Spring)	15	14.2	42.1	27.6	<0.7
2008 (Fall)	15	14.2	3.8	1.6	<0.7
2009 (Spring)	19	11.55	99.8	43	29.4
			49.6	27.3	18.9
2009 (Fall)	19	11.55	47.4	48.3	<0.7
			31.4	11.8	3
2010 (Spring)	19	18.51	245	46.7	115
2011 (Spring)	22	8.43	176	40	58

Location: Near City Park Boat Launch in West Beaver Dam Lake

Year	Treatment Polygon ID	Treatment Area (acres)	Herbicide Residue Concentration (µg/L)		
			1 Day After Treatment	2 Days After Treatment	7 Days After Treatment
2008 (Spring)	25	9.5	49.7	35.8	82.1
2008 (Fall)	25	9.5	49.1	128	14.1
2009 (Spring)	39	2.24	17.2	25.4	12.7
			15	21.6	22.6
2009 (Fall)	39	2.24	32.8	27.6	9.9
			78.2	38.3	11.4
2010 (Spring)	39	0.72	77.6	43.6	95.4

Site 46
Area of Treatment: 1.84 acres
Treatment: Type 3

Site 52
Area of Treatment: 2.47 acres
Treatment: Type 3

East 45-1

East 51

Site 45
Area of Treatment: 59.52 acres
Treatment: Type 3

East 49

Site 49
Area of Treatment: 4.82 acres
Treatment: Type 3

East 45-2

Site 51
Area of Treatment: 4.86 acres
Treatment: Type 3

East 44

Site 41
Area of Treatment: 2.09 acres
Treatment: Type 3

Site 44
Area of Treatment: 9.77 acres
Treatment: Type 3

Site 42
Area of Treatment: 1.15 acres
Treatment: Type 3

Site 43
Area of Treatment: 2.57 acres
Treatment: Type 3

2009 East Beaver Dam Lake Herbicide Treatment Site

2009 Herbicide Residual Monitoring Sites

East Beaver Dam Lake
Herbicide Residual Monitoring

Types of Samples: Sites 45-1 and 45-2 will be sampled for both Endothal and 2,4-D. All other sites will be sampled for 2,4-D only.
Sample Collection Day: 1, 3, 5, 12, 19, and 26 days after treatment.

N

0 500 1,000 2,000
Feet

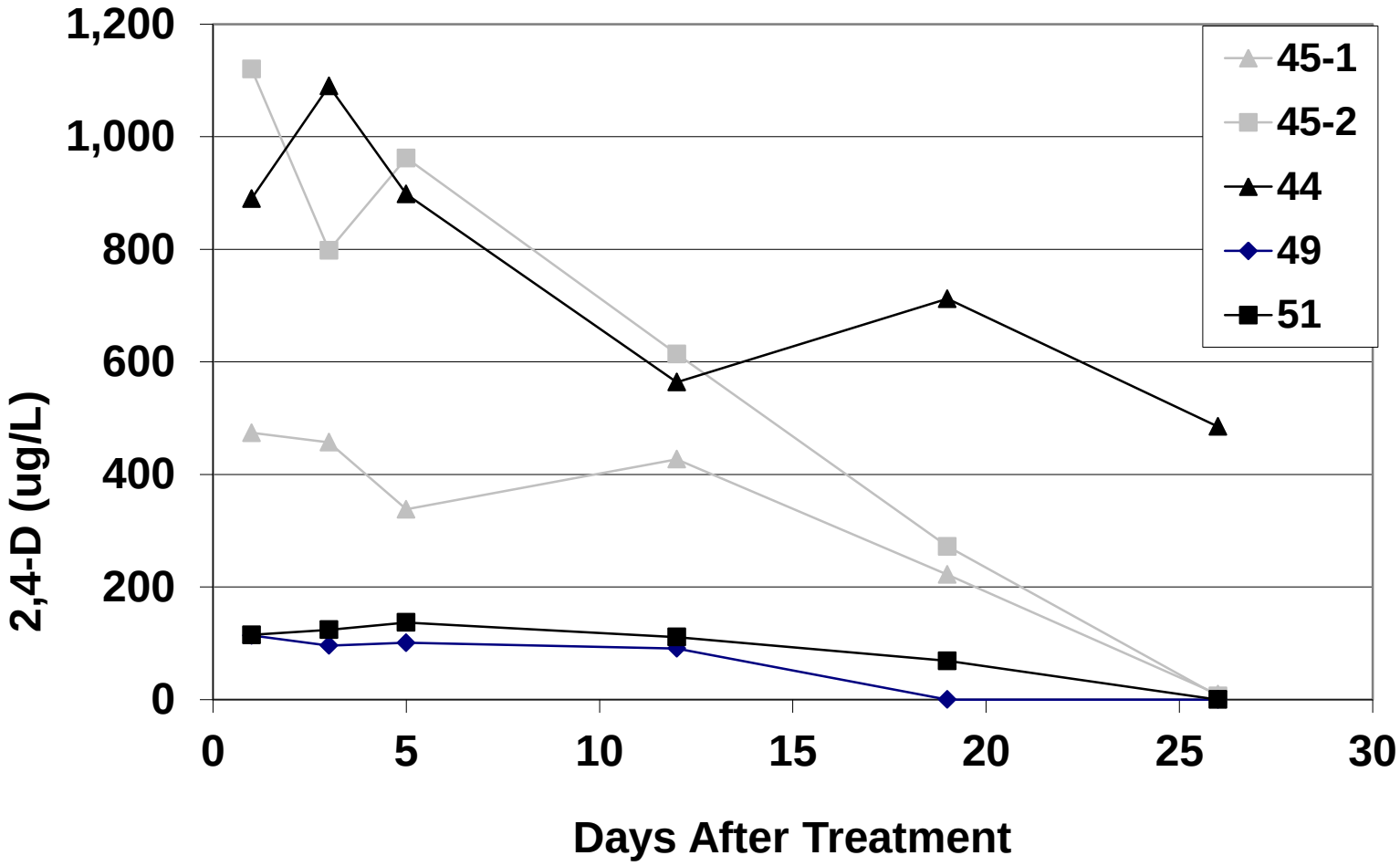
BARR

2009 East Beaver Dam Lake
Herbicide Residual Monitoring Sites
Barron County, WI
Job No. 49-03-011

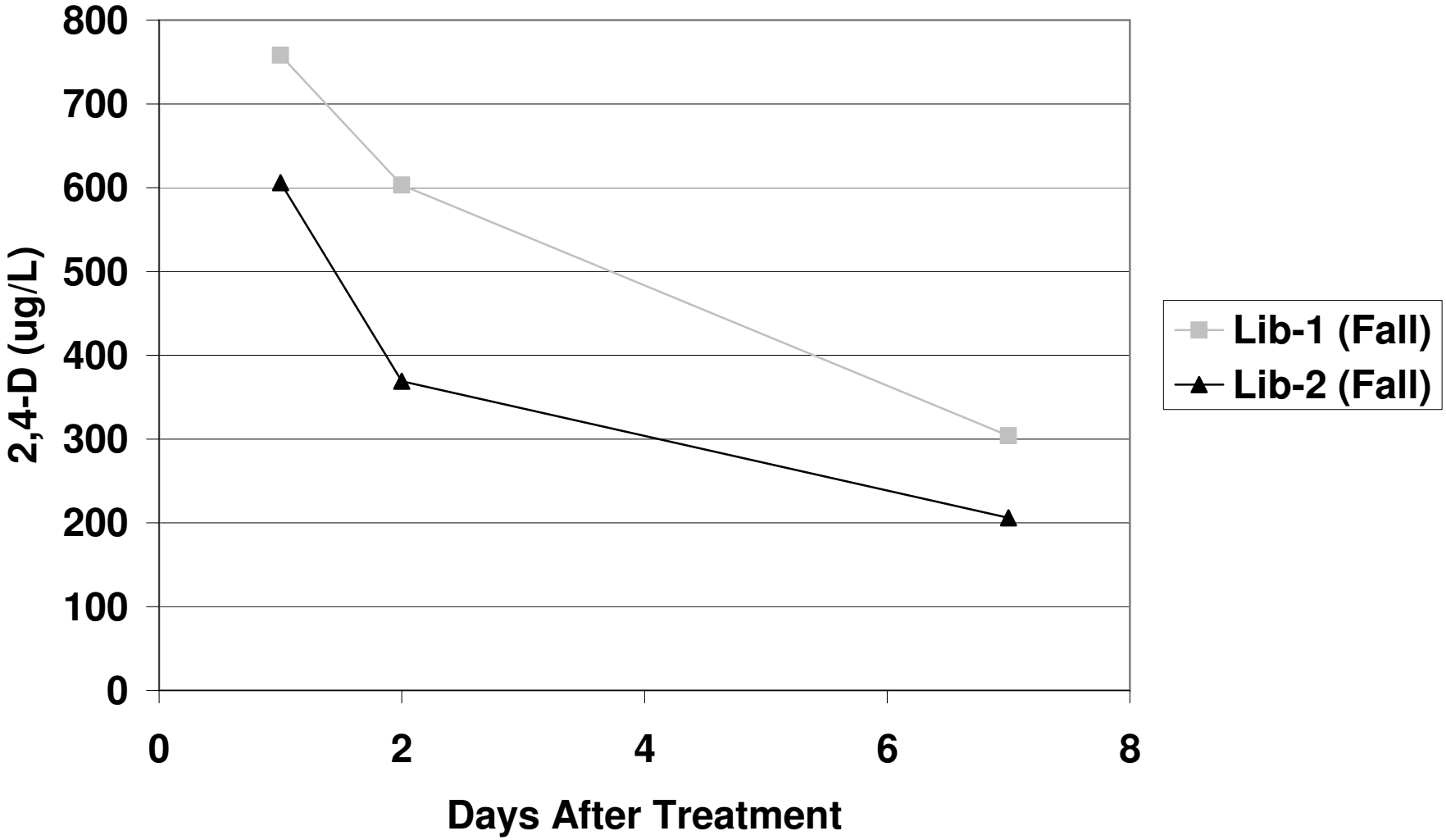
M-2

Barr Footer: Date: 4/27/2009 11:11:19 AM File: I:\Projects\49\03\011\GIS\Maps\2009\MISC\Figure X - Herbicide Residual Monitoring Sites - East.mxd User: amm

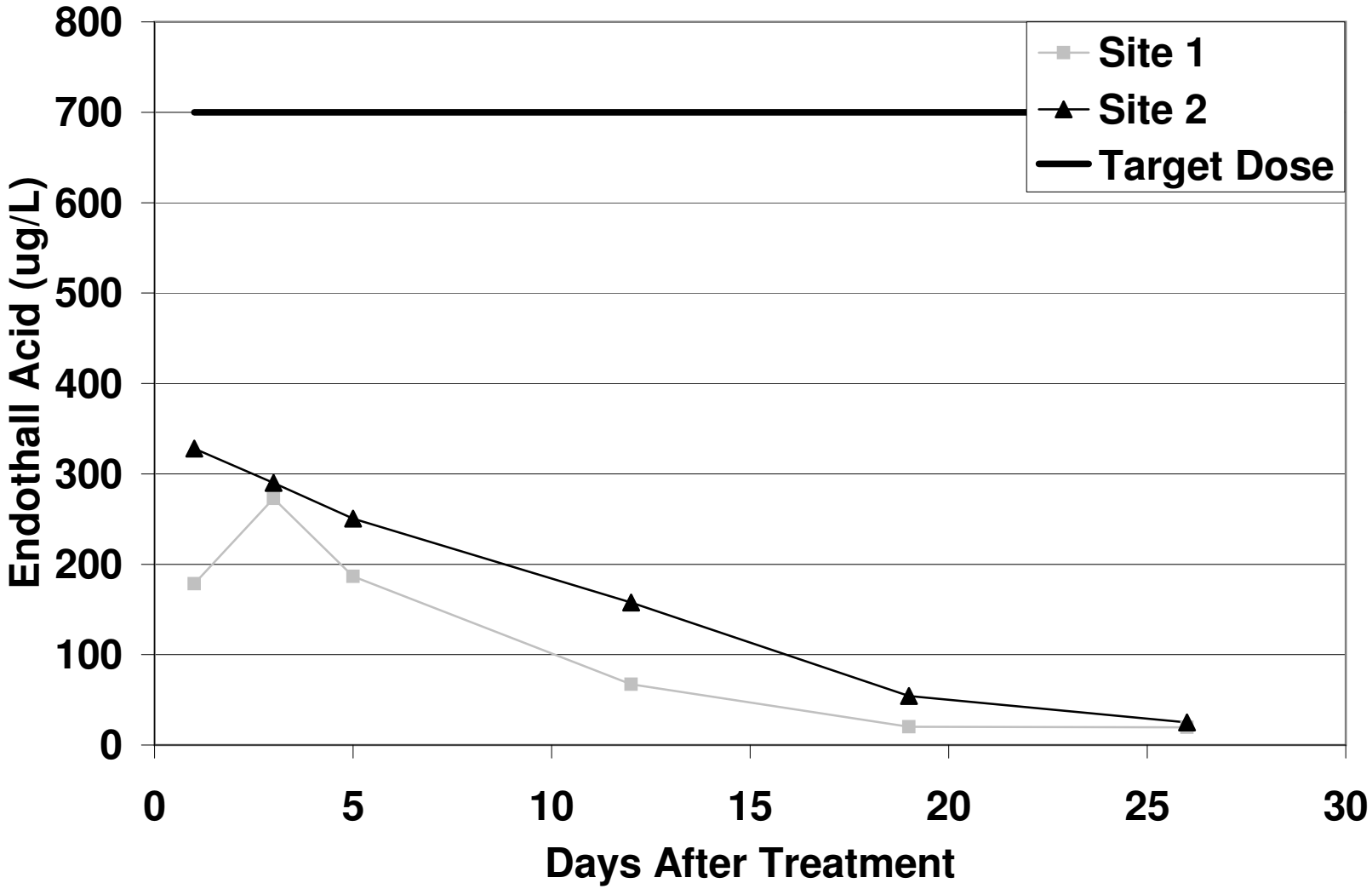
2009 Beaver Dam Lake Spring East Lake Herbicide Residual Data Summary: 2,4-D



2009 Library Lake Herbicide Residual Data Summary



2009 Library Lake Herbicide Residual Data Summary



Library 1

Site 50
Area of Treatment: 4.97 acres
Treatment: Library Lake

Library 2

2009 Library Lake Herbicide Treatment Area

2009 Herbicide Residual Monitoring Sites

Library Herbicide Residual Monitoring

Types of Samples: Endothal and 2,4-D
Sample Collection Day: 1, 3, 5, 12, 19, and 26 days after treatment.

N

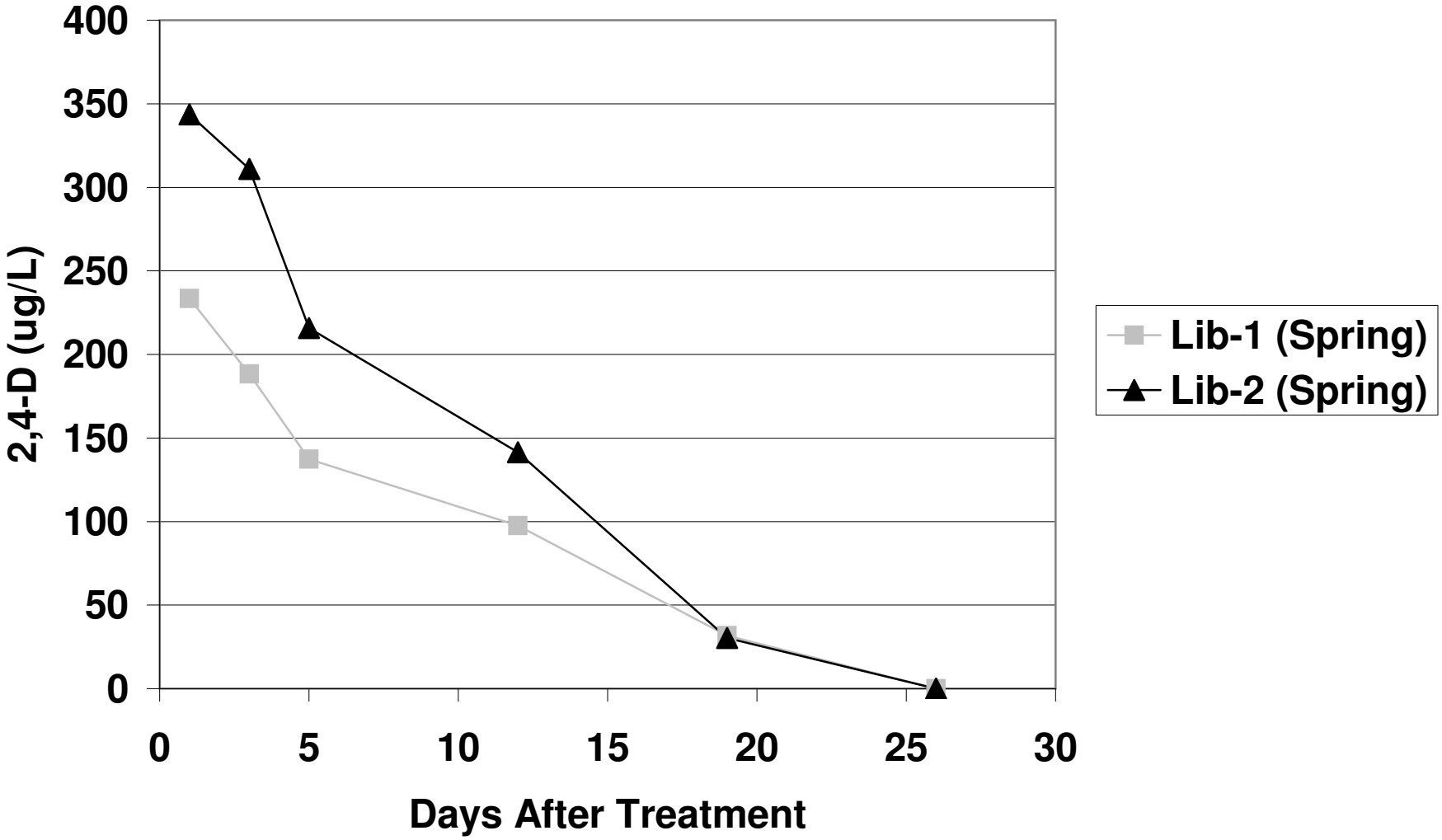
0 100 200 400
Feet

BARR

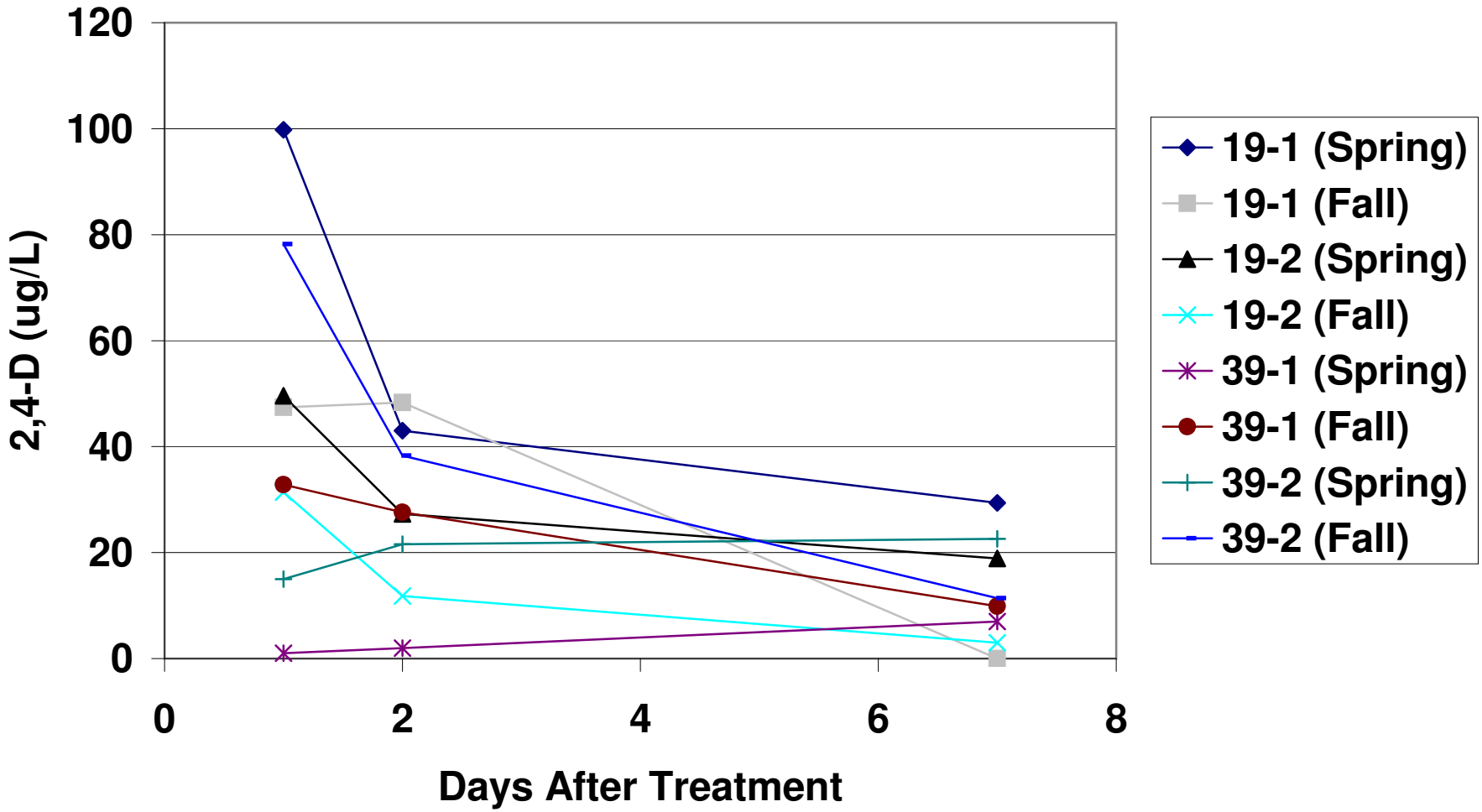
2009 Library Lake Herbicide Residual Monitoring Sites
Barron County, WI
Job No. 49-03-011
M-6

Barr Footer: Date: 4/27/2009 8:13:00 AM File: I:\Projects\49\03\011\GIS\Maps\2009\MISC\Figure X - Herbicide Residual Monitoring Sites - Library.mxd User: amm

2009 Library Lake Spring Herbicide Residual Data Summary



2009 Beaver Dam Lake Herbicide Residual Data Summary: West



2009 West Beaver Dam Lake Herbicide Treatment Site

2009 Herbicide Residual Monitoring Sites

West Beaver Dam Lake
Herbicide Residual Monitoring

Types of Samples: 2,4-D
Sample Collection Day: 1, 2, and 7 days after treatment.

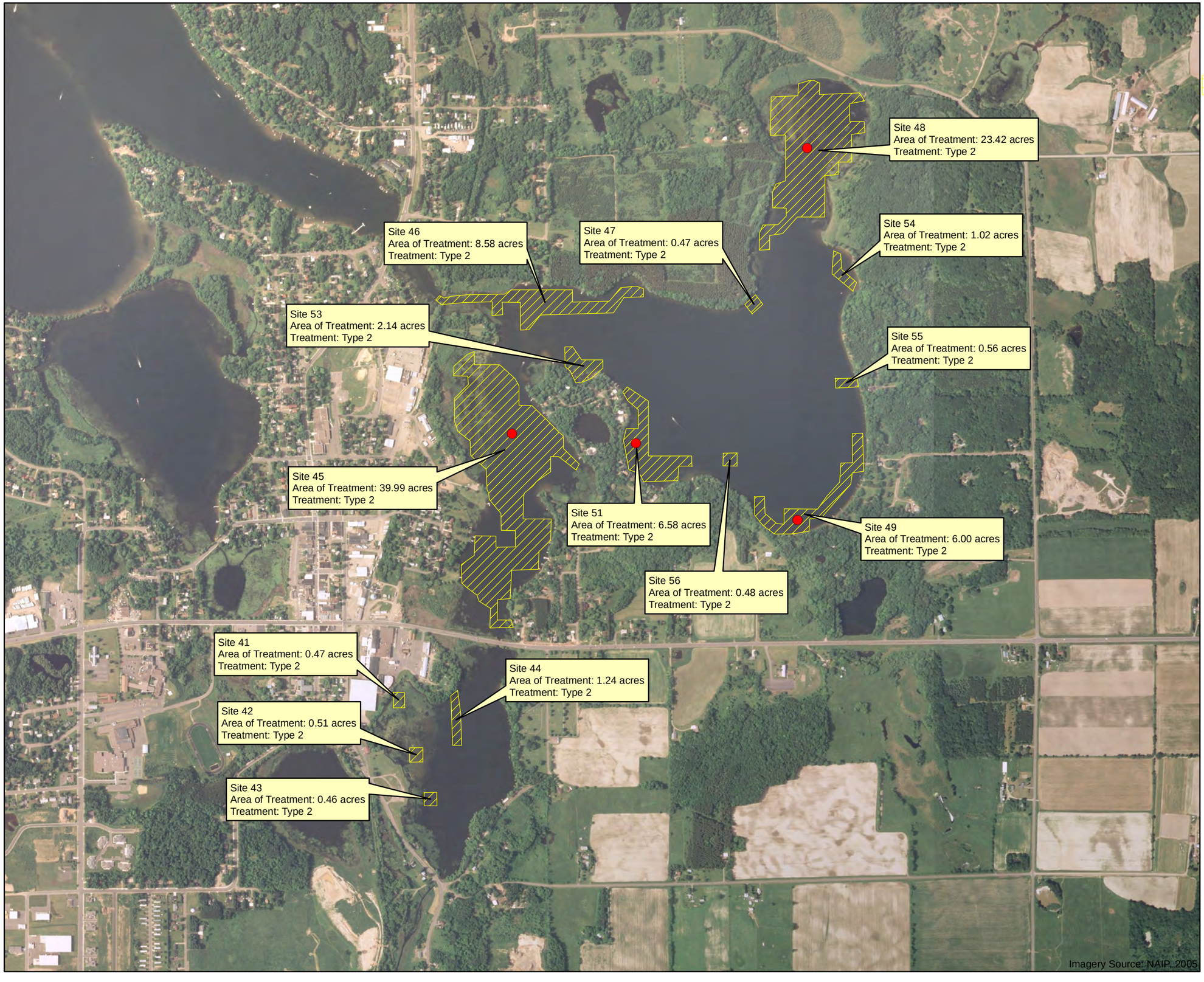
N

0 750 1,500 3,000
Feet

BARR

2009 West Beaver Dam Lake
Herbicide Residual Monitoring Sites
Barron County, WI
Job No. 49-03-011
M-9

Barr Footer: Date: 4/27/2009 8:11:35 AM File: I:\Projects\49\03\011\GIS\Maps\2009\MISC\Figure X - Herbicide Residual Monitoring Sites - West.mxd User: amm



Proposed 2010 Treatment Site

2010 Herbicide Residual Monitoring Site

N

0 500 1,000 2,000

Feet

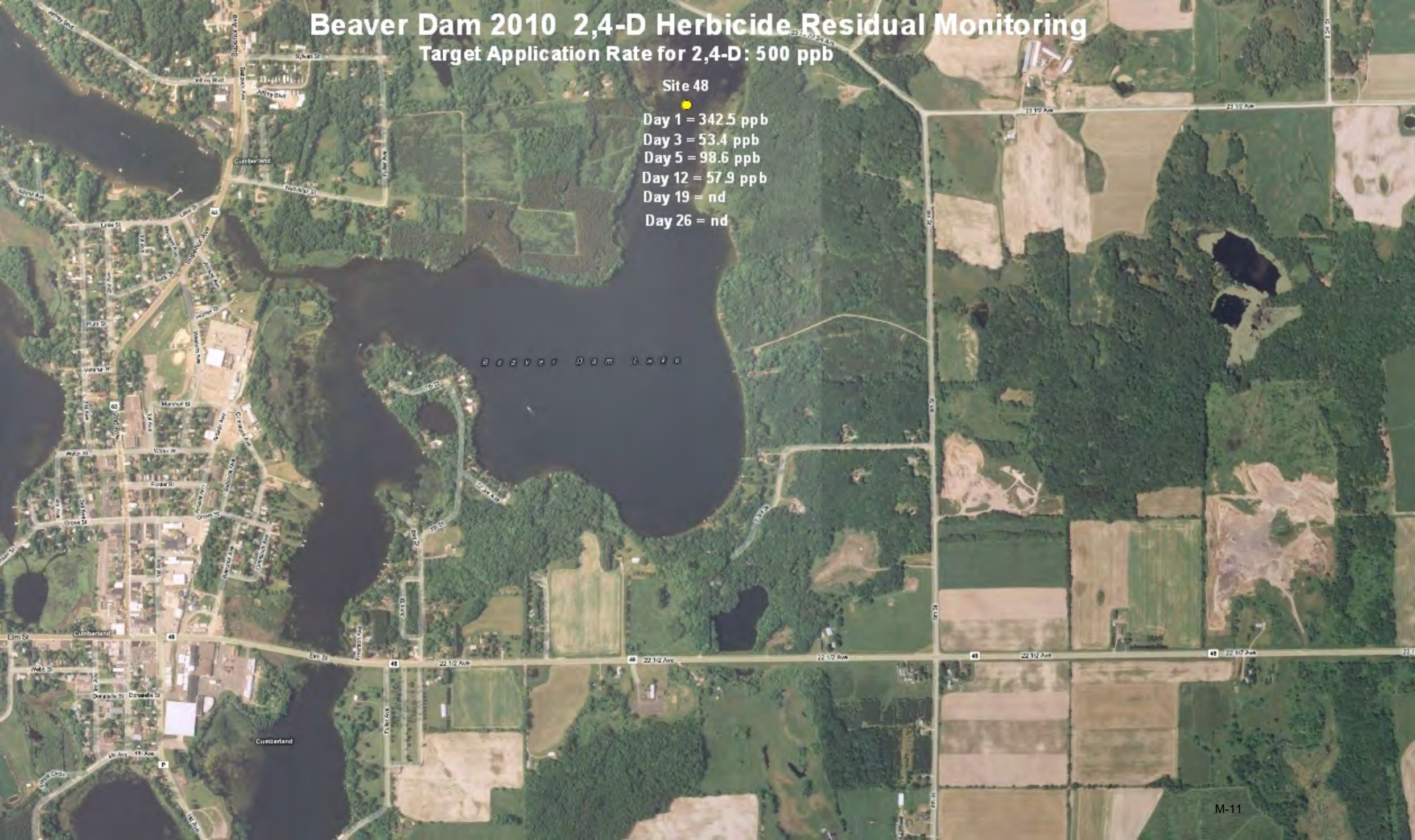
BARR

Figure 34
2010 EAST BEAVER DAM LAKE
HERBICIDE RESIDUAL
MONITORING SITES
Beaver Dam Lake
Barron County, WI
Job No. 49-03-011

Barr Footer: Date: 2/5/2010 6:26:23 PM File: I:\Projects\49\03\011\GIS\Maps\2009\2009_Annual_Report\Fig34_2010_Herb_Resid_monit_sites_East_BDL.mxd User: MRR

Beaver Dam 2010 2,4-D Herbicide Residual Monitoring

Target Application Rate for 2,4-D: 500 ppb



Proposed 2010 Treatment Site

2010 Herbicide Residual Monitoring Site

N

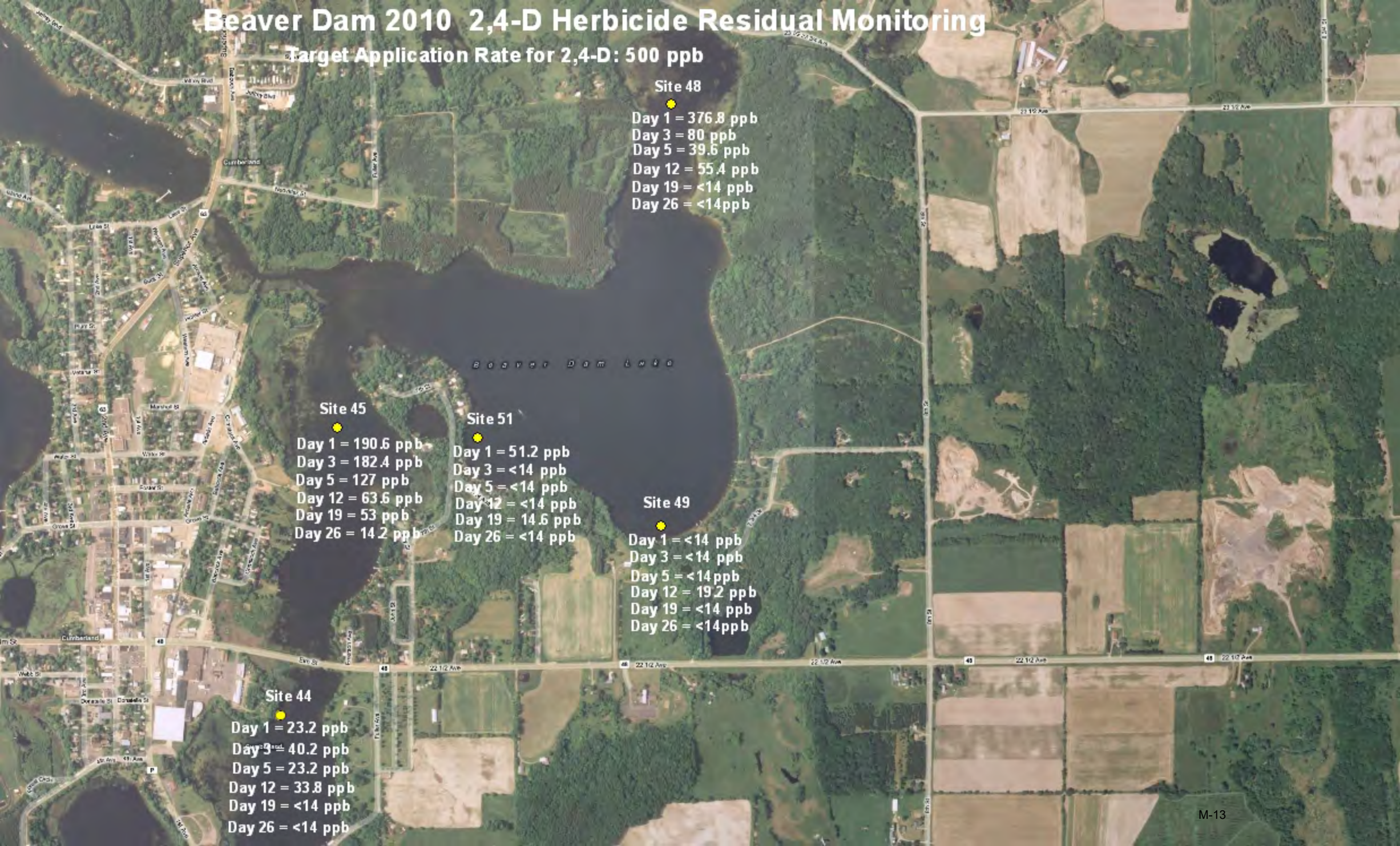
0 100 200 400

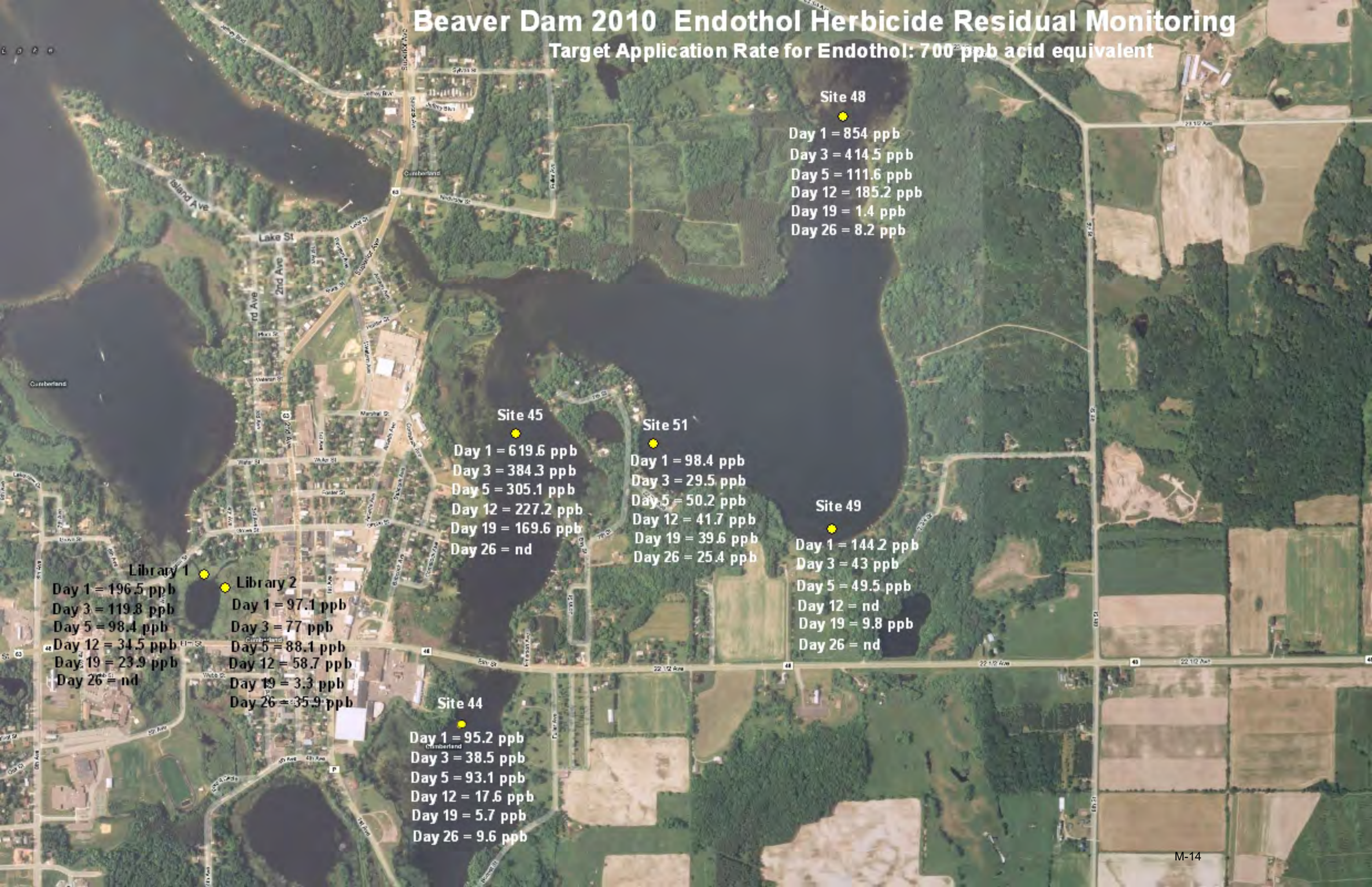
Feet

BARR

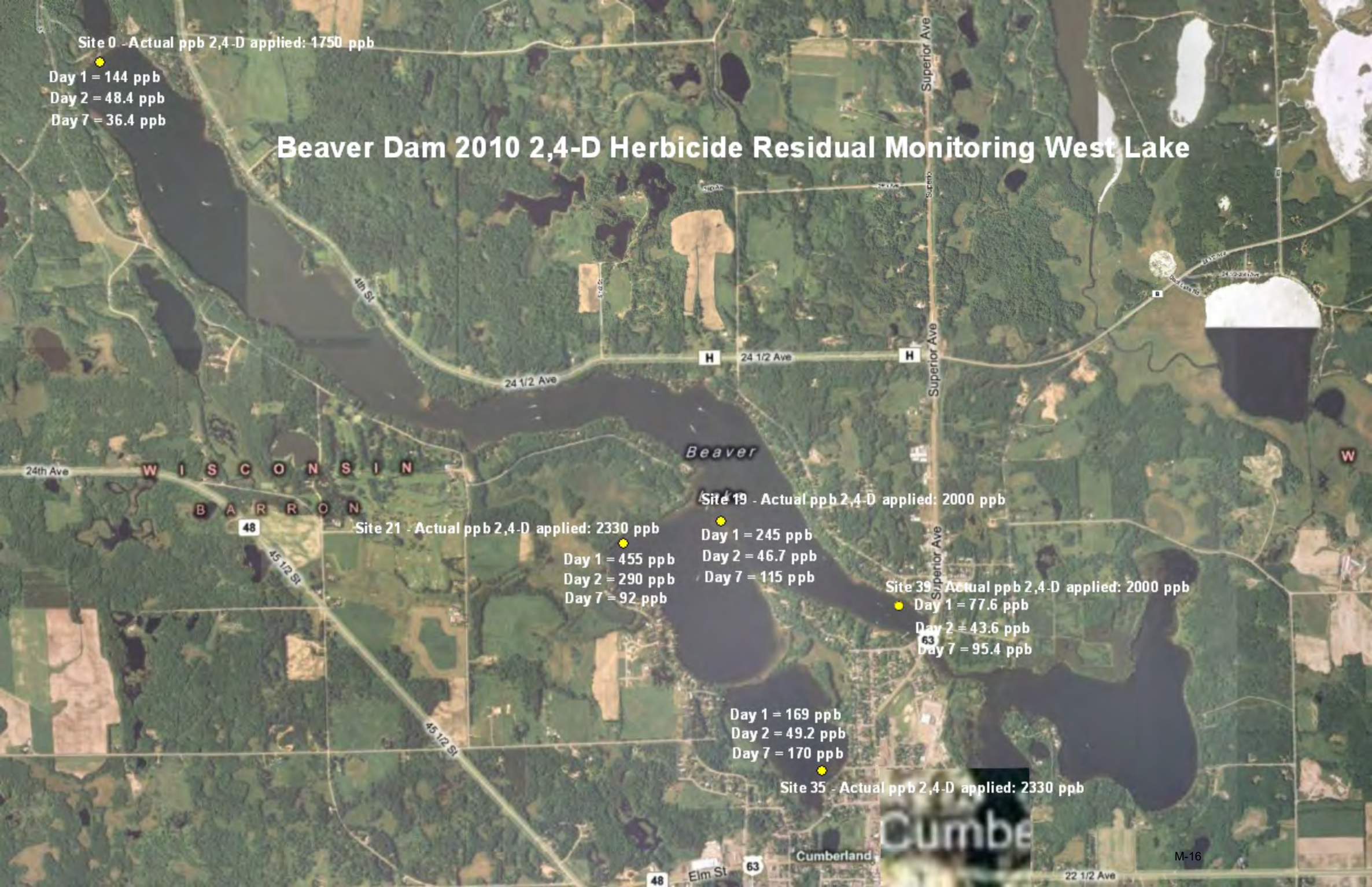
Figure 33
2010 LIBRARY LAKE
HERBICIDE RESIDUAL
MONITORING SITES
Library Lake
Barron County, WI
Job No. 49-03-011
M-12

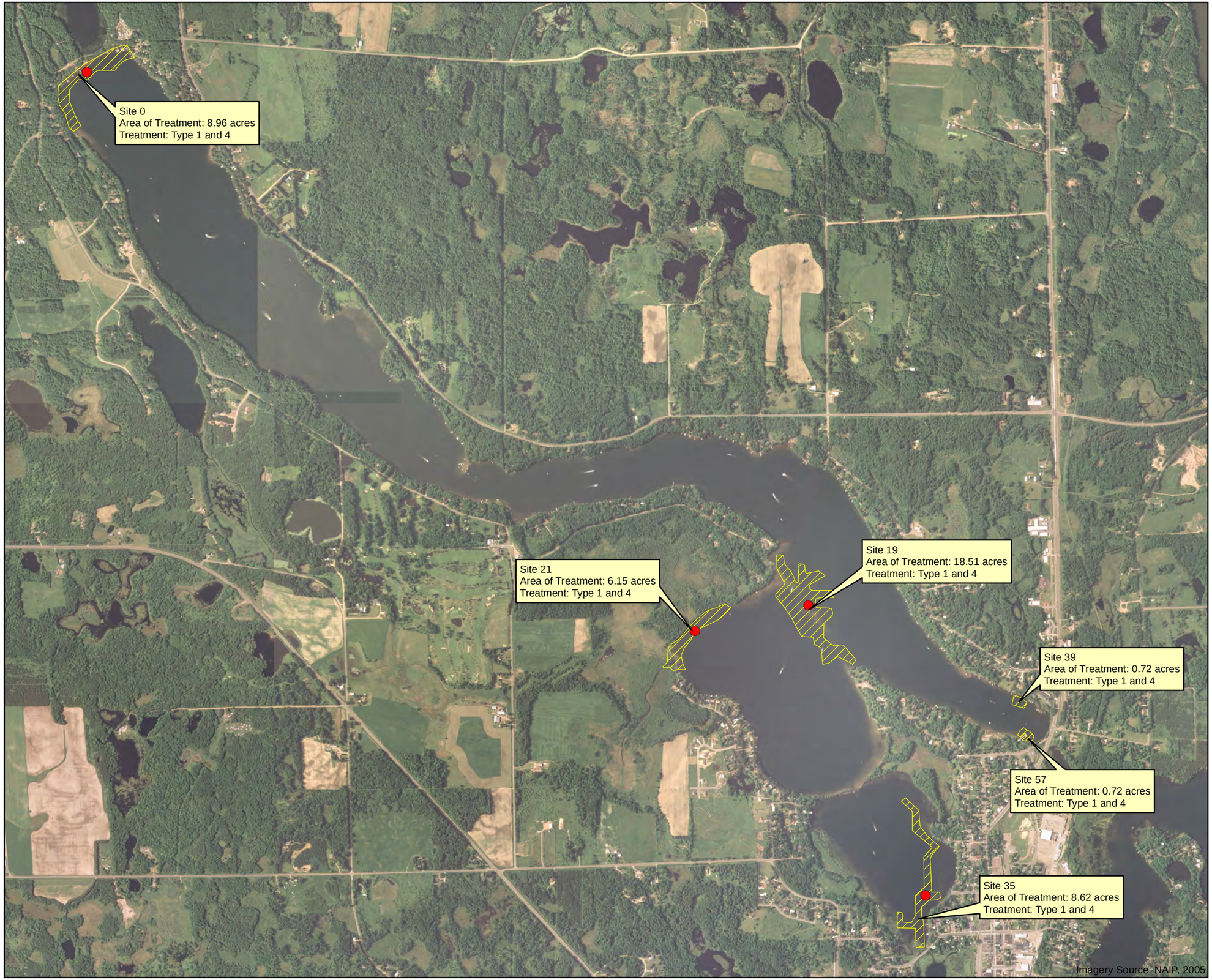
Barr Footer: Date: 2/5/2010 6:25:11 PM File: I:\Projects\49\03\011\GIS\Maps\2009\2009_Annual_Report\Fig33_2010_Herb_Resid_monit_sites_Library.mxd User: MRR


Beaver Dam 2010 2,4-D Herbicide Residual Monitoring
Target Application Rate for 2,4-D: 500 ppb
Site 48
Day 1 = 376.8 ppb
Day 3 = 80 ppb
Day 5 = 39.6 ppb
Day 12 = 55.4 ppb
Day 19 = <14 ppb
Day 26 = <14ppb
Beaver Dam Lake
Site 45
Day 1 = 190.6 ppb
Day 3 = 182.4 ppb
Day 5 = 127 ppb
Day 12 = 63.6 ppb
Day 19 = 53 ppb
Day 26 = 14.2 ppb
Site 51
Day 1 = 51.2 ppb
Day 3 = <14 ppb
Day 5 = <14 ppb
Day 12 = <14 ppb
Day 19 = 14.6 ppb
Day 26 = <14 ppb
Site 49
Day 1 = <14 ppb
Day 3 = <14 ppb
Day 5 = <14ppb
Day 12 = 19.2 ppb
Day 19 = <14 ppb
Day 26 = <14ppb
Site 44
Day 1 = 23.2 ppb
Day 3 = 40.2 ppb
Day 5 = 23.2 ppb
Day 12 = 33.8 ppb
Day 19 = <14 ppb
Day 26 = <14 ppb


Beaver Dam 2010 Endothol Herbicide Residual Monitoring
Target Application Rate for Endothol: 700 ppb acid equivalent
Site 48
Day 1 = 854 ppb
Day 3 = 414.5 ppb
Day 5 = 111.6 ppb
Day 12 = 185.2 ppb
Day 19 = 1.4 ppb
Day 26 = 8.2 ppb
Site 45
Day 1 = 619.6 ppb
Day 3 = 384.3 ppb
Day 5 = 305.1 ppb
Day 12 = 227.2 ppb
Day 19 = 169.6 ppb
Day 26 = nd
Site 51
Day 1 = 98.4 ppb
Day 3 = 29.5 ppb
Day 5 = 50.2 ppb
Day 12 = 41.7 ppb
Day 19 = 39.6 ppb
Day 26 = 25.4 ppb
Site 49
Day 1 = 144.2 ppb
Day 3 = 43 ppb
Day 5 = 49.5 ppb
Day 12 = nd
Day 19 = 9.8 ppb
Day 26 = nd
Library 1
Day 1 = 196.5 ppb
Day 3 = 119.8 ppb
Day 5 = 98.4 ppb
Day 12 = 34.5 ppb
Day 19 = 23.9 ppb
Day 26 = nd
Library 2
Day 1 = 97.1 ppb
Day 3 = 77 ppb
Day 5 = 88.1 ppb
Day 12 = 58.7 ppb
Day 19 = 3.3 ppb
Day 26 = 35.9 ppb
Site 44
Day 1 = 95.2 ppb
Day 3 = 38.5 ppb
Day 5 = 93.1 ppb
Day 12 = 17.6 ppb
Day 19 = 5.7 ppb
Day 26 = 9.6 ppb
Island Ave
Lake St
2nd Ave
3rd Ave
Cumberland


Beaver Dam 2010 2,4-D Herbicide Residual Monitoring Library Lake
Target Application Rate for 2,4-D: 500 ppb
Library 1
Day 1 = 51.2 ppb
Day 3 = 27.2 ppb
Day 5 = 22.6 ppb
Day 12 = <14 ppb
Day 19 = <14 ppb
Day 26 = <14 ppb
Library 2
Day 1 = 25 ppb
Day 3 = 26.6 ppb
Day 5 = 63 ppb
Day 12 = <14 ppb
Day 19 = <14 ppb
Day 26 = <14 ppb
Grove St
Sorensen St
6th Ave
5th Ave
Elm St
48
63
Cumberland


Beaver Dam 2010 2,4-D Herbicide Residual Monitoring West Lake
Site 0 - Actual ppb 2,4-D applied: 1750 ppb
Day 1 = 144 ppb
Day 2 = 48.4 ppb
Day 7 = 36.4 ppb
Site 19 - Actual ppb 2,4-D applied: 2000 ppb
Day 1 = 245 ppb
Day 2 = 46.7 ppb
Day 7 = 115 ppb
Site 21 - Actual ppb 2,4-D applied: 2330 ppb
Day 1 = 455 ppb
Day 2 = 290 ppb
Day 7 = 92 ppb
Site 39 - Actual ppb 2,4-D applied: 2000 ppb
Day 1 = 77.6 ppb
Day 2 = 43.6 ppb
Day 7 = 95.4 ppb
Day 1 = 169 ppb
Day 2 = 49.2 ppb
Day 7 = 170 ppb
Site 35 - Actual ppb 2,4-D applied: 2330 ppb
Beaver
Lake
WISCONSIN
BARRON
Superior Ave
24 1/2 Ave
24th Ave
45 1/2 St
4th St
Elm St
Cumberland
22 1/2 Ave
48
63
H



Proposed 2010 Treatment Site

2010 Herbicide Residual Monitoring Site

N

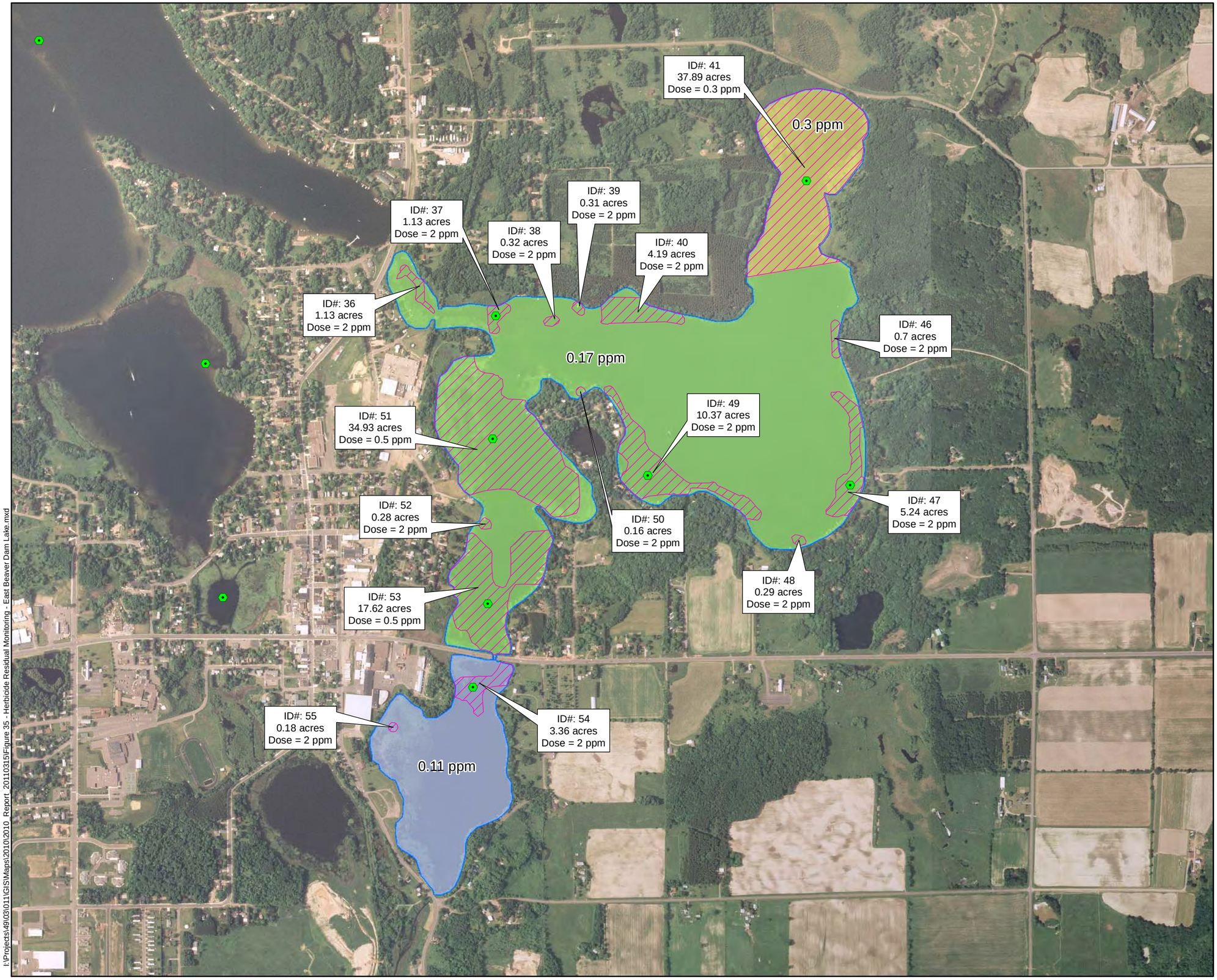
0 750 1,500 3,000

Feet

BARR

Figure 32
2010 WEST BEAVER DAM LAKE
HERBICIDE RESIDUAL
MONITORING SITES
Beaver Dam Lake
Barron County, WI
Job No. 49-03-011

Barr Footer: Date: 2/5/2010 6:23:39 PM File: I:\Projects\49\03\011\GIS\Maps\2009\2009_Annual_Report\Fig32_2010_Herb_Resid_monit_sites_West_BDL.mxd User: MRR



Proposed 2011 EWM Treatment Areas

Cemetery Bay (0.11 ppm)

East Lake (0.17 ppm)

Norwegian Bay (0.3 ppm)

Herbicide Residual Monitroing Locations

N

0 500 1,000 2,000

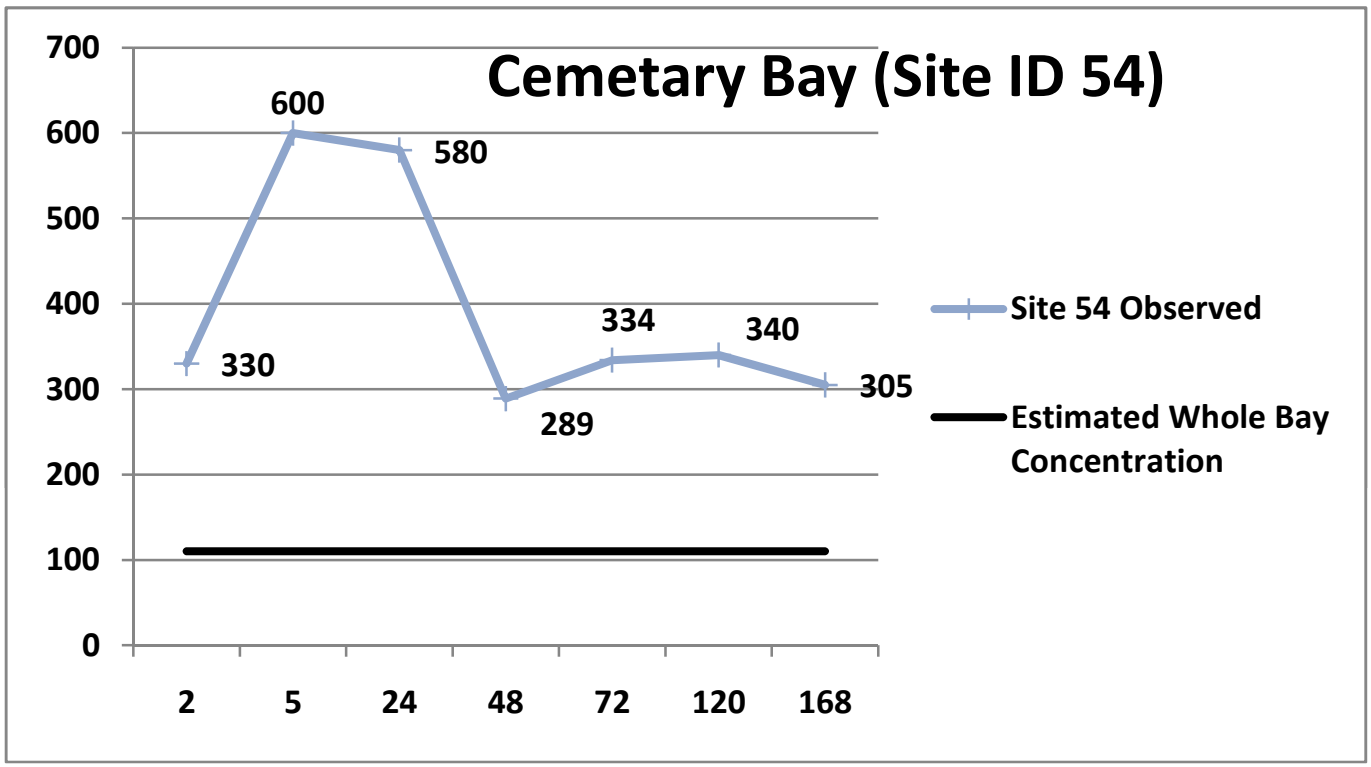
Feet

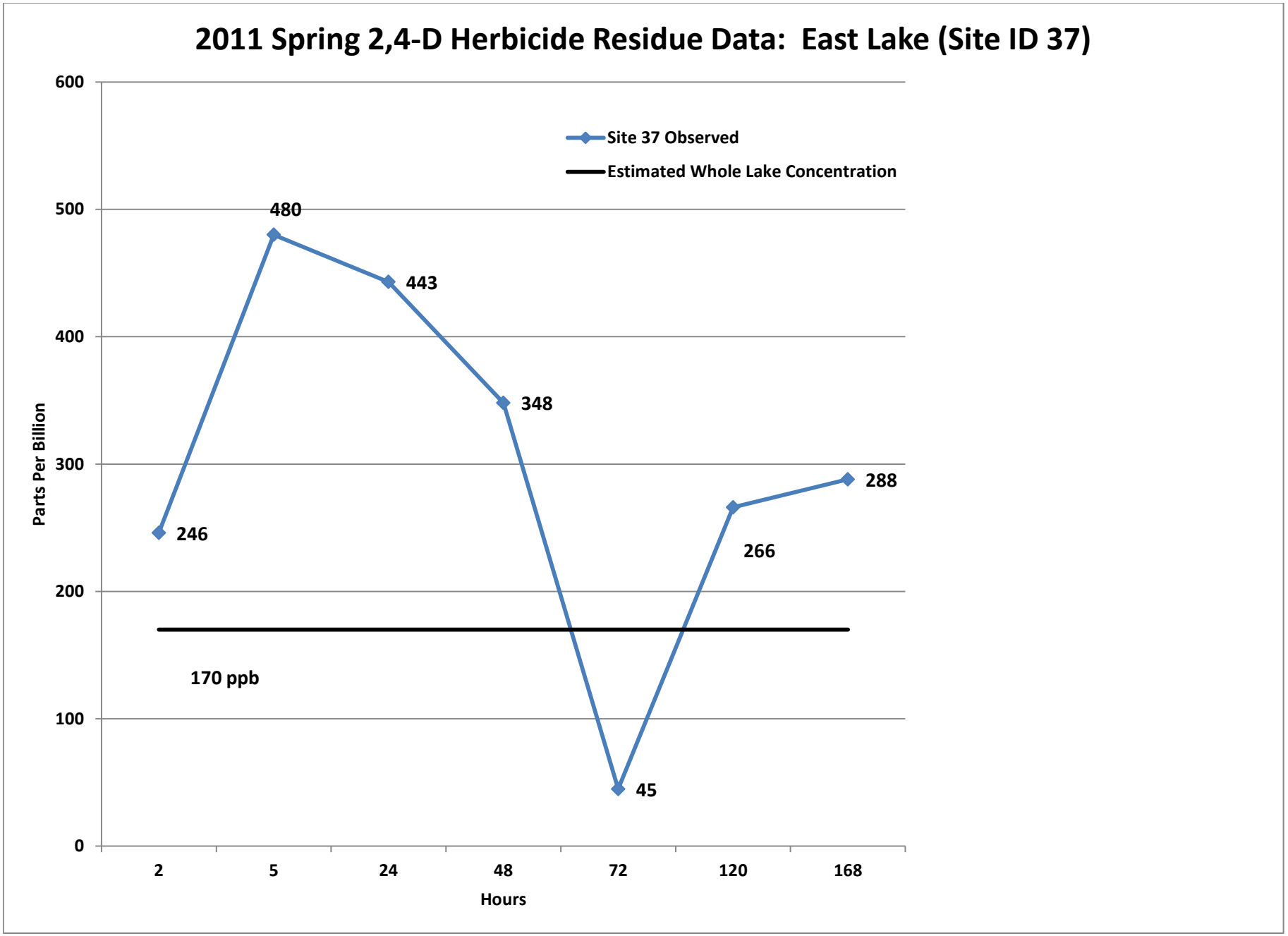
BARR

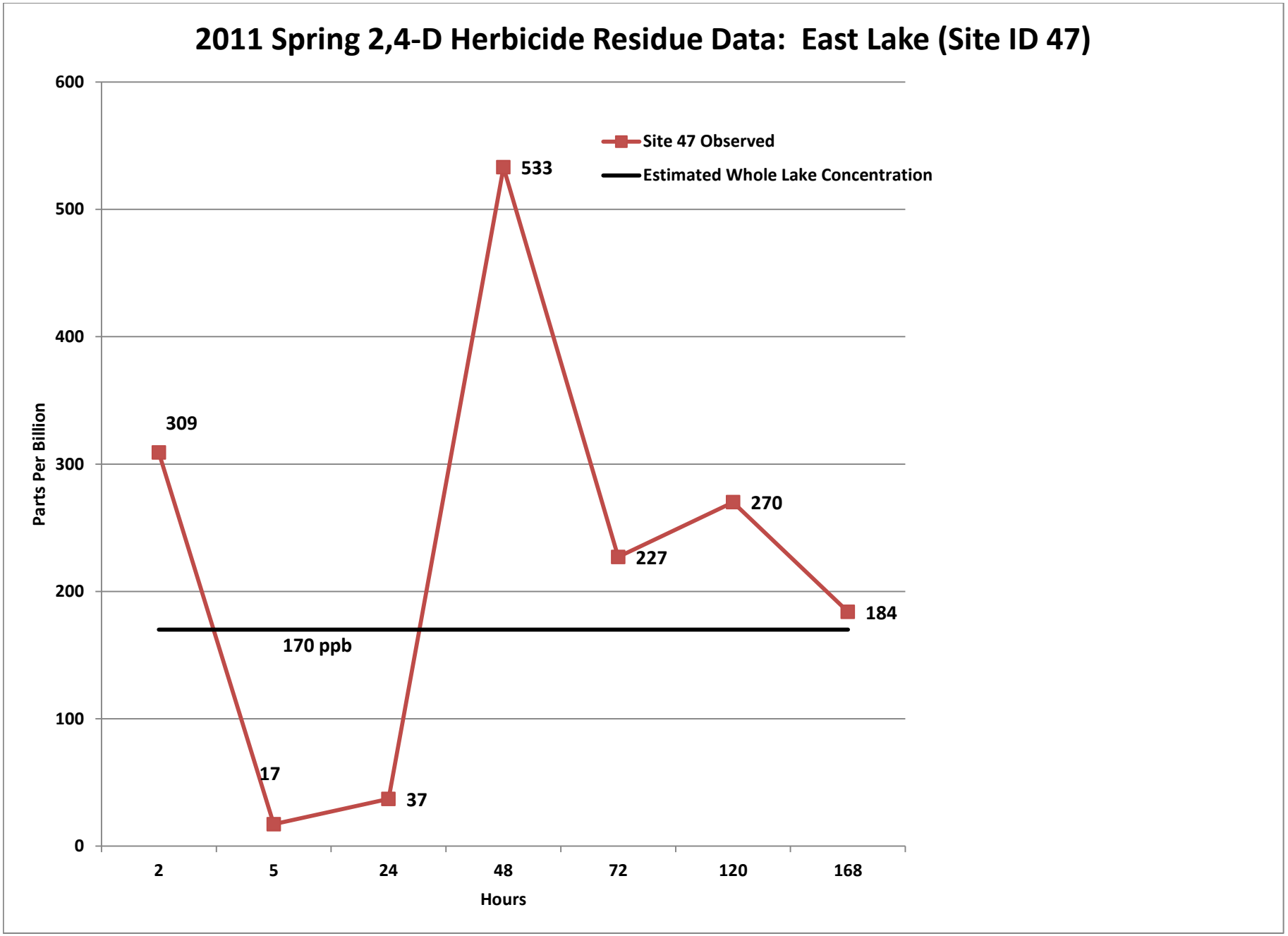
Figure 35

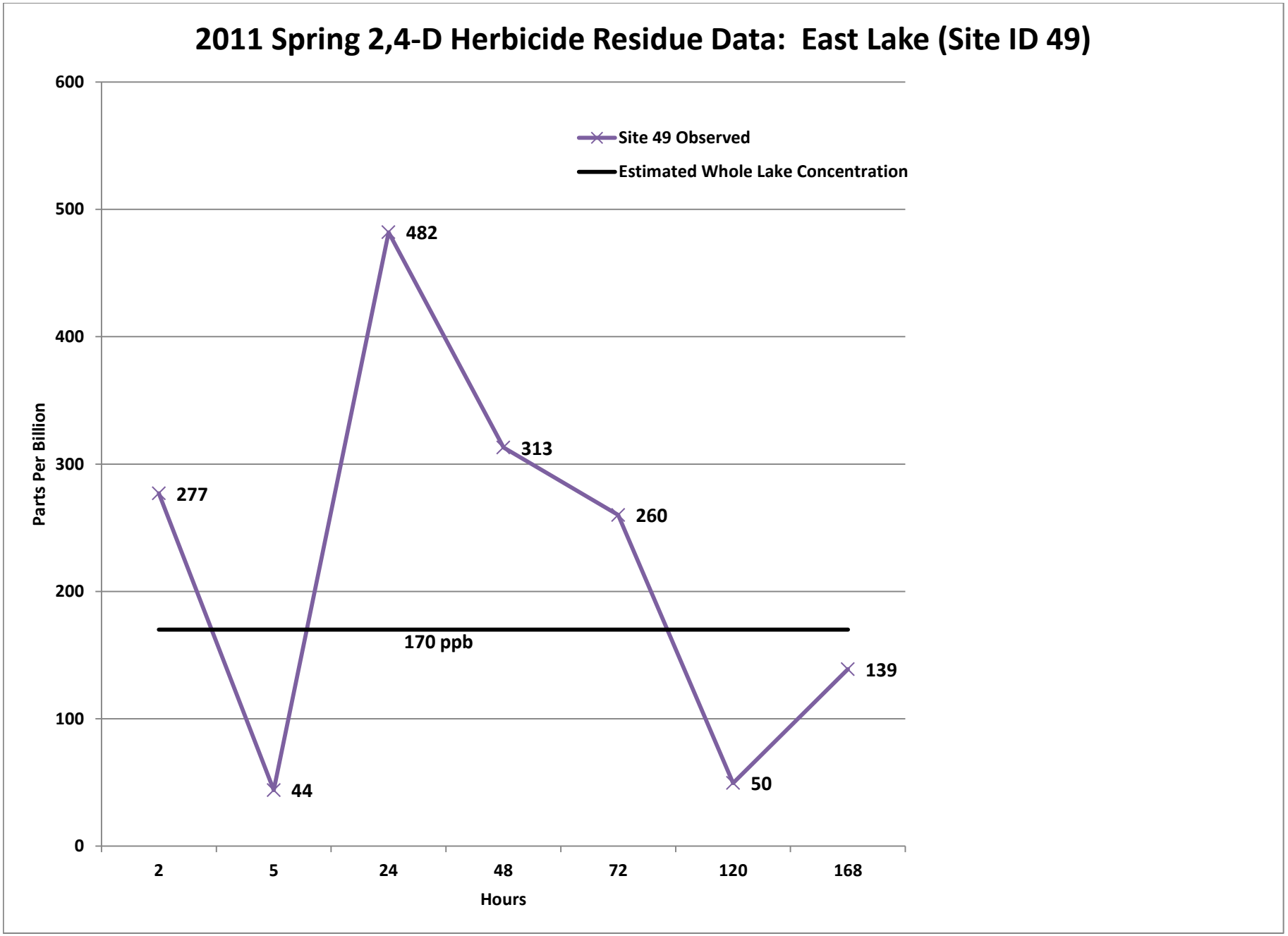
Herbicide Residual Monitoring
Beaver Dam Lake
Barron County, WI
Job No. 49-03-011

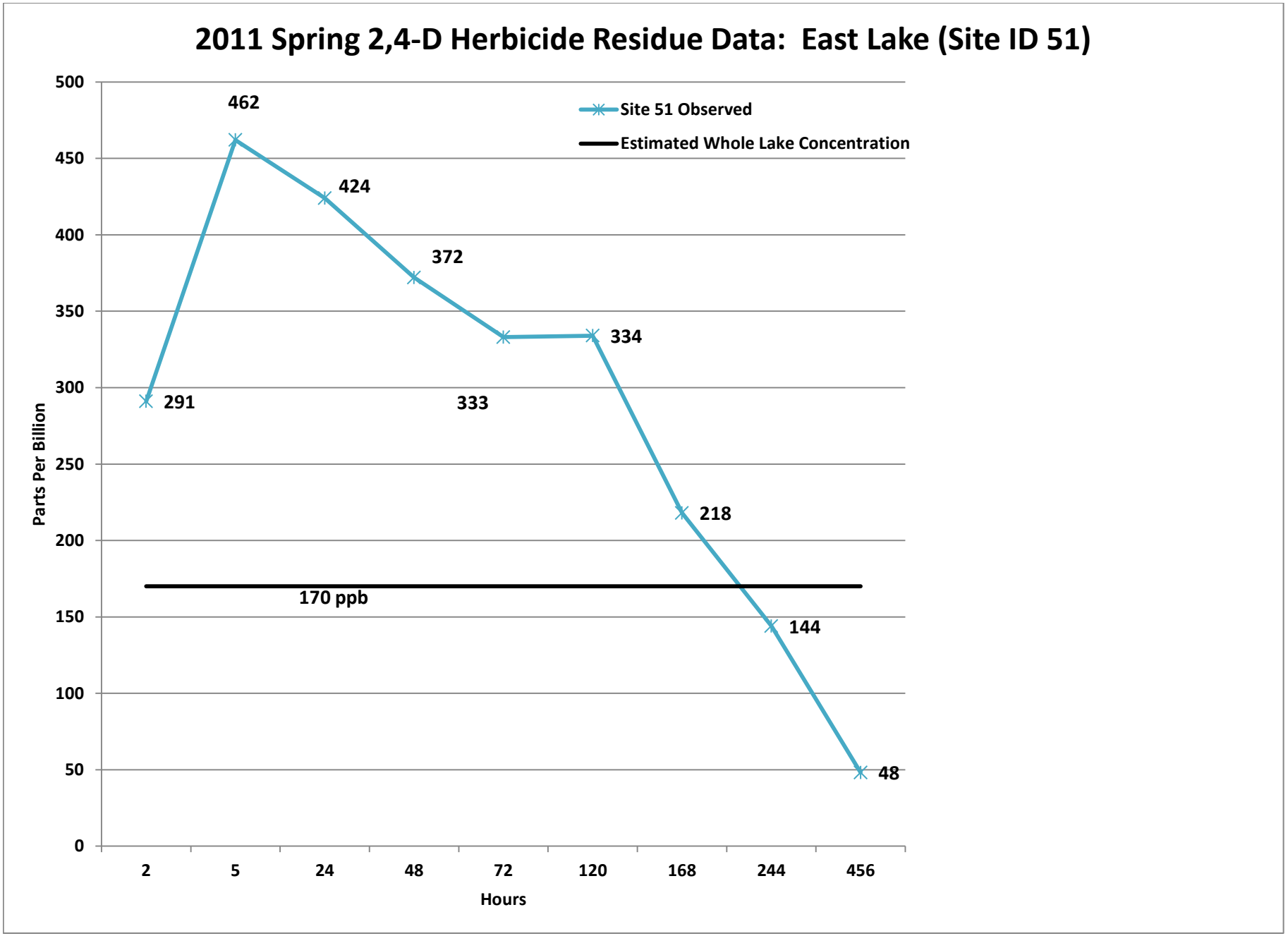
I:\Projects\49\03\011\GIS\Maps\2010\2010_Report_20110315\Figure 35 - Herbicide Residual Monitoring - East Beaver Dam Lake.mxd

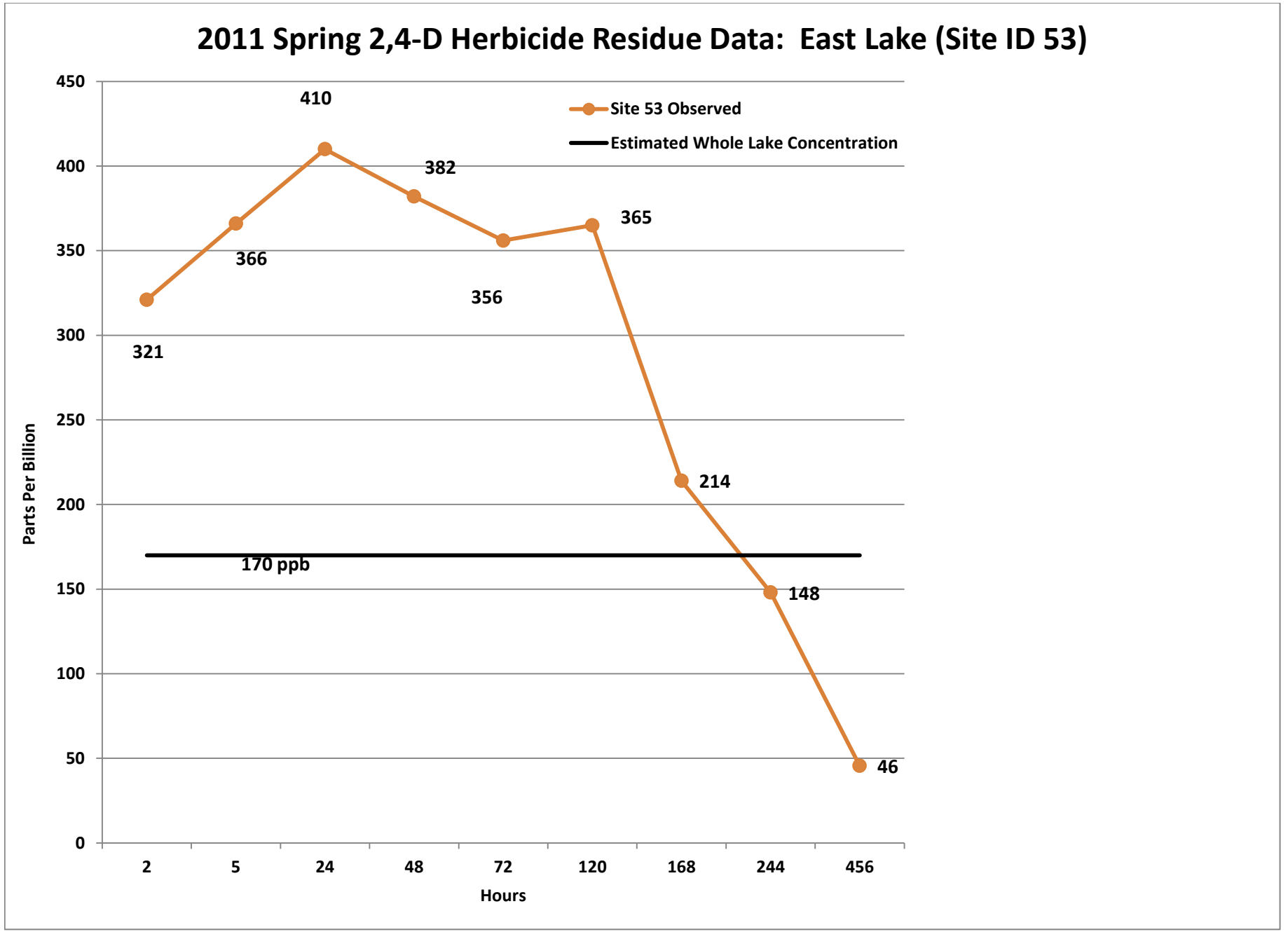

Cemetary Bay (Site ID 54)
700
600
500
400
300
200
100
0
2
5
24
48
72
120
168
330
600
580
289
334
340
305
Site 54 Observed
Estimated Whole Bay Concentration

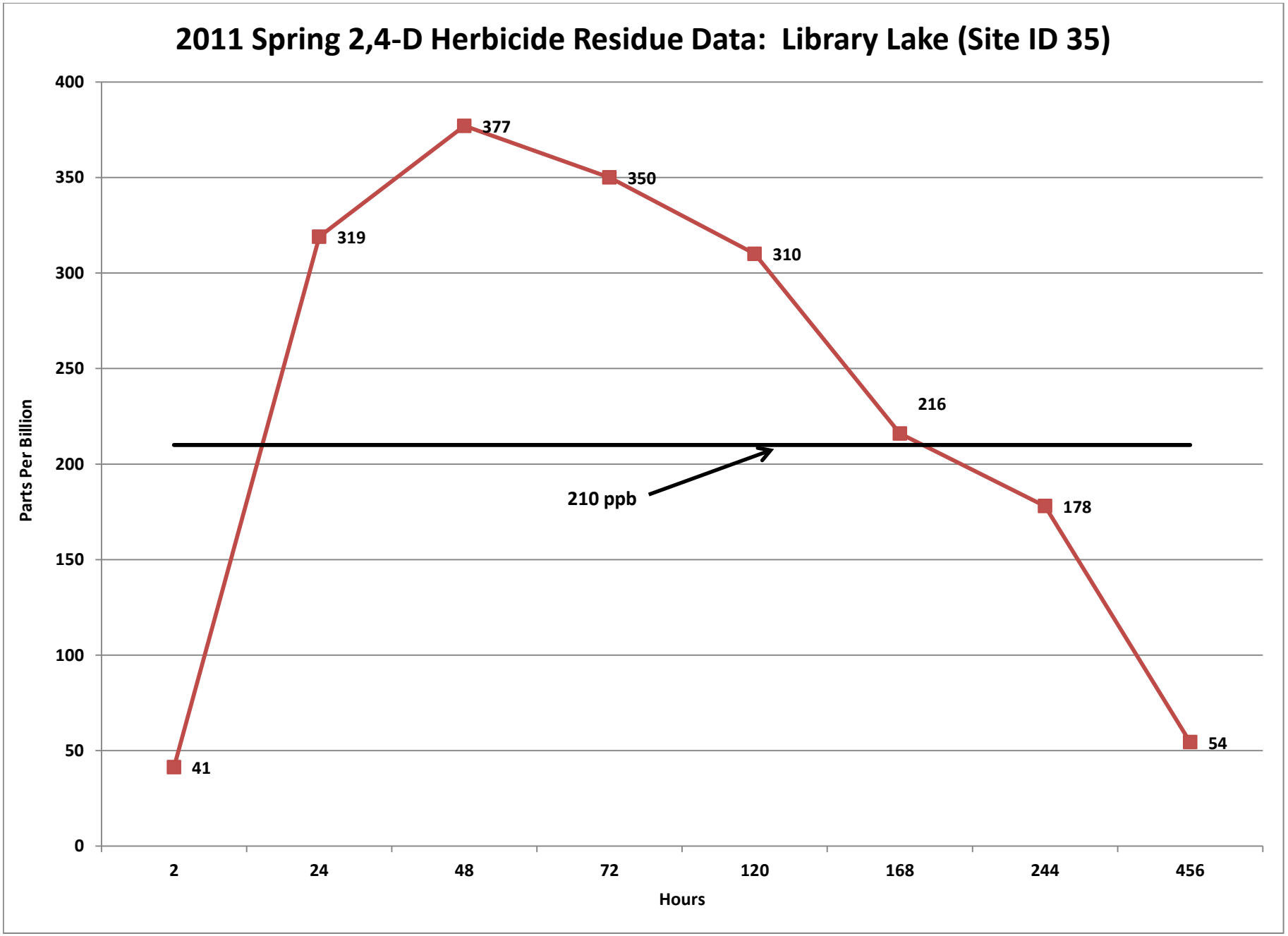

2011 Spring 2,4-D Herbicide Residue Data: East Lake (Site ID 37)
Site 37 Observed
Estimated Whole Lake Concentration
Parts Per Billion
600
500
400
300
200
100
0
480
443
348
246
45
266
288
170 ppb
2
5
24
48
72
120
168
Hours

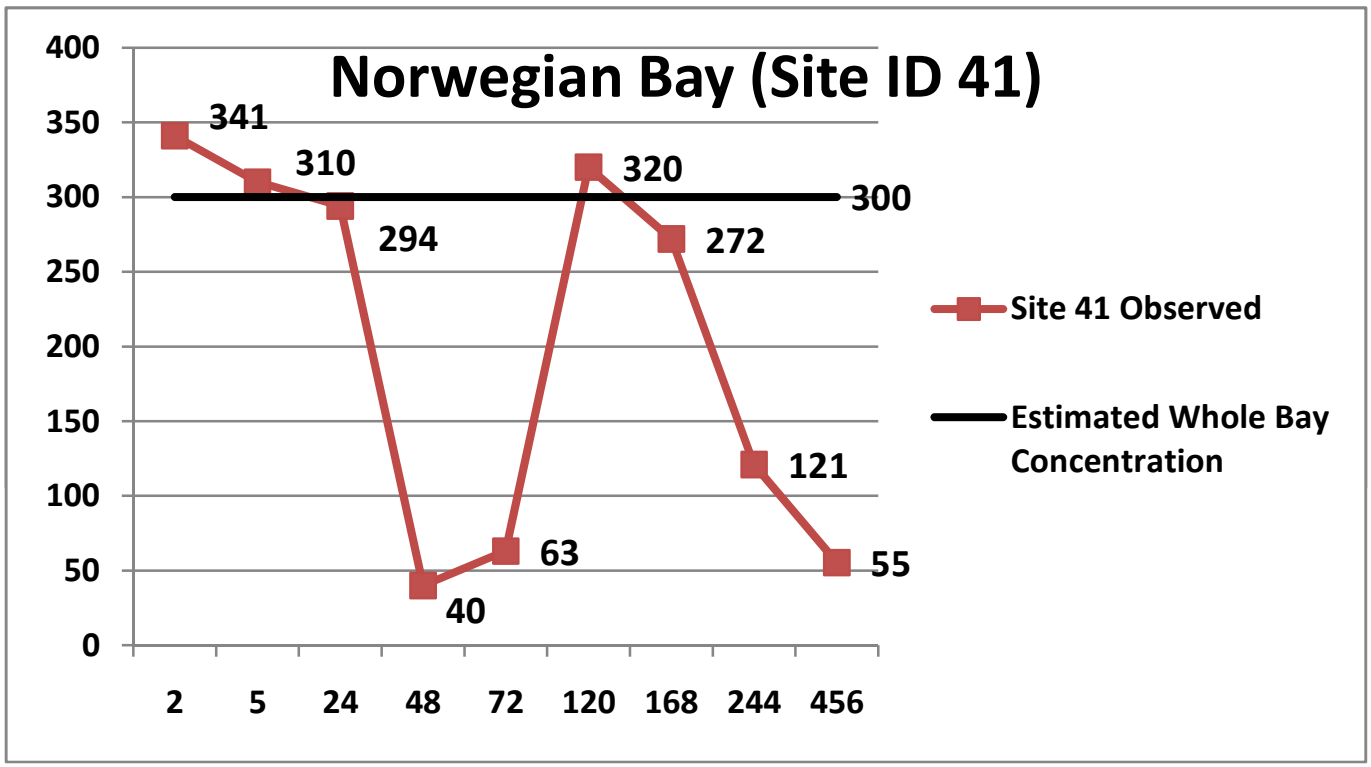

2011 Spring 2,4-D Herbicide Residue Data: East Lake (Site ID 47)
600
500
400
300
200
100
0
Parts Per Billion
Site 47 Observed
Estimated Whole Lake Concentration
309
17
37
533
227
270
184
170 ppb
2
5
24
48
72
120
168
Hours

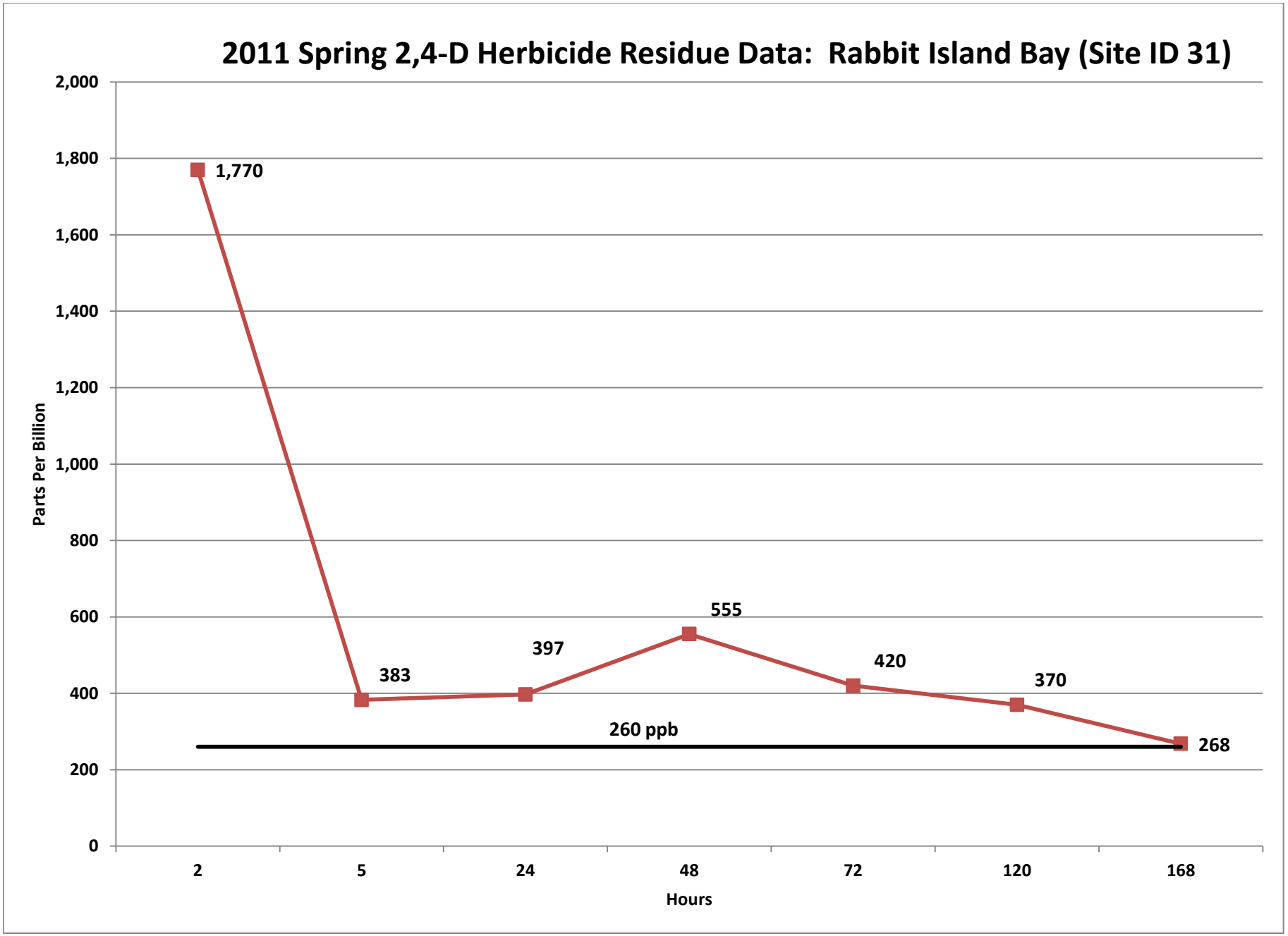

2011 Spring 2,4-D Herbicide Residue Data: East Lake (Site ID 49)
Site 49 Observed
Estimated Whole Lake Concentration
Parts Per Billion
600
500
400
300
200
100
0
277
44
482
313
260
50
139
170 ppb
2
5
24
48
72
120
168
Hours


2011 Spring 2,4-D Herbicide Residue Data: East Lake (Site ID 51)
Site 51 Observed
Estimated Whole Lake Concentration
Parts Per Billion
Hours
500
450
400
350
300
250
200
150
100
50
0
2
5
24
48
72
120
168
244
456
462
424
372
334
291
333
218
144
48
170 ppb

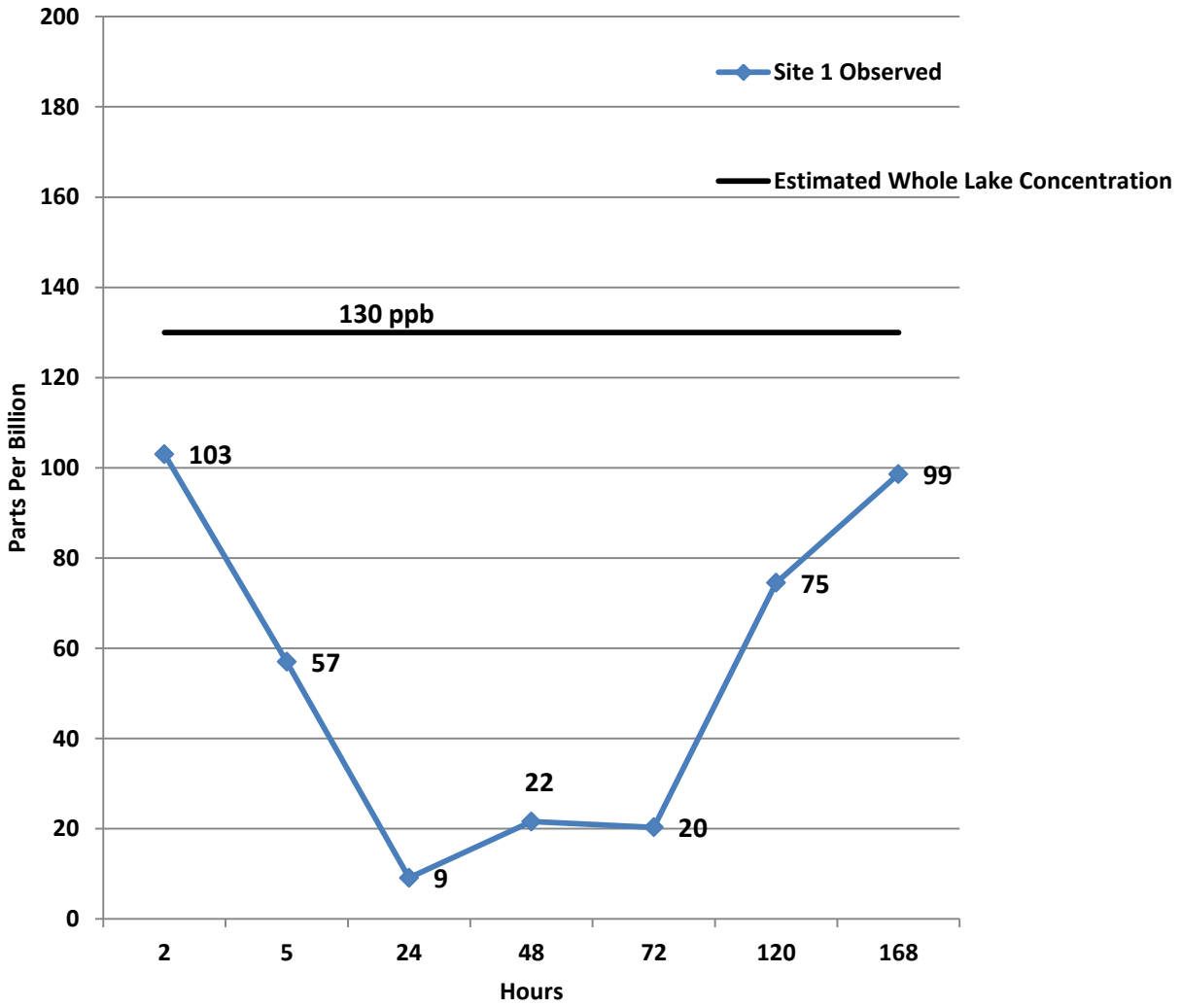

2011 Spring 2,4-D Herbicide Residue Data: East Lake (Site ID 53)
Site 53 Observed
Estimated Whole Lake Concentration
Parts Per Billion
Hours
450
400
350
300
250
200
150
100
50
0
2
5
24
48
72
120
168
244
456
410
382
365
366
356
321
214
148
46
170 ppb


2011 Spring 2,4-D Herbicide Residue Data: Library Lake (Site ID 35)
Parts Per Billion
400
350
300
250
200
150
100
50
0
377
350
319
310
216
178
54
41
210 ppb
2
24
48
72
120
168
244
456
Hours

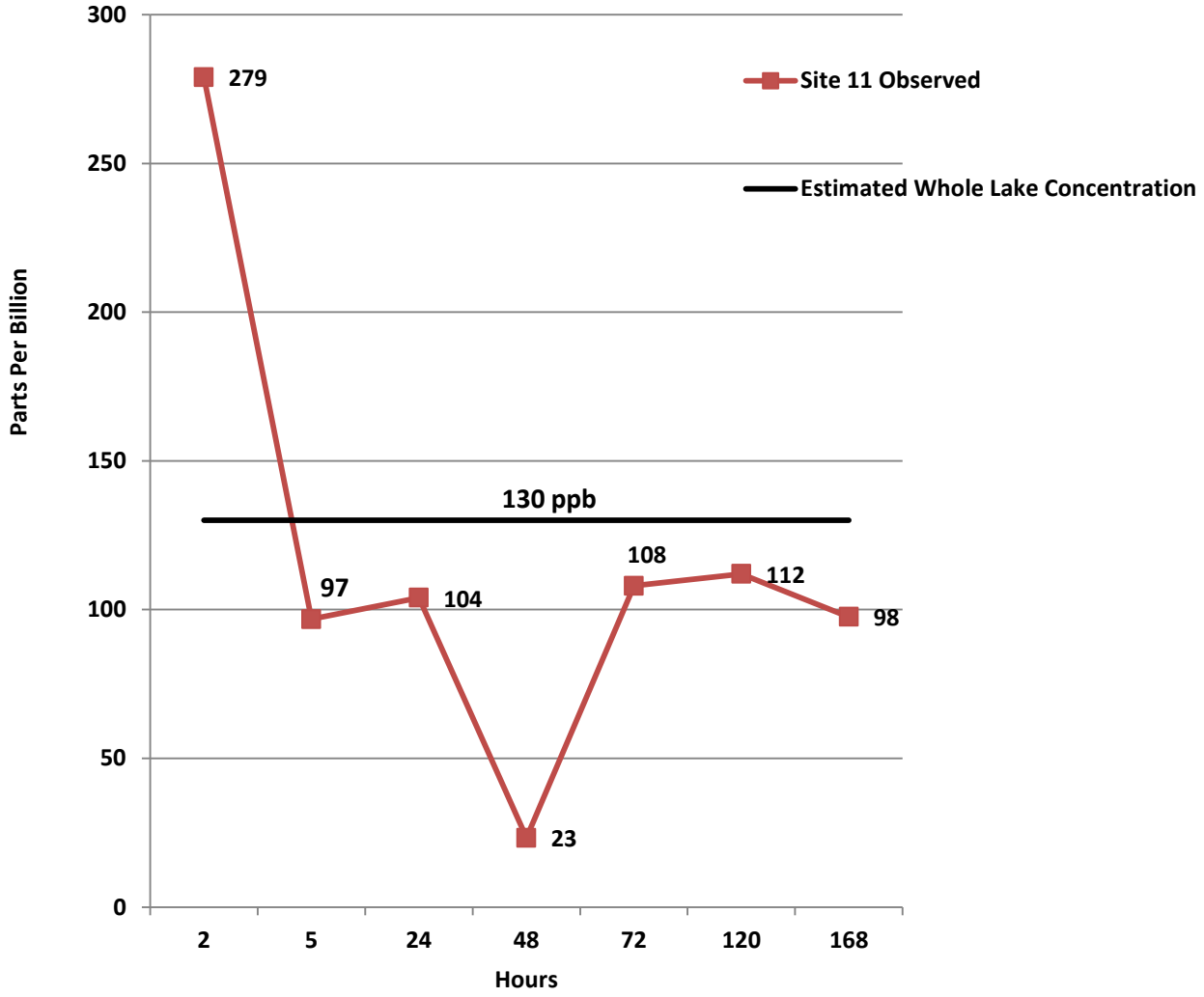

Norwegian Bay (Site ID 41)
400
350
300
250
200
150
100
50
0
341
310
294
40
63
320
272
121
55
300
2
5
24
48
72
120
168
244
456
Site 41 Observed
Estimated Whole Bay Concentration


2011 Spring 2,4-D Herbicide Residue Data: Rabbit Island Bay (Site ID 31)
Parts Per Billion
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1,770
383
397
555
420
370
268
260 ppb
2
5
24
48
72
120
168
Hours

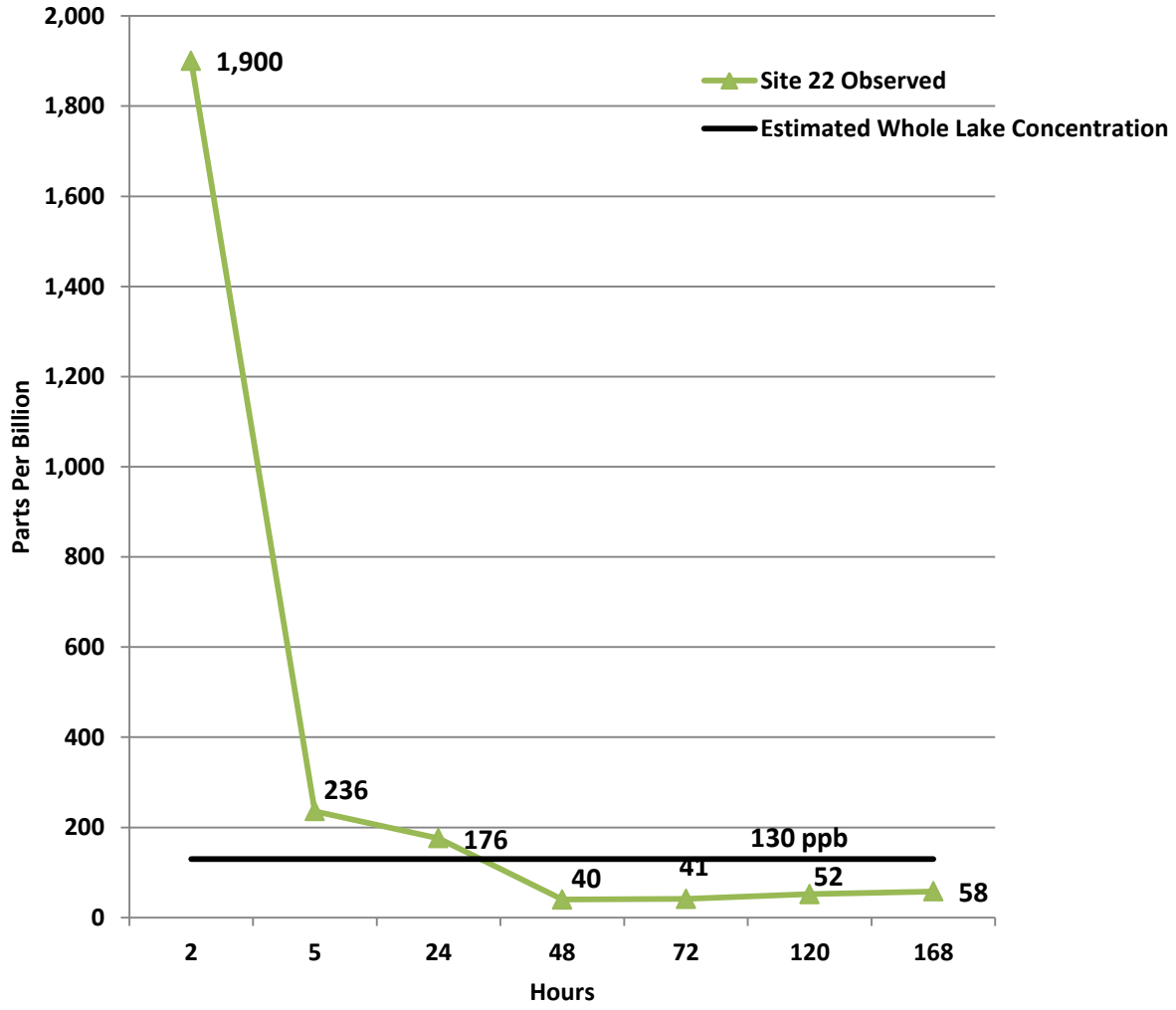
2011 Spring 2,4-D Herbicide Residue Data: West Lake (Site ID 1)



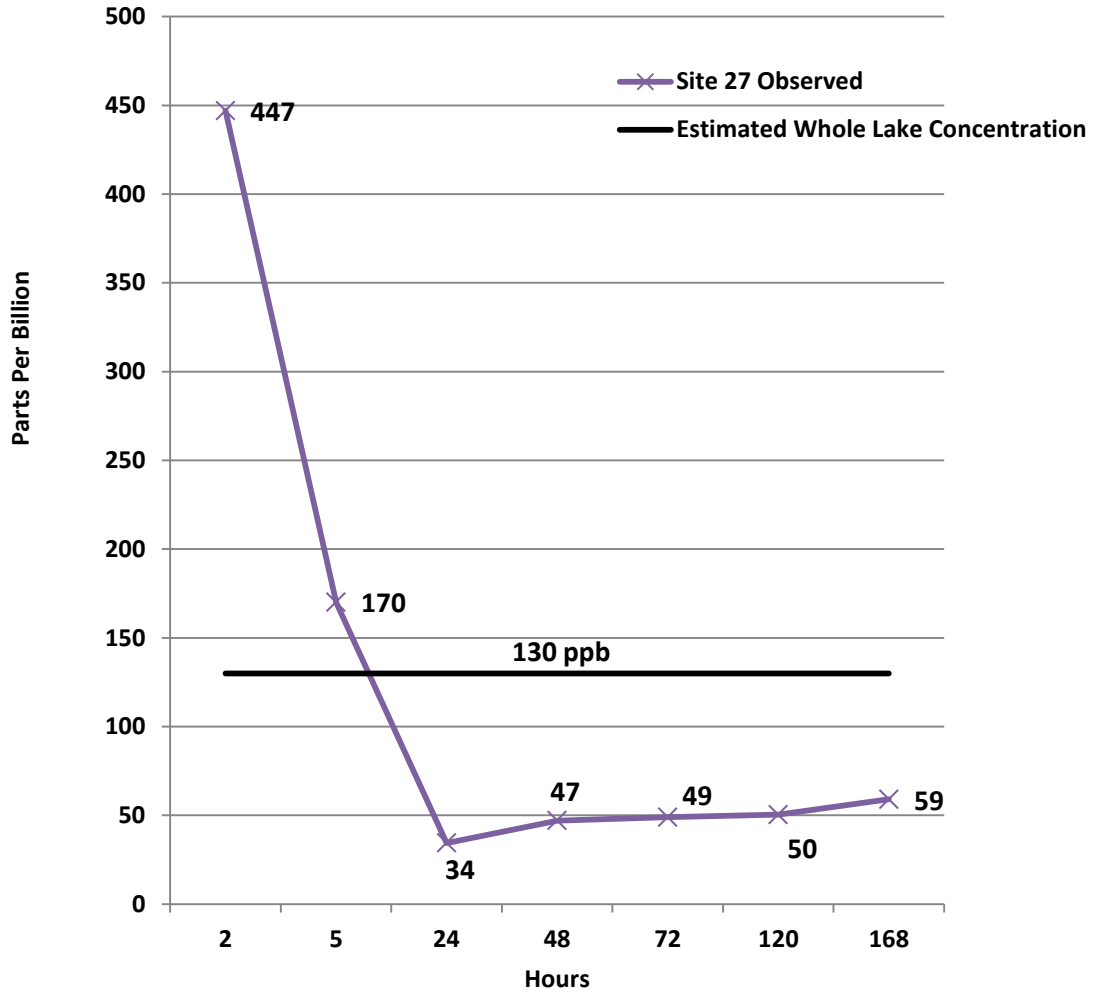
2011 Spring 2,4-D Herbicide Residue Data: West Lake (Site ID 11)

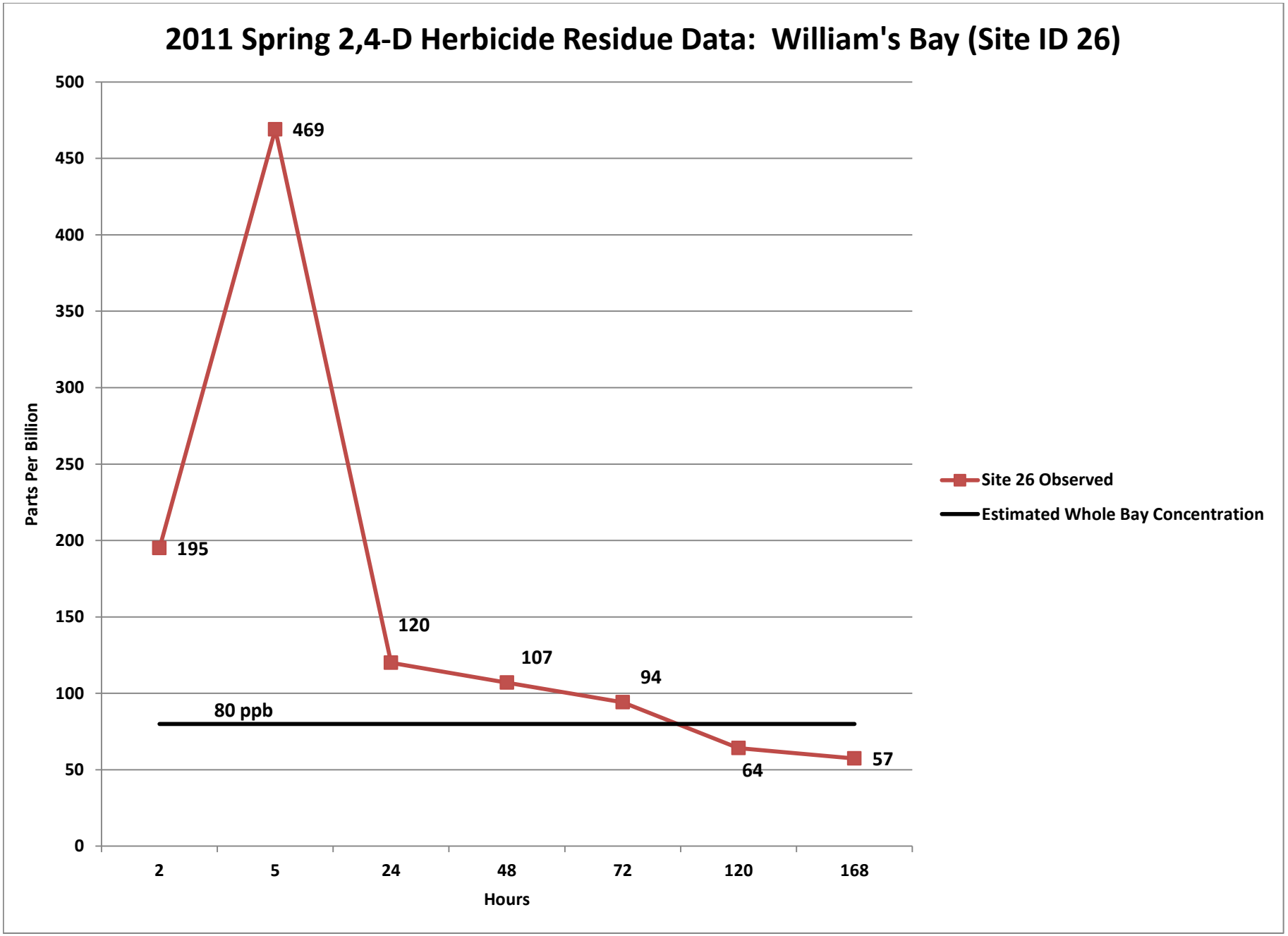


2011 Spring 2,4-D Herbicide Residue Data: West Lake (Site ID 22)



2011 Spring 2,4-D Herbicide Residue Data: West Lake (Site ID 27)




2011 Spring 2,4-D Herbicide Residue Data: William's Bay (Site ID 26)
Parts Per Billion
500
450
400
350
300
250
200
150
100
50
0
469
195
120
107
94
64
57
80 ppb
2
5
24
48
72
120
168
Hours
Site 26 Observed
Estimated Whole Bay Concentration

ID#: 1
1.5 acres
Dose = 4 ppm

ID#: 2
0.5 acres
Dose = 4 ppm

ID#: 3
0.5 acres
Dose = 4 ppm

ID#: 4
0.89 acres
Dose = 4 ppm

ID#: 5
0.5 acres
Dose = 4 ppm

ID#: 6
0.98 acres
Dose = 4 ppm

ID#: 7
0.57 acres
Dose = 4 ppm

ID#: 8
1.26 acres
Dose = 4 ppm

ID#: 9
0.61 acres
Dose = 4 ppm

ID#: 10
0.77 acres
Dose = 4 ppm

ID#: 11
1.64 acres
Dose = 4 ppm

0.13 ppm

ID#: 12
0.59 acres
Dose = 4 ppm

ID#: 13
2.05 acres
Dose = 4 ppm

ID#: 14
2.23 acres
Dose = 4 ppm

ID#: 15
0.59 acres
Dose = 4 ppm

ID#: 16
1.96 acres
Dose = 4 ppm

ID#: 17
2.46 acres
Dose = 4 ppm

ID#: 19
1.46 acres
Dose = 4 ppm

ID#: 18
0.5 acres
Dose = 4 ppm

ID#: 20
0.63 acres
Dose = 4 ppm

ID#: 21
1.22 acres
Dose = 4 ppm

ID#: 23
1.91 acres
Dose = 4 ppm

ID#: 24
3.66 acres
Dose = 2 ppm

ID#: 22
8.43 acres
Dose = 2 ppm

ID#: 27
0.41 acres
Dose = 4 ppm

0.08 ppm

ID#: 25
0.3 acres
Dose = 4 ppm

ID#: 26
0.42 acres
Dose = 4 ppm

ID#: 28
0.33 acres
Dose = 4 ppm

ID#: 29
1.45 acres
Dose = 4 ppm

ID#: 31
6.68 acres
Dose = 2.5 ppm

0.26 ppm

ID#: 36
1.56 acres
Dose = 0.3 ppm

ID#: 30
2.43 acres
Dose = 2.5 ppm

ID#: 32
2.28 acres
Dose = 2.5 ppm

ID#: 33
4.79 acres
Dose = 2.5 ppm

ID#: 34
1.43 acres
Dose = 2.5 ppm

ID#: 35
3.0 acres
Dose = 1.0 ppm

0.21 ppm

Library Lake Inset Map

ID#: 35
3.0 acres
Dose = 1.0 ppm

0.21 ppm

N

0 100 200 400
Feet

Proposed 2011 EWM Treatment Areas
West Lake (0.13 ppm)
Williams Bay (0.08 ppm)
Rabbit Bay (0.26 ppm)
Library Lake (0.21 ppm)
Herbicide Residual Monitroing Locations

N

0 1,000 2,000 4,000
Feet

BARR

Figure 34

Herbicide Residual Monitoring
Beaver Dam and Library Lake
Barron County, WI
Job No. 49-03-011

ID#: 32
22.85 acres
0.48 ppm 2,4-D

ID#: 34
1.13 acres
Stratified: 3.6 ppm 2,4-D
Not Stratified: 4 ppm 2,4-D

ID#: 33
5.02 acres
Stratified: 3.6 ppm 2,4-D
Not Stratified: 4 ppm 2,4-D

ID#: 35
0.86 acres
Stratified: 3.6 ppm 2,4-D
Not Stratified: 4 ppm 2,4-D

ID#: 30
2.78 acres
0.36 ppm 2,4-D

ID#: 31
76.7 acres
0.36 ppm 2,4-D

ID#: 37
7.21 acres
Stratified: 3.6 ppm 2,4-D
Not Stratified: 4 ppm 2,4-D

ID#: 36
13.28 acres
Stratified: 3.6 ppm 2,4-D
Not Stratified: 4 ppm 2,4-D

ID#: 38
53.37 acres
0.3 ppm 2,4-D
0.7 ppm Endothall

32
31-A
East Lake Center
31-B
37
36
31-C
38

Proposed 2012 EWM Treatment Areas

Treatment Zones (183.19 Total Treated Acres)

East Lake (0.30 ppm 2,4-D (Stratified) / 0.20 ppm 2,4-D (Not Stratified) - 27.5 Treated Acres)

City Bay (0.30 ppm 2,4-D - 79.47 Treated Acres)

Cemetery Bay (0.3 ppm 2,4-D / 0.7 ppm Endothall - 53.37 Treated Acres)

Norwegian Bay (0.30 ppm 2,4-D- 22.85 Treated Acres)

Herbicide Residue Monitoring Locations

N

0 500 1,000 2,000
Feet

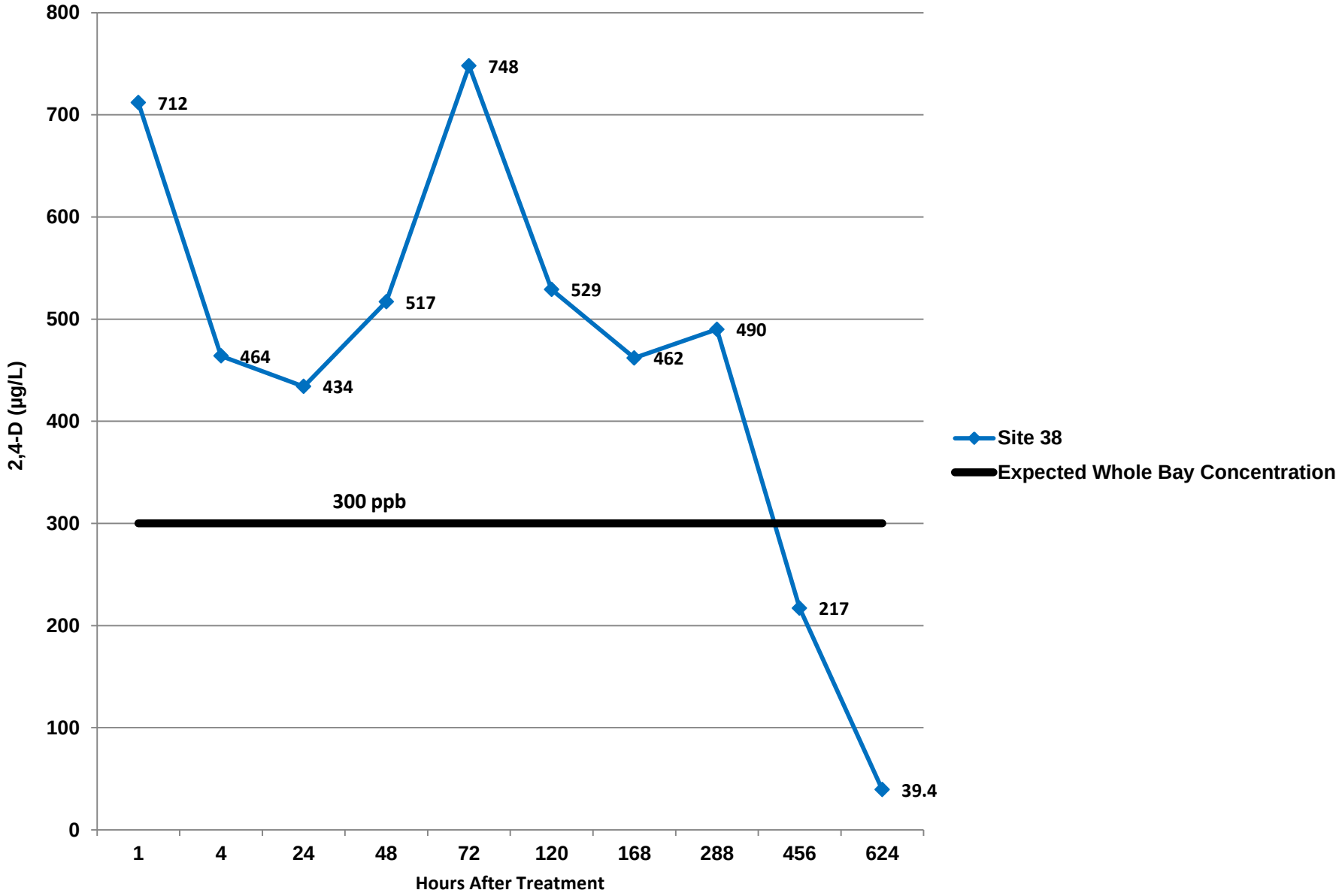
BARR

Eurasian Watermilfoil Proposed 2012 Treatment and Herbicide Residue Monitoring Locations Beaver Dam Lake Barron County, WI

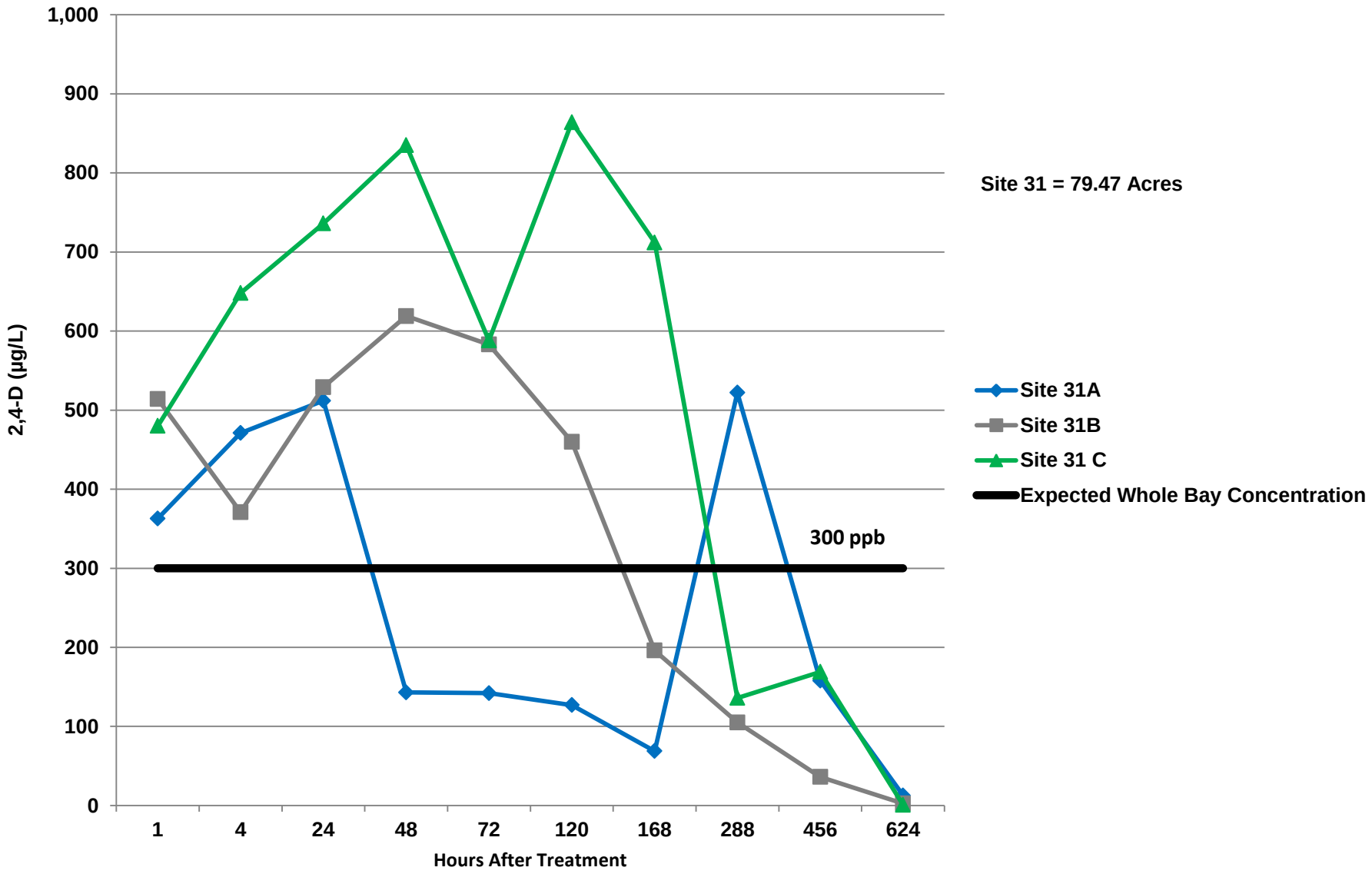
M-34

Barr Footer: ArcGIS 10.0, 2012-02-03 13:26 File: I:\Projects\49\03\01\GIS\Maps\2011\Fall_2011_Result_Figures\Proposed Treatment and Herbicide Residue Monitoring Locations 2012 - East Beaver Dam Lake.mxd User: kac2

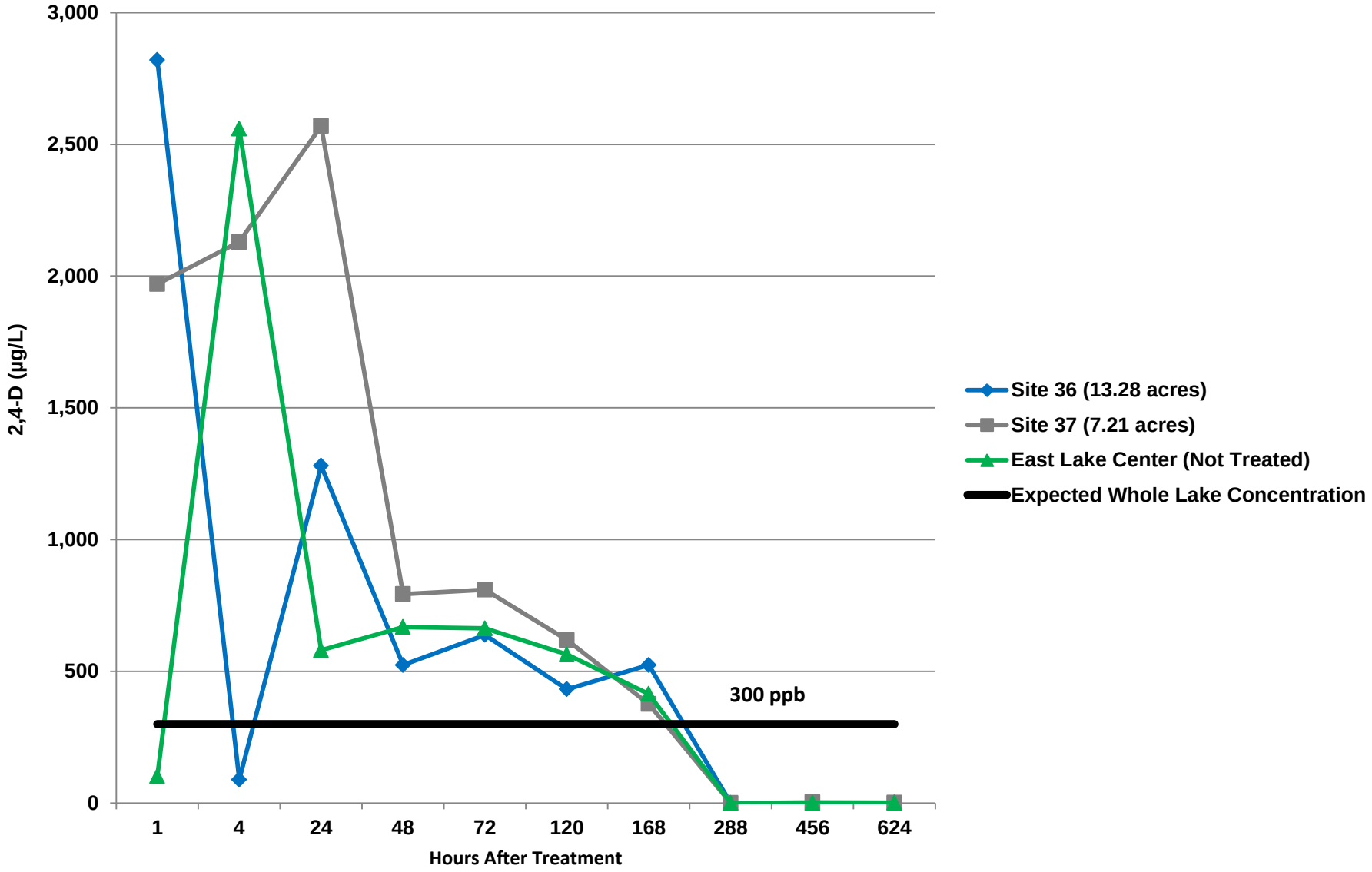
2012 Spring 2,4-D Herbicide Residue Data: Cemetary Bay (Site ID 38)



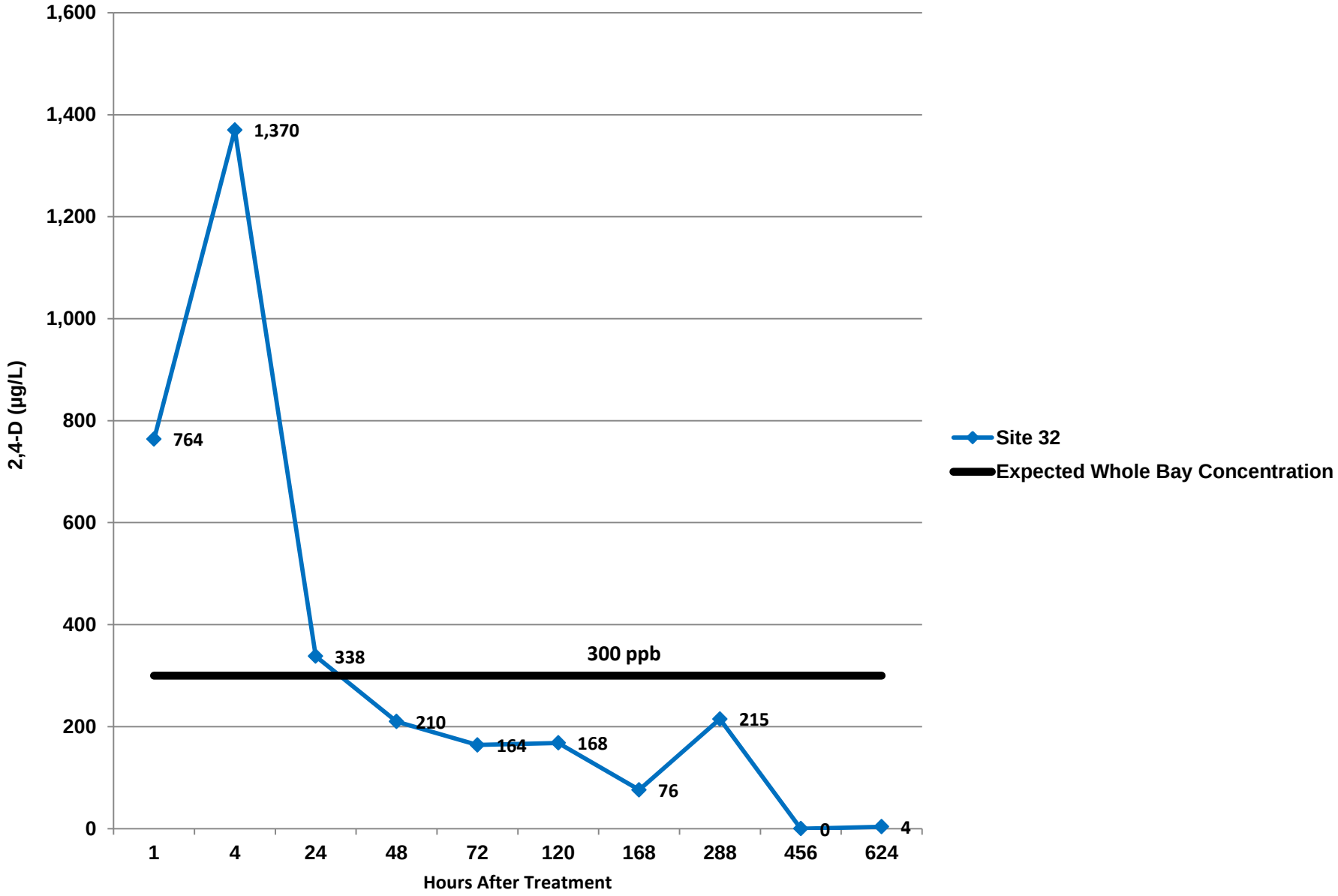
2012 Spring 2,4-D Herbicide Residue Data: City Bay (Site ID 31A, 31B, and 31C)



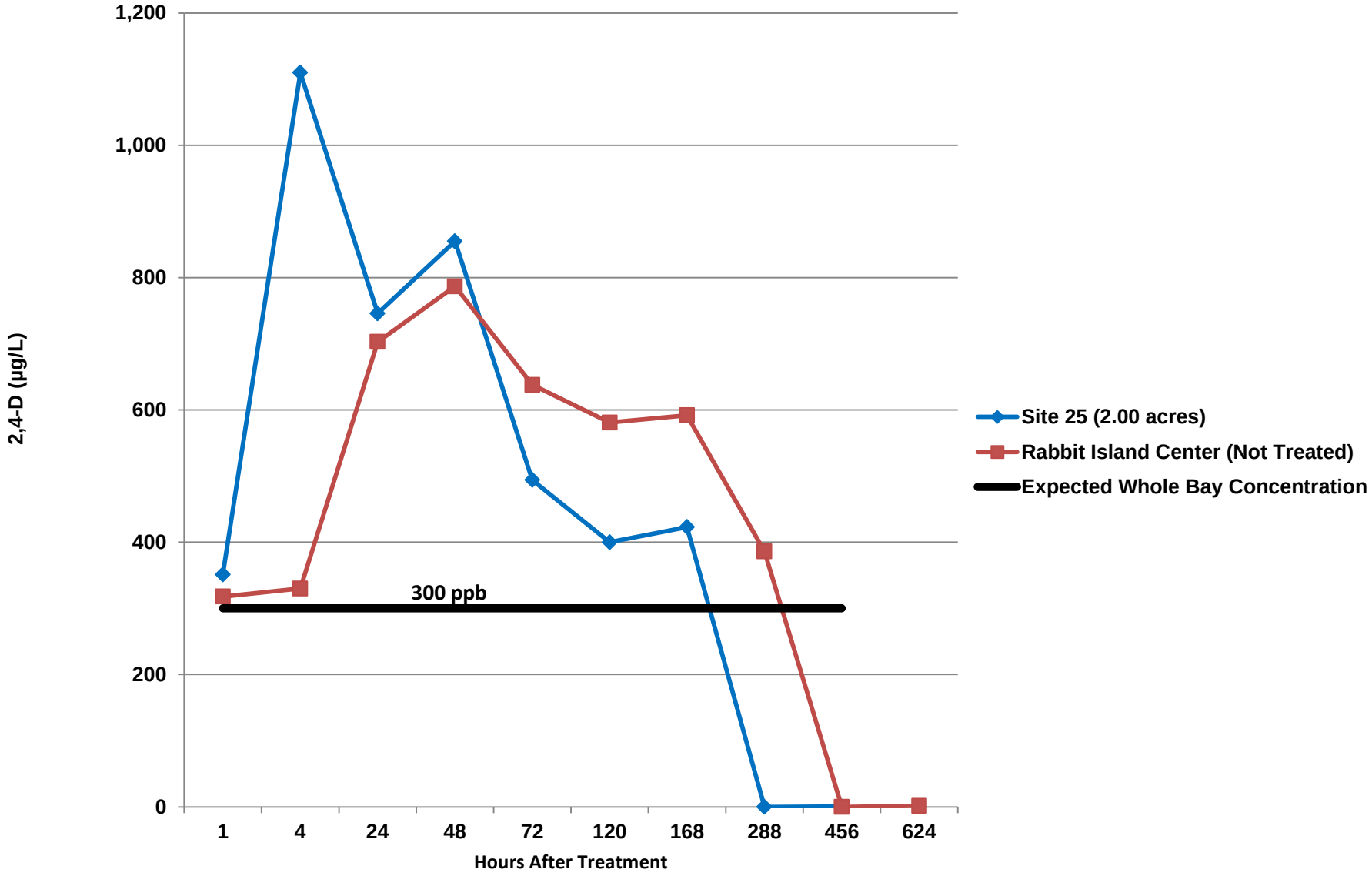
2012 Spring 2,4-D Herbicide Residue Data: East Lake (Site ID 36, 37, and East Lake Center)



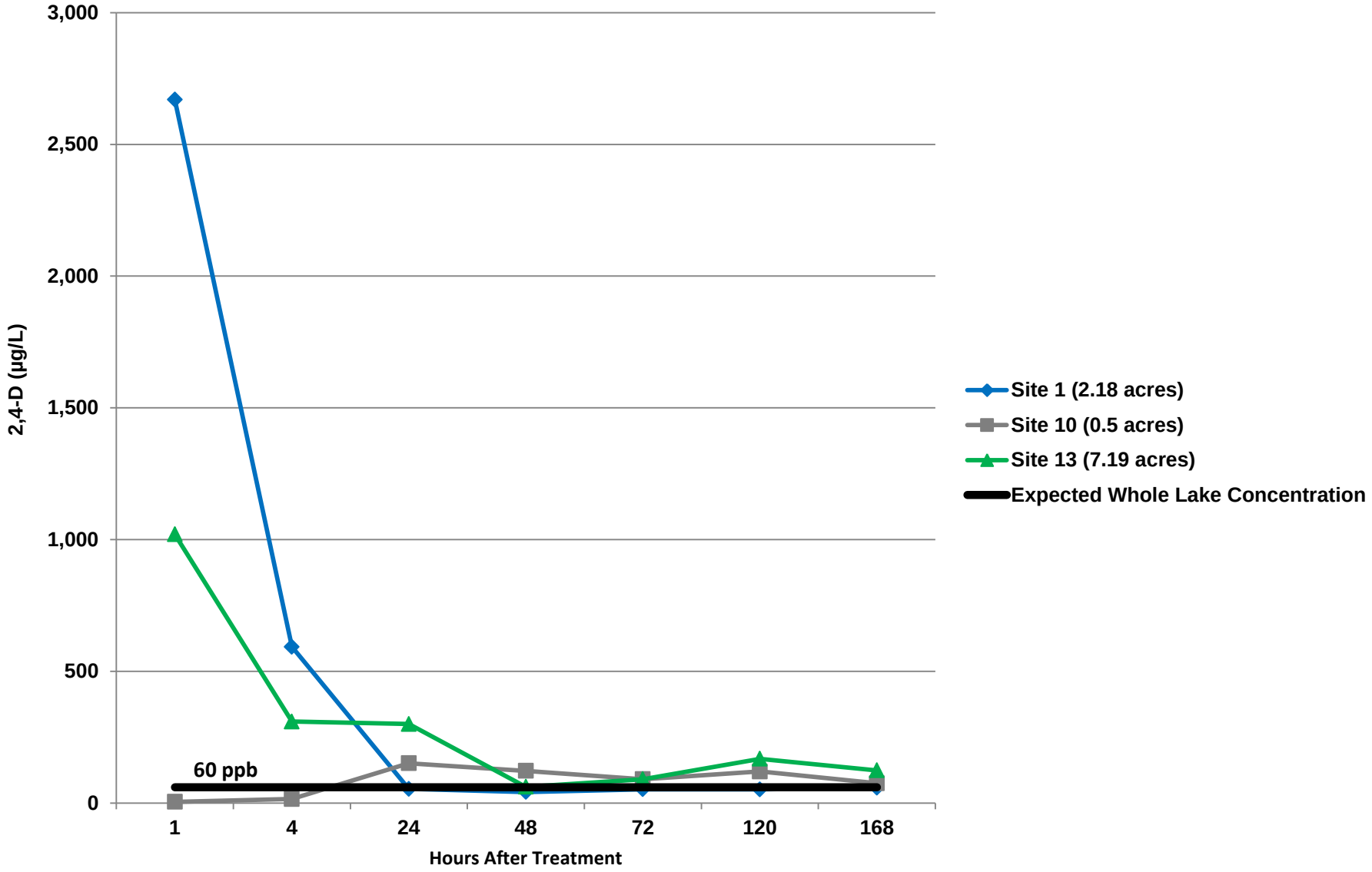
2012 Spring 2,4-D Herbicide Residue Data: Norwegian Bay (Site ID 32)



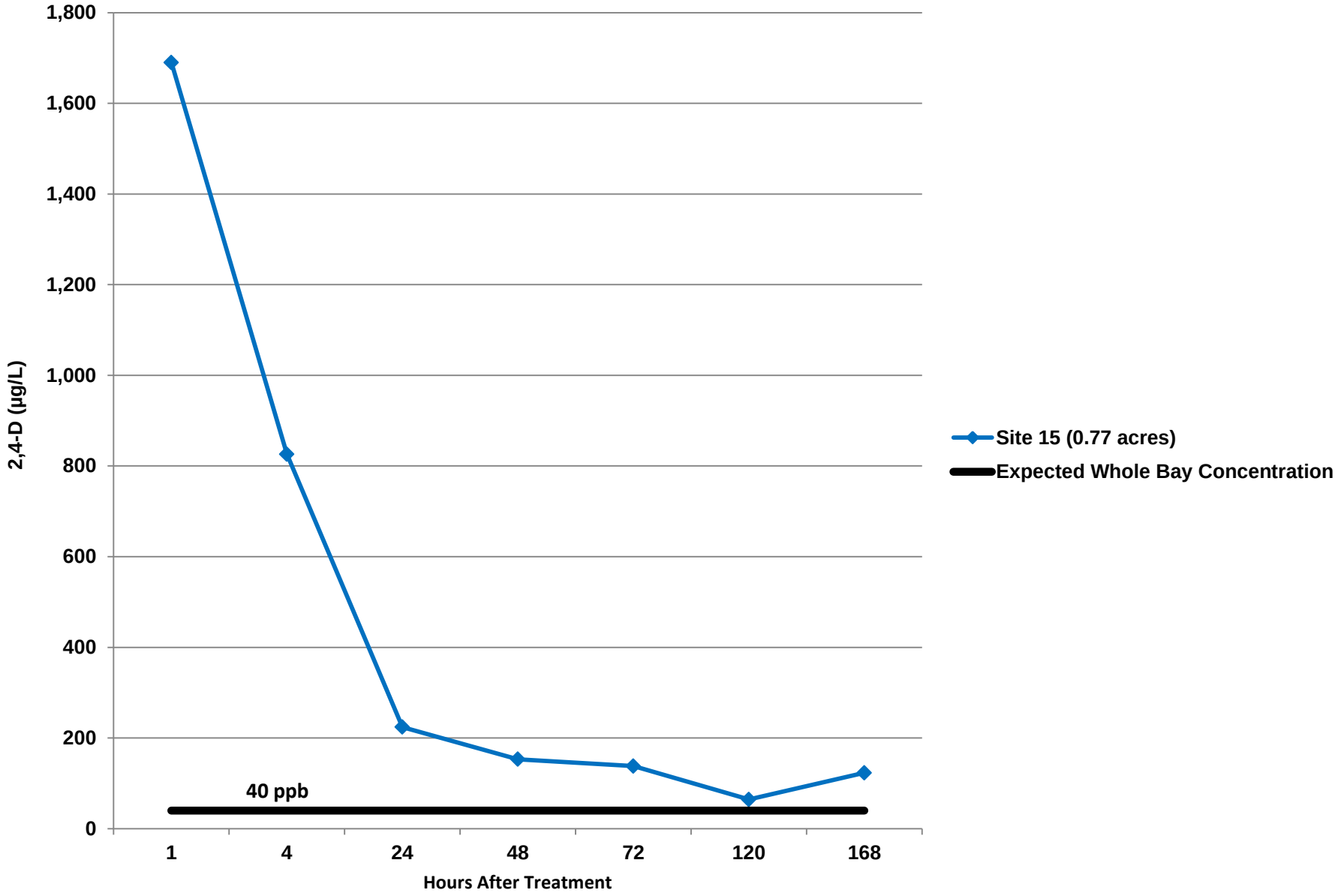
2012 Spring 2,4-D Herbicide Residue Data: Rabbit Island Bay (Site ID 25 and Rabbit Island Center)



2012 Spring 2,4-D Herbicide Residue Data: West Lake (Site ID 1, 10, and 13)



2012 Spring 2,4-D Herbicide Residue Data: Williams Bay (Site 15)



ID#: 1
2.18 acres
Dose = 4 ppm 2,4-D

ID#: 2
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 3
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 4
2.08 acres
Dose = 4 ppm 2,4-D

ID#: 5
2.35 acres
Dose = 4 ppm 2,4-D

ID#: 7
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 8
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 6
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 9
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 10
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 11
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 12
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 13
7.19 acres
Dose = 4 ppm 2,4-D

ID#: 14
0.50 acres
Dose = 4 ppm 2,4-D

ID#: 15
0.77 acres
Dose = 4 ppm 2,4-D

ID#: 16
0.61 acres
Dose = 4 ppm 2,4-D

ID#: 17
1.45 acres
Dose = 4 ppm 2,4-D

ID#: 27
0.53 acres
Dose = 4 ppm
2,4-D

ID#: 18
1.45 acres
Dose = 4 ppm 2,4-D

ID#: 19
2.00 acres
Dose = 4 ppm 2,4-D

Rabbit Island
Bay Center

ID#: 20
2.00 acres
Dose = 4 ppm 2,4-D

ID#: 26
1.80 acres
Dose = 4 ppm 2,4-D

ID#: 21
2.00 acres
Dose = 4 ppm 2,4-D

ID#: 25
2.00 acres
Dose = 4 ppm 2,4-D

ID#: 22
1.80 acres
Dose = 4 ppm 2,4-D

ID#: 23
2.00 acres
Dose = 4 ppm 2,4-D

ID#: 24
2.00 acres
Dose = 4 ppm 2,4-D

1
10
13
15
25

Library Lake Inset Map

N

0 100 200 400
Feet

Proposed 2012 EWM Treatment Areas

Treatment Zones (39.2 Total Treated Acres)

Library Lake (0 Treated Acres)

Rabbit Island Bay (0.30 ppm 2,4-D-
15.6 Treated Acres)

West Lake (0.06 ppm 2,4-D -
19 Treated Acres)

Williams Bay (0.04 ppm 2,4-D-
4.6 Treated Acres)

Herbicide Residue Monitoring Locations

N

0 750 1,500 3,000
Feet

BARR

Eurasian Watermilfoil
Proposed 2012 Treatment and
Herbicide Residue Monitoring
Locations
Beaver Dam Lake
Barron County, WI

M-42

Barr Footer: ArcGIS 10.0, 2012-02-03 13:30 File: J:\Projects\49\03\011\GIS\Maps\2011\Fall 2011 Result Figures\Proposed Treatment and Herbicide Residue Monitoring Locations 2012 - West Beaver Dam Lake.mxd User: kac2

Draft: Beaver Dam Lake, Barron County,
2,4-D Concentration Monitoring Summary, 2013
31 October 2013

John Skogerboe

Beaver Dam Lake has an area of 1163 acres, and a maximum depth of 106 ft. The lake is listed on the WI DNR Lakes Finder web page as a seepage lake, however the lake has a water control structure and is more likely a flowage. Beaver Dam Lake is divided into two separate basins, East Lake and West Lake. Each basin can also be divided into 4 sub basins or bays (Table). Treatment scenarios can be divided into three different treatment scenarios: whole bay treatments, spot treatments with a bay wide target concentration, and spot treatments with insignificant bay wide concentrations (Figure 1 and Figure 2). Herbicide treatments on Beaver Dam Lake occurred between 5/28/13 and 6/18/13

Treatment Area	Treatment	Target	Whole Bay	Treatment	Wind	Wind	Water
Area	Scenario	Conc.	Conc.	Date	Speed	Direction	Temperature
1. East Lake							
Norwegian Bay	whole bay	500	500	05/28/13	4 to 7	E	58.7
East Lake Bay I	spot/whole bay	4000	500	05/28/13	2 to 8	N	59.1
East Lake Bay II	spot/whole bay	4000	500	05/29/13	4 to 10	SE	58.2
City Bay	whole bay	500	500	05/30/13	8 to 10	S	61.9
Cemetery Bay	spot/whole bay	2000	300	05/31/13	8 to 12	SSE	65.8
2. West Lake							
Library Bay	spot/whole bay	2400	300	05/20/13	5 to 8	SE	59.6
Rabbit Bay	spot/whole bay	4000	300	06/04/13	4 to 9	SE	64.9
Rabbit Bay	spot/whole bay	4000	300	06/06/13	4 to 7	SSE	58.1
Williams Bay	spot/whole bay	4000	300	06/05/13	4 to 10	SE	58.1
West Lake Bay I	spot	4000	70	06/03/13	3 to 5	SE	65.4
West Lake Bay II	spot	4000	70	06/13/13	4 to 8	NW	59
West Lake Bay III	spot	4000	70	06/14/13	4 to 7	SW	68.2
West Lake Bay IV	spot	4000	70	06/17/13	4 to 6	N	66.2
West Lake Bay V	spot	4000	70	06/18/13	4 to 6	SE	67.1

Water samples were collected at all sites using an integrated water sampler which collects a water sample from the entire water column. Water samples were collected at intervals of approximately 0.04, 0.16, 1, 2, 3, 5, 7, 12, 19, and 26 days after treatment (DAT). Samples were taken to shore after completion of each sample interval, and 3 drops of muriatic acid were added to each sample bottle to fix the 2,4-D and prevent degradation. Samples were then stored in a refrigerator, until shipped to the US Army Engineer Research and Development Center (ERDC) laboratory in Gainesville, FL for analysis of 2,4-D.

Norwegian Bay was a whole bay 2,4-D treatment with a bay wide target concentration of 500 ug/L ae. Concentrations of 2,4-D in water samples ranged from 539 to 1008 ug/L ae from 0.04 to 1 DAT (Figure 3). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 590 ug/L ae compared to the target bay wide concentration of 500 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 12 DAT.

East Lake Bay included six spot treatments with target concentrations of 4000 ug/L ae, which were calculated to result in a bay wide target concentration of 500 ug/L ae assuming dissipation throughout the bay. Concentrations of 2,4-D in water samples ranged from 58 to 2304 ug/L ae from 0.04 to 1 DAT compared to the target concentration of 4000 ug/L ae (Figure 4). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 792 ug/L ae compared to the target bay wide concentration of 500 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 12 DAT.

City Bay was a whole bay 2,4-D treatment with a bay wide target concentration of 500 ug/L ae. Concentrations of 2,4-D in water samples ranged from 358 to 792 ug/L ae from 0.04 to 1 DAT (Figure 5). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 636 ug/L ae compared to the target bay wide concentration of 500 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 7 DAT.

Cemetery Lake Bay included five spot treatments with target concentrations of 2000 ug/L ae, which were calculated to result in a bay wide target concentration of 300 ug/L ae assuming dissipation throughout the bay. Concentrations of 2,4-D in water samples ranged from 233 to 1137 ug/L ae from 0.04 to 1 DAT compared to the target concentration of 2000 ug/L ae (Figure 6). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 511 ug/L ae compared to the target bay wide concentration of 300 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 7 DAT.

Library Lake Bay included one spot treatment with target concentrations of 2400 ug/L ae, which was calculated to result in a bay wide target concentration of 300 ug/L ae assuming dissipation throughout the bay. Concentrations of 2,4-D in water samples ranged from 24 to 1494 ug/L ae from 0.04 to 1 DAT compared to the target concentration of 2400 ug/L ae (Figure 7). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 442 ug/L ae compared to the target bay wide concentration of 300 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 12 DAT.

Rabbit Island Bay included five spot treatments with target concentrations of 4000 ug/L ae, which were calculated to result in a bay wide target concentration of 300 ug/L ae assuming dissipation throughout the bay. Concentrations of 2,4-D in water samples ranged from 51 to 1848 ug/L ae from 0.04 to 1 DAT compared to the target concentration of 4000 ug/L ae (Figure 8). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 478 ug/L ae compared to the target bay wide concentration of 300 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 12 DAT.

Williams Bay included six spot treatments with target concentrations of 4000 ug/L ae, which were calculated to result in a bay wide target concentration of 300 ug/L ae assuming dissipation throughout the bay. Concentrations of 2,4-D in water samples ranged from 65 to 1514 ug/L ae from 0.04 to 1 DAT compared to the target concentration of 4000 ug/L ae (Figure 9). The mean bay wide concentration in samples collected from 0.04 to 7 DAT was 321 ug/L ae compared to

the target bay wide concentration of 300 ug/L ae. Concentrations of 2,4-D exceeded the 2,4-D irrigation standard (100 ug/L ae) through 7 DAT.

West Lake Bay included eighteen spot treatments with target concentrations of 4000 ug/L ae, which were calculated to result in a bay wide target concentration of 70 ug/L ae assuming dissipation throughout the bay. Herbicide applications were conducted over a period of 15 days. Max concentrations of 2,4-D in water samples from the monitored treatment areas ranged from 785 to 2066 ug/L ae compared to the target concentration of 4000 ug/L ae (Figure 10). Concentrations of 2,4-D from site 1 and site 38 were less than the 2,4-D irrigation standard (100 ug/L ae) by 0.16 DAT. Concentrations of 2,4-D from site 43 were less than the 2,4-D irrigation standard (100 ug/L ae) by 2 DAT.

Concentrations and exposure times were similar in bays treated either as whole bay treatments or spot treatments with whole bay target concentrations (Figure 11 and Figure 12). Initial concentrations of (0.04 to 1 DAT) were more variable in spot treatments with whole lake target concentrations. Concentrations of 2,4-D exceeded 100 ug/L ae for 7 to 12 DAT in these treatment scenarios. Concentrations of 2,4-D in West Lake Bay spot treatments were less than 100 ug/L by 0.16 DAT , however the most down stream site 43 exceeded 100 ug/L through 1 DAT. This site was probably significantly influenced by the numerous upstream herbicide treatments.

Figure 1. Beaver Dam East Lake 2,4-D Treatment Areas and Herbicide Sample Sites, 2013 (Barr Engineering)

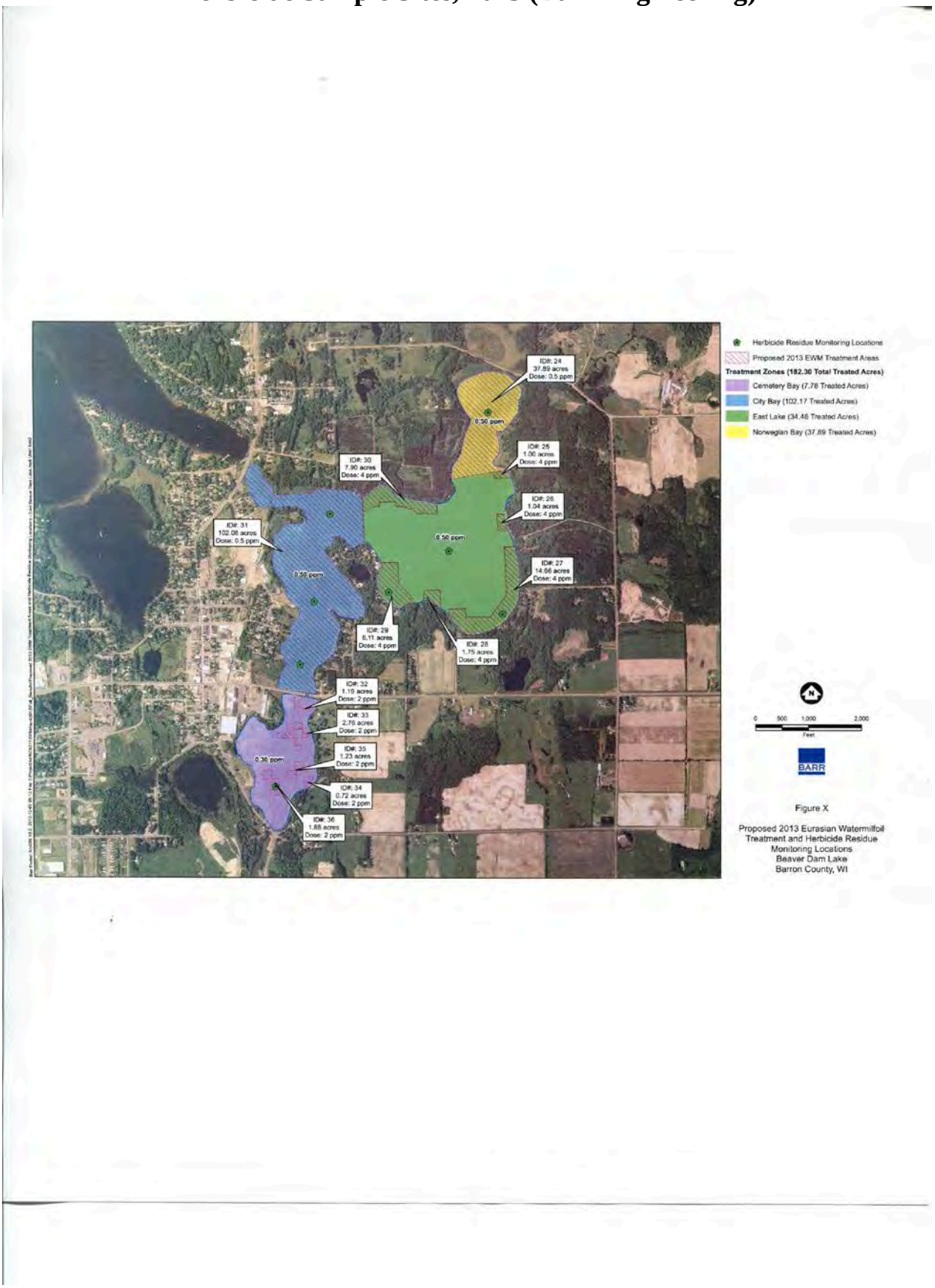


Figure 2. Beaver Dam West Lake 2,4-D Treatment Areas and Herbicide Sample Sites, 2013 (Barr Engineering

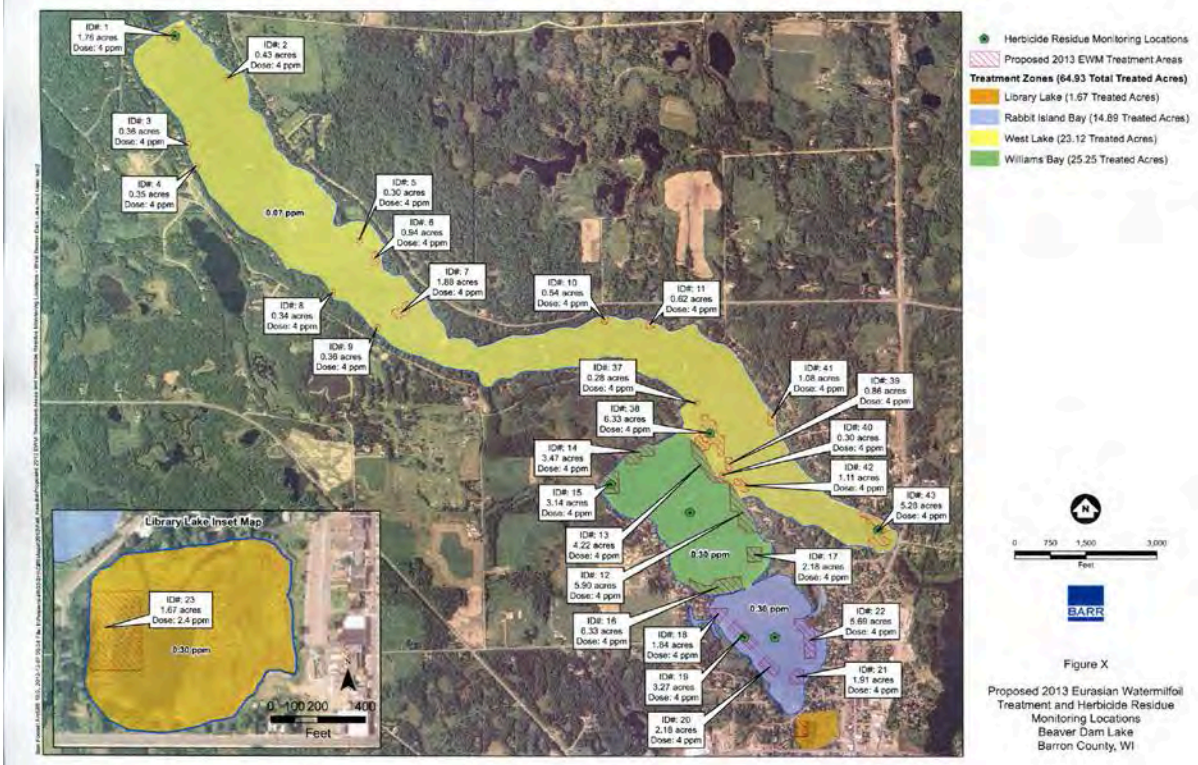


Figure 3

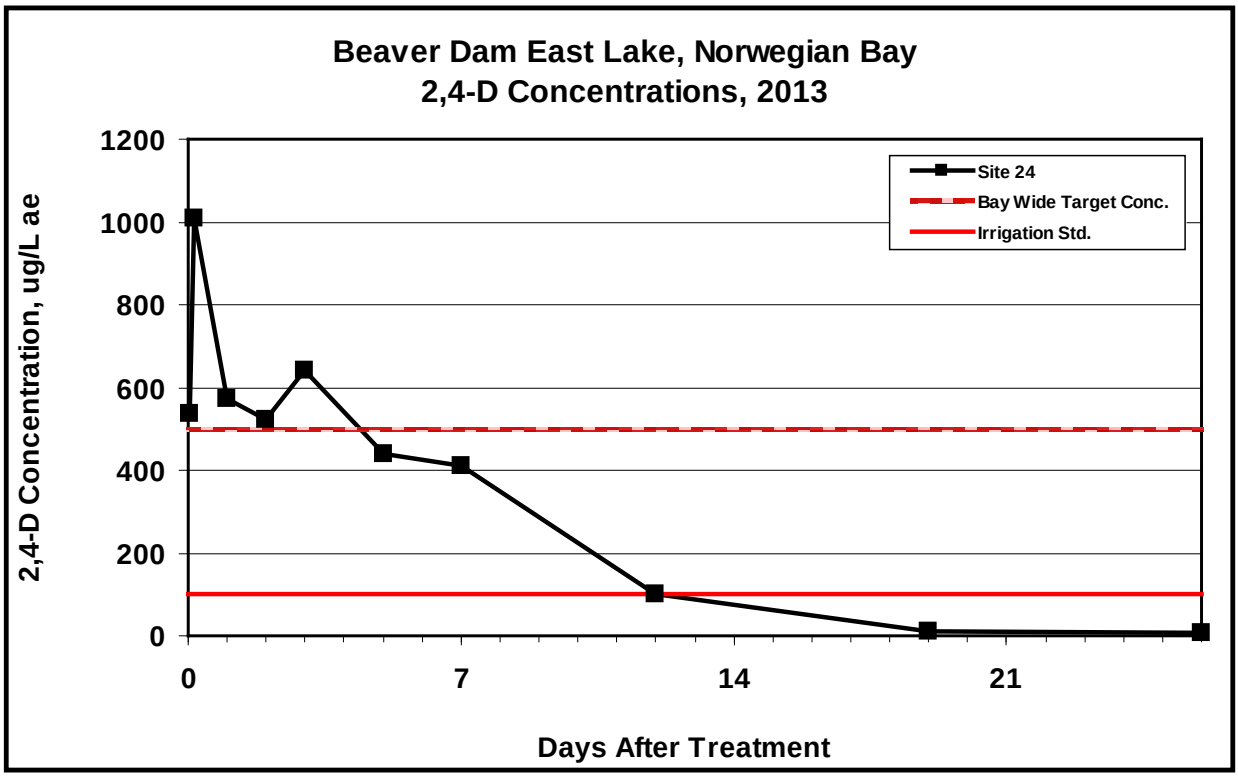


Figure 4

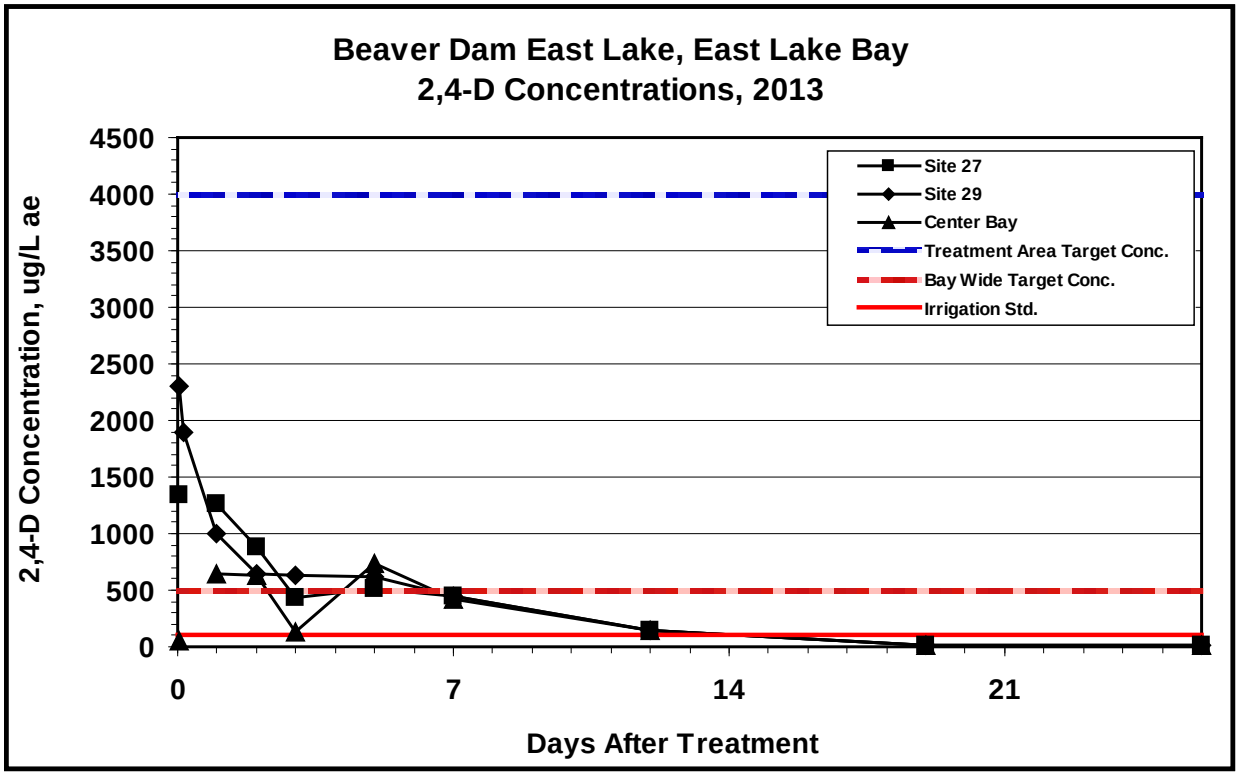


Figure 5

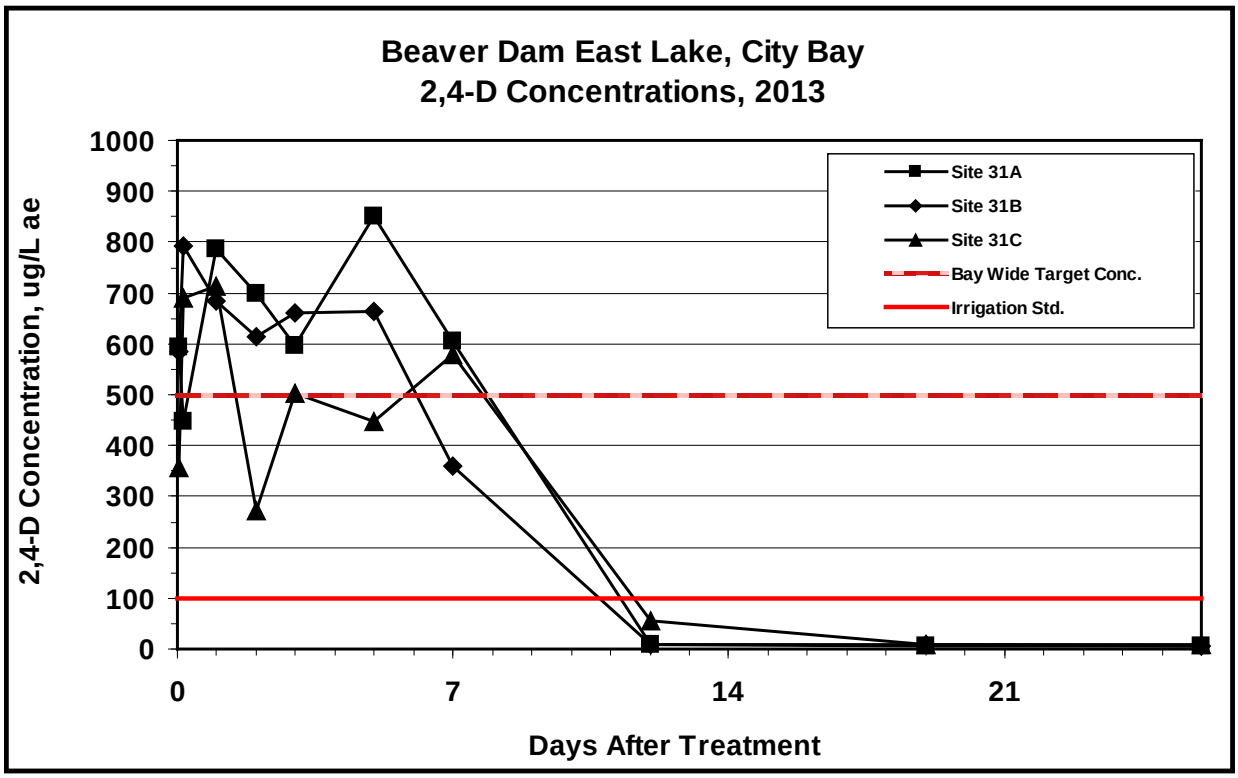


Figure 6

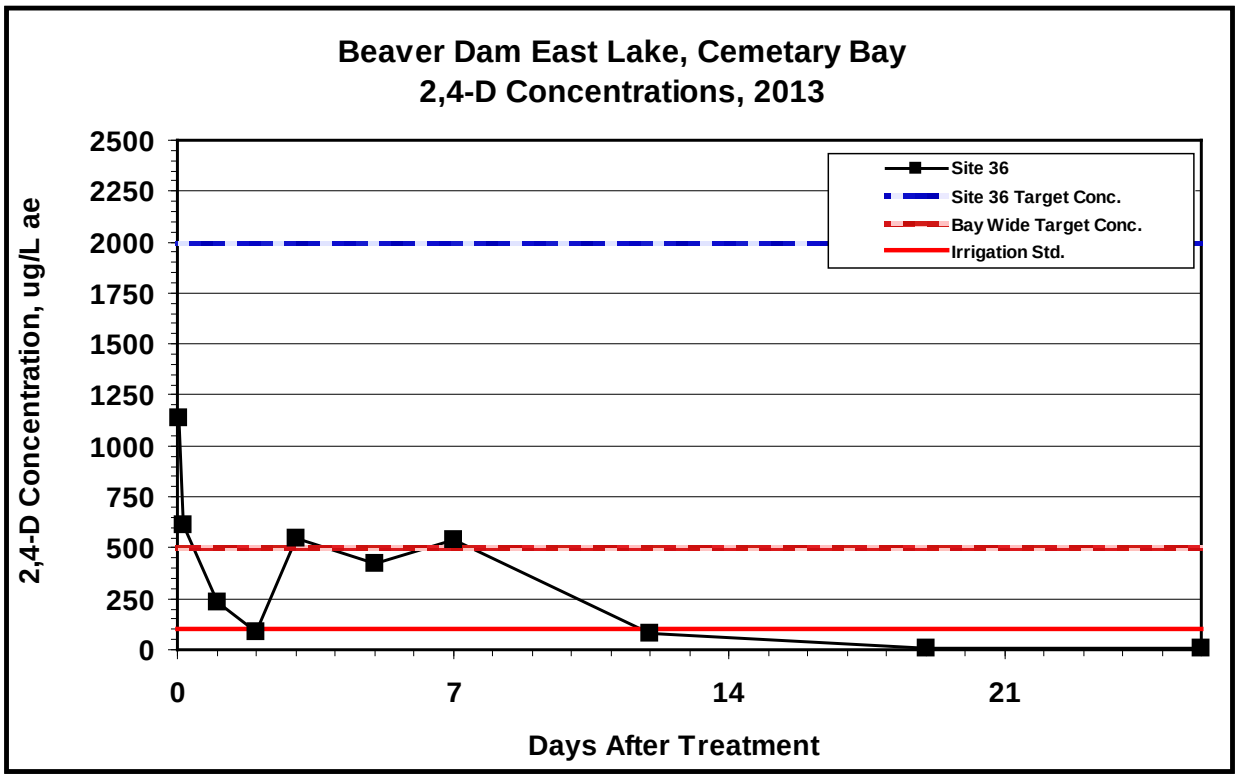


Figure 7

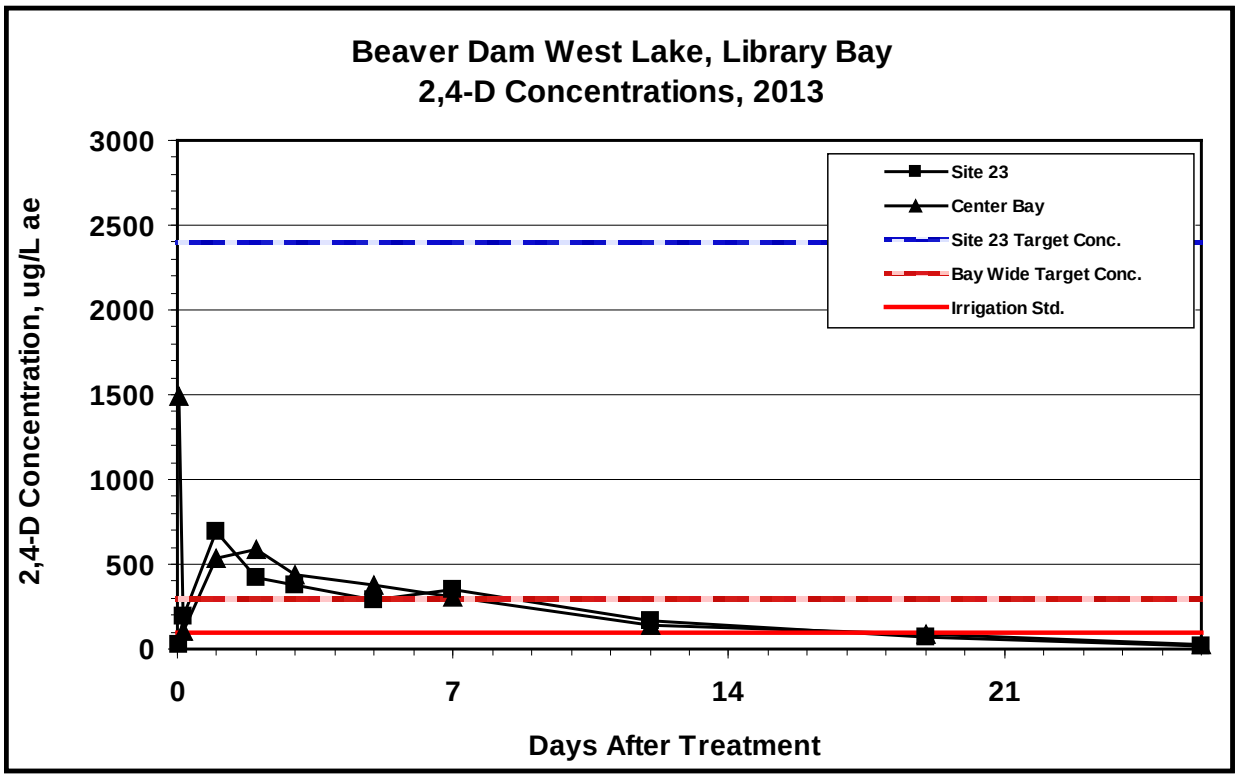


Figure 8

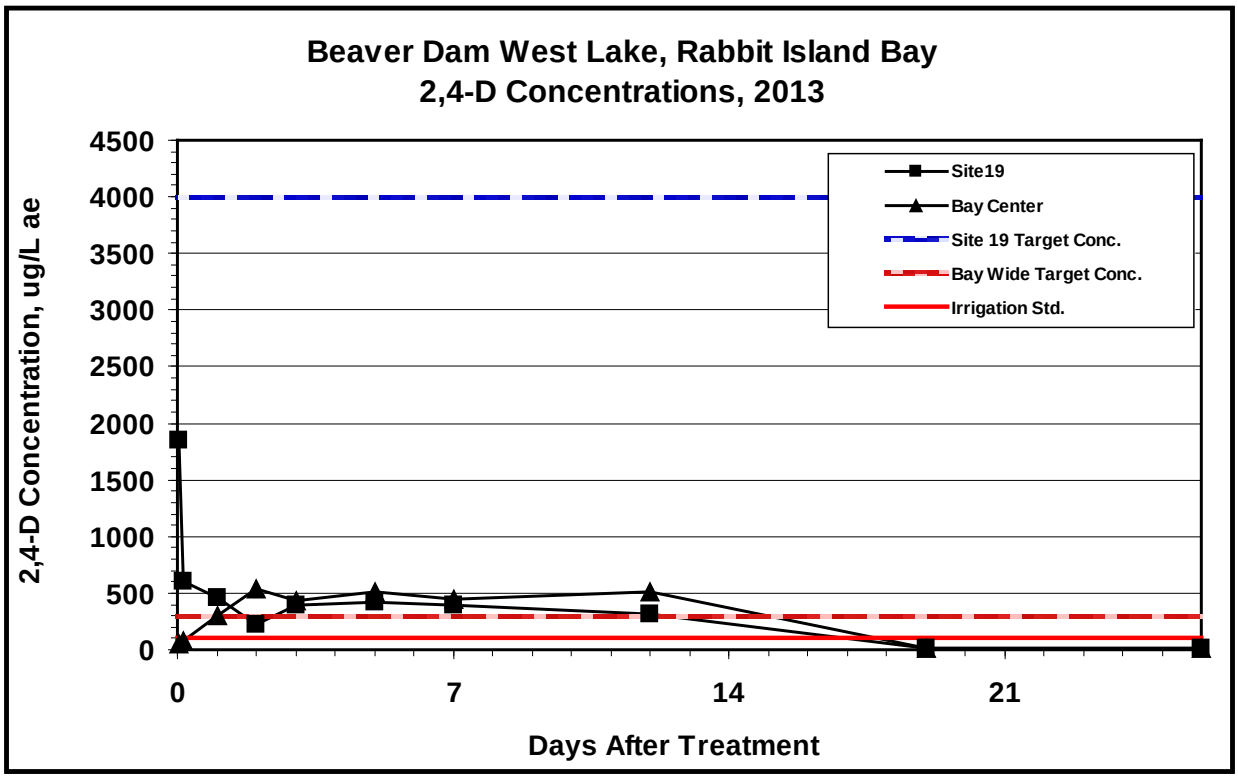


Figure 9

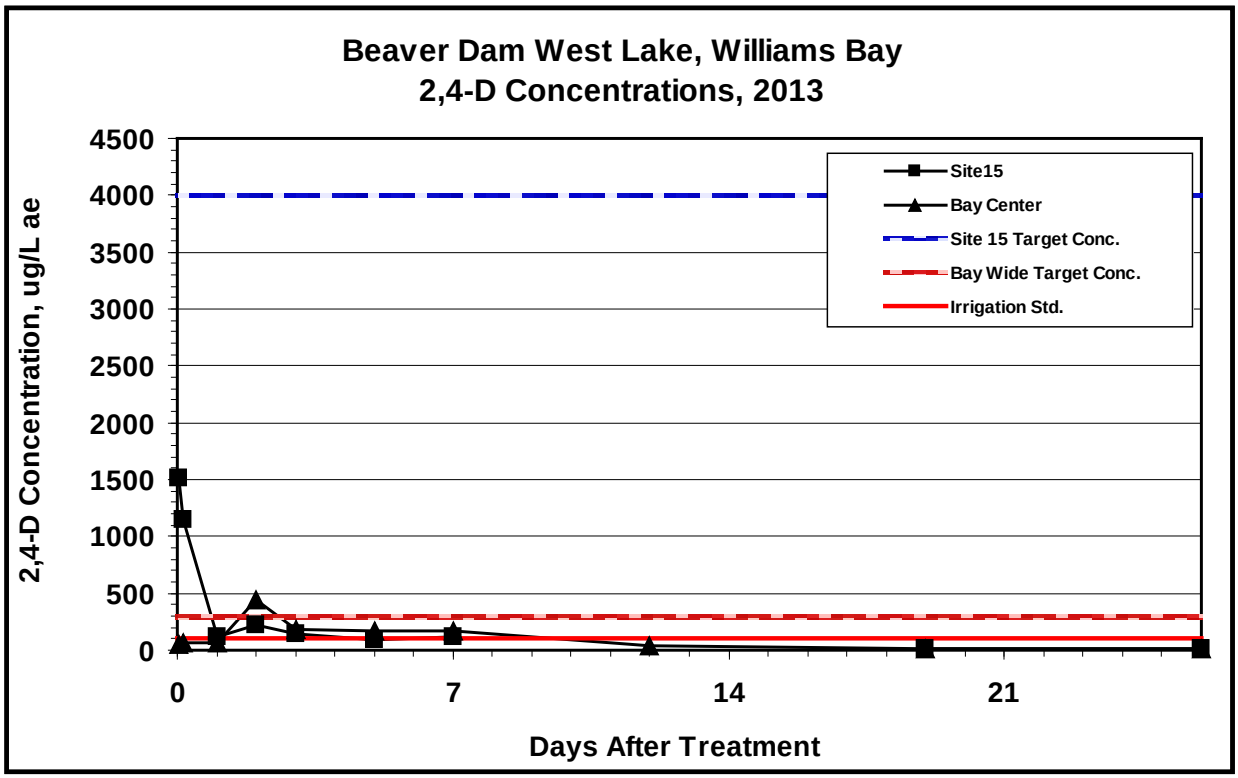


Figure 10

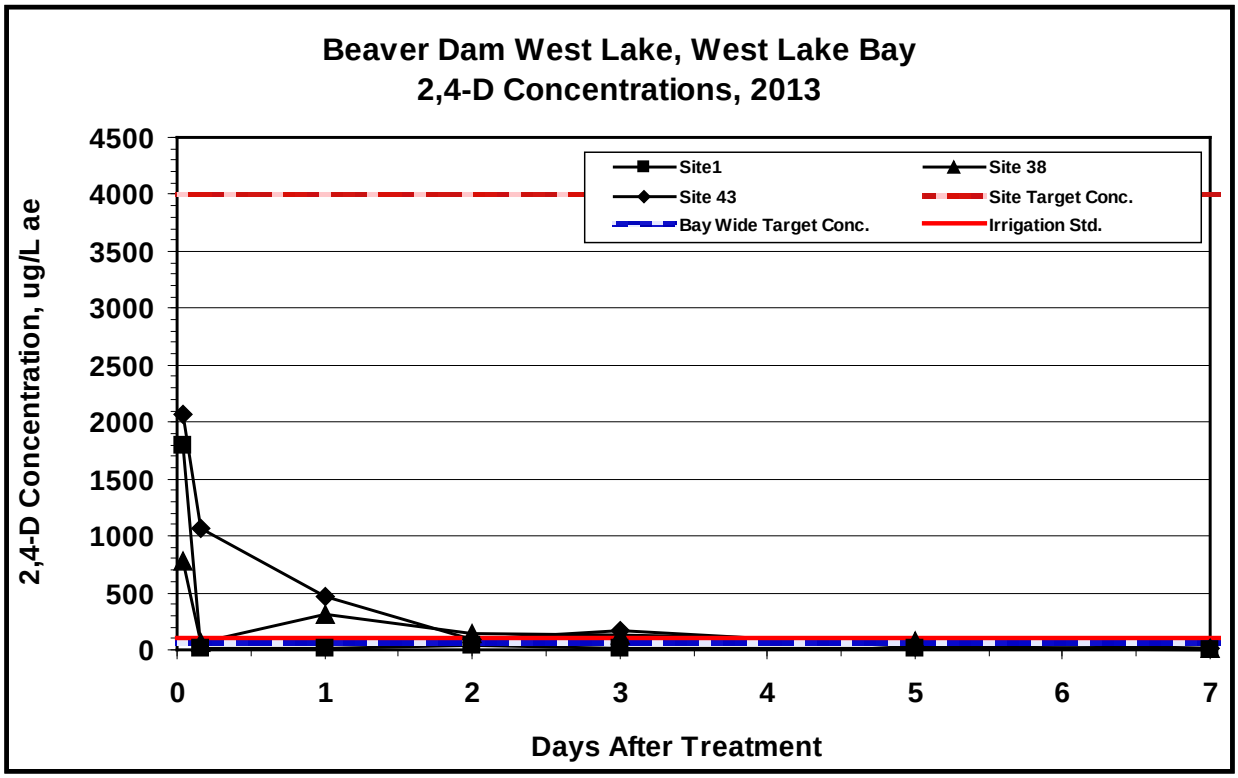


Figure 11

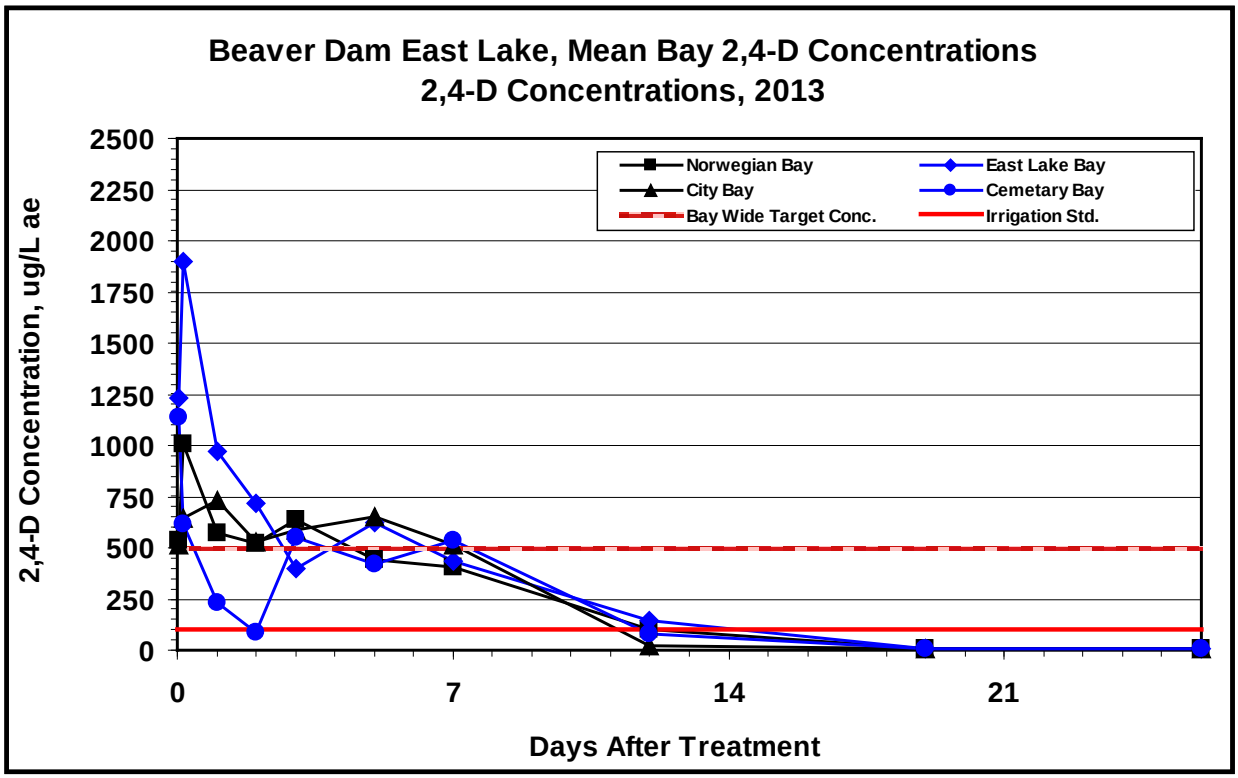
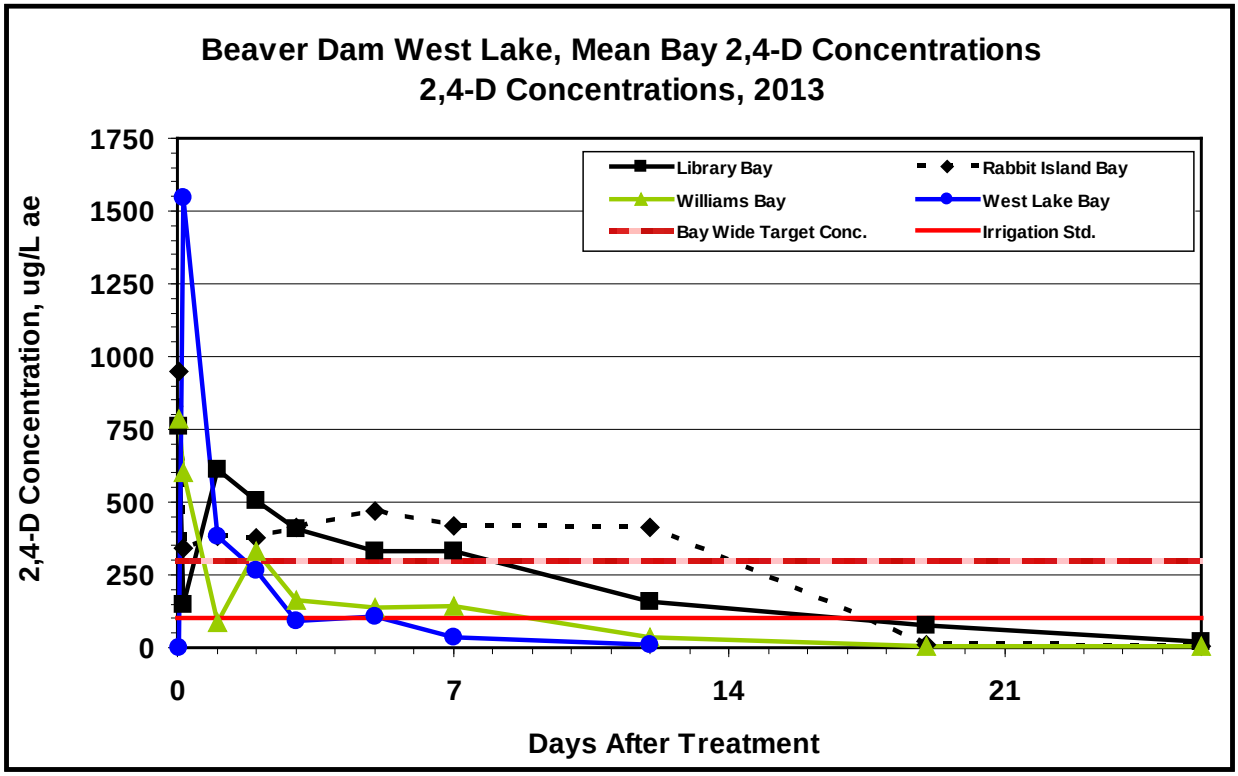
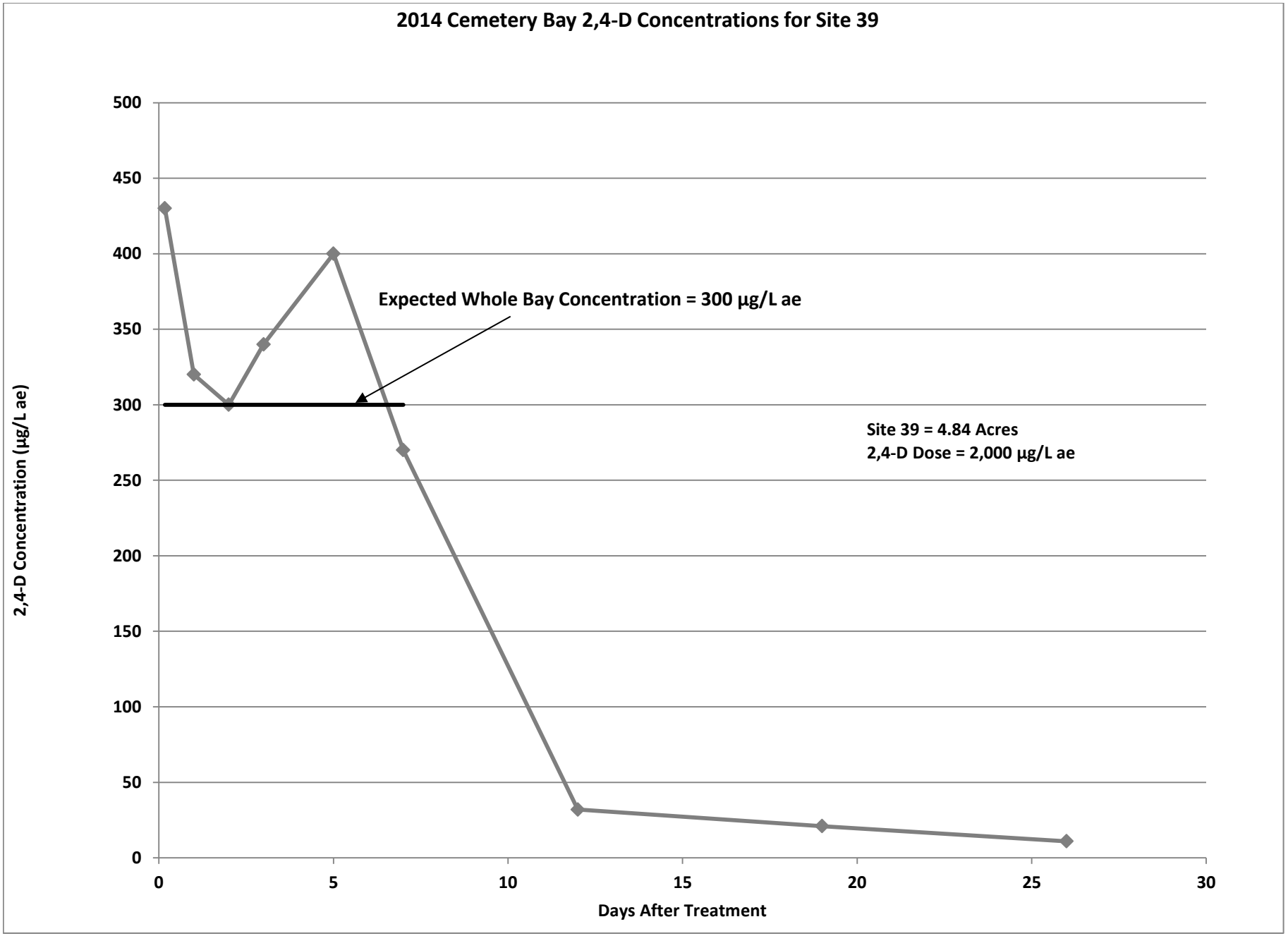
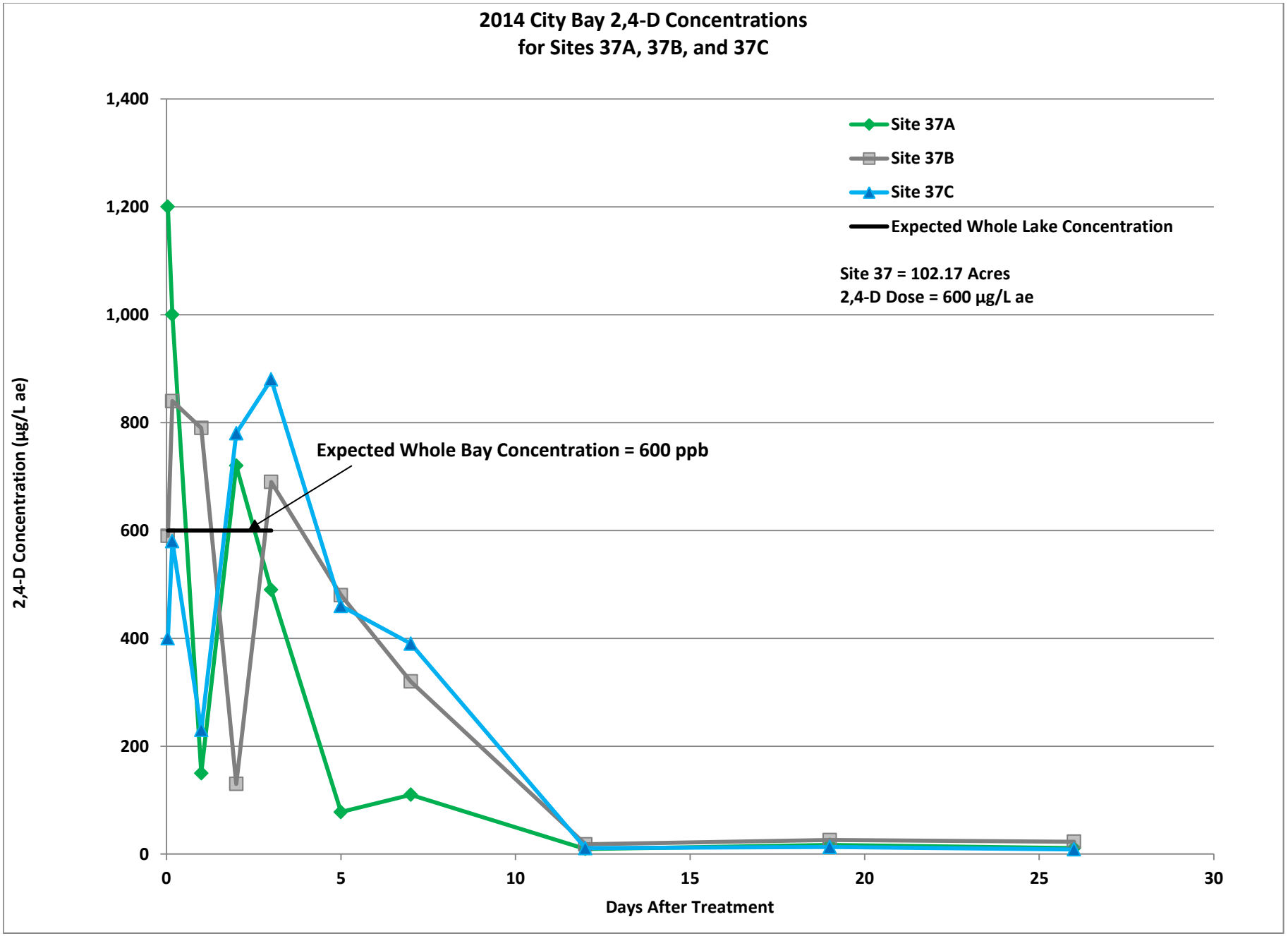
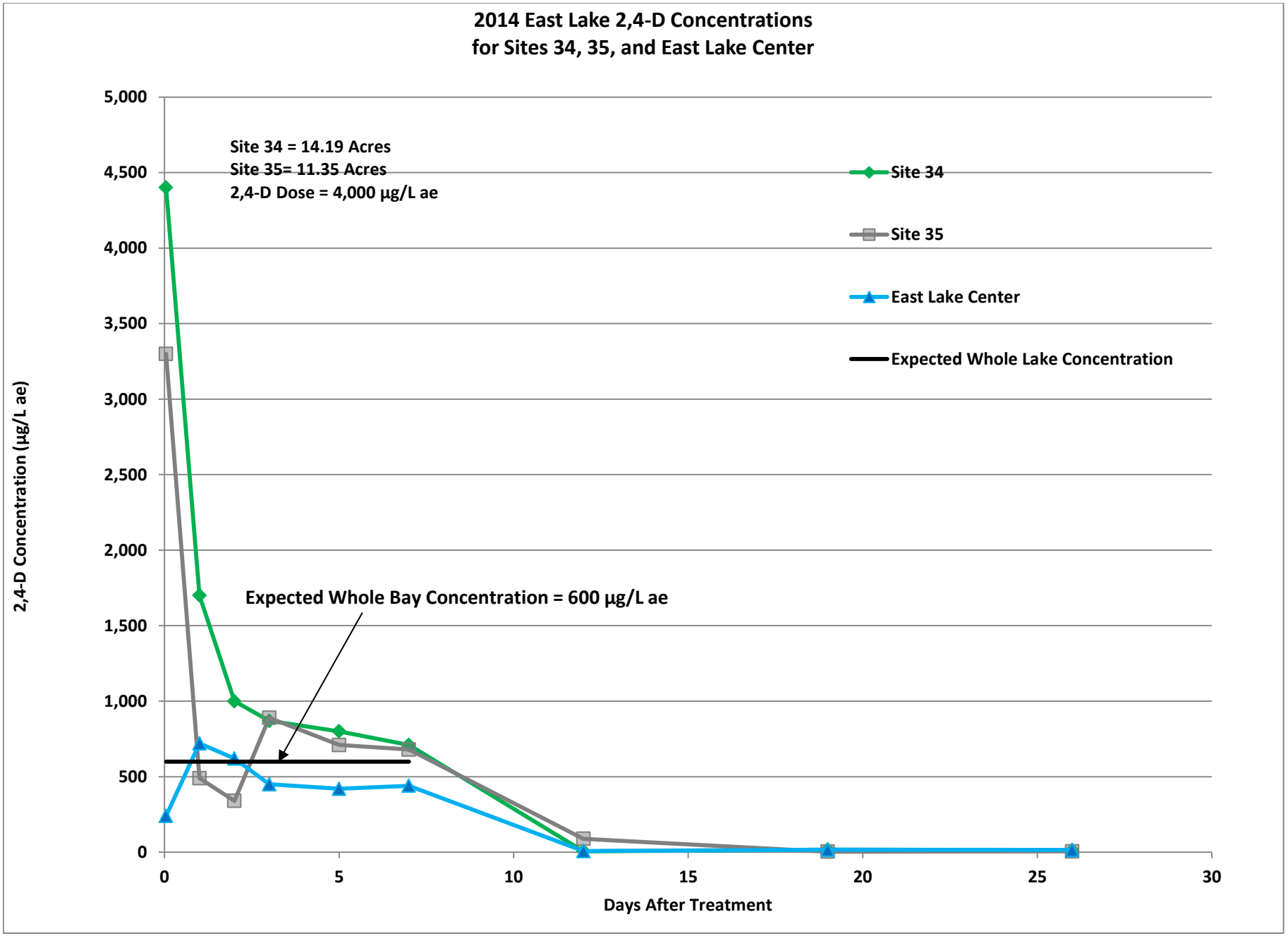


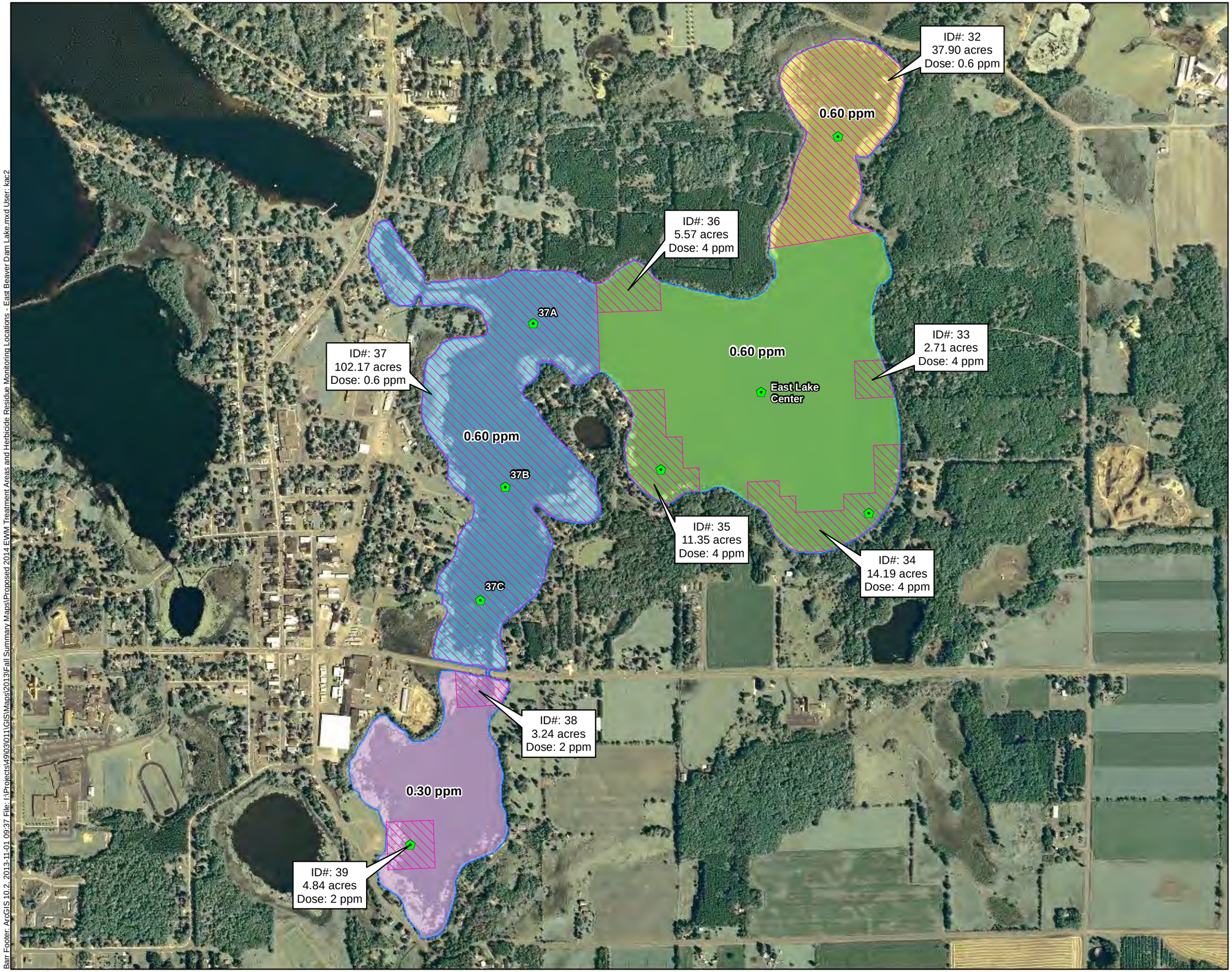
Figure 12




2014 Cemetery Bay 2,4-D Concentrations for Site 39
2,4-D Concentration (µg/L ae)
500
450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
Days After Treatment
Expected Whole Bay Concentration = 300 µg/L ae
Site 39 = 4.84 Acres
2,4-D Dose = 2,000 µg/L ae


2014 City Bay 2,4-D Concentrations
for Sites 37A, 37B, and 37C
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 37A
Site 37B
Site 37C
Expected Whole Lake Concentration
Site 37 = 102.17 Acres
2,4-D Dose = 600 µg/L ae
Expected Whole Bay Concentration = 600 ppb


2014 East Lake 2,4-D Concentrations
for Sites 34, 35, and East Lake Center
Site 34 = 14.19 Acres
Site 35= 11.35 Acres
2,4-D Dose = 4,000 µg/L ae
Site 34
Site 35
East Lake Center
Expected Whole Lake Concentration
Expected Whole Bay Concentration = 600 µg/L ae
2,4-D Concentration (µg/L ae)
Days After Treatment
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
5
10
15
20
25
30



Herbicide Residue Monitoring Location

Proposed 2014 EWM Treatment Areas

Treatment Zones

Cemetery Bay (0.30 ppm)

City Bay (0.60 ppm)

East Lake (0.60 ppm)

Norwegian Bay (0.60 ppm)

N

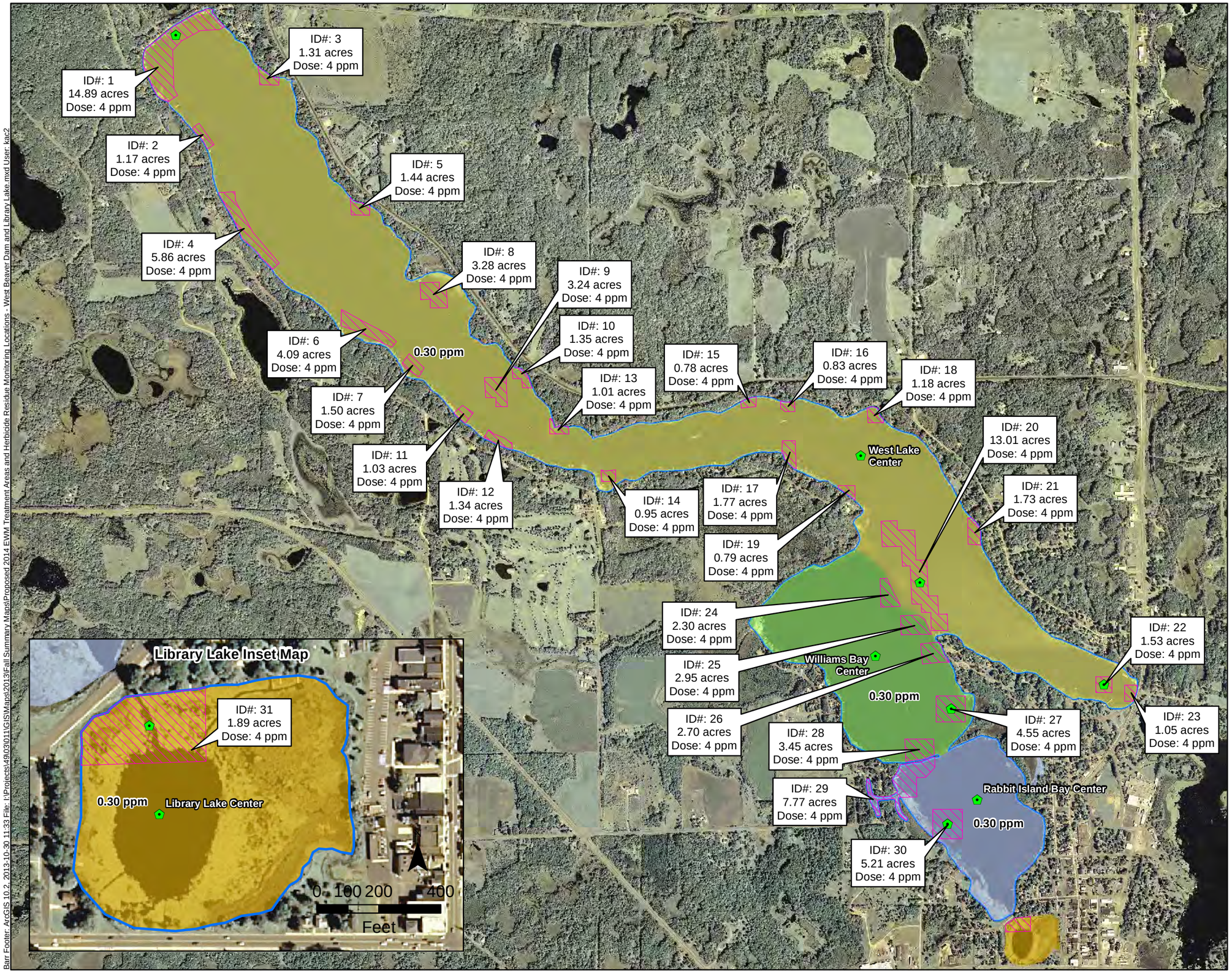
0 450 900 1,800

Feet

BARR

Proposed 2014 Eurasian Watermilfoil Treatment Areas and Herbicide Residue Monitoring Locations
Beaver Dam and Library Lake
Barron County, WI

M-56



Herbicide Residue Monitoring Location

Proposed 2014 EWM Treatment Areas

Treatment Zones

- Library Lake (0.30 ppm)
- Rabbit Island Bay (0.30 ppm)
- West Lake (0.30 ppm)
- Williams Bay (0.30 ppm)

N

0 750 1,500 3,000

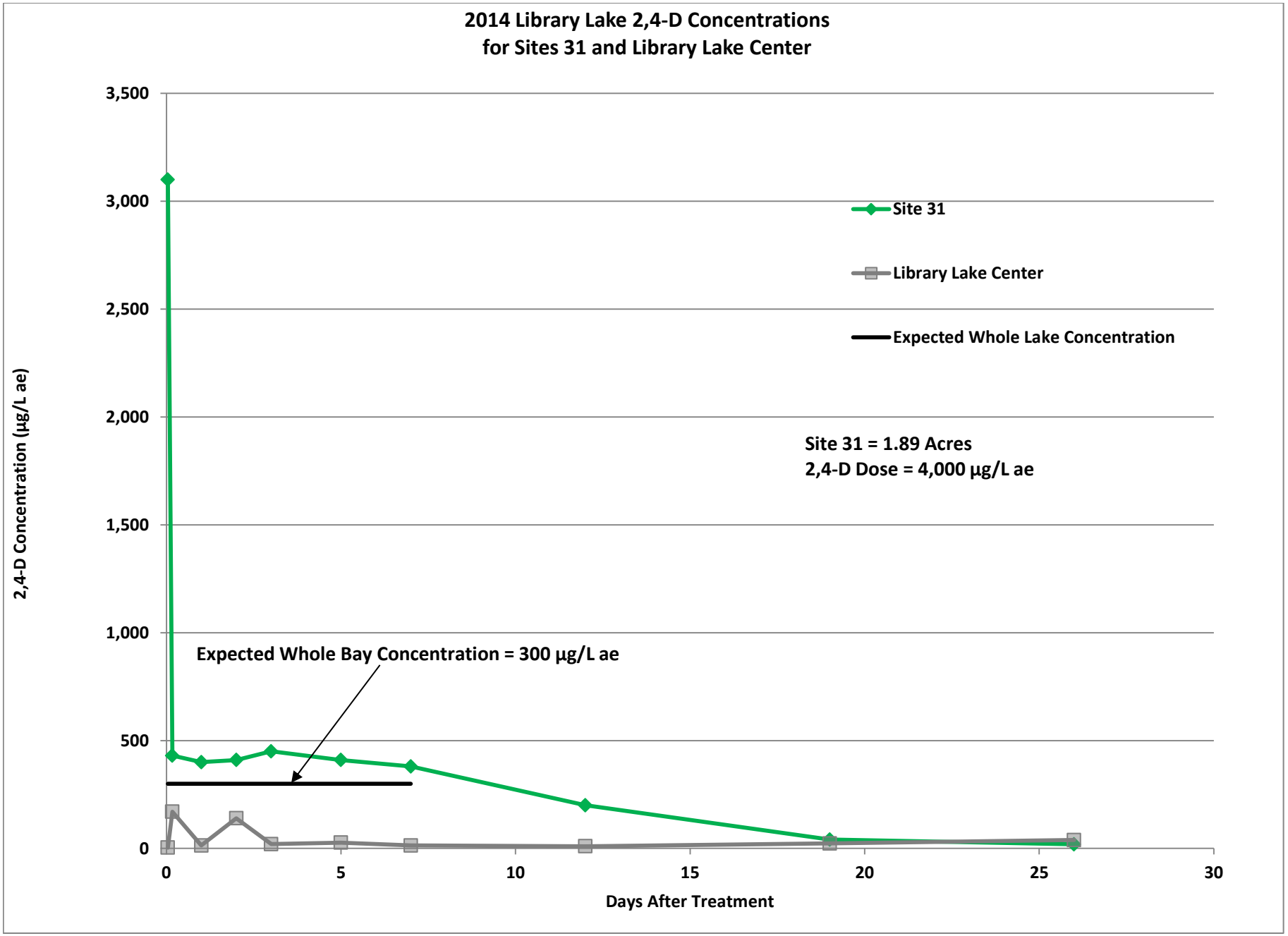
Feet

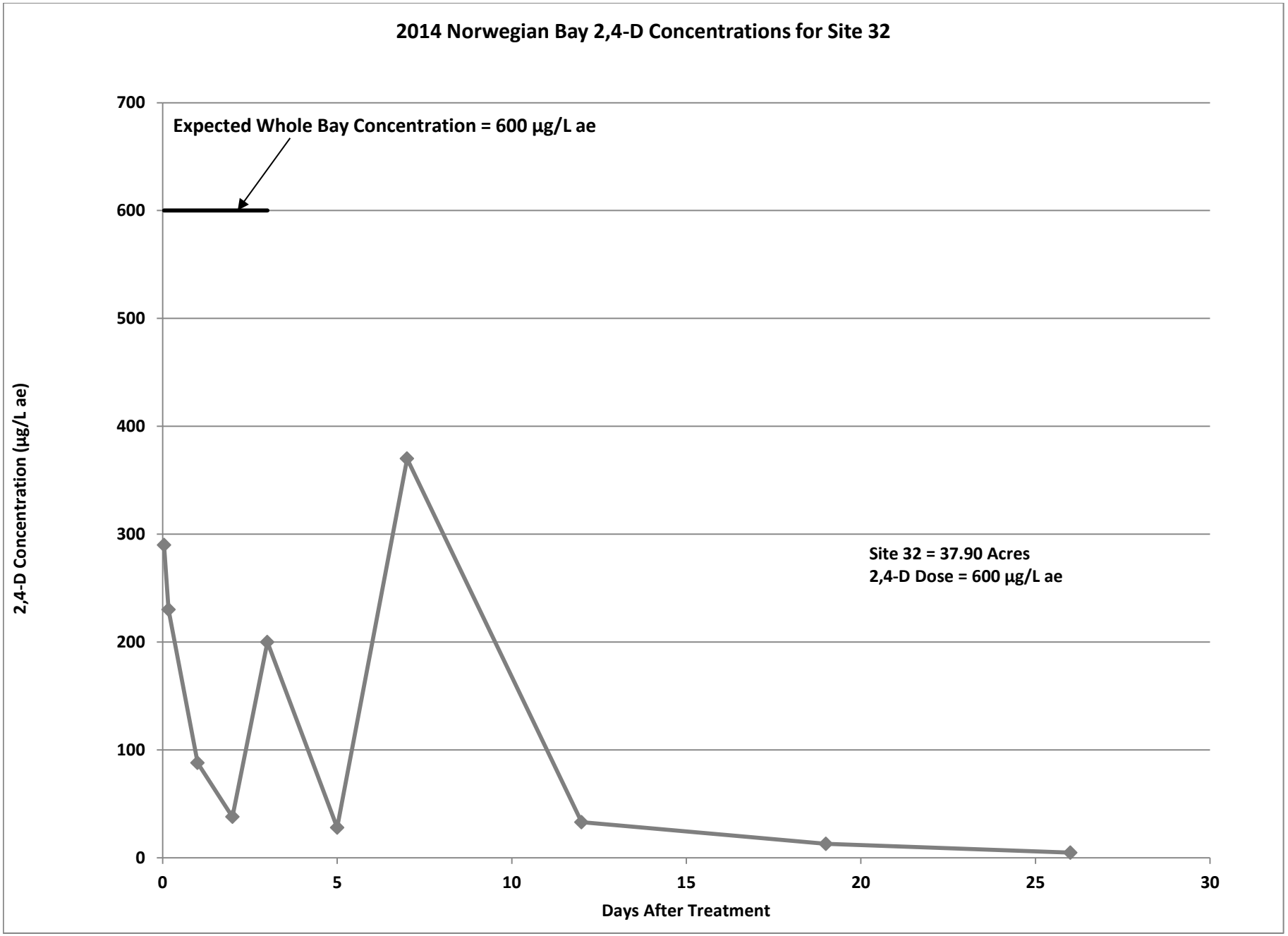
BARR

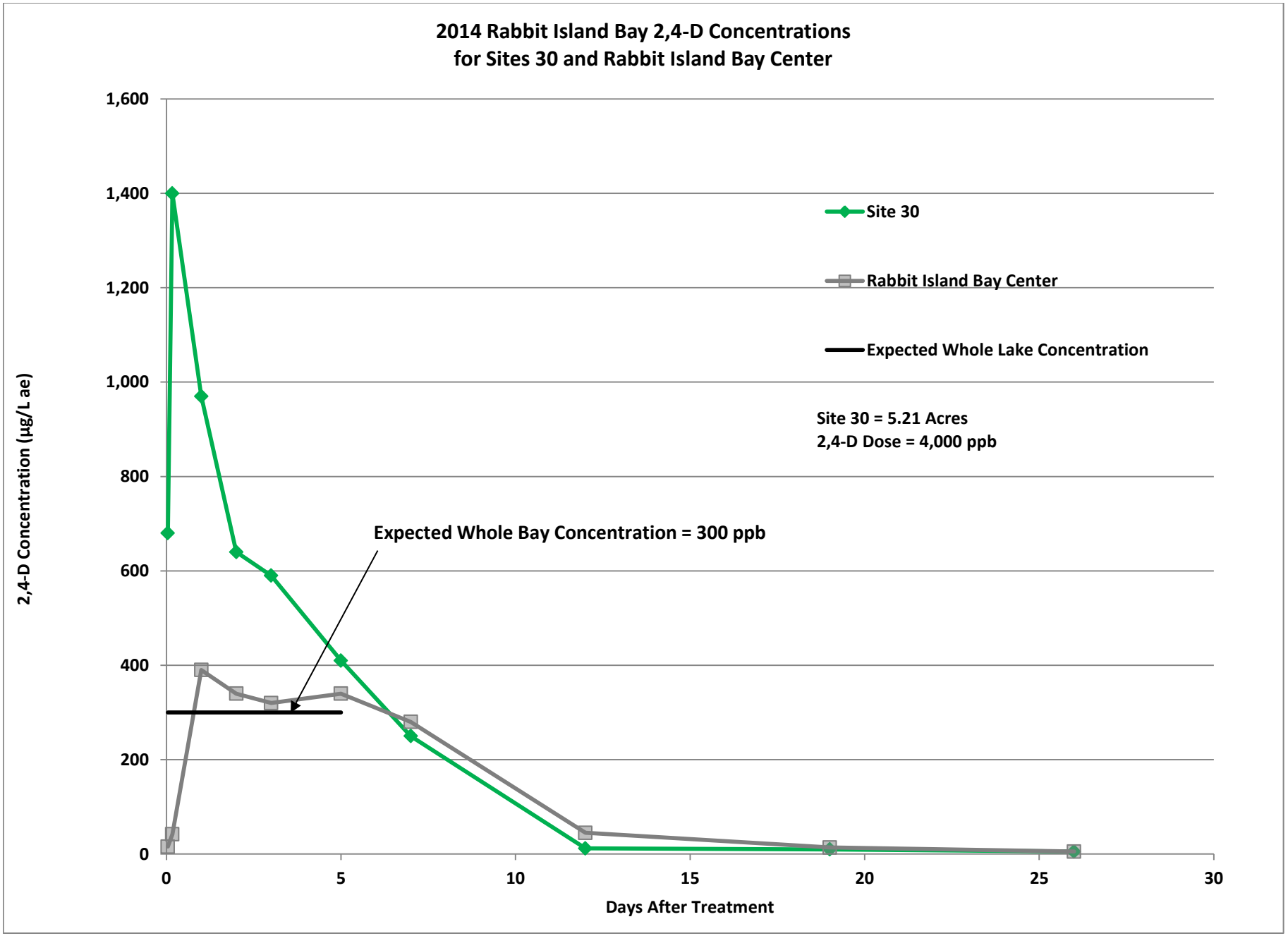
Proposed 2014 Eurasian Watermilfoil Treatment Areas and Herbicide Residue Monitoring Locations
Beaver Dam and Library Lake
Barron County, WI

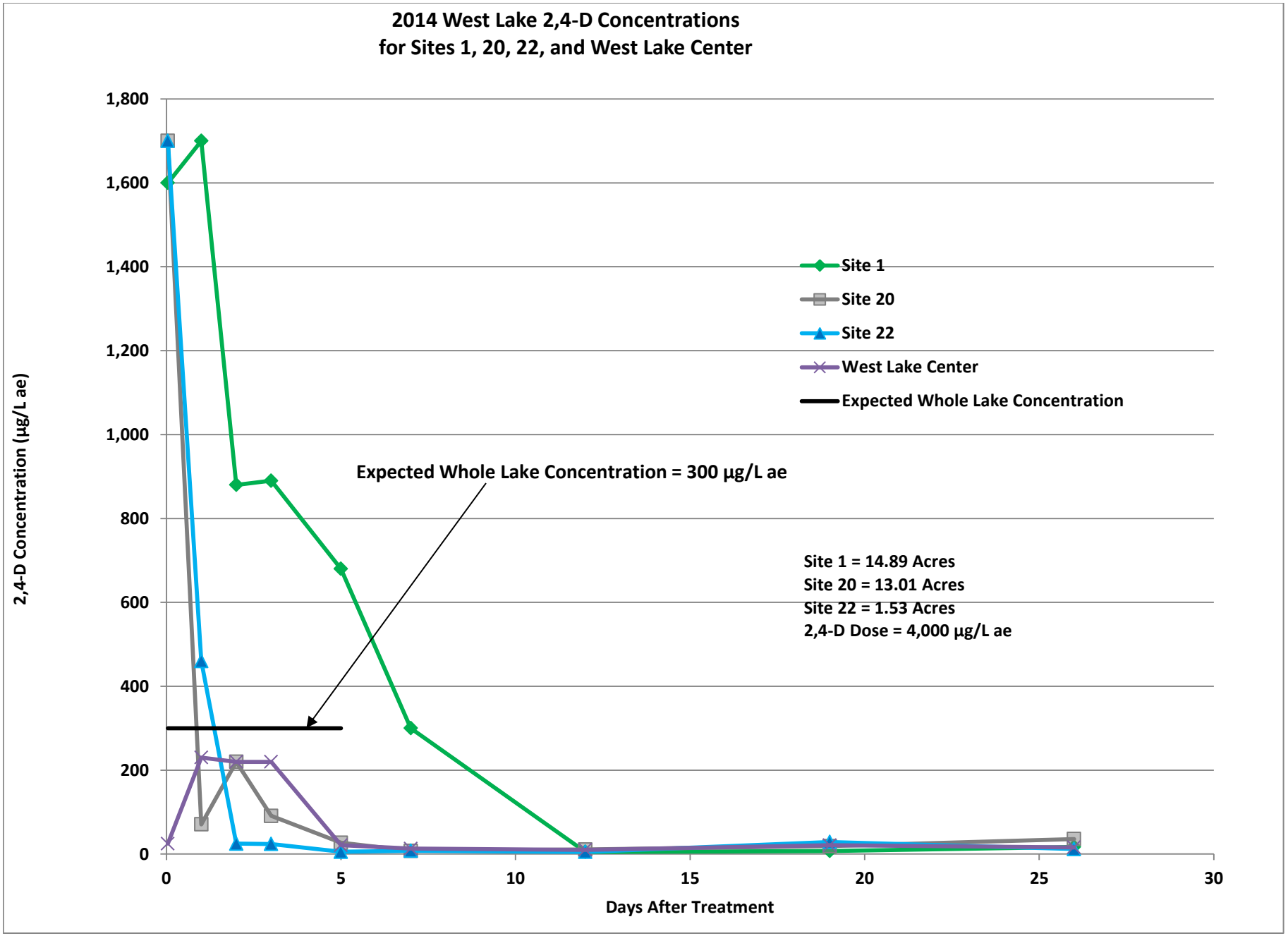
M-57

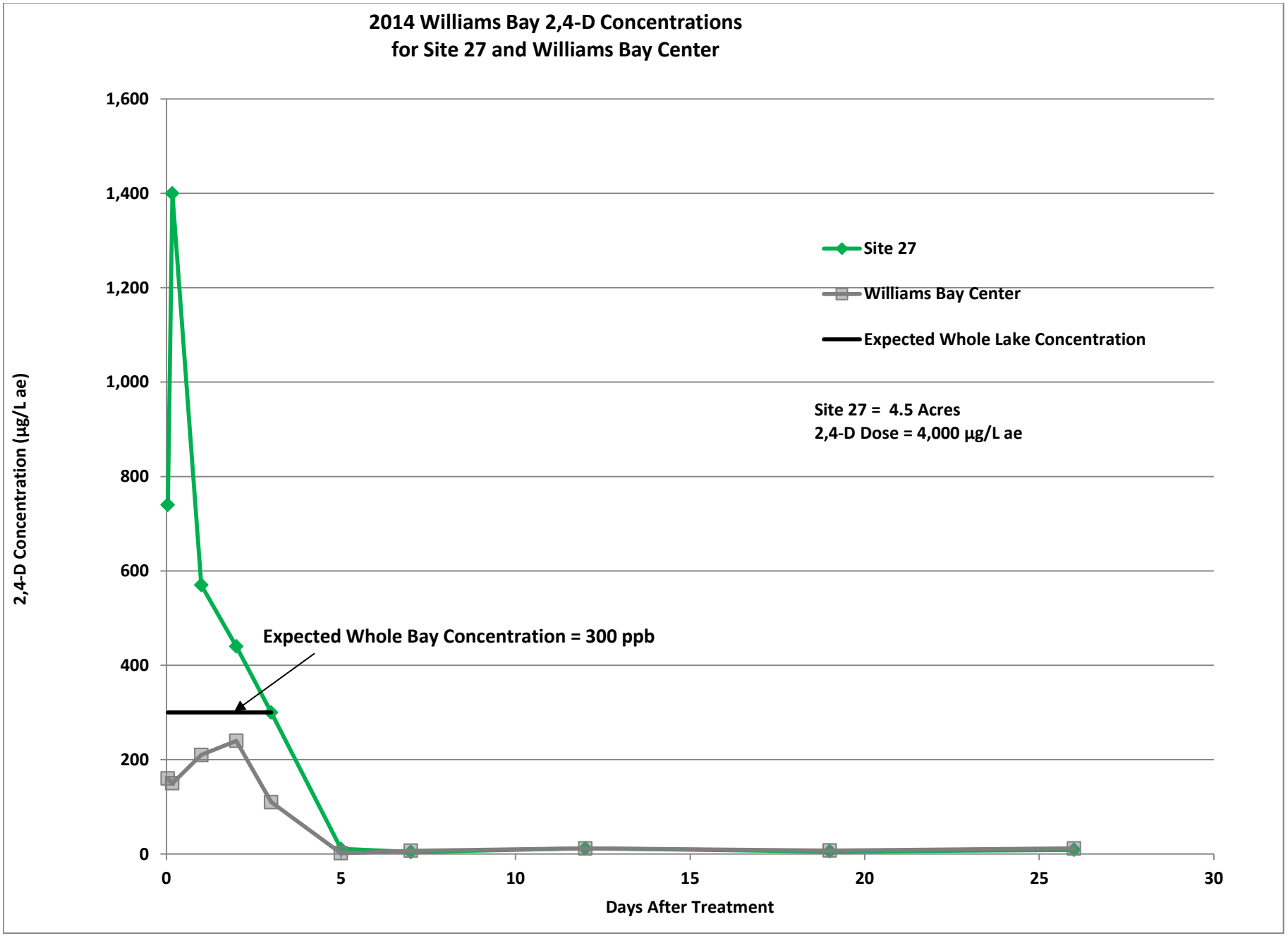
Barr Footer: ArcGIS 10.2, 2013-10-30 11:33 File: I:\Projects\49\03\011\GIS\Maps\2013\Fall Summary Maps\Proposed 2014 EWM Treatment Areas and Herbicide Residue Monitoring Locations - West Beaver Dam and Library Lake.mxd User: kac2


2014 Library Lake 2,4-D Concentrations
for Sites 31 and Library Lake Center
2,4-D Concentration (µg/L ae)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
5
10
15
20
25
30
Days After Treatment
Site 31
Library Lake Center
Expected Whole Lake Concentration
Site 31 = 1.89 Acres
2,4-D Dose = 4,000 µg/L ae
Expected Whole Bay Concentration = 300 µg/L ae


2014 Norwegian Bay 2,4-D Concentrations for Site 32
Expected Whole Bay Concentration = 600 µg/L ae
Site 32 = 37.90 Acres
2,4-D Dose = 600 µg/L ae
2,4-D Concentration (µg/L ae)
Days After Treatment
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30


2014 Rabbit Island Bay 2,4-D Concentrations
for Sites 30 and Rabbit Island Bay Center
2,4-D Concentration (µg/L ae)
1,600
1,400
1,200
1,000
800
600
400
200
0
0
5
10
15
20
25
30
Days After Treatment
Site 30
Rabbit Island Bay Center
Expected Whole Lake Concentration
Site 30 = 5.21 Acres
2,4-D Dose = 4,000 ppb
Expected Whole Bay Concentration = 300 ppb


2014 West Lake 2,4-D Concentrations
for Sites 1, 20, 22, and West Lake Center
2,4-D Concentration (µg/L ae)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
0
5
10
15
20
25
30
Days After Treatment
Site 1
Site 20
Site 22
West Lake Center
Expected Whole Lake Concentration
Expected Whole Lake Concentration = 300 µg/L ae
Site 1 = 14.89 Acres
Site 20 = 13.01 Acres
Site 22 = 1.53 Acres
2,4-D Dose = 4,000 µg/L ae


2014 Williams Bay 2,4-D Concentrations
for Site 27 and Williams Bay Center
2,4-D Concentration (µg/L ae)
1,600
1,400
1,200
1,000
800
600
400
200
0
0
5
10
15
20
25
30
Days After Treatment
Site 27
Williams Bay Center
Expected Whole Lake Concentration
Site 27 = 4.5 Acres
2,4-D Dose = 4,000 µg/L ae
Expected Whole Bay Concentration = 300 ppb

Treatment Area #7
37.90 acres
Avg. Depth: 5.20 ft
Dose: 0.8 ppm

Treatment Area #11
7.66 acres
Avg. Depth: 15.8 ft
Dose: 4 ppm

Treatment Area #8
7.97 acres
Avg. Depth: 16.9 ft
Dose: 4 ppm

#12A

Treatment Area #9
3.86 acres
Avg. Depth: 15.2 ft
Dose: 4 ppm

East Lake Center

Treatment Area #12
102.17 acres
Avg. Depth: 5.10 ft
Dose: 0.8 ppm

#12B

#12C

Treatment Area #10
4.01 acres
Avg. Depth: 9.9 ft
Dose: 4 ppm

Herbicide Residue Monitoring Location

2015 EWM Treatment Areas

Treatment Zones

- Cemetery Bay
- City Bay
- East Lake
- Norwegian Bay

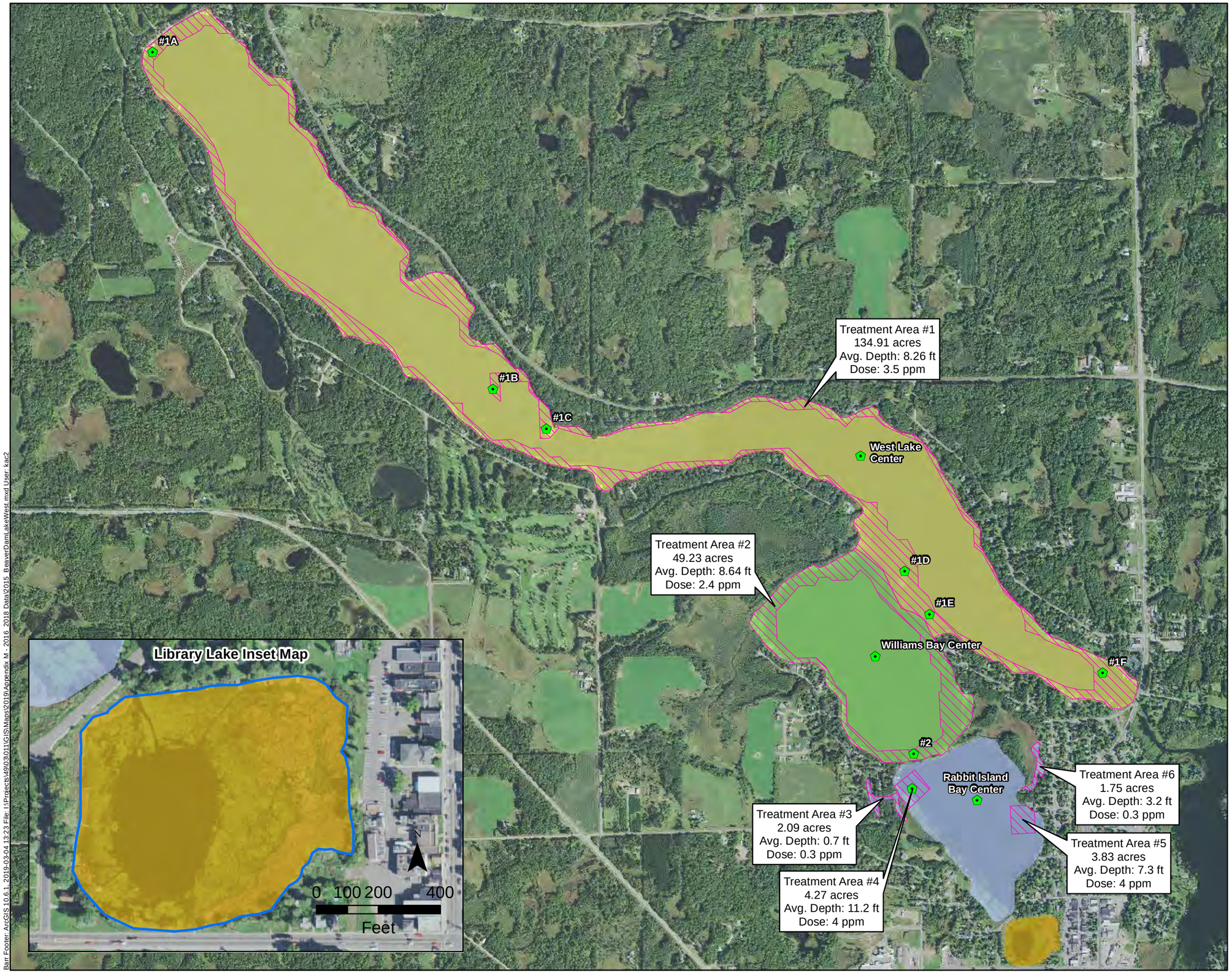
N

0 450 900 1,800
Feet

BARR

2015 EURASIAN WATERMILFOIL TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS
Beaver Dam - East
Barron County, WI
M-63

Barr Footer: ArcGIS 10.6.1 2019-03-04 13:23 File: I:\Projects\49\03\011\GIS\Maps\2019\Appendix M - 2016 2018 Data\2015 BeaverDamLakeEast.mxd User: kac2



Herbicide Residue Monitoring Location

2015 EWM Treatment Areas

Treatment Zones

- Library Lake
- Rabbit Island Bay
- West Lake
- Williams Bay

N

0 750 1,500 3,000

Feet

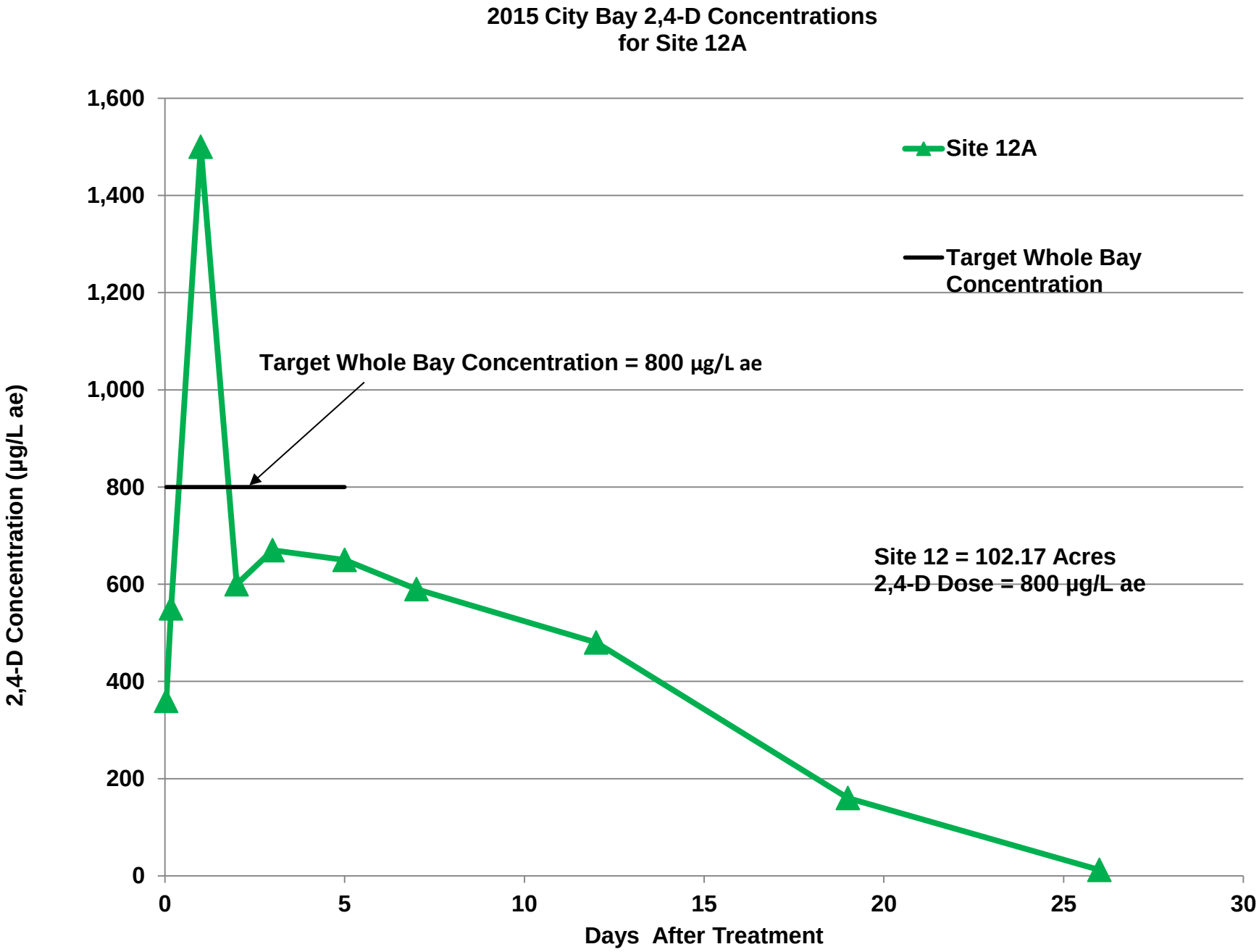
BARR

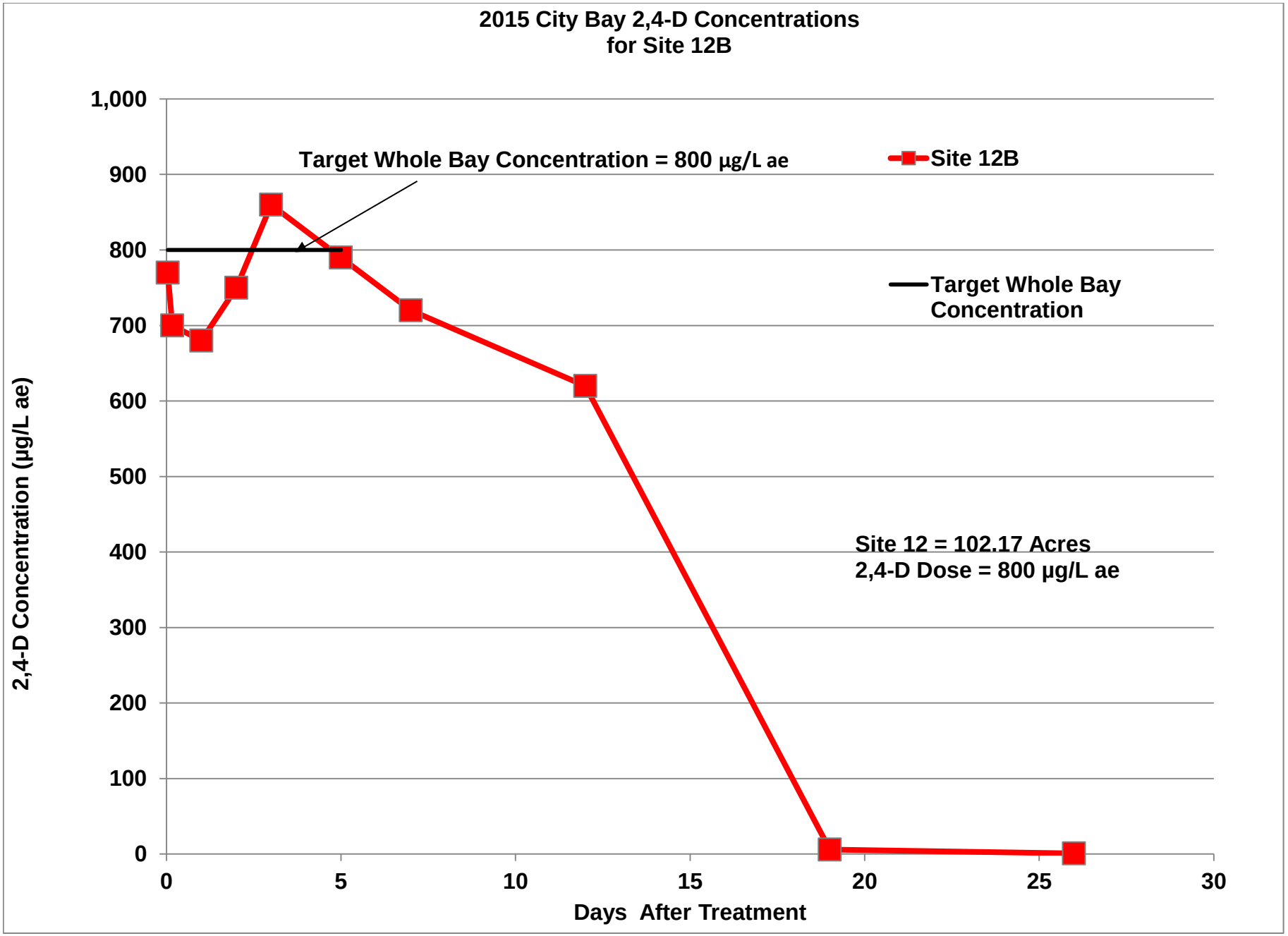
2015 EURASIAN WATERMILFOIL TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS

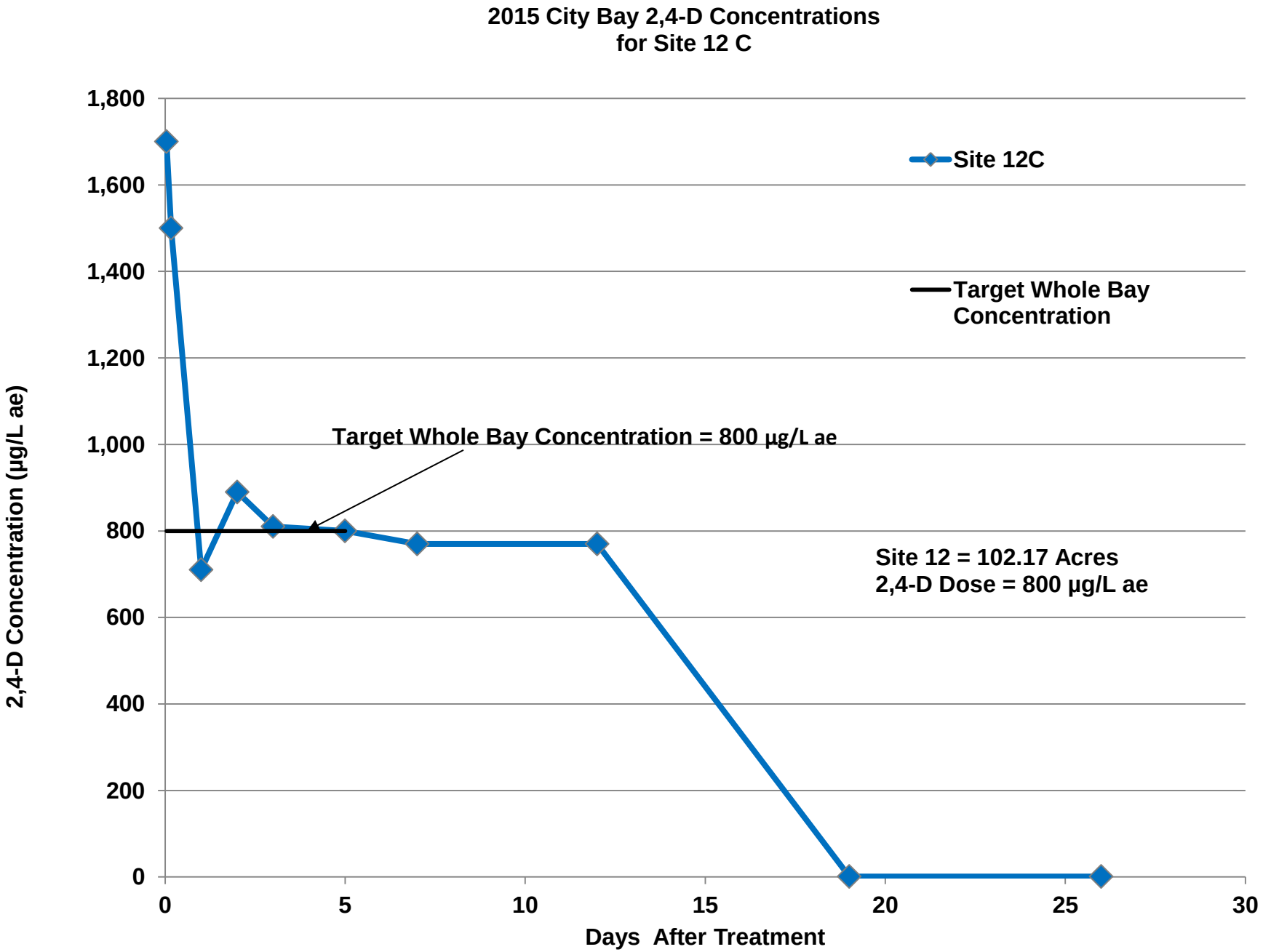
Beaver Dam - West

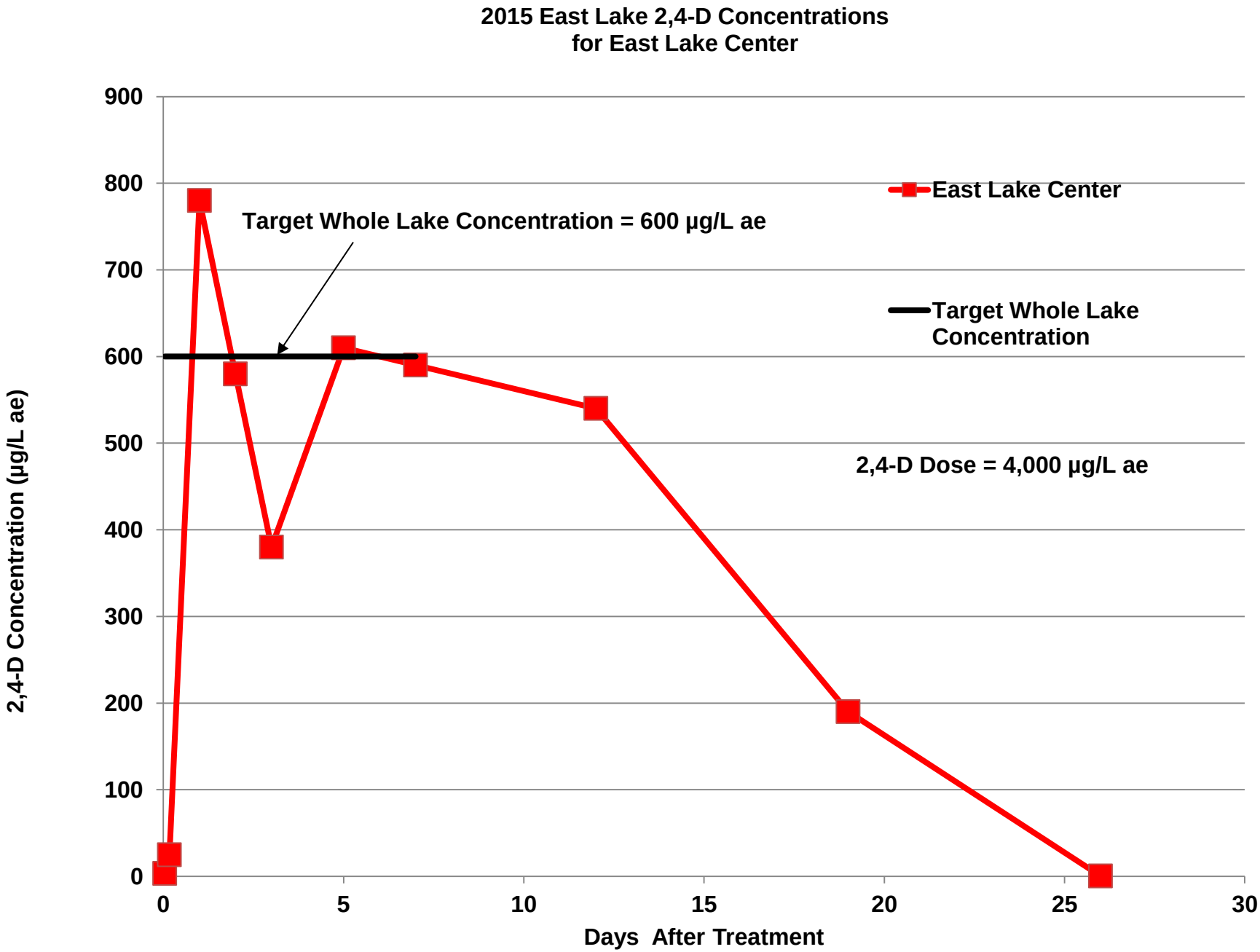
Barron County, WI

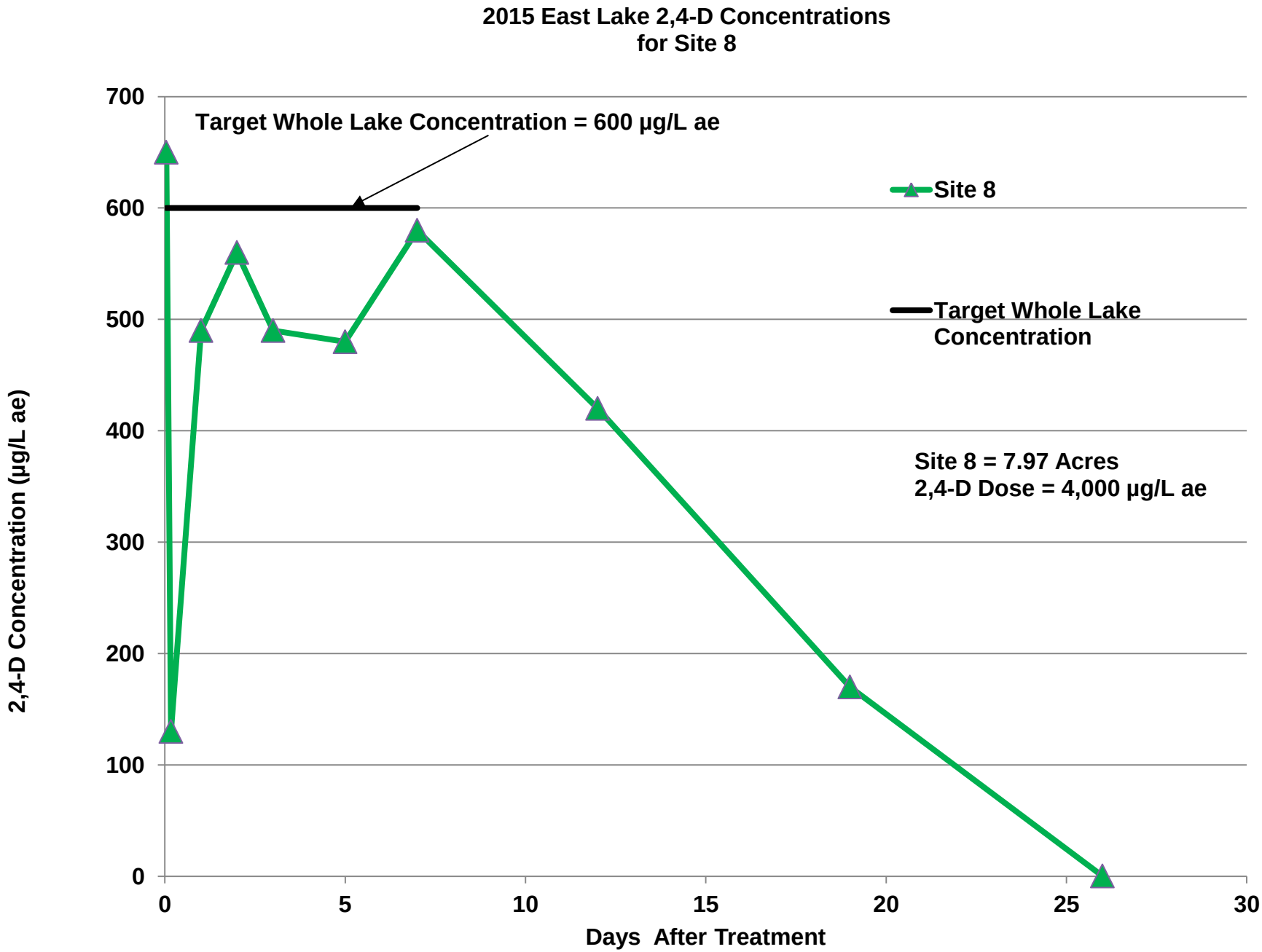
M-64

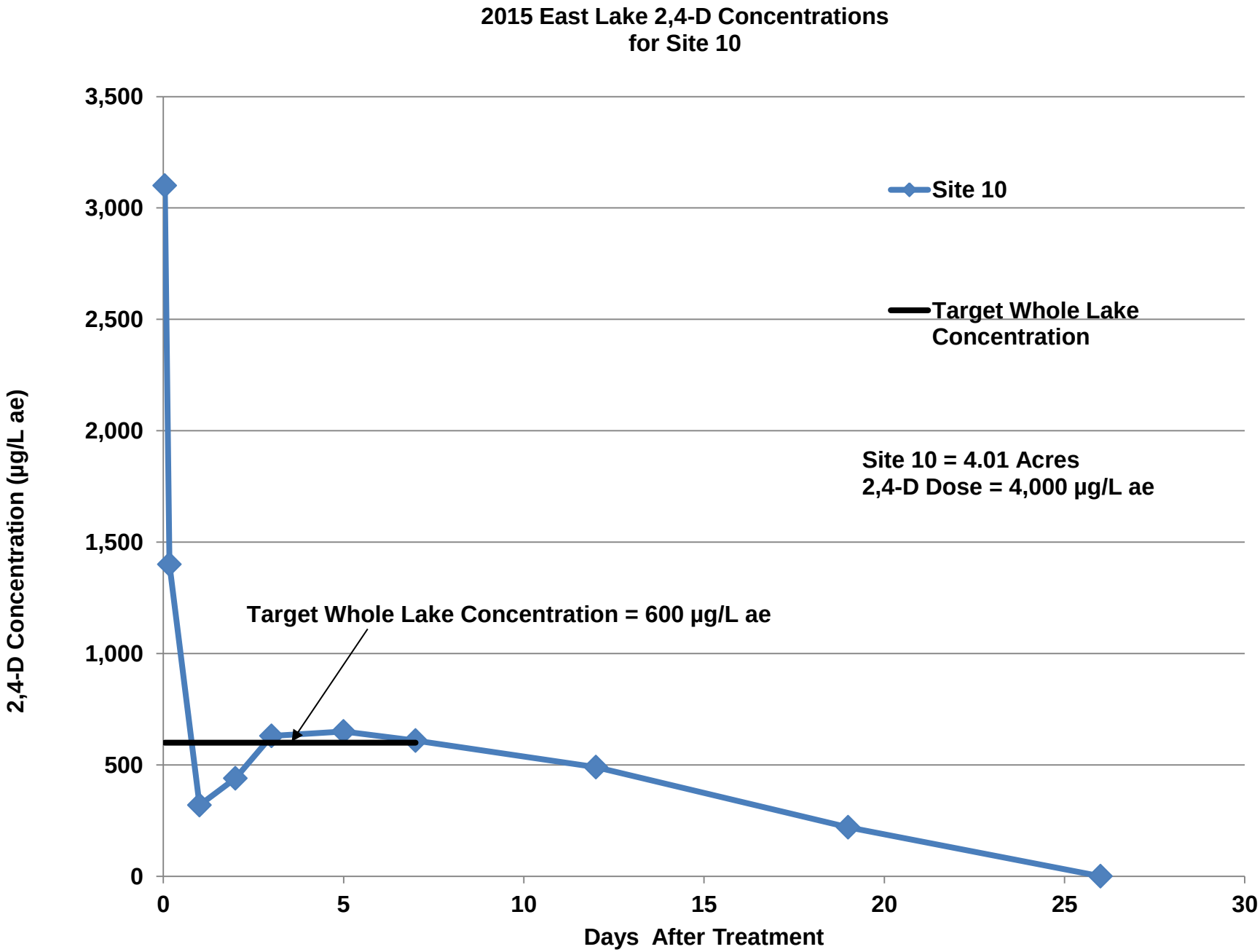

2015 City Bay 2,4-D Concentrations
for Site 12A
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 12A
Target Whole Bay Concentration
Target Whole Bay Concentration = 800 µg/L ae
Site 12 = 102.17 Acres
2,4-D Dose = 800 µg/L ae

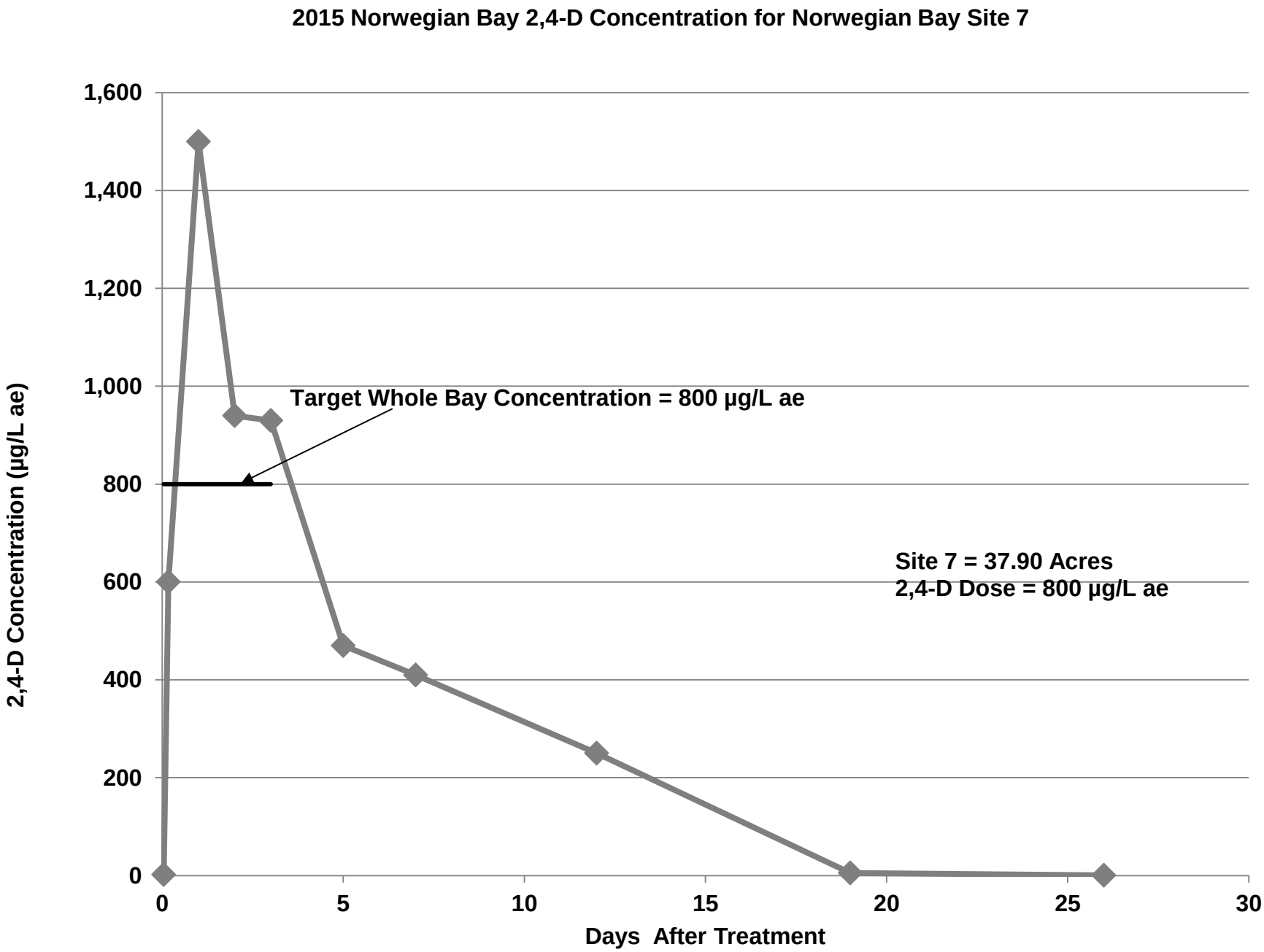

2015 City Bay 2,4-D Concentrations
for Site 12B
1,000
900
800
700
600
500
400
300
200
100
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Target Whole Bay Concentration = 800 µg/L ae
Site 12B
Target Whole Bay Concentration
Site 12 = 102.17 Acres
2,4-D Dose = 800 µg/L ae

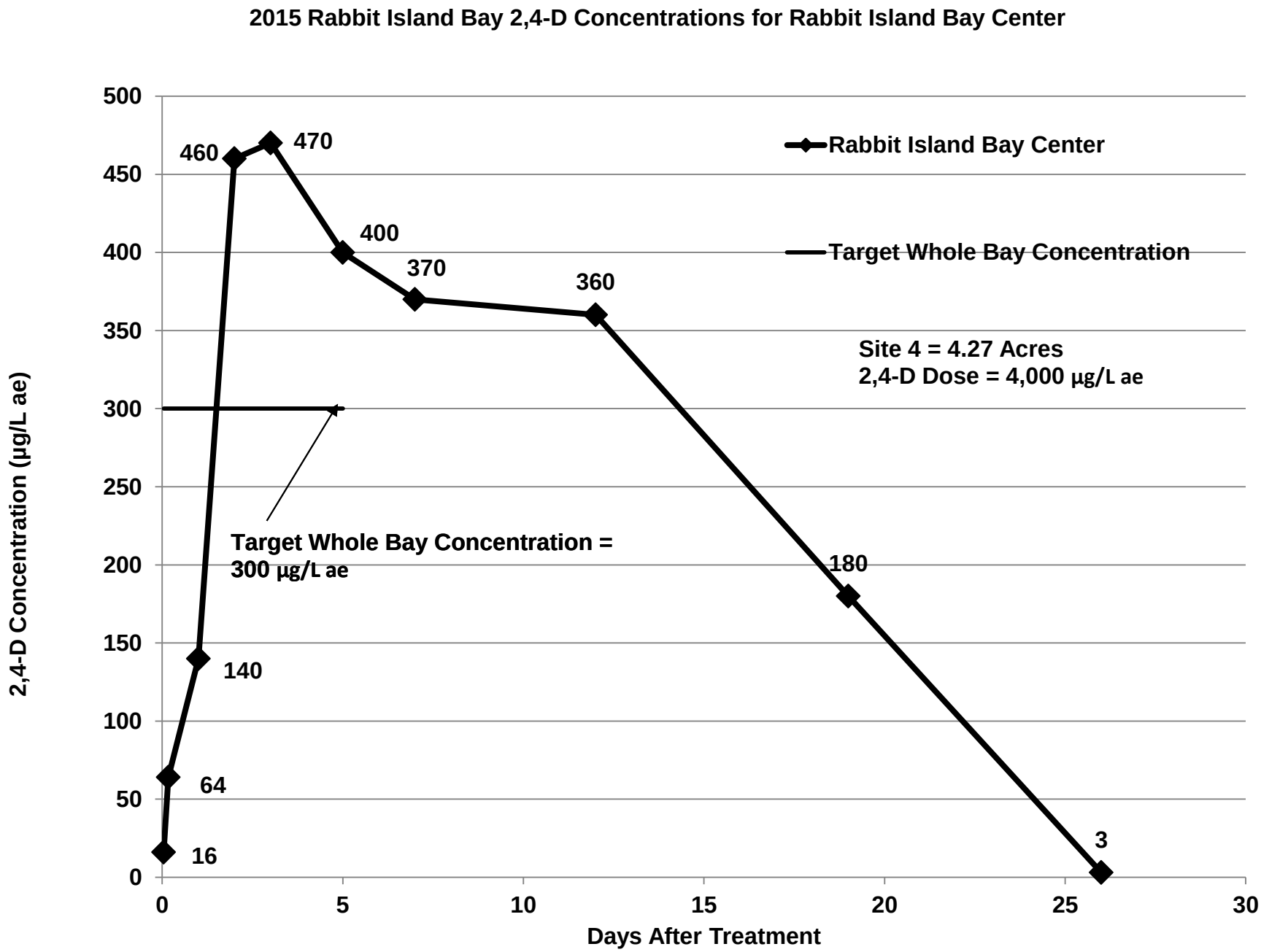

2015 City Bay 2,4-D Concentrations
for Site 12 C
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 12C
Target Whole Bay Concentration
Target Whole Bay Concentration = 800 µg/L ae
Site 12 = 102.17 Acres
2,4-D Dose = 800 µg/L ae

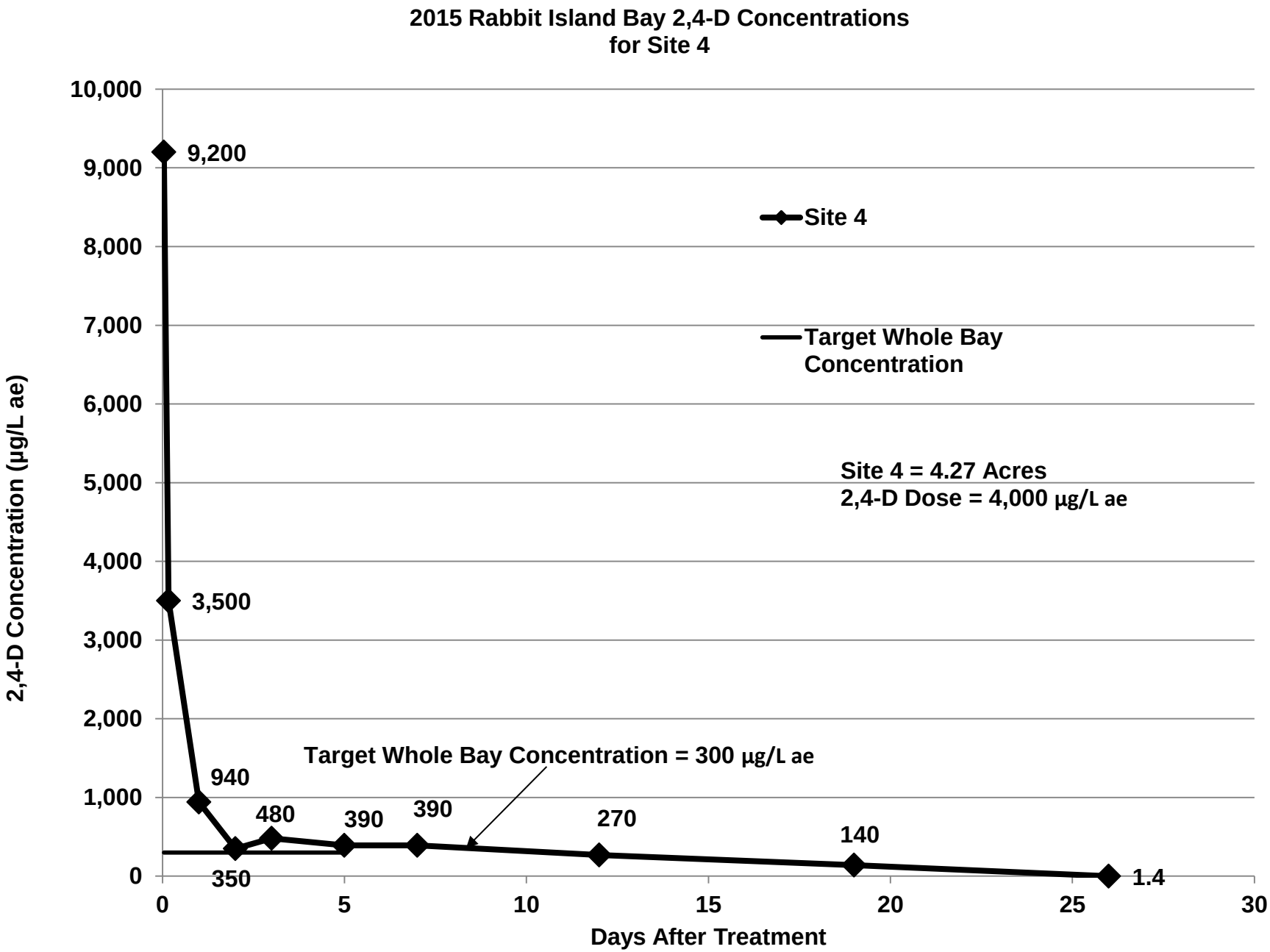

2015 East Lake 2,4-D Concentrations
for East Lake Center
900
800
700
600
500
400
300
200
100
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
East Lake Center
Target Whole Lake Concentration
Target Whole Lake Concentration = 600 µg/L ae
2,4-D Dose = 4,000 µg/L ae

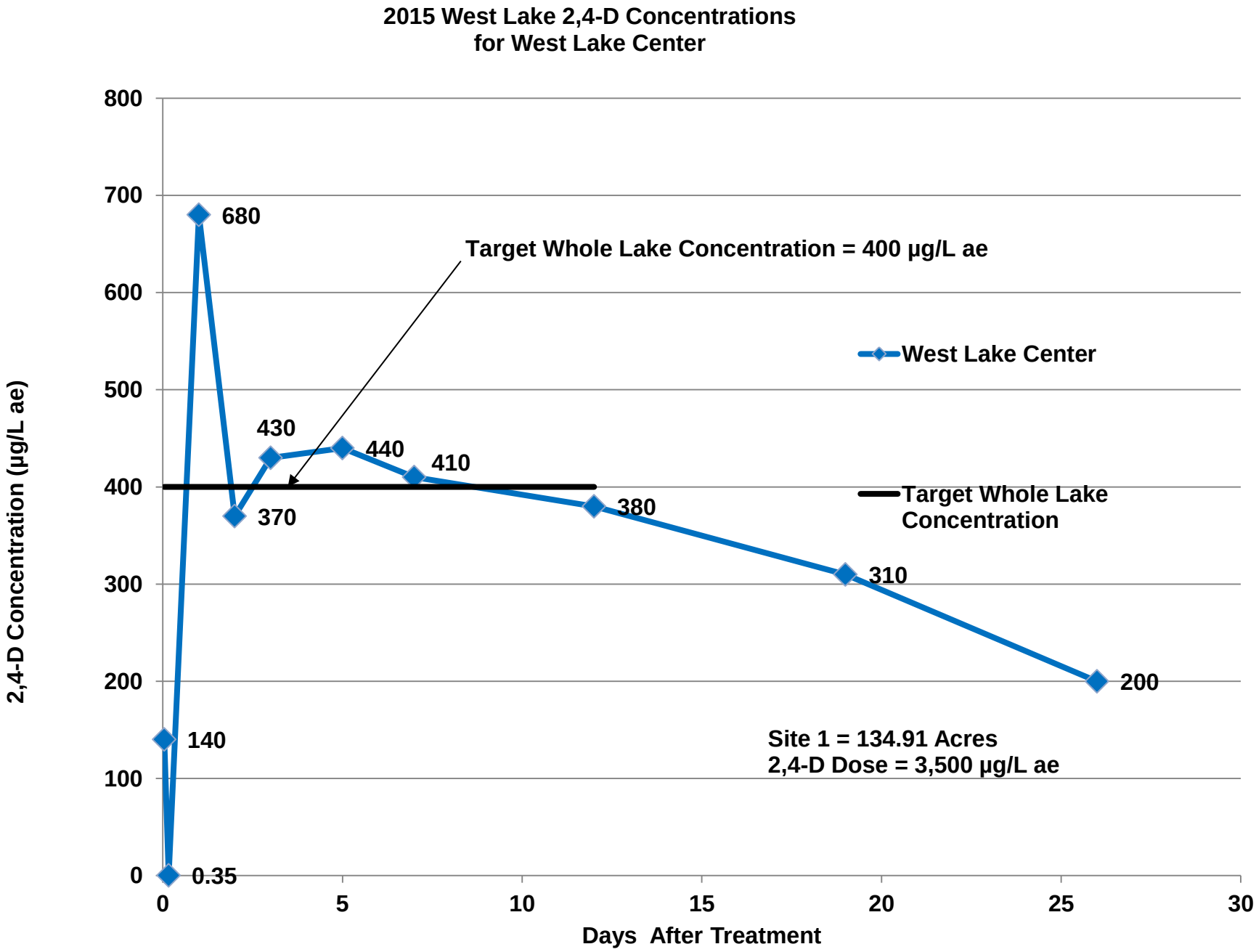

2015 East Lake 2,4-D Concentrations
for Site 8
Target Whole Lake Concentration = 600 µg/L ae
Site 8
Target Whole Lake Concentration
Site 8 = 7.97 Acres
2,4-D Dose = 4,000 µg/L ae
2,4-D Concentration (µg/L ae)
Days After Treatment
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30

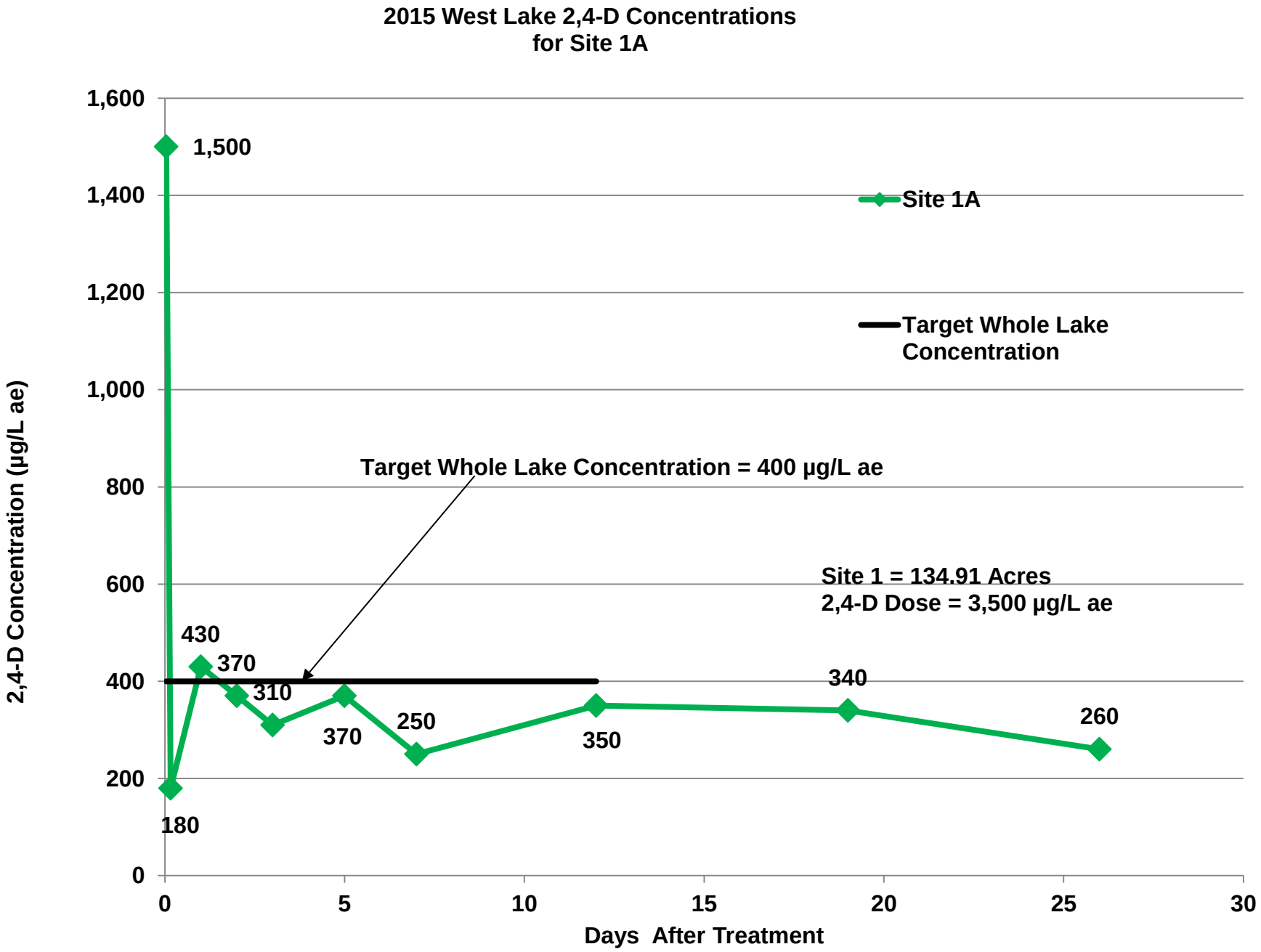

2015 East Lake 2,4-D Concentrations
for Site 10
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 10
Target Whole Lake
Concentration
Site 10 = 4.01 Acres
2,4-D Dose = 4,000 µg/L ae
Target Whole Lake Concentration = 600 µg/L ae

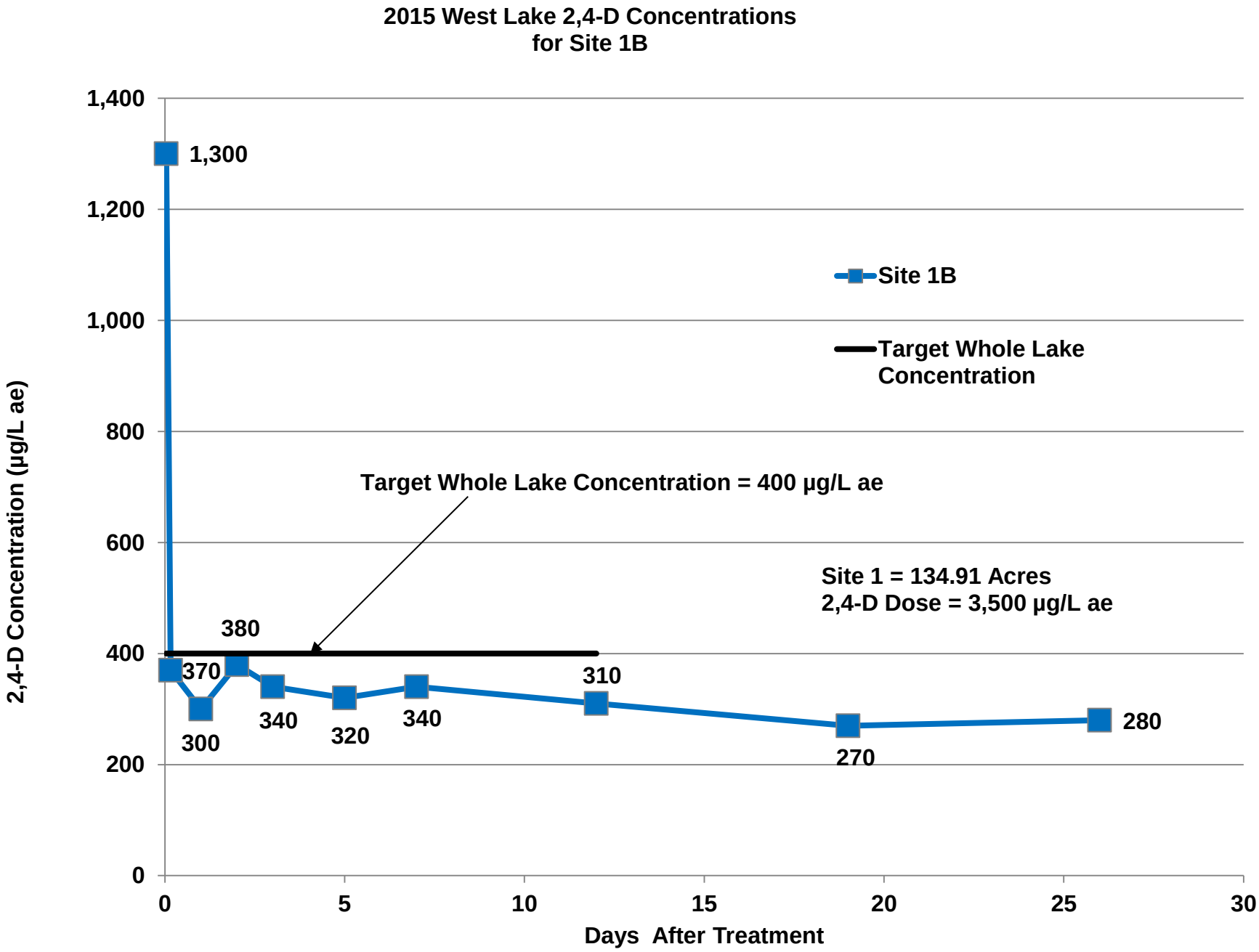

2015 Norwegian Bay 2,4-D Concentration for Norwegian Bay Site 7
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
Target Whole Bay Concentration = 800 µg/L ae
Site 7 = 37.90 Acres
2,4-D Dose = 800 µg/L ae
0
5
10
15
20
25
30
Days After Treatment

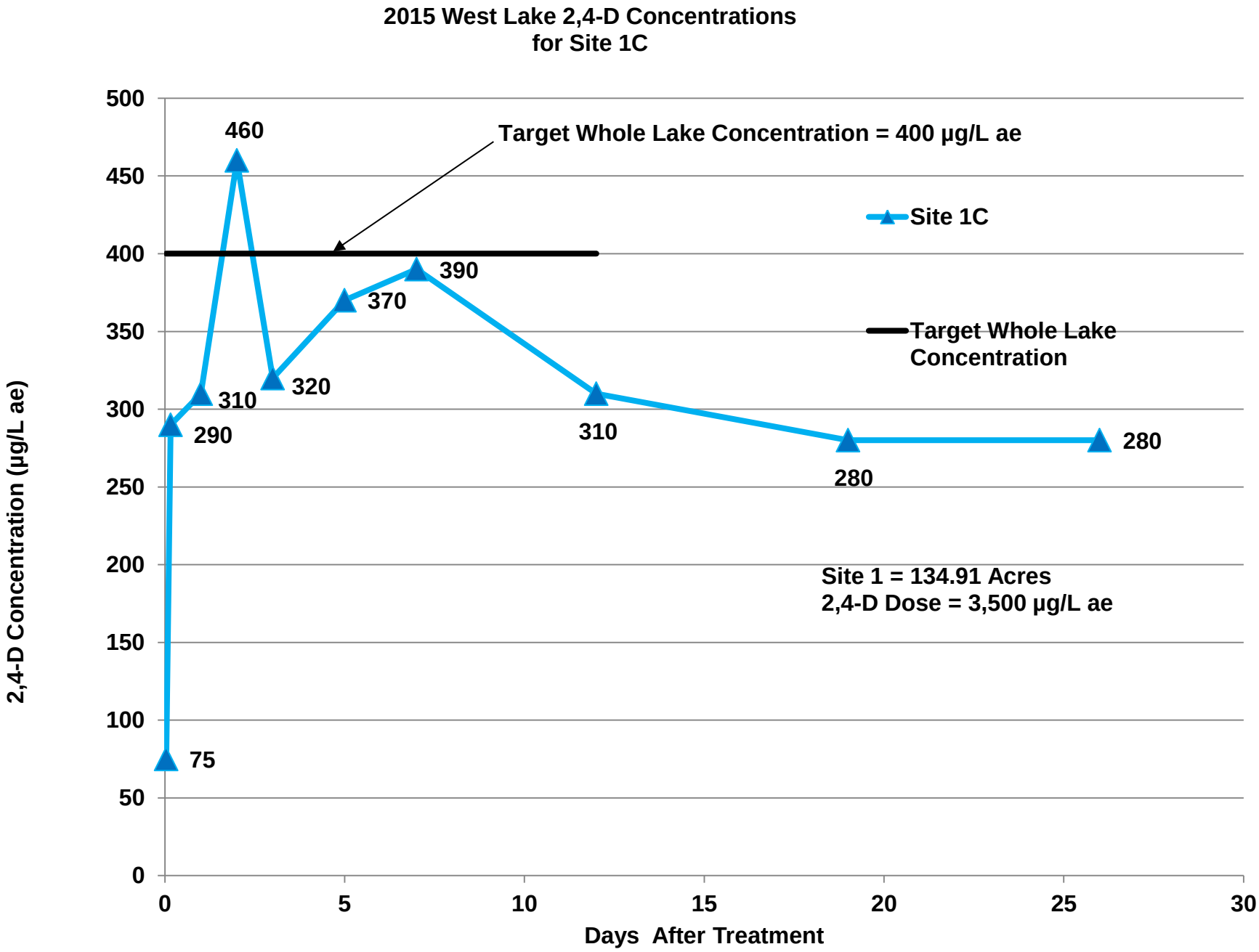

2015 Rabbit Island Bay 2,4-D Concentrations for Rabbit Island Bay Center
2,4-D Concentration (µg/L ae)
Days After Treatment
Rabbit Island Bay Center
Target Whole Bay Concentration
Site 4 = 4.27 Acres
2,4-D Dose = 4,000 µg/L ae
Target Whole Bay Concentration = 300 µg/L ae
460
470
400
370
360
180
140
64
16
3
0
50
100
150
200
250
300
350
400
450
500
0
5
10
15
20
25
30

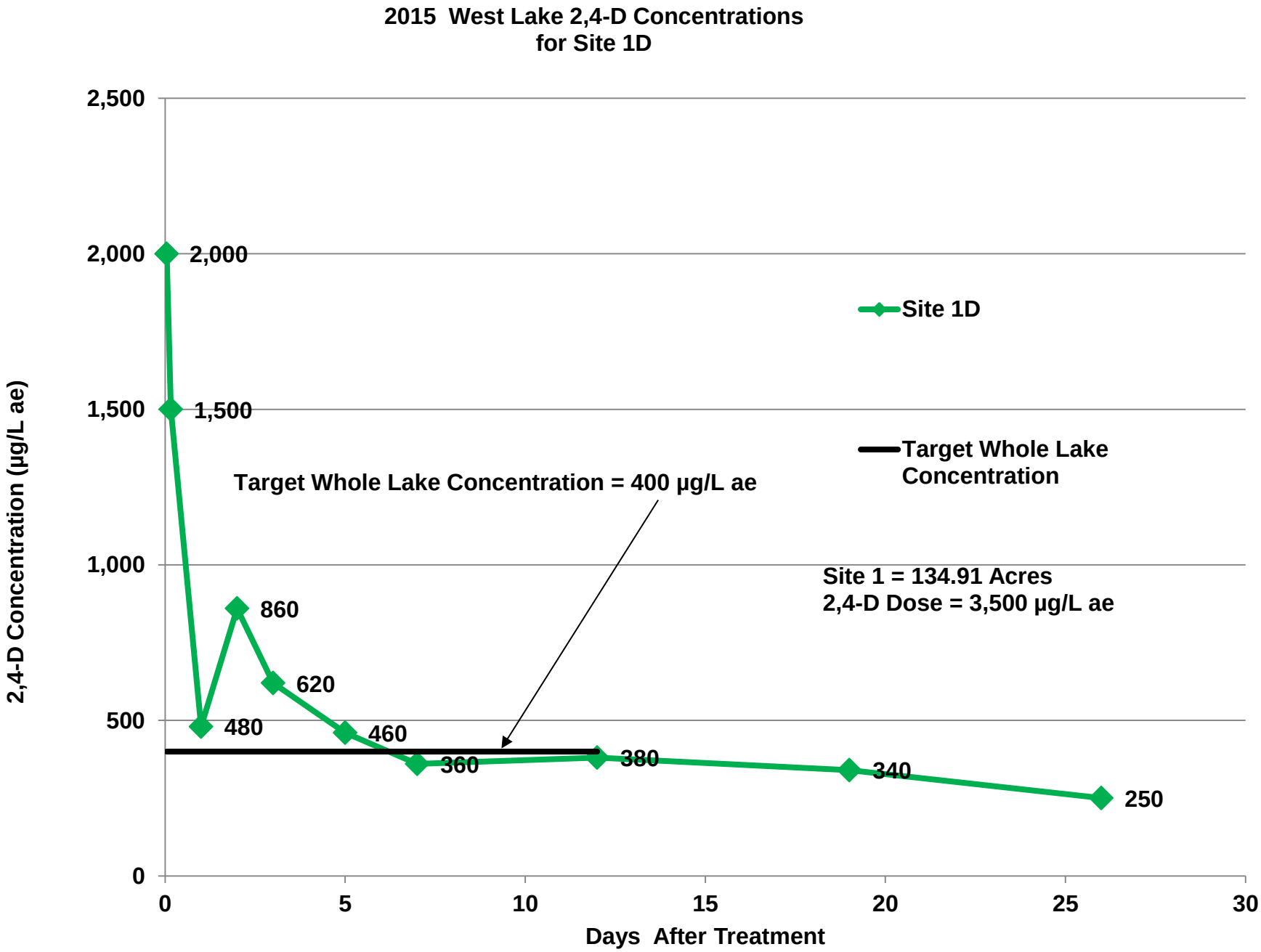

2015 Rabbit Island Bay 2,4-D Concentrations
for Site 4
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2,4-D Concentration (µg/L ae)
9,200
3,500
940
350
480
390
390
270
140
1.4
Site 4
Target Whole Bay
Concentration
Site 4 = 4.27 Acres
2,4-D Dose = 4,000 µg/L ae
Target Whole Bay Concentration = 300 µg/L ae
0
5
10
15
20
25
30
Days After Treatment

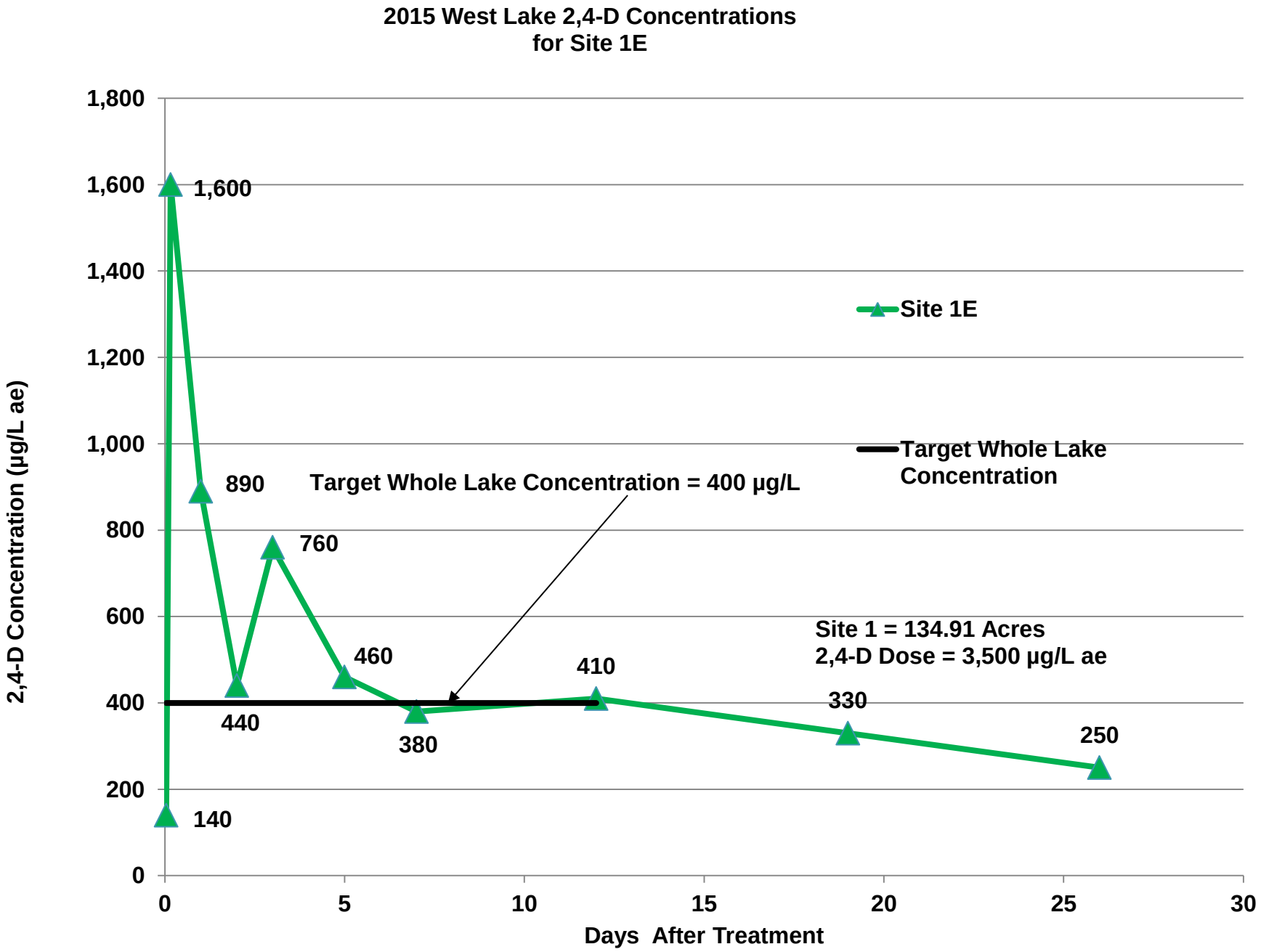

2015 West Lake 2,4-D Concentrations
for West Lake Center
800
700
600
500
400
300
200
100
0
2,4-D Concentration (µg/L ae)
680
430
440
410
370
380
310
200
140
0.35
Target Whole Lake Concentration = 400 µg/L ae
West Lake Center
Target Whole Lake Concentration
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae
0
5
10
15
20
25
30
Days After Treatment

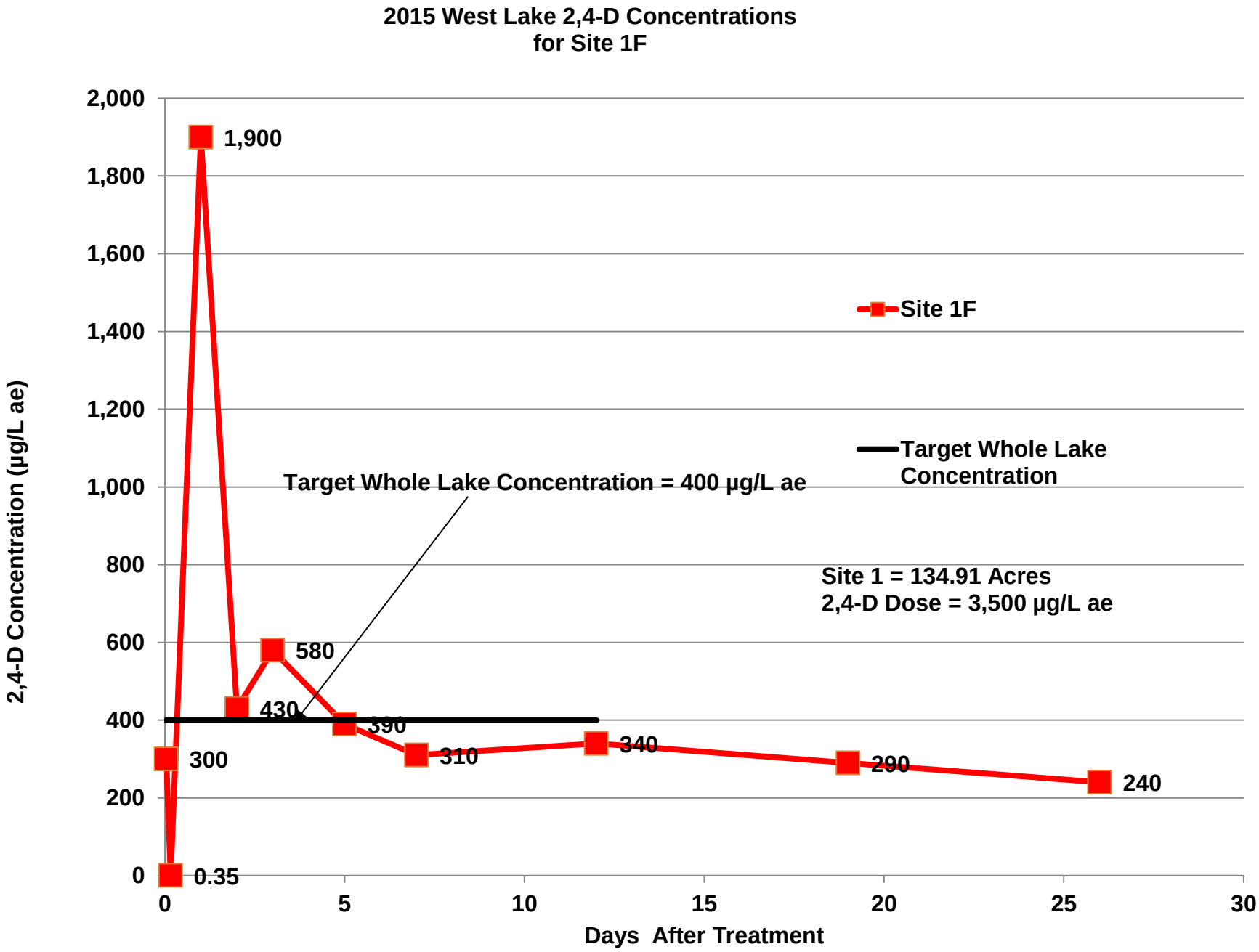

2015 West Lake 2,4-D Concentrations
for Site 1A
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 1A
Target Whole Lake Concentration
Target Whole Lake Concentration = 400 µg/L ae
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae
1,500
430
370
310
370
250
350
340
260
180

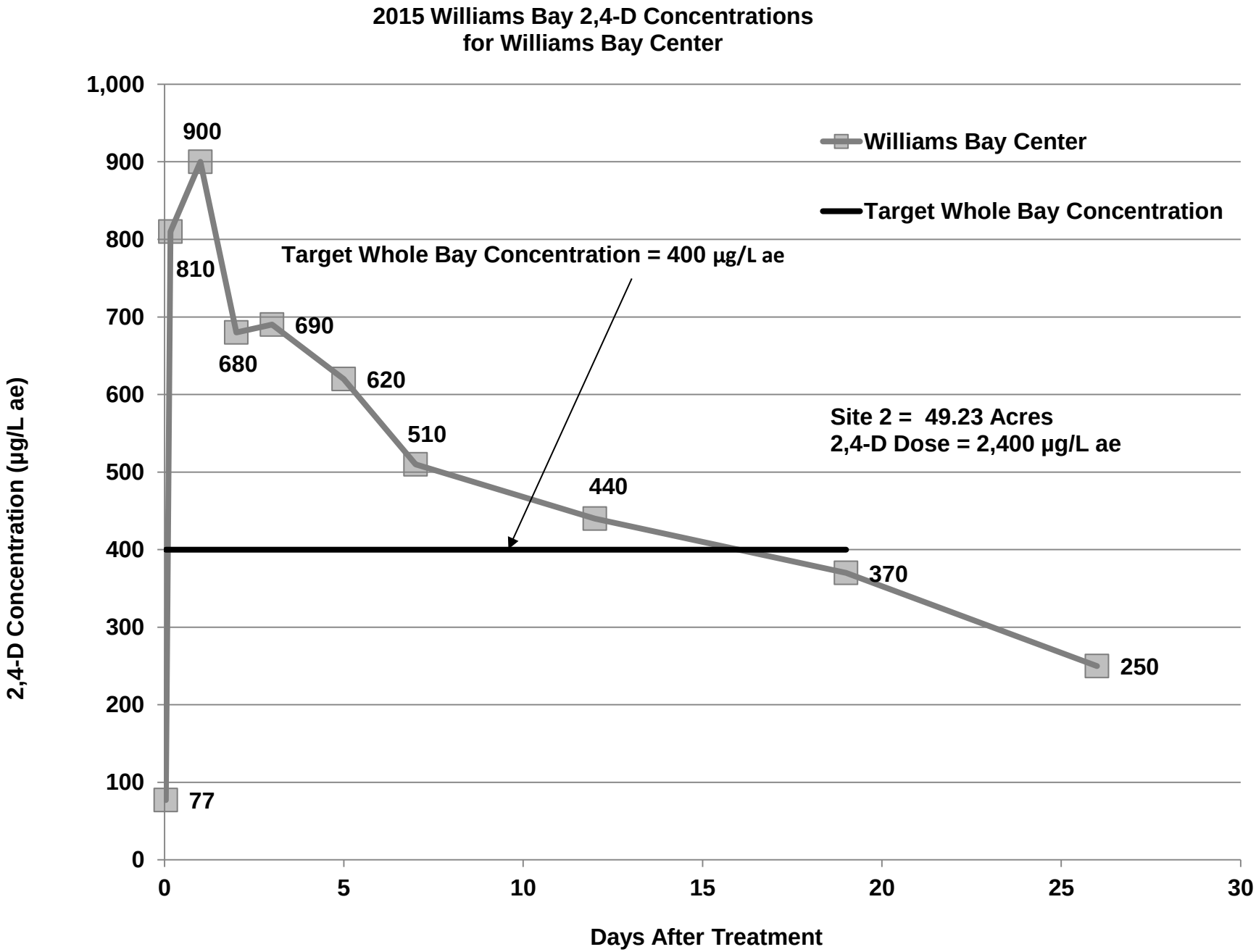

2015 West Lake 2,4-D Concentrations
for Site 1B
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 1B
Target Whole Lake Concentration
Target Whole Lake Concentration = 400 µg/L ae
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae
1,300
370
300
380
340
320
340
310
270
280

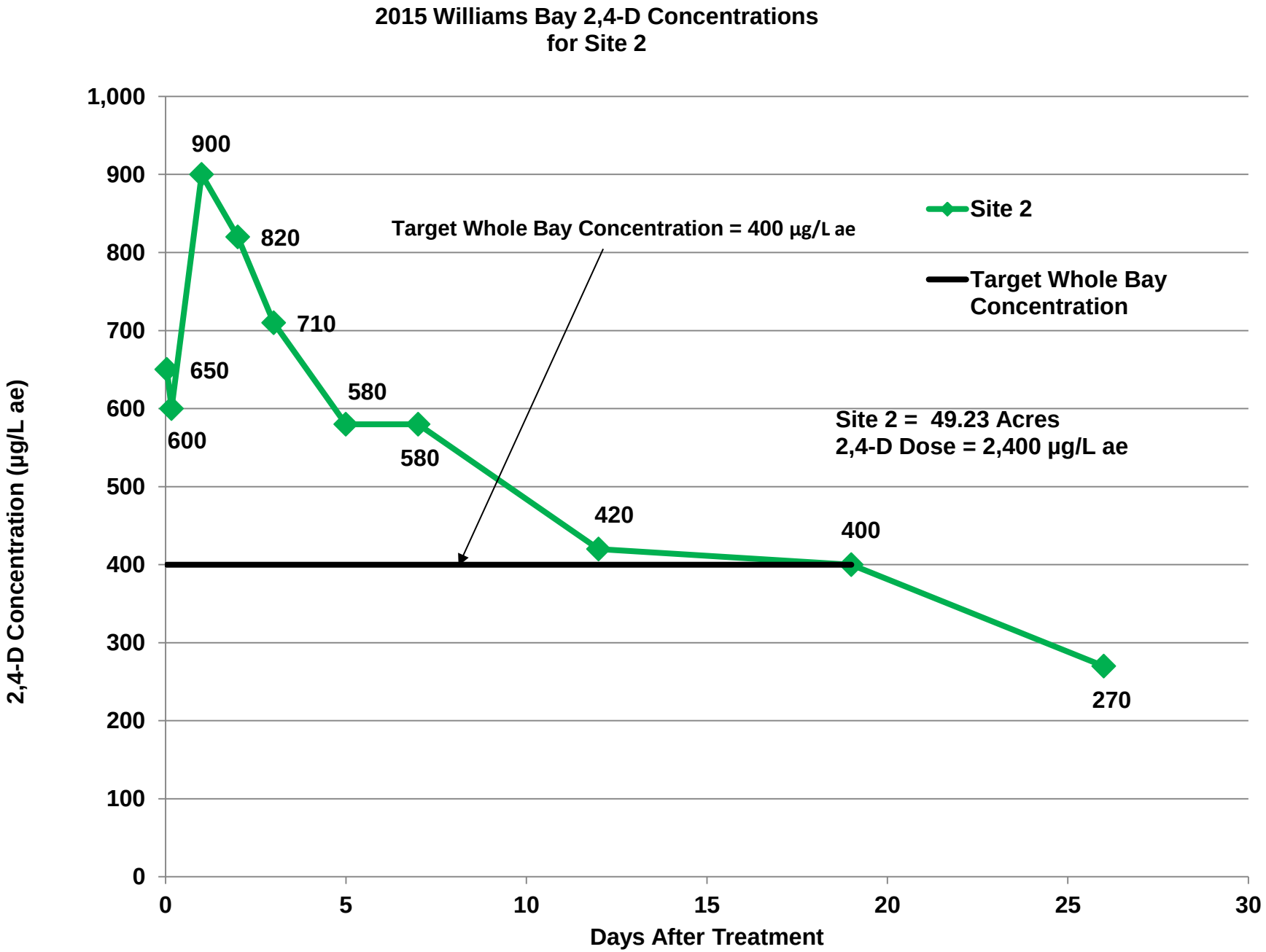

2015 West Lake 2,4-D Concentrations
for Site 1C
Target Whole Lake Concentration = 400 µg/L ae
Site 1C
Target Whole Lake Concentration
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae
2,4-D Concentration (µg/L ae)
Days After Treatment
500
450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
460
390
370
320
310
290
310
280
280
75

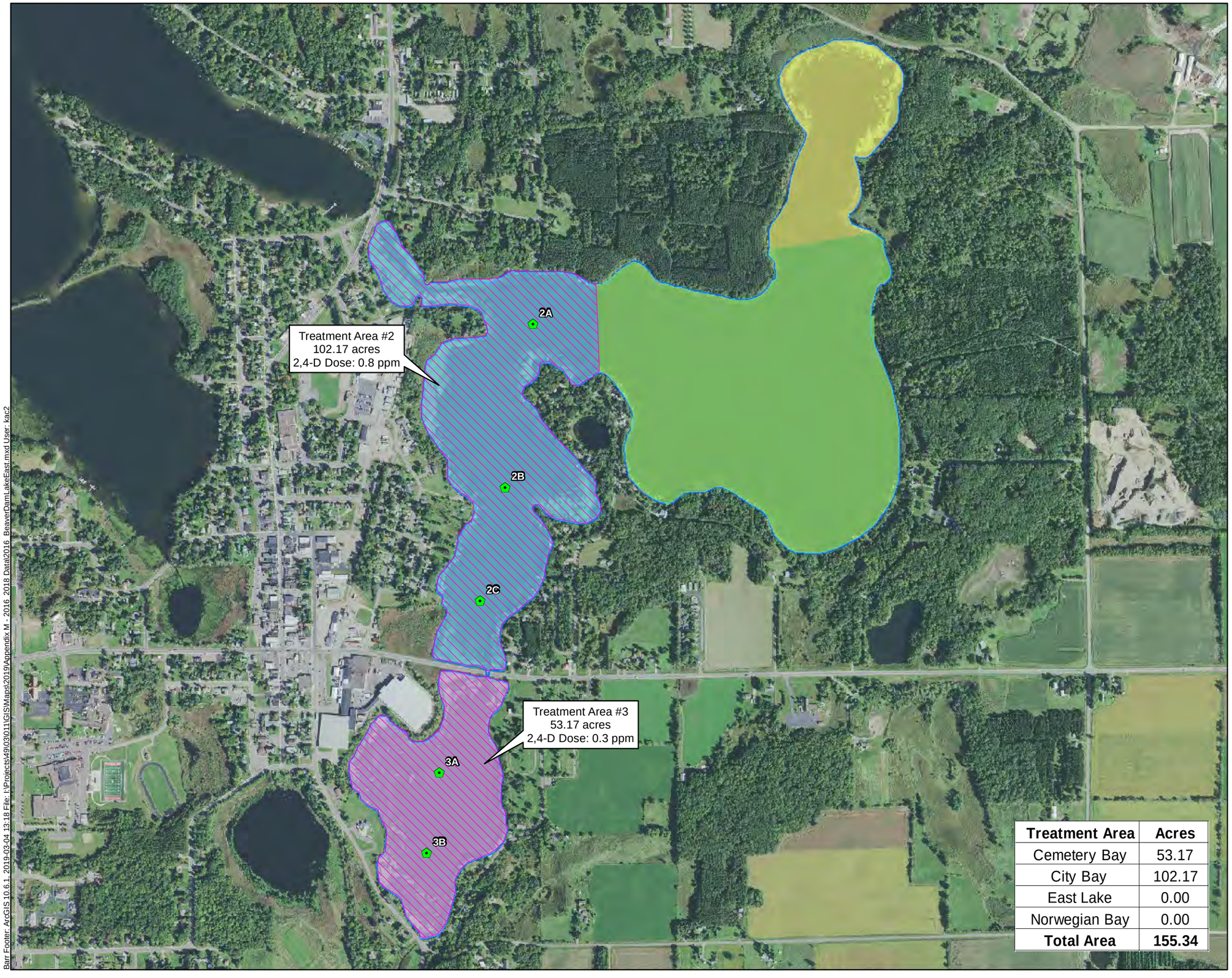

2015 West Lake 2,4-D Concentrations for Site 1D
2,500
2,000
1,500
1,000
500
0
2,000
1,500
860
620
480
460
360
380
340
250
Site 1D
Target Whole Lake Concentration
Target Whole Lake Concentration = 400 µg/L ae
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment


2015 West Lake 2,4-D Concentrations
for Site 1E
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
1,600
890
760
460
440
380
410
330
250
140
Site 1E
Target Whole Lake Concentration
Target Whole Lake Concentration = 400 µg/L
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae


2015 West Lake 2,4-D Concentrations
for Site 1F
2,4-D Concentration (µg/L ae)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
0
5
10
15
20
25
30
Days After Treatment
1,900
580
430
390
300
310
340
290
240
0.35
Site 1F
Target Whole Lake Concentration
Target Whole Lake Concentration = 400 µg/L ae
Site 1 = 134.91 Acres
2,4-D Dose = 3,500 µg/L ae


2015 Williams Bay 2,4-D Concentrations
for Williams Bay Center
1,000
900
800
700
600
500
400
300
200
100
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Williams Bay Center
Target Whole Bay Concentration
Target Whole Bay Concentration = 400 µg/L ae
Site 2 = 49.23 Acres
2,4-D Dose = 2,400 µg/L ae
900
810
680
690
620
510
440
370
250
77


2015 Williams Bay 2,4-D Concentrations
for Site 2
1,000
900
800
700
600
500
400
300
200
100
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
900
820
710
650
600
580
580
420
400
270
Target Whole Bay Concentration = 400 µg/L ae
Site 2
Target Whole Bay Concentration
Site 2 = 49.23 Acres
2,4-D Dose = 2,400 µg/L ae



Treatment Area	Acres
Cemetery Bay	53.17
City Bay	102.17
East Lake	0.00
Norwegian Bay	0.00
Total Area	**155.34**

2016 EWM Treatment Areas

Herbicide Residue Monitoring Locations

Treatment Zones

Cemetery Bay (0.3 ppm 2,4-D)

City Bay (0.80 ppm 2,4-D)

East Lake (Not Treated)

Norwegian Bay (Hand Removal)

N

0 450 900 1,800

Feet

BARR

2016 EURASIAN WATERMILFOIL TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS

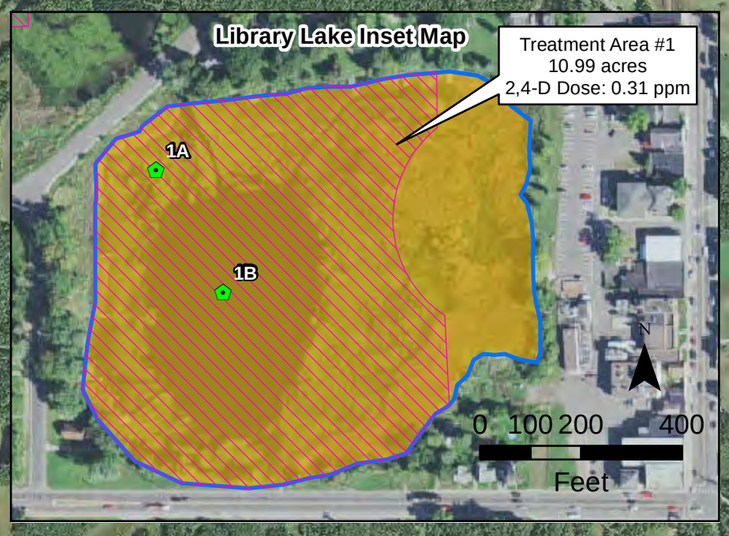
Beaver Dam - East

Barron County, WI

M-83

Barr Footer: ArcGIS 10.6.1, 2019-03-04 13:18 File: I:\Projects\49\03011\GIS\Maps\2019\Appendix M - 2016_2018 Data\2016_BeaverDamLakeEast.mxd User: kac2

Treatment Area	Acres
Rabbit Island Bay	0.00
West Lake	0.00
Williams Bay	0.00
Library Lake	10.99
Total Area	**10.99**



2016 EWM Treatment Areas

Herbicide Residue Monitoring Locations

Treatment Zones

- Library Lake (0.3 ppm 2,4-D)
- Rabbit Island Bay (Hand Removal)
- West Lake (Hand Removal)
- Williams Bay (Not Treated)

N

0 750 1,500 3,000

Feet

BARR

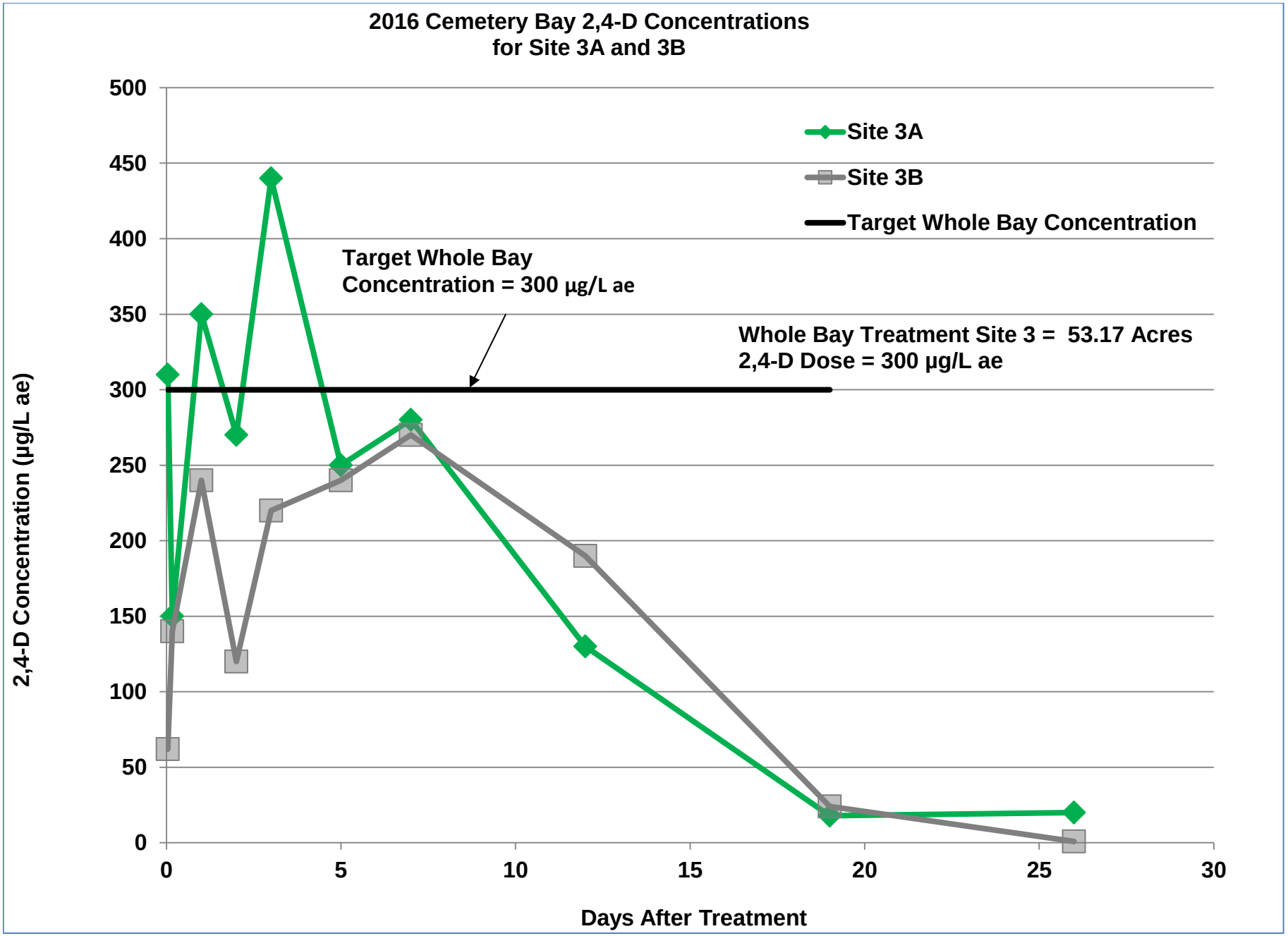
2016 EURASIAN WATERMILFOIL TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS

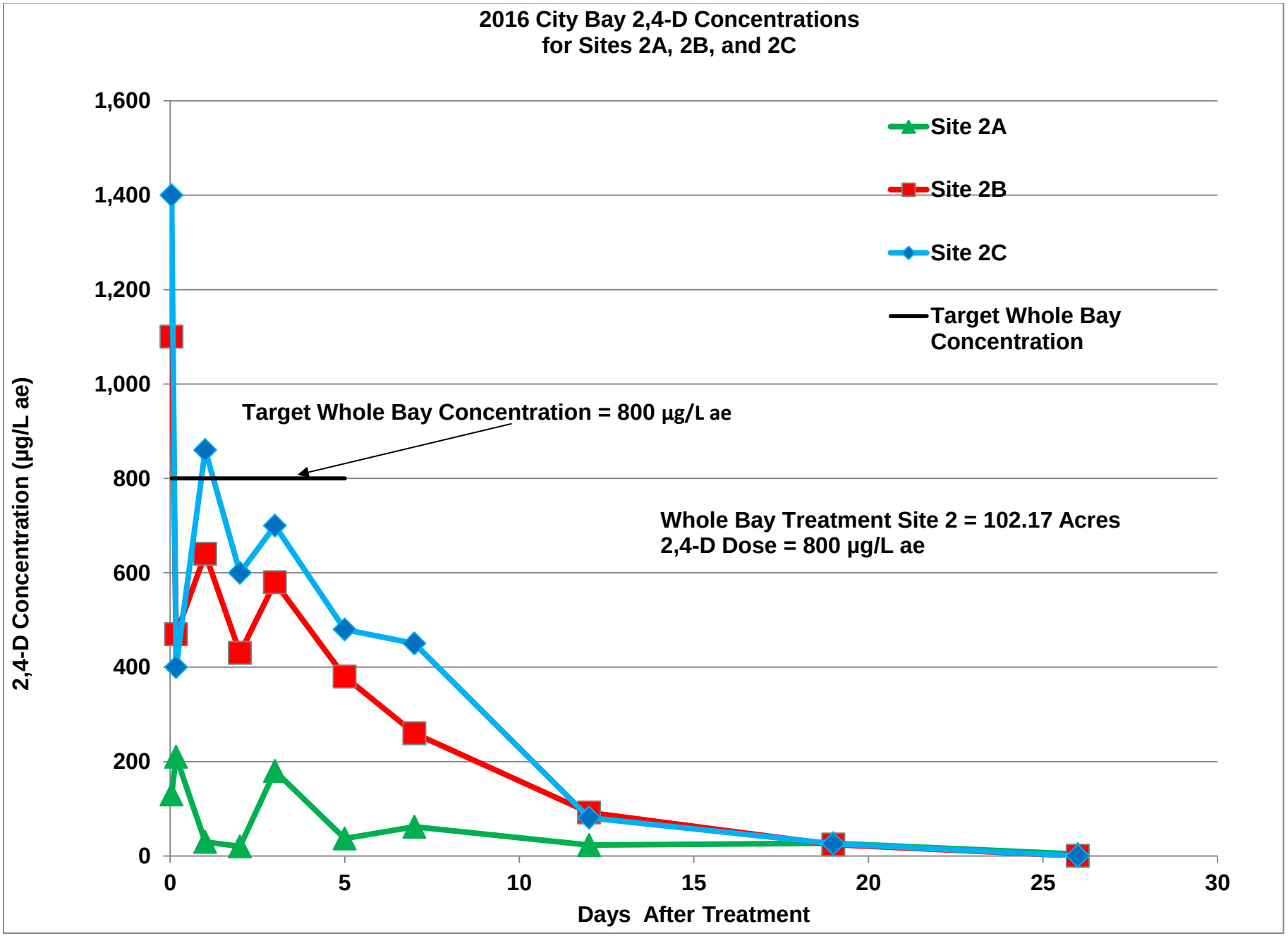
Beaver Dam - West

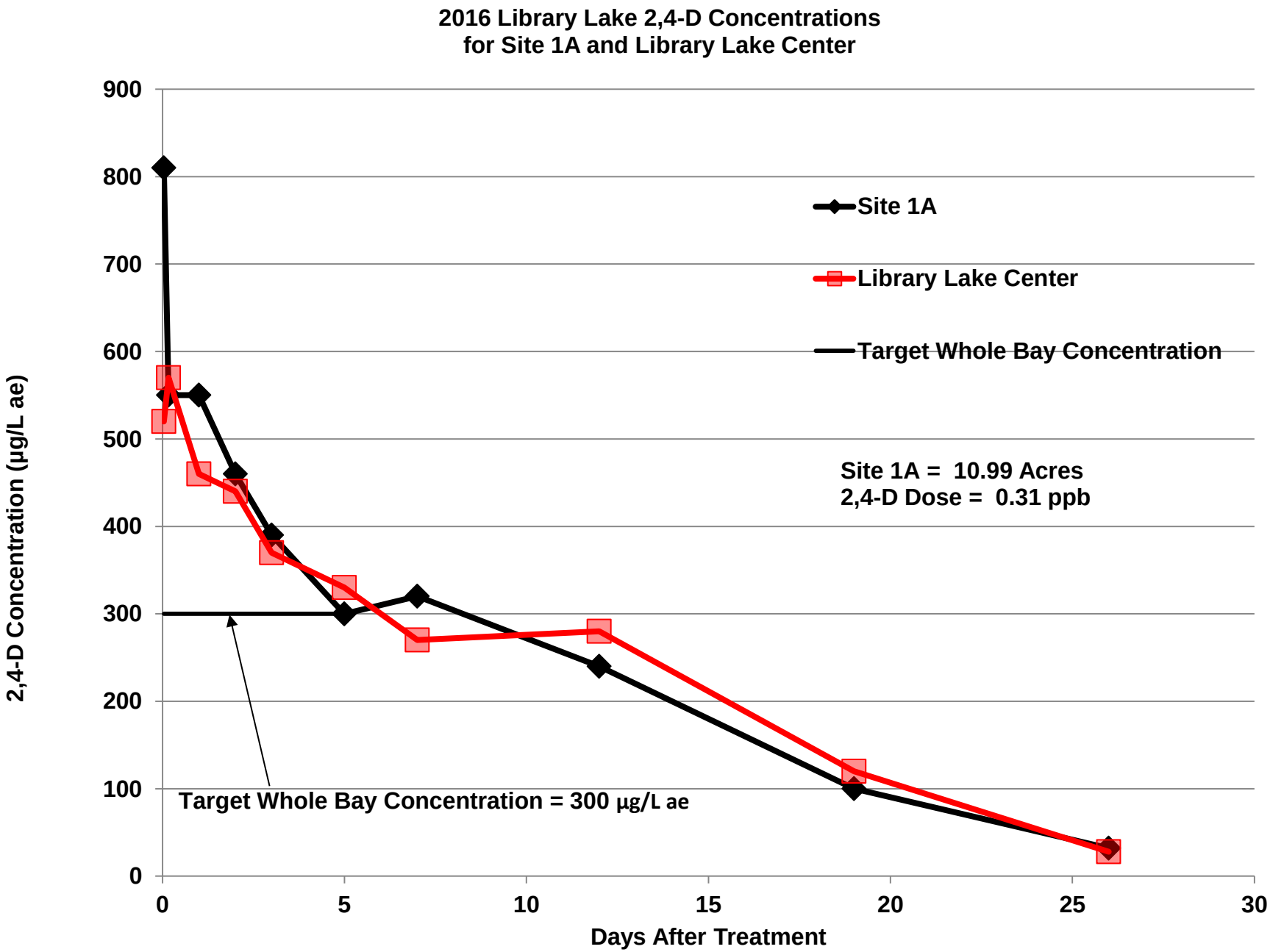
Barron County, WI

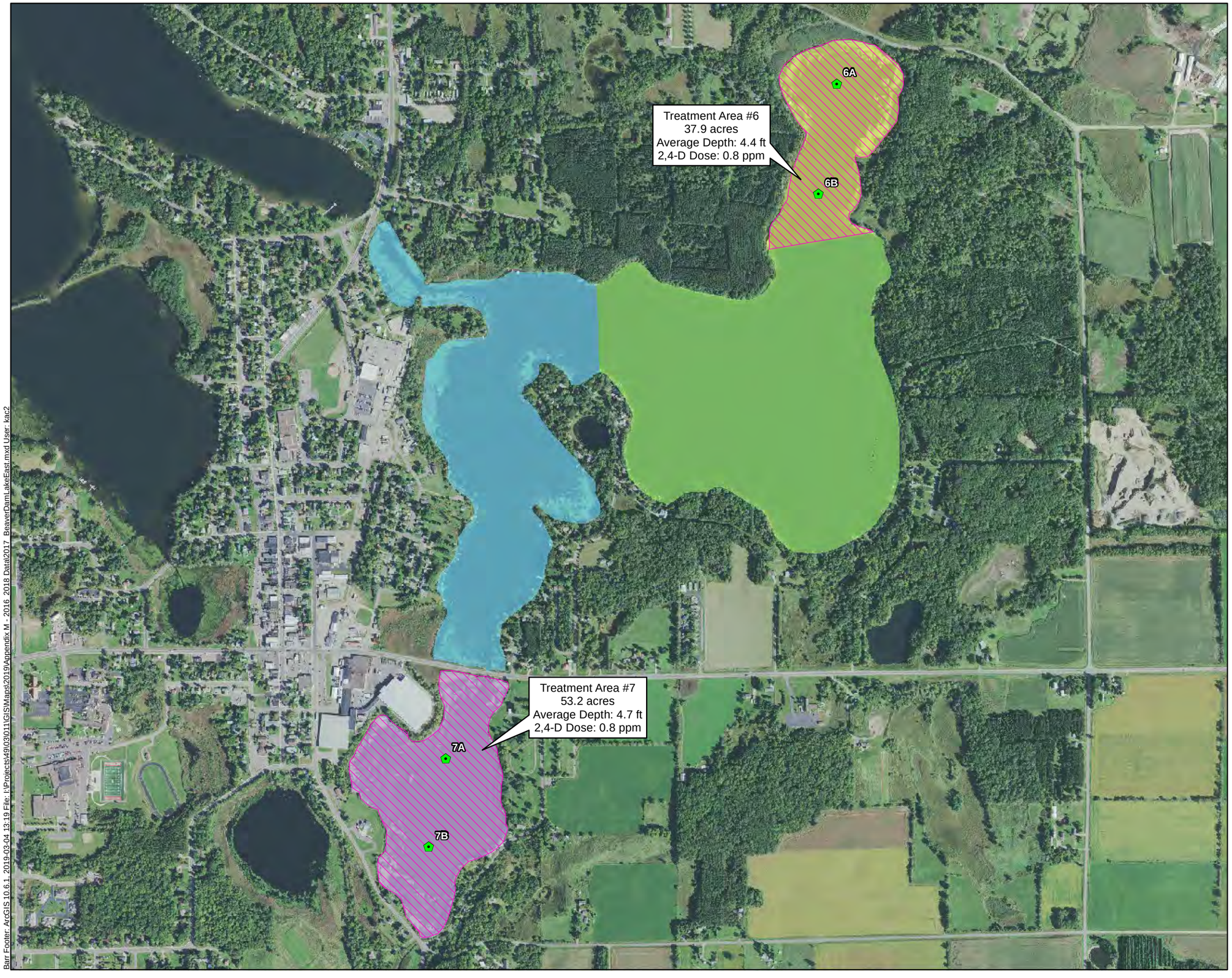
M-84

Barr Footer: ArcGIS 10.6.1, 2019-03-04 13:17 File: I:\Projects\49\030110\GIS\Maps\2019\Appendix M - 2016_2018 Data\2016_BeaverDamLakeWest.mxd User: kac2


2016 Cemetery Bay 2,4-D Concentrations
for Site 3A and 3B
2,4-D Concentration (µg/L ae)
Days After Treatment
Site 3A
Site 3B
Target Whole Bay Concentration
Target Whole Bay
Concentration = 300 µg/L ae
Whole Bay Treatment Site 3 = 53.17 Acres
2,4-D Dose = 300 µg/L ae
500
450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30


2016 City Bay 2,4-D Concentrations
for Sites 2A, 2B, and 2C
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 2A
Site 2B
Site 2C
Target Whole Bay Concentration
Target Whole Bay Concentration = 800 µg/L ae
Whole Bay Treatment Site 2 = 102.17 Acres
2,4-D Dose = 800 µg/L ae


2016 Library Lake 2,4-D Concentrations
for Site 1A and Library Lake Center
2,4-D Concentration (µg/L ae)
900
800
700
600
500
400
300
200
100
0
0
5
10
15
20
25
30
Days After Treatment
Site 1A
Library Lake Center
Target Whole Bay Concentration
Site 1A = 10.99 Acres
2,4-D Dose = 0.31 ppb
Target Whole Bay Concentration = 300 µg/L ae



Proposed 2017 EWM Treatment Areas

Herbicide Residue Monitoring Locations

Treatment Zones

East Lake (Manual Removal)

City Bay (Manual Removal)

Cemetery Bay (Whole Bay 2,4-D Concentration - 0.8 ppm)

Norwegian Bay (Whole Bay 2,4-D Concentration - 0.8 ppm)

N

0 450 900 1,800

Feet

BARR

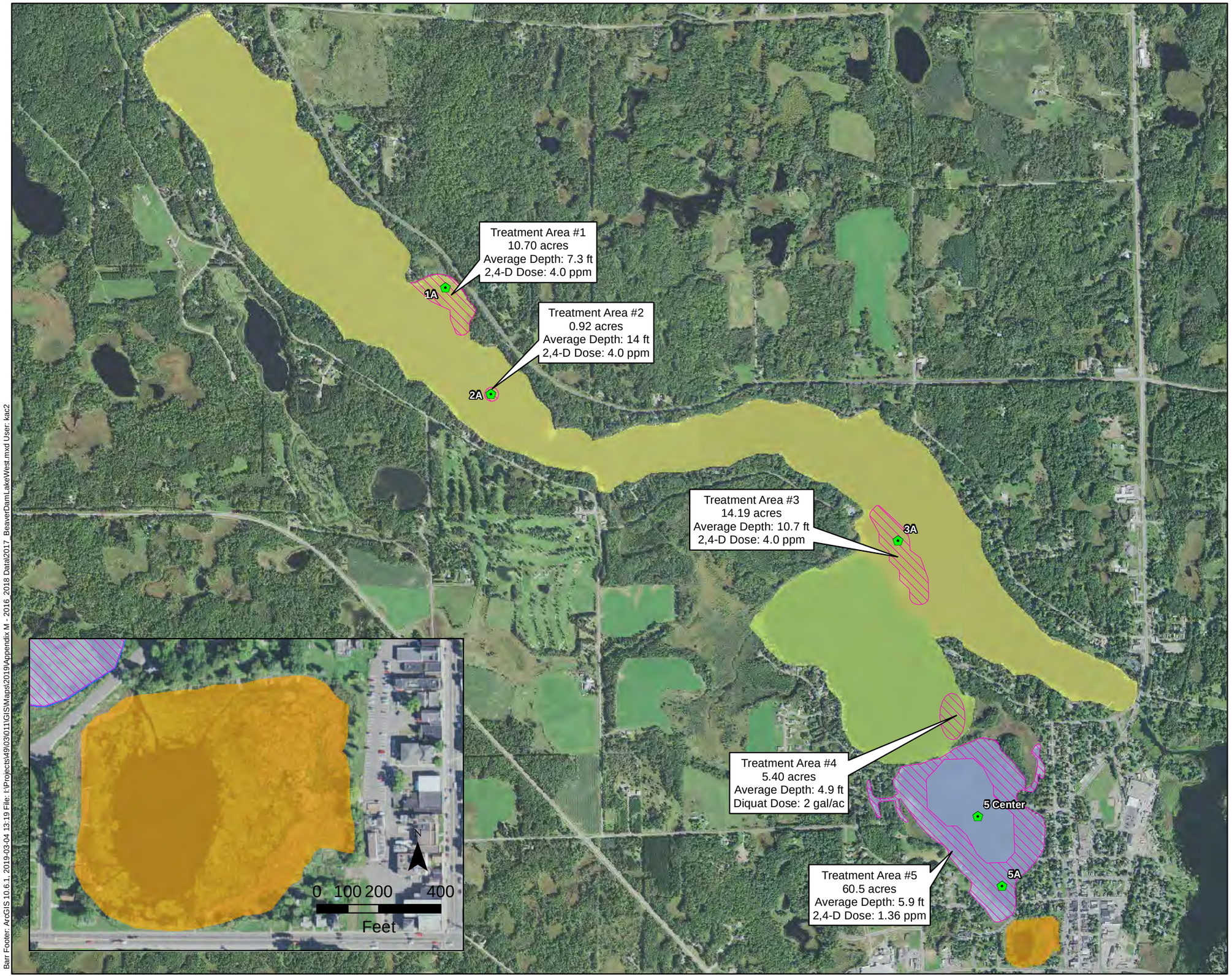
2017 EURASIAN WATERMILFOIL TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS

Beaver Dam - East

Barron County, WI

M-88

Barr Footer: ArcGIS 10.6.1, 2019-03-04 13:19 File: I:\Projects\49\03011\GIS\Maps\2019\Appendix M - 2016_2018 Data\2017_BeaverDamLakeEast.mxd User: kac2



Proposed 2017 EWM Treatment Areas

Herbicide Residue Monitoring Locations

Treatment Zones

Library Lake (No Treatment)

Rabbit Island Bay (Whole Lake 2,4-D Concenbration 0.4 ppm)

West Lake (Spot Treatment with 2,4-D)

Williams Bay (Spot Treatment with Diquat)

N

0 750 1,500 3,000

Feet

BARR

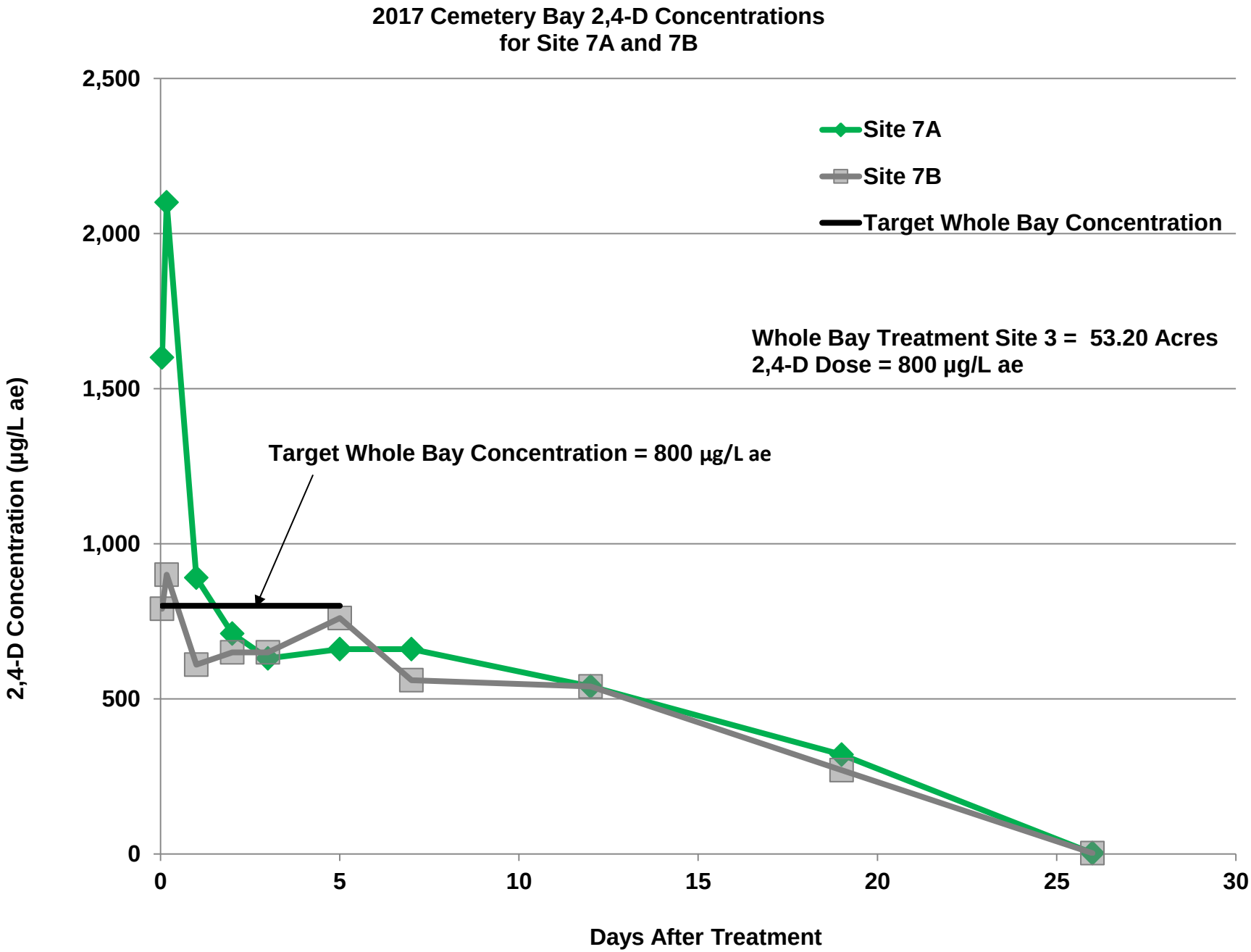
2017 EURASIAN WATERMILFOIL TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS

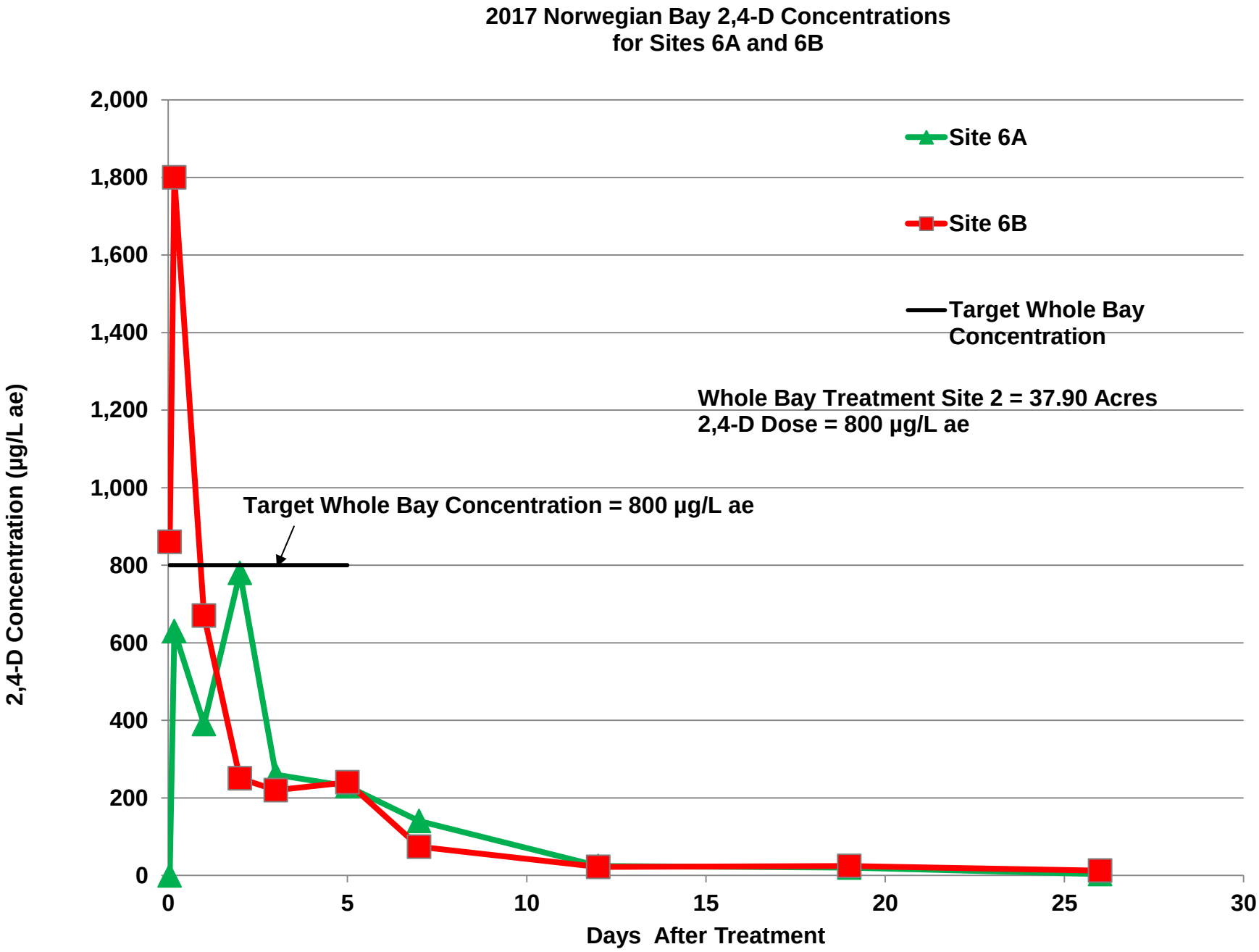
Beaver Dam - West

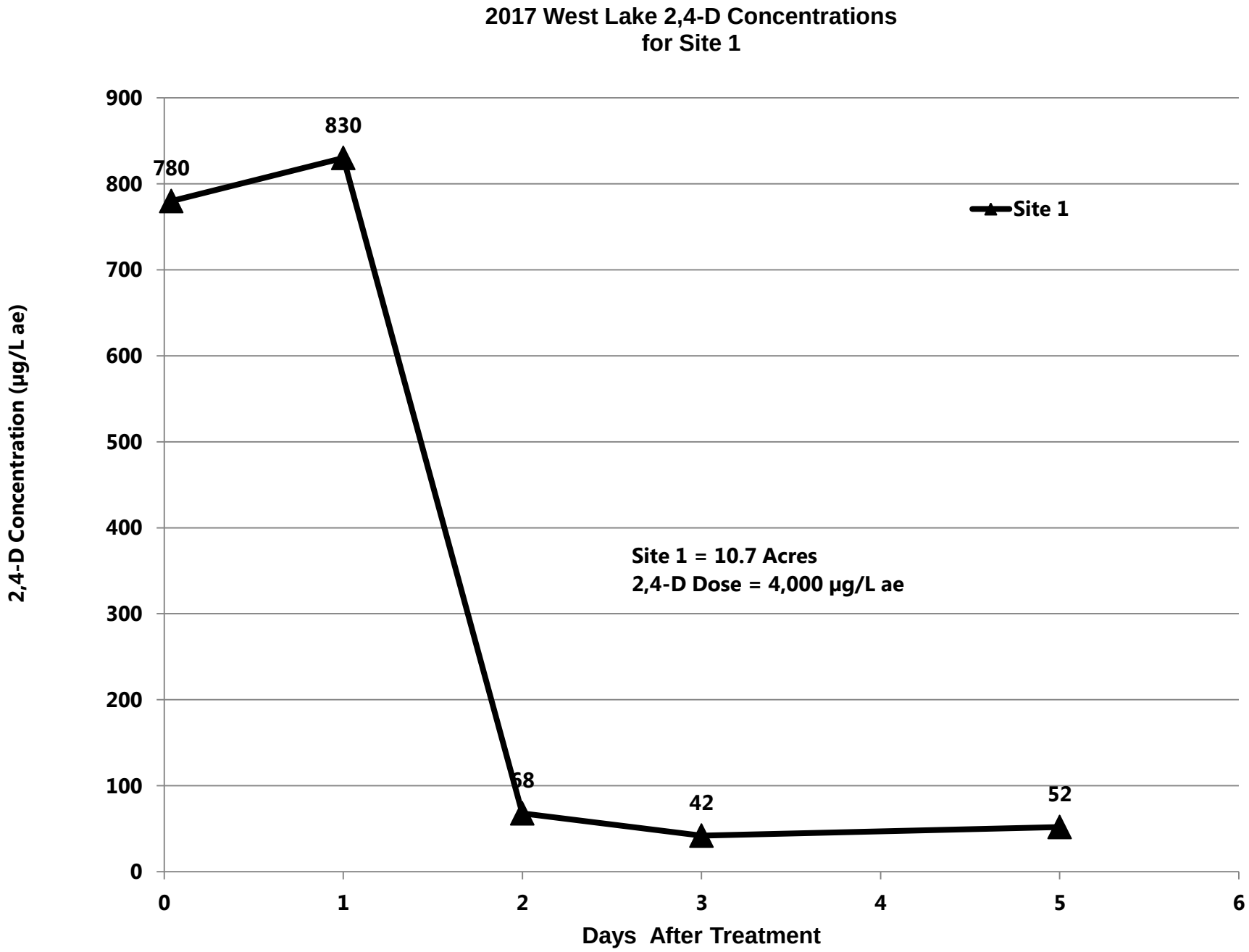
Barron County, WI

M-89

Barr Footer: ArcGIS 10.6.1, 2019-03-04 13:19 File: I:\Projects\49\03\011\GIS\Maps\2019\Appendix M - 2016_2018 Data\2017_BeaverDamLakeWest.mxd User: kac2


2017 Cemetery Bay 2,4-D Concentrations
for Site 7A and 7B
2,500
2,000
1,500
1,000
500
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 7A
Site 7B
Target Whole Bay Concentration
Whole Bay Treatment Site 3 = 53.20 Acres
2,4-D Dose = 800 µg/L ae
Target Whole Bay Concentration = 800 µg/L ae


2017 Norwegian Bay 2,4-D Concentrations
for Sites 6A and 6B
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 6A
Site 6B
Target Whole Bay Concentration
Whole Bay Treatment Site 2 = 37.90 Acres
2,4-D Dose = 800 µg/L ae
Target Whole Bay Concentration = 800 µg/L ae


2017 West Lake 2,4-D Concentrations
for Site 1
2,4-D Concentration (µg/L ae)
900
800
700
600
500
400
300
200
100
0
780
830
68
42
52
Site 1
Site 1 = 10.7 Acres
2,4-D Dose = 4,000 µg/L ae
0
1
2
3
4
5
6
Days After Treatment

Treatment Area #24
37.9 acres
Average Depth: 4.5 ft
2,4-D Dose: 1.2 ppm

24A

24B

27A

Treatment Area #27
102.2 acres
Average Depth: 4.8 ft
2,4-D Dose: 1.2 ppm

27B

27C

Treatment Area #25
0.3 acres
Average Depth: 3 ft
DASH

Treatment Area #26
0.4 acres
Average Depth: 5 ft
DASH

Herbicide Residue Monitoring Locations

Proposed 2018 EWM Treatment Areas

Treatment Zones

East Lake

City Bay

Cemetery Bay

Norwegian Bay

N

0 450 900 1,800

Feet

BARR

2018 2,4-D RESIDUE MONITORING LOCATIONS: NORWEGIAN BAY AND CITY BAY

Beaver Dam - East
Barron County, WI

M-93

Barr Footer: ArcGIS 10.6.1, 2019-03-04 13:18 File: I:\Projects\49\03\011\GIS\Maps\2019\Appendix M - 2016_2018 Data\2018_BeaverDamLakeEast.mxd User: kac2

Treatment Area #1
7.92 acres
Average Depth: 7.4 ft
2,4-D Dose: 4 ppm

Treatment Area #2
0.52 acres
Average Depth: 4.5 ft
DASH

Treatment Area #4
0.36 acres
Average Depth: 11.0 ft
DASH

Treatment Area #5
0.38 acres
Average Depth: 3.0 ft
DASH

Treatment Area #6
1.02 acres
Average Depth: 9.0 ft
DASH

Treatment Area #7
1.01 acres
Average Depth: 9.0 ft
DASH

Treatment Area #3
1.16 acres
Average Depth: 12.0 ft
DASH

Treatment Area #8
0.26 acres
Average Depth: 4.0 ft
DASH

Treatment Area #9
0.94 acres
Average Depth: 14.0 ft
Diquat Dose: 2 gal/acre

Treatment Area #10
0.45 acres
Average Depth: 8.0 ft
DASH

Treatment Area #11
3.23 acres
Average Depth: 4.3 ft
2,4-D Dose: 4 ppm

Treatment Area #12
0.18 acres
Average Depth: 5.0 ft
DASH

Treatment Area #13
2.45 acres
Average Depth: 10.8 ft
Diquat Dose: 2 gal/acre

Treatment Area #14
5.05 acres
Average Depth: 9.6 ft
Diquat Dose: 2 gal/acre

Treatment Area #15
0.67 acres
Average Depth: 7.8 ft
Diquat Dose: 2 gal/acre

Treatment Area #16
10.05 acres
Average Depth: 5.8 ft
2,4-D Dose: 4 ppm

Treatment Area #17
0.38 acres
Average Depth: 7.0 ft
DASH

Treatment Area #18
0.5 acres
Average Depth: 3.3 ft
Diquat Dose: 2 gal/acre

Treatment Area #19
0.3 acres
Average Depth: 3.0 ft
Diquat Dose: 2 gal/acre

Treatment Area #20
0.4 acres
Average Depth: 5.0 ft
Diquat Dose: 2 gal/acre

Treatment Area #22
0.5 acres
Average Depth: 2.2 ft
Rake Removal in June

Treatment Area #23
0.1 acres
Average Depth: 3 ft
Rake Removal in June

Treatment Area #24
0.1 acres
Average Depth: 4 ft
Rake Removal in June

N
0 100 200 400
Feet

Herbicide Residue Monitoring Locations
Proposed 2018 EWM Treatment Areas

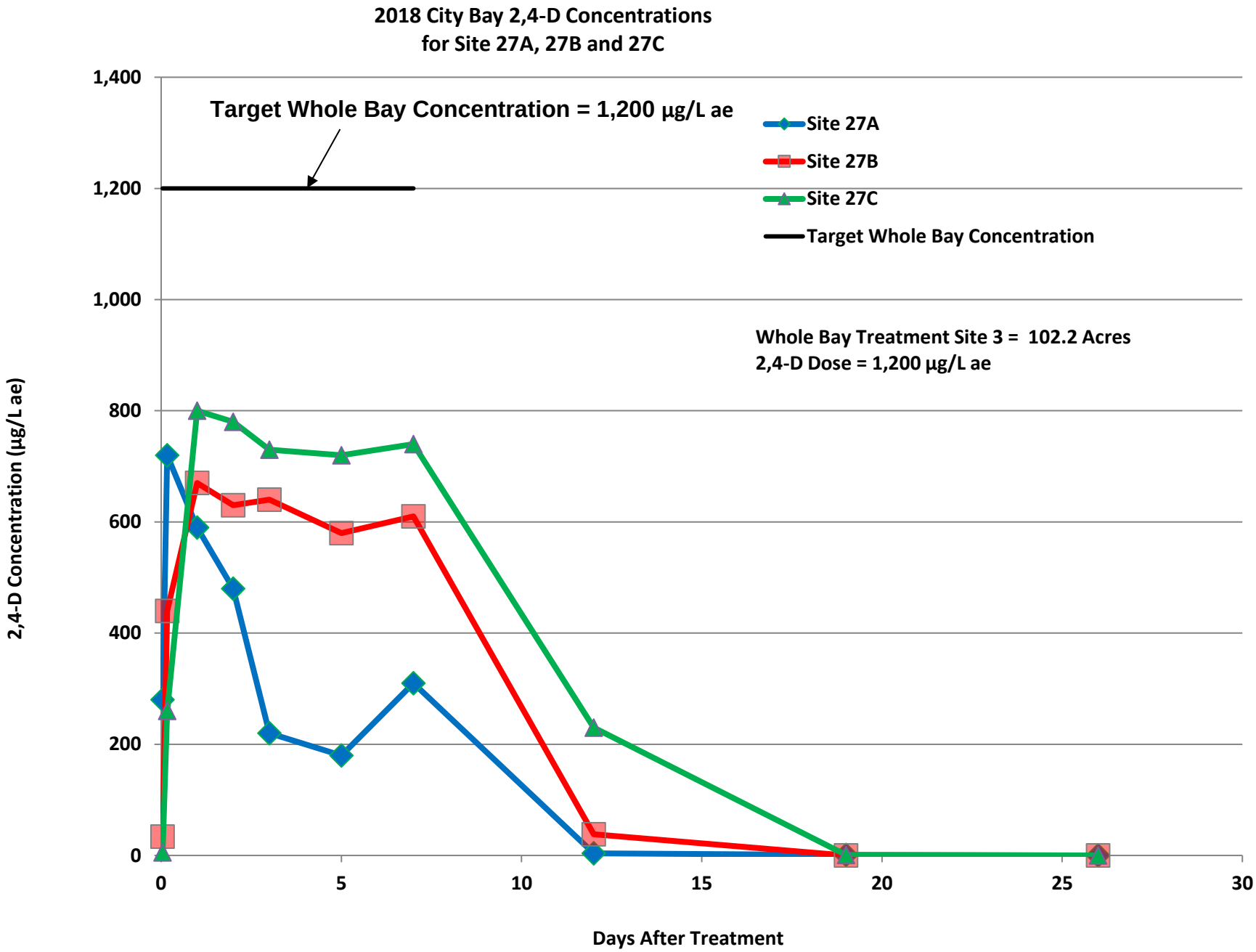
Treatment Zones
- Library Lake
- Rabbit Island Bay
- West Lake
- Williams Bay

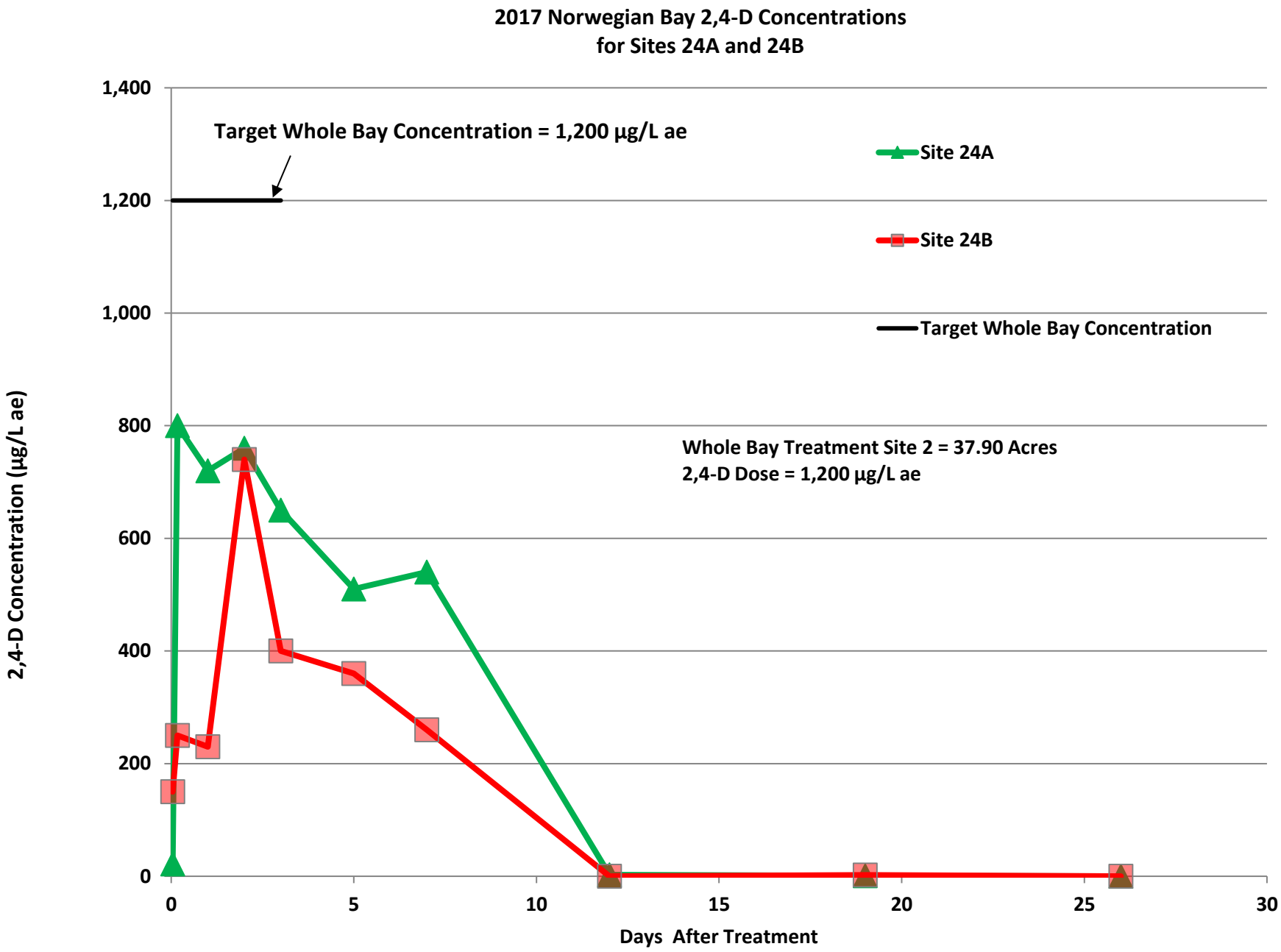
N
0 750 1,500 3,000
Feet

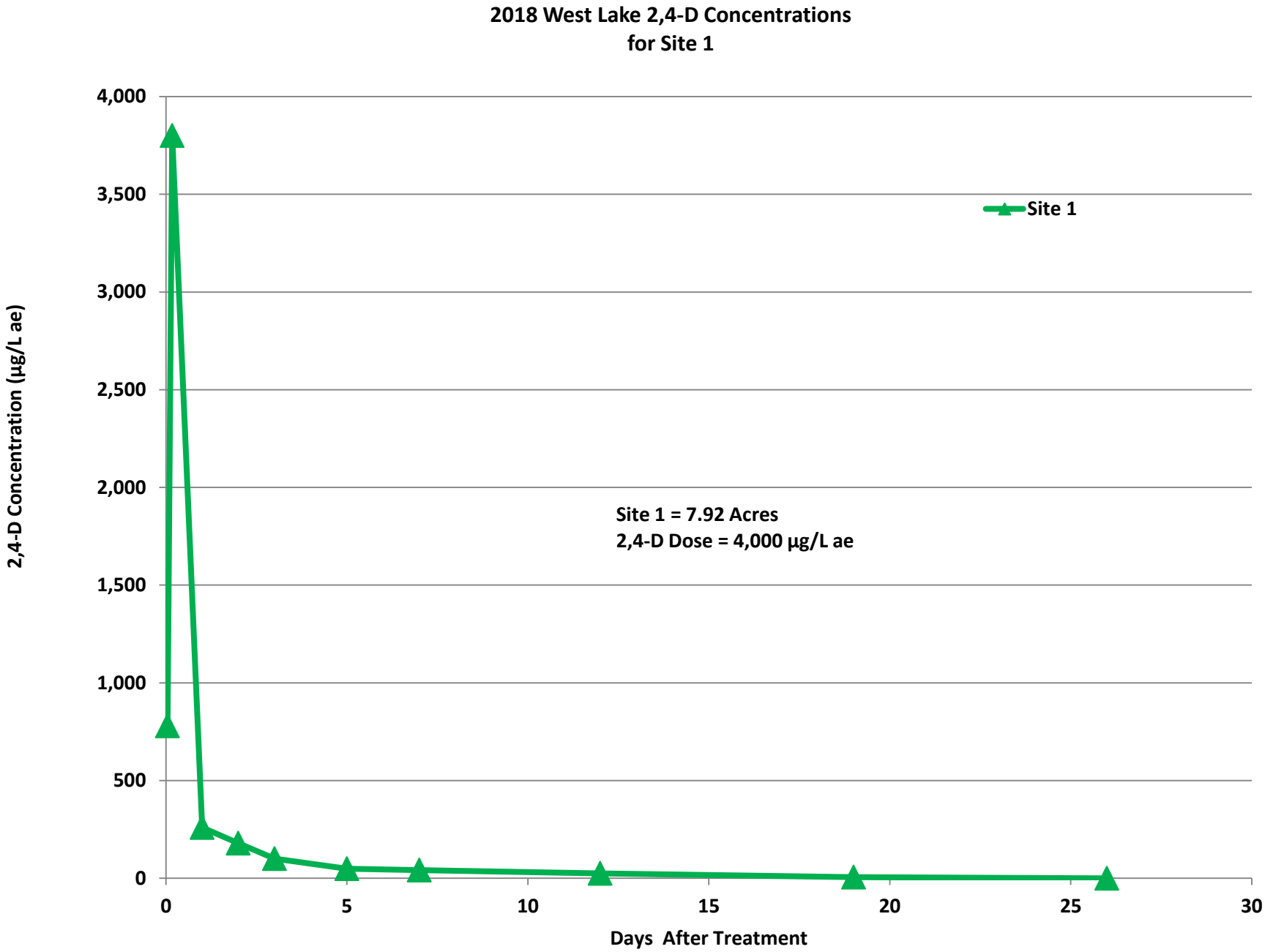
BARR

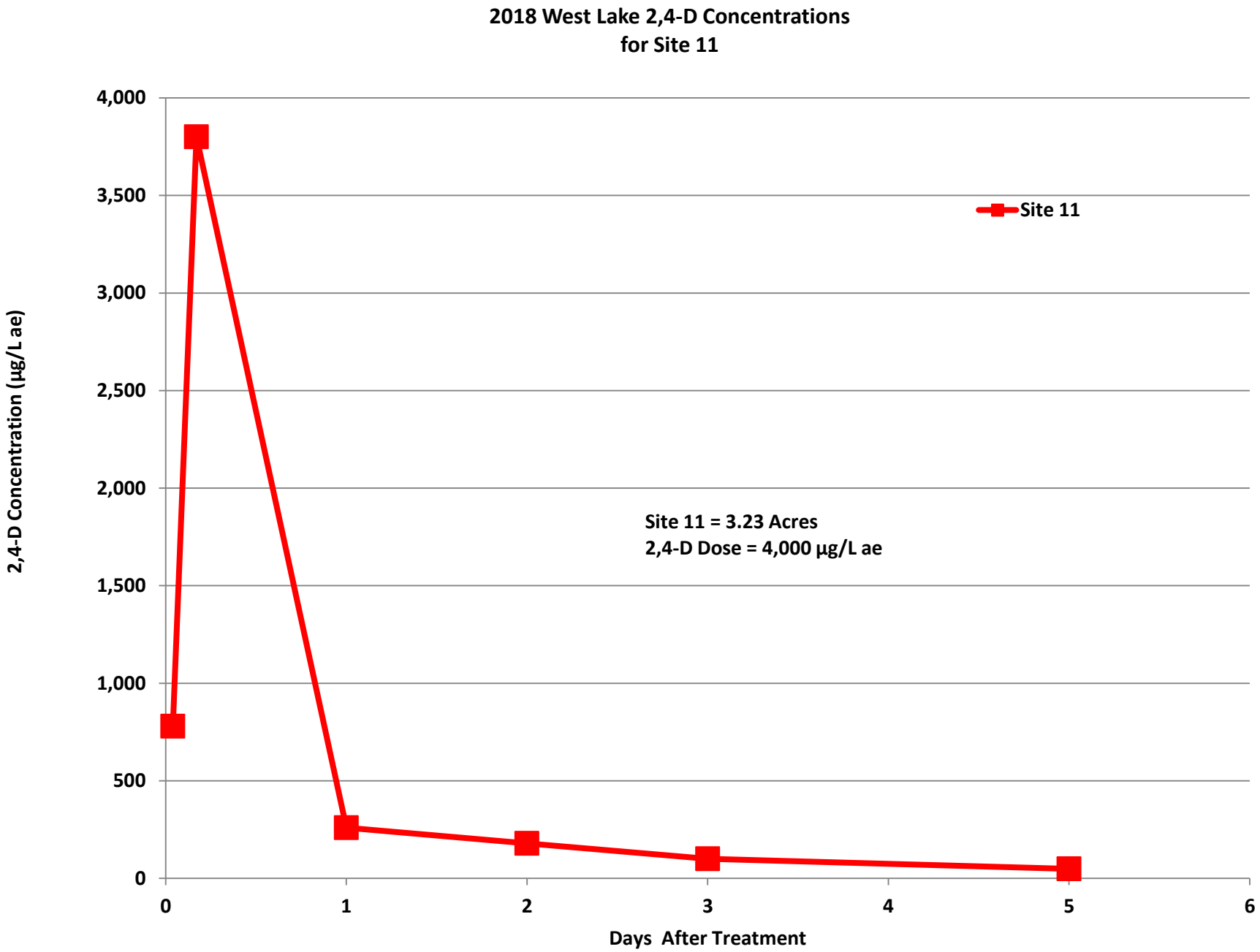
2018 2,4-D RESIDUE MONITORING LOCATIONS: WEST LAKE
Beaver Dam - West
Barron County, WI
M-94

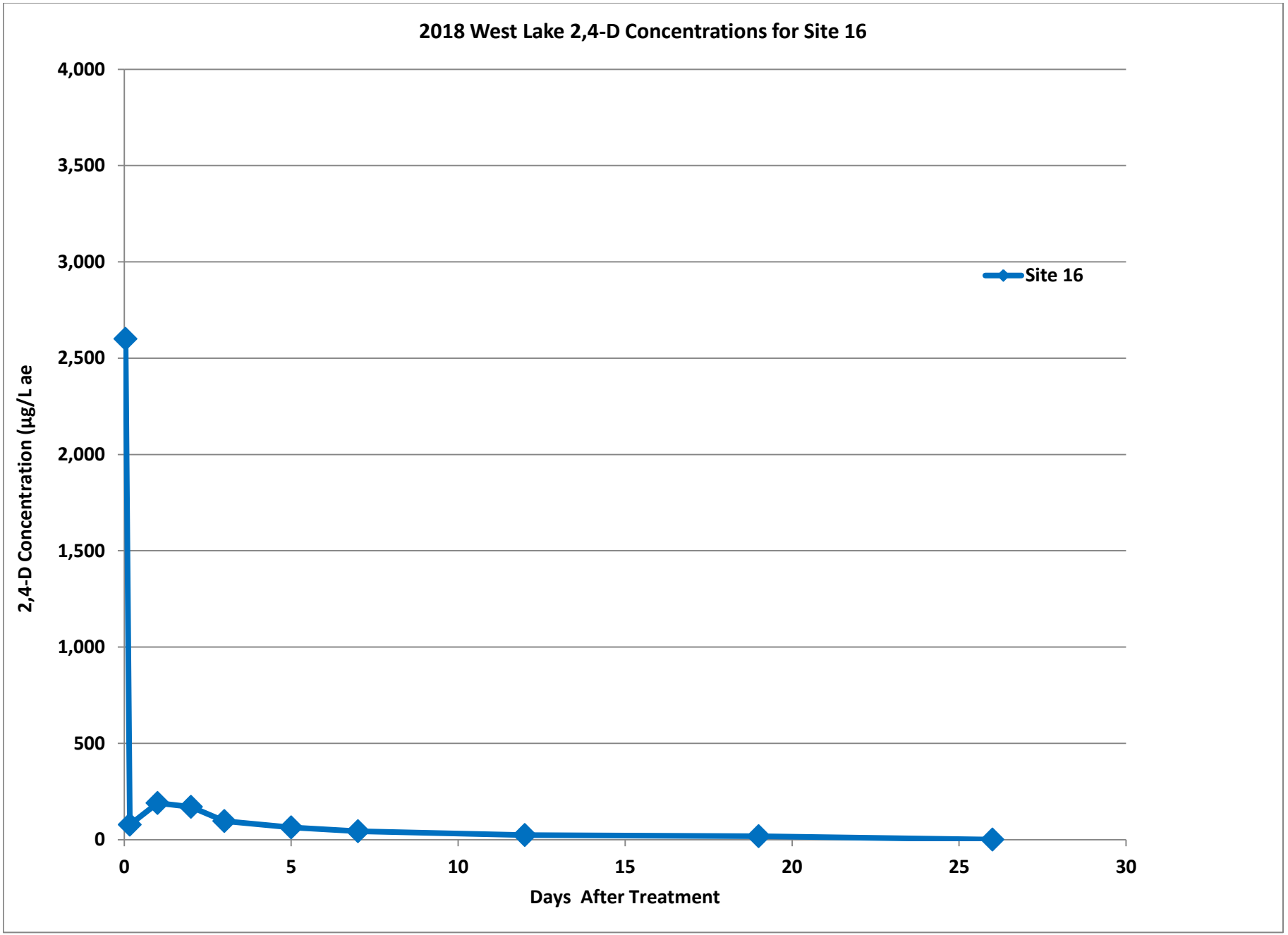
Barr Footer: ArcGIS 10.6.1 2019-03-04 13:18 File: I:\Projects\49\03\011\GIS\Maps\2019\Appendix M - 2016 2018 Data\2018 BeaverDamLakeWest.mxd User: kac2

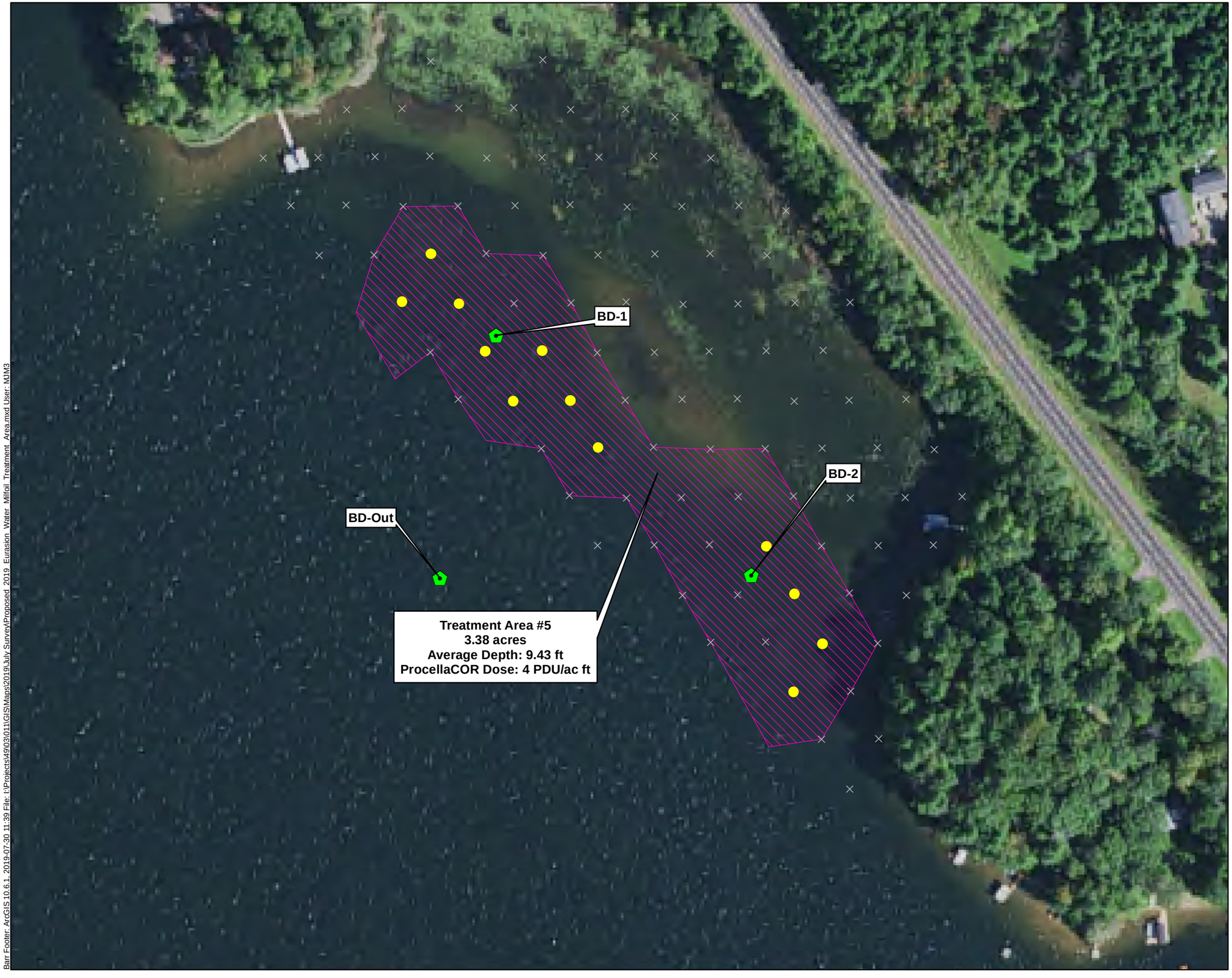

2018 City Bay 2,4-D Concentrations
for Site 27A, 27B and 27C
Target Whole Bay Concentration = 1,200 µg/L ae
Site 27A
Site 27B
Site 27C
Target Whole Bay Concentration
Whole Bay Treatment Site 3 = 102.2 Acres
2,4-D Dose = 1,200 µg/L ae
2,4-D Concentration (µg/L ae)
1,400
1,200
1,000
800
600
400
200
0
0
5
10
15
20
25
30
Days After Treatment


2017 Norwegian Bay 2,4-D Concentrations
for Sites 24A and 24B
Target Whole Bay Concentration = 1,200 µg/L ae
Site 24A
Site 24B
Target Whole Bay Concentration
Whole Bay Treatment Site 2 = 37.90 Acres
2,4-D Dose = 1,200 µg/L ae
2,4-D Concentration (µg/L ae)
Days After Treatment
1,400
1,200
1,000
800
600
400
200
0
0
5
10
15
20
25
30


2018 West Lake 2,4-D Concentrations
for Site 1
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2,4-D Concentration (µg/L ae)
Site 1
Site 1 = 7.92 Acres
2,4-D Dose = 4,000 µg/L ae
0
5
10
15
20
25
30
Days After Treatment


2018 West Lake 2,4-D Concentrations
for Site 11
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2,4-D Concentration (µg/L ae)
Site 11
Site 11 = 3.23 Acres
2,4-D Dose = 4,000 µg/L ae
0
1
2
3
4
5
6
Days After Treatment


2018 West Lake 2,4-D Concentrations for Site 16
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2,4-D Concentration (µg/L ae
Site 16
0
5
10
15
20
25
30
Days After Treatment



Herbicide Residue Monitoring Locations

Proposed 2019 EWM Treatment Area

July EWM Survey Results

EWM Observed

No EWM Present

N

0 60 120 240

Feet

BARR

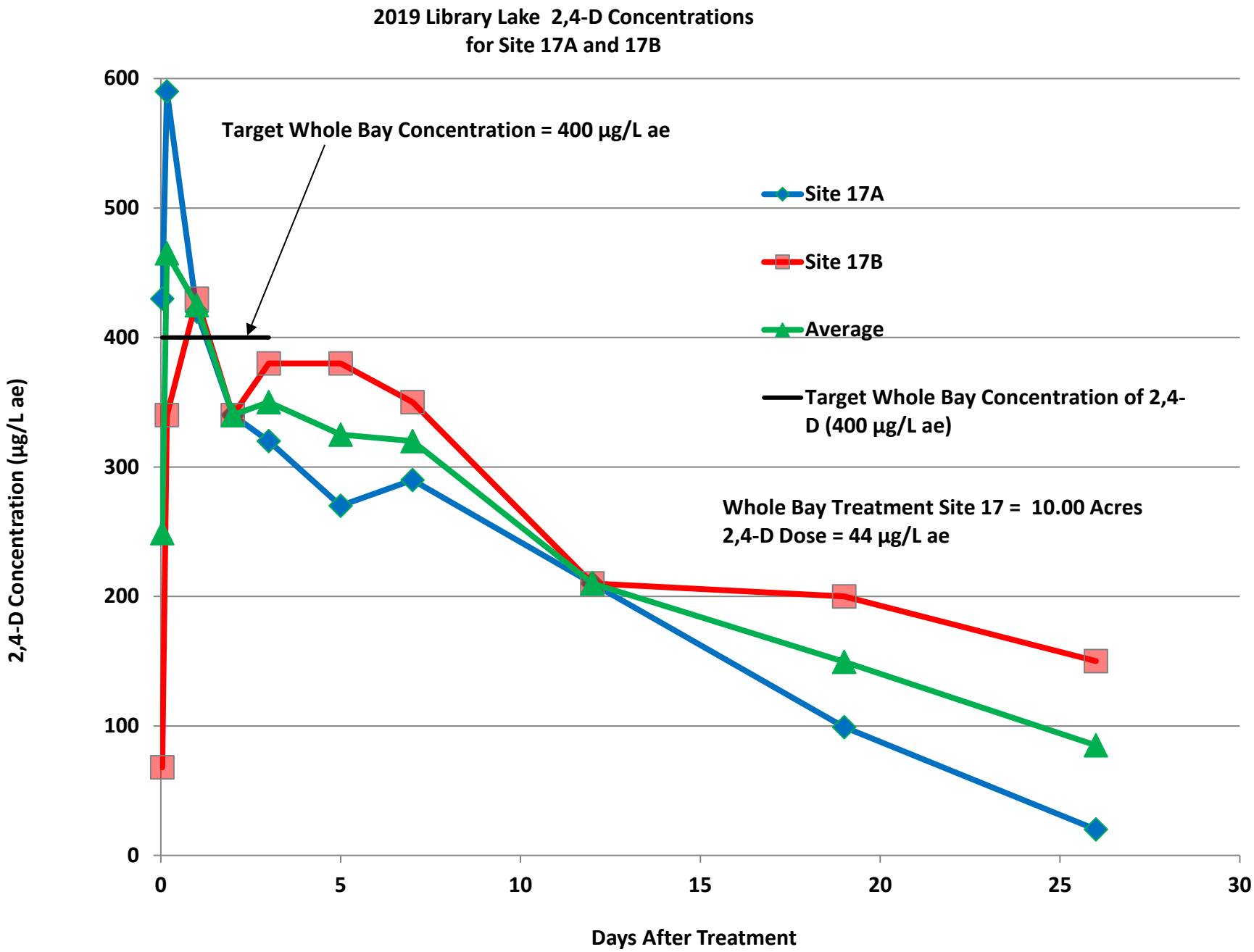
PROPOSED 2019 EURASIAN WATERMILFOIL TREATMENT AREA AND HERBICIDE RESIDUE MONITORING LOCATIONS: HUNT BAY
Beaver Dam Lake
Barron County, WI

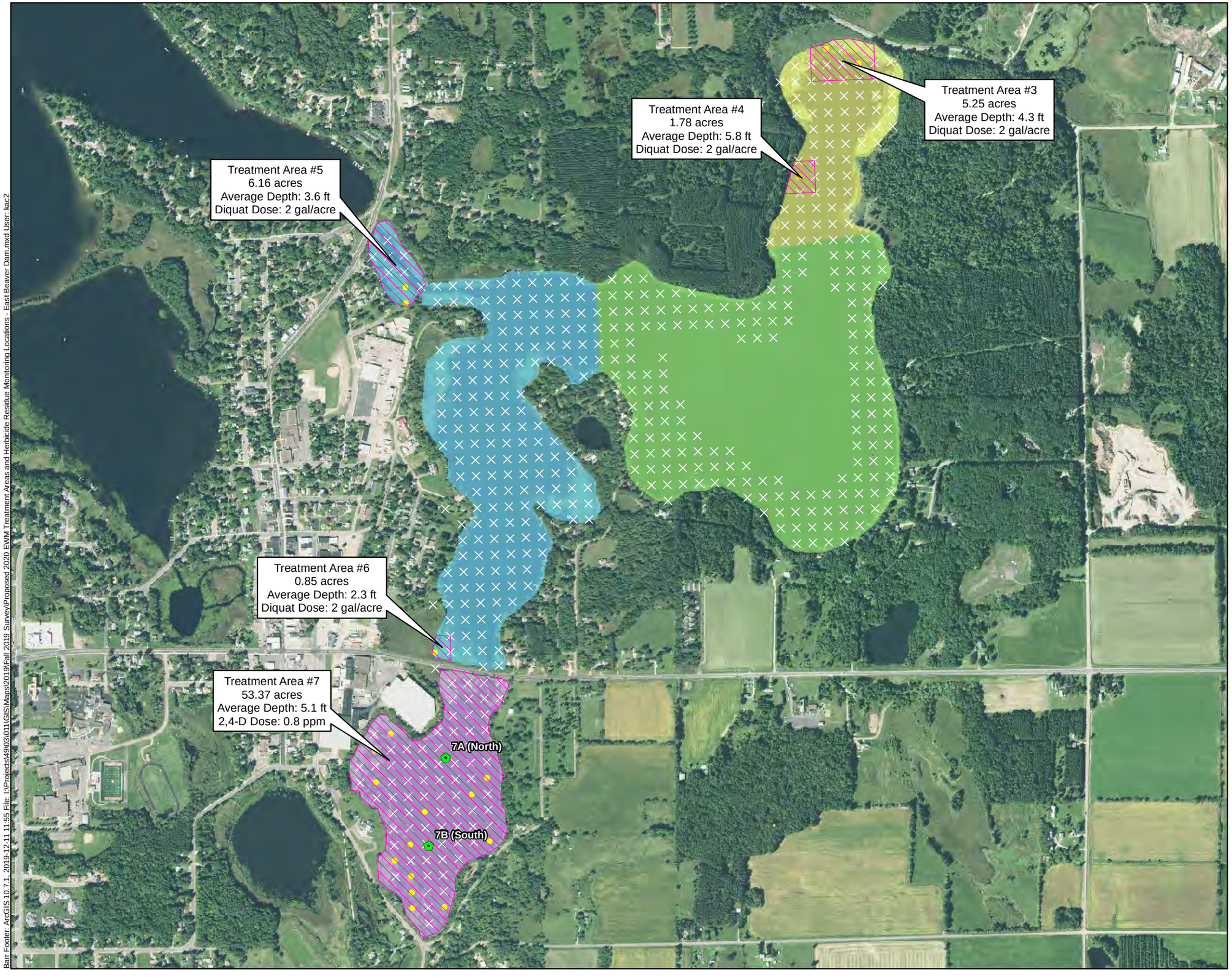
M-100

Barr Footer: ArcGIS 10.6.1, 2019-07-30 11:39 File: I:\Projects\4903\011\GIS\Maps\2019\July Survey\Proposed_2019_Eurasion_Water_Milfoil_Treatment_Area.mxd User: MJM3

2019 Hunt Bay ProcellaCOR Residue Results

BEAVER DAM: HUNT BAY	Hours After Treatment (HAT)					
	3	6	9	12	24	48
BD-1	< 1	< 1	< 1	< 1	< 1	< 1
BD-2	< 1	< 1	< 1	< 1	< 1	< 1
BD-Out	< 1	< 1	< 1	< 1	< 1	< 1
TARGET (PDU)	4 PDU	4 PDU	4 PDU	4 PDU	4 PDU	4 PDU


2019 Library Lake 2,4-D Concentrations
for Site 17A and 17B
Target Whole Bay Concentration = 400 µg/L ae
Site 17A
Site 17B
Average
Target Whole Bay Concentration of 2,4-D (400 µg/L ae)
Whole Bay Treatment Site 17 = 10.00 Acres
2,4-D Dose = 44 µg/L ae
2,4-D Concentration (µg/L ae)
Days After Treatment
600
500
400
300
200
100
0
0
5
10
15
20
25
30



Proposed 2020 EWM Treatment Areas

Herbicide Residue Monitoring Locations

EWM Observed

No EWM Present

Treatment Zones

East Lake (No Treatment)

City Bay (Spot Treatment with Diquat at 2 gal/acre)

Cemetery Bay (Whole Bay 2,4-D Concentration - 0.8 ppm)

Norwegian Bay (Spot Treatment with Diquat at 2 gal/acre)

N

0 450 900 1,800

Feet

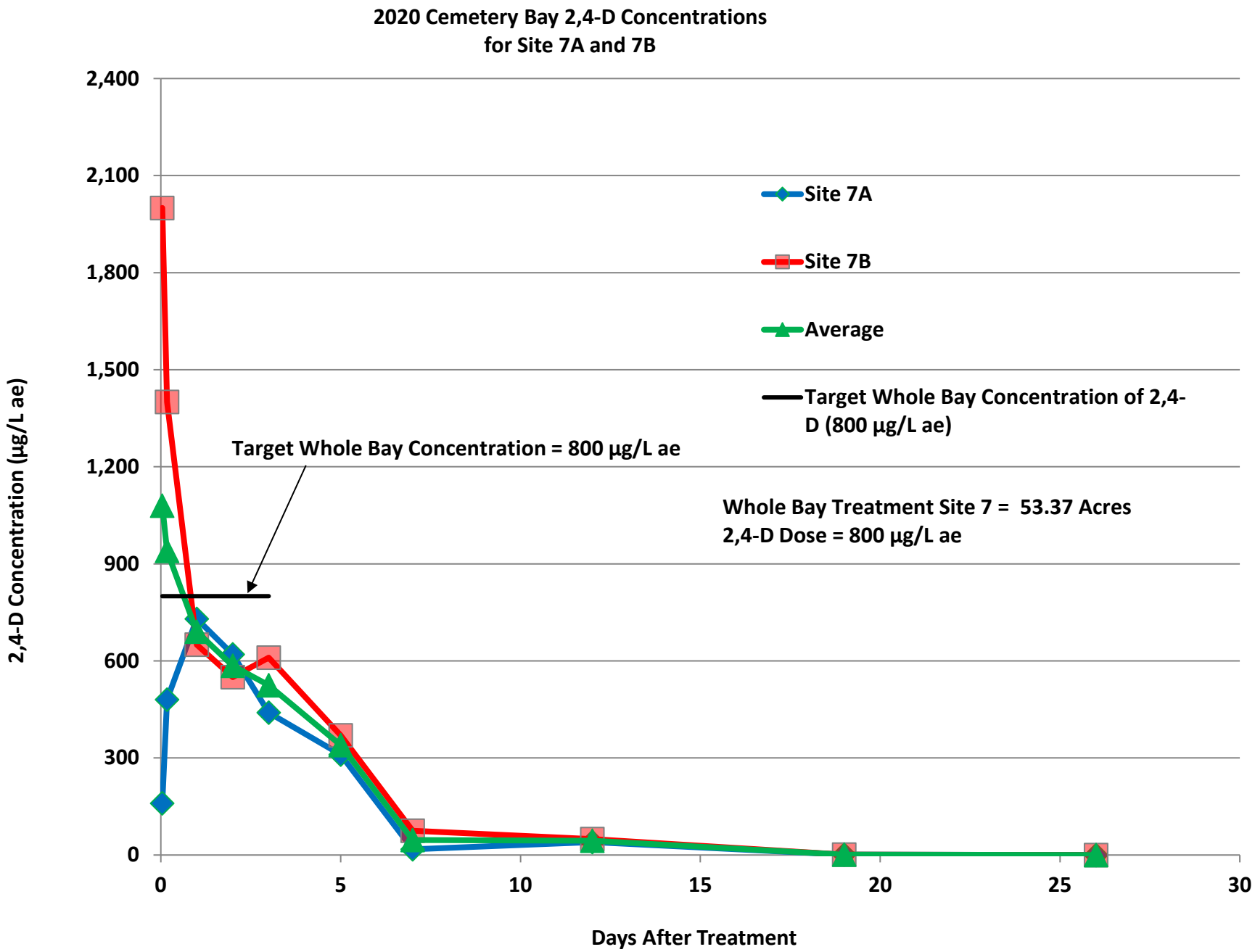
BARR

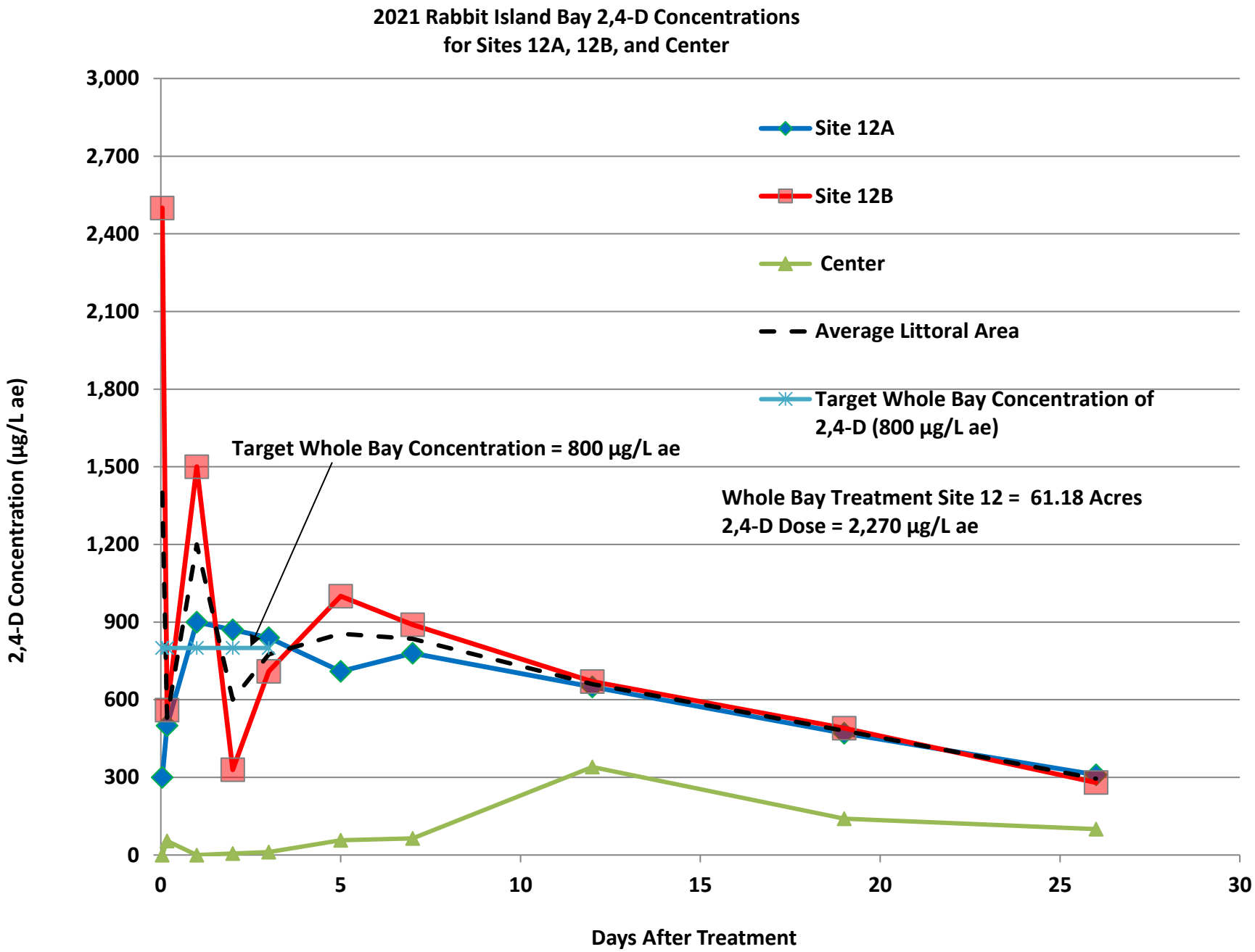
PROPOSED 2020 EURASIAN WATERMILFOIL MANAGEMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS

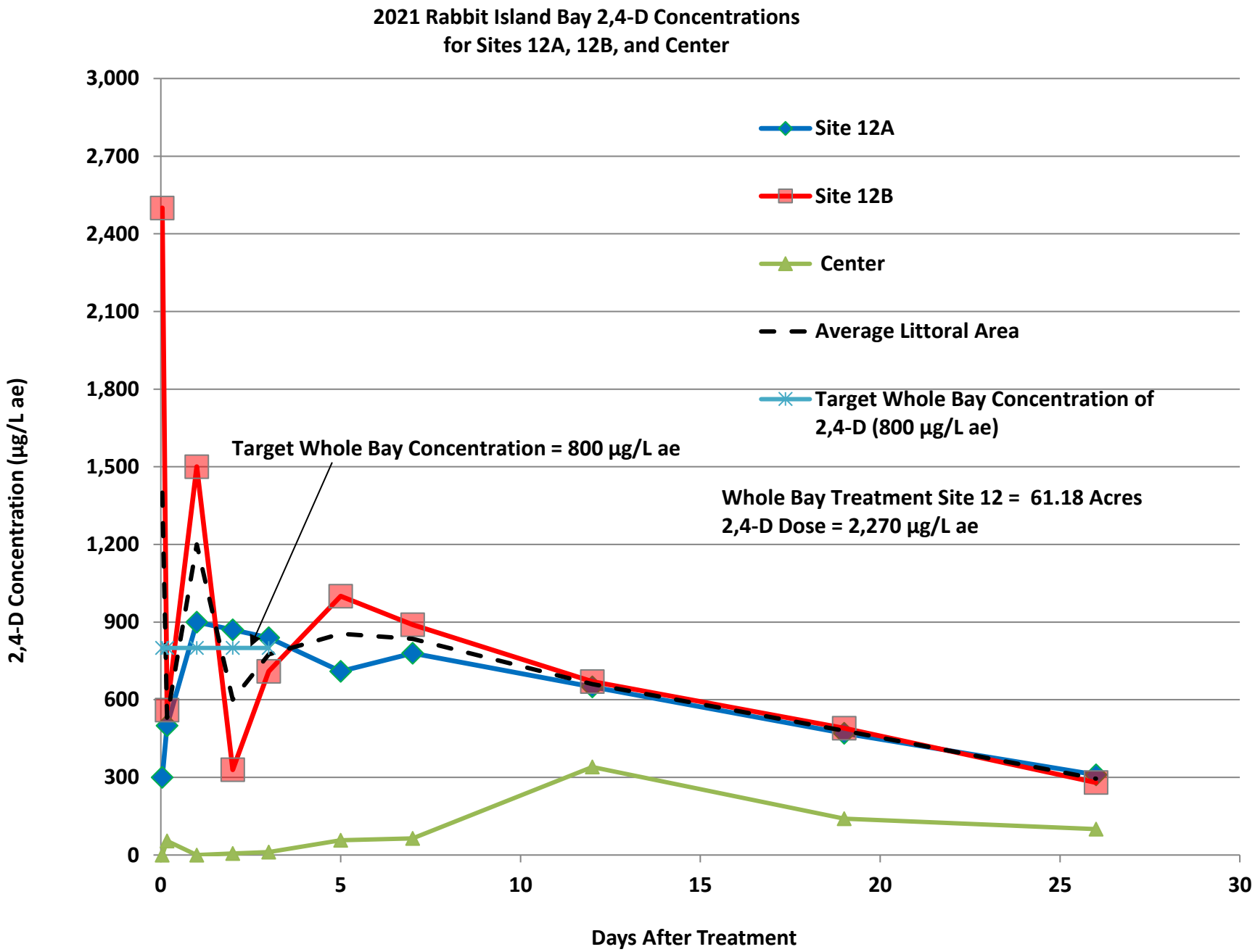
Beaver Dam and Library Lake
Barron County, WI

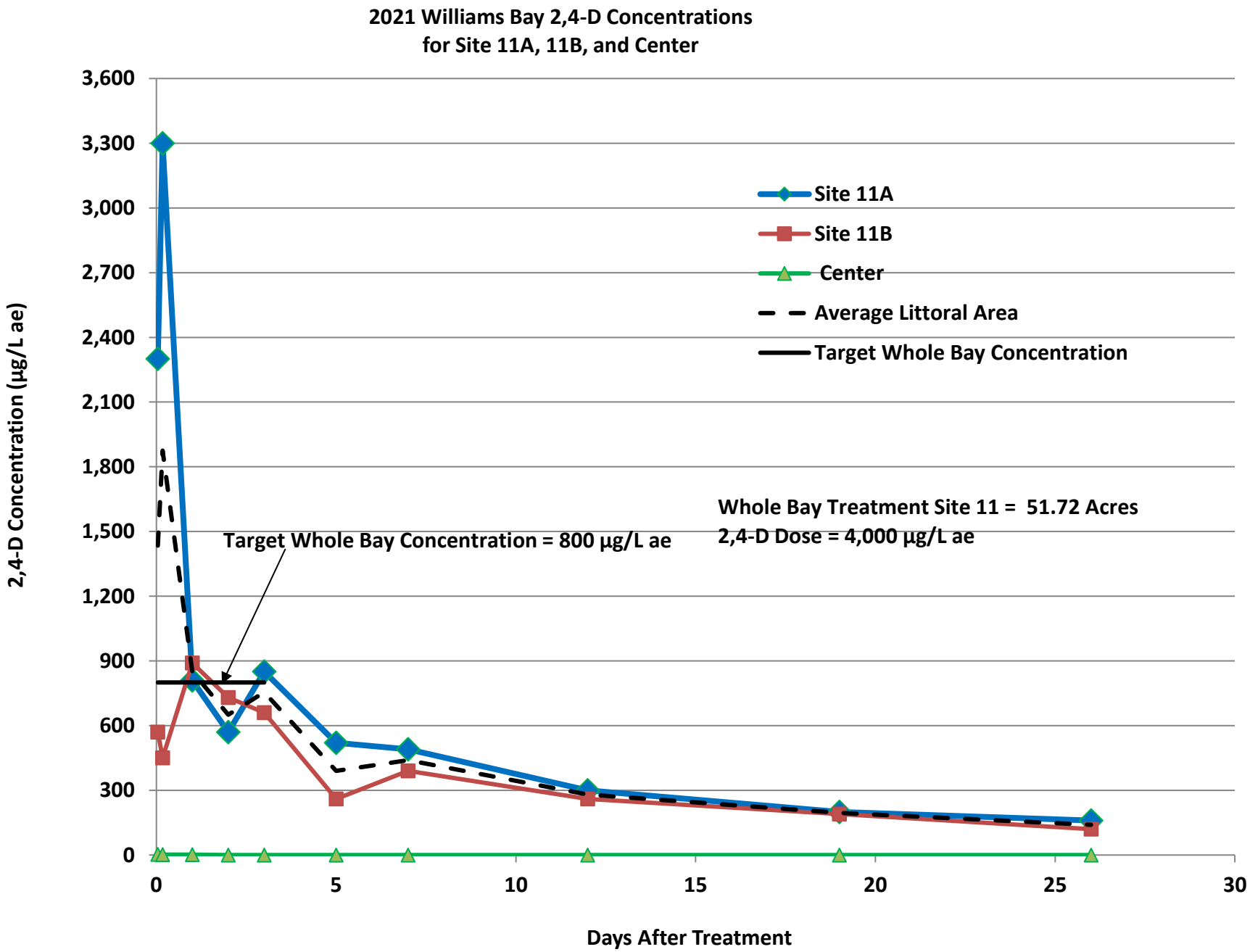
M-103

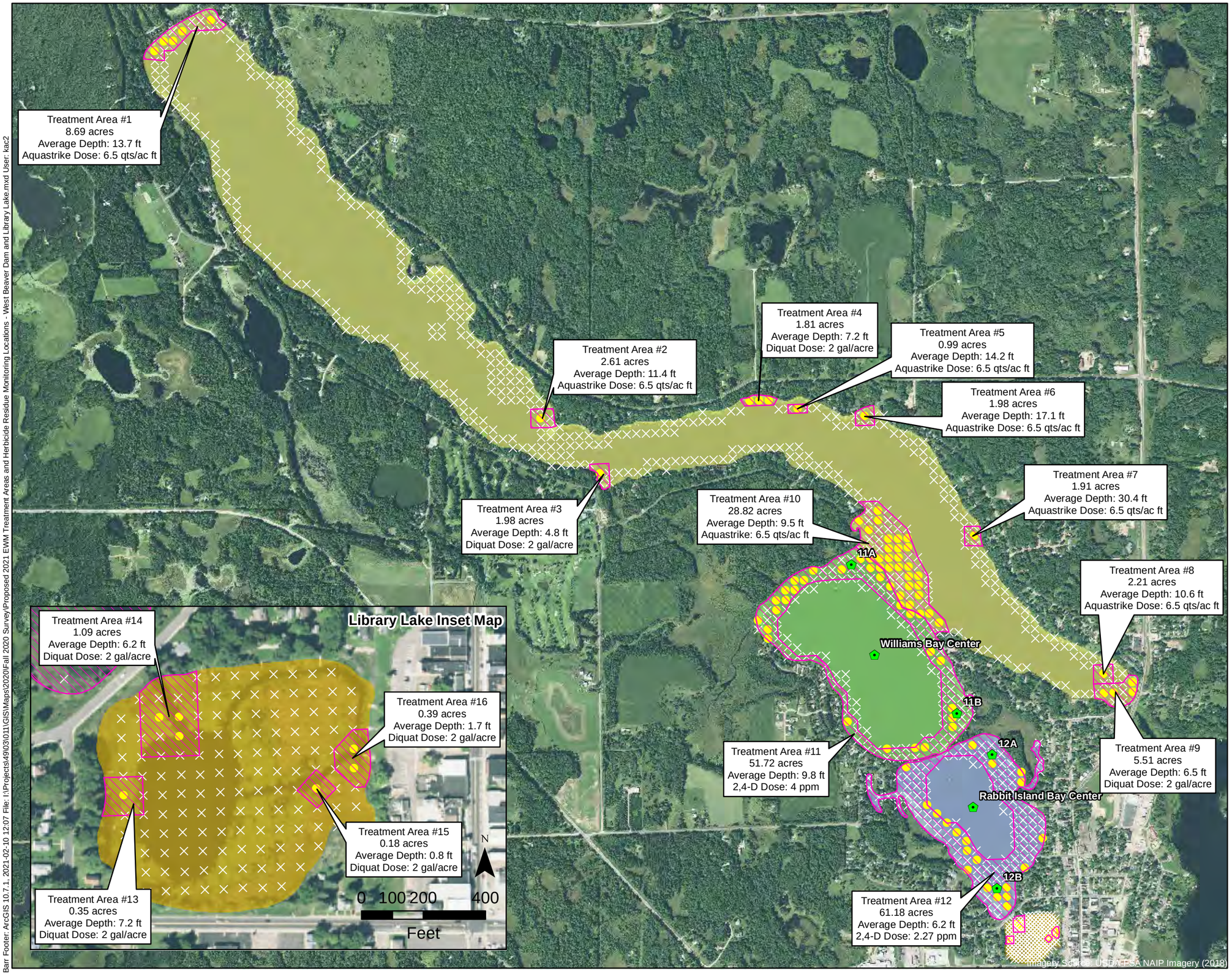
Barr Footer: ArcGIS 10.7.1 2019-12-11 11:55 File: I:\Projects\49\03\011\GIS\Maps\2019\Fall 2019 Survey\Proposed 2020 EWM Treatment Areas and Herbicide Residue Monitoring Locations - East Beaver Dam.mxd User: kac2


2020 Cemetery Bay 2,4-D Concentrations
for Site 7A and 7B
2,400
2,100
1,800
1,500
1,200
900
600
300
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 7A
Site 7B
Average
Target Whole Bay Concentration of 2,4-D (800 µg/L ae)
Target Whole Bay Concentration = 800 µg/L ae
Whole Bay Treatment Site 7 = 53.37 Acres
2,4-D Dose = 800 µg/L ae


2021 Rabbit Island Bay 2,4-D Concentrations
for Sites 12A, 12B, and Center
2,4-D Concentration (µg/L ae)
3,000
2,700
2,400
2,100
1,800
1,500
1,200
900
600
300
0
0
5
10
15
20
25
30
Days After Treatment
Site 12A
Site 12B
Center
Average Littoral Area
Target Whole Bay Concentration of
2,4-D (800 µg/L ae)
Target Whole Bay Concentration = 800 µg/L ae
Whole Bay Treatment Site 12 = 61.18 Acres
2,4-D Dose = 2,270 µg/L ae


2021 Rabbit Island Bay 2,4-D Concentrations
for Sites 12A, 12B, and Center
2,4-D Concentration (µg/L ae)
3,000
2,700
2,400
2,100
1,800
1,500
1,200
900
600
300
0
0
5
10
15
20
25
30
Days After Treatment
Site 12A
Site 12B
Center
Average Littoral Area
Target Whole Bay Concentration of 2,4-D (800 µg/L ae)
Target Whole Bay Concentration = 800 µg/L ae
Whole Bay Treatment Site 12 = 61.18 Acres
2,4-D Dose = 2,270 µg/L ae


2021 Williams Bay 2,4-D Concentrations
for Site 11A, 11B, and Center
2,4-D Concentration (µg/L ae)
3,600
3,300
3,000
2,700
2,400
2,100
1,800
1,500
1,200
900
600
300
0
0
5
10
15
20
25
30
Days After Treatment
Site 11A
Site 11B
Center
Average Littoral Area
Target Whole Bay Concentration
Target Whole Bay Concentration = 800 µg/L ae
Whole Bay Treatment Site 11 = 51.72 Acres
2,4-D Dose = 4,000 µg/L ae



Proposed 2021 EWM Treatment Areas

Herbicide Residue Monitoring Locations

EWM Observed

No EWM Present

Treatment Zones

Library Lake (Spot Treatment with Diquat at 2 gal/acre)

Rabbit Island Bay (Whole Bay 2,4-D Concentration - 0.8 ppm)

West Lake (Spot Treatment with Diquat at 2 gal/acre or Aquastrike at 6.5 qts/ac ft)

Williams Bay (Whole Bay 2,4-D Concentration - 0.8 ppm)

N

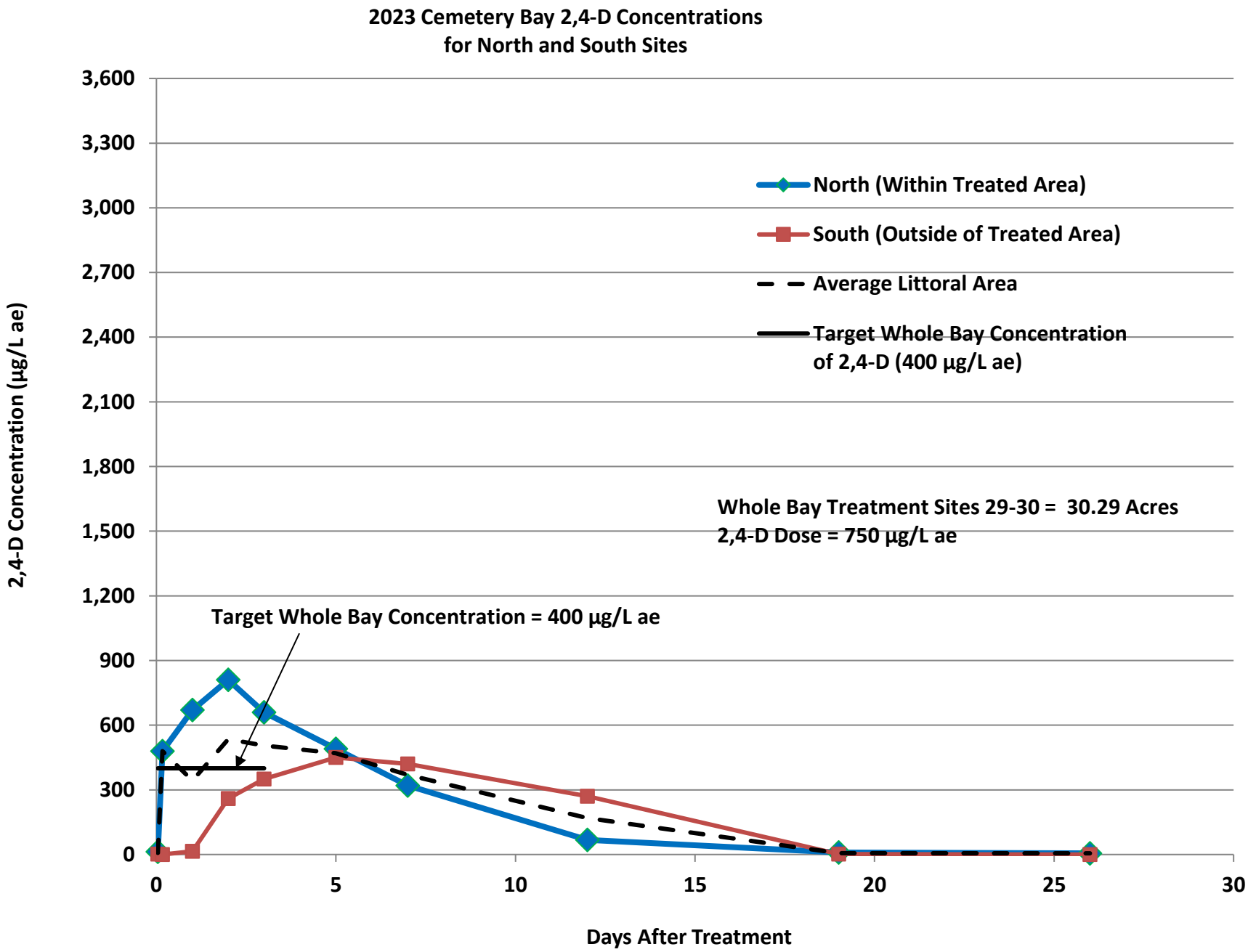
0 750 1,500 3,000

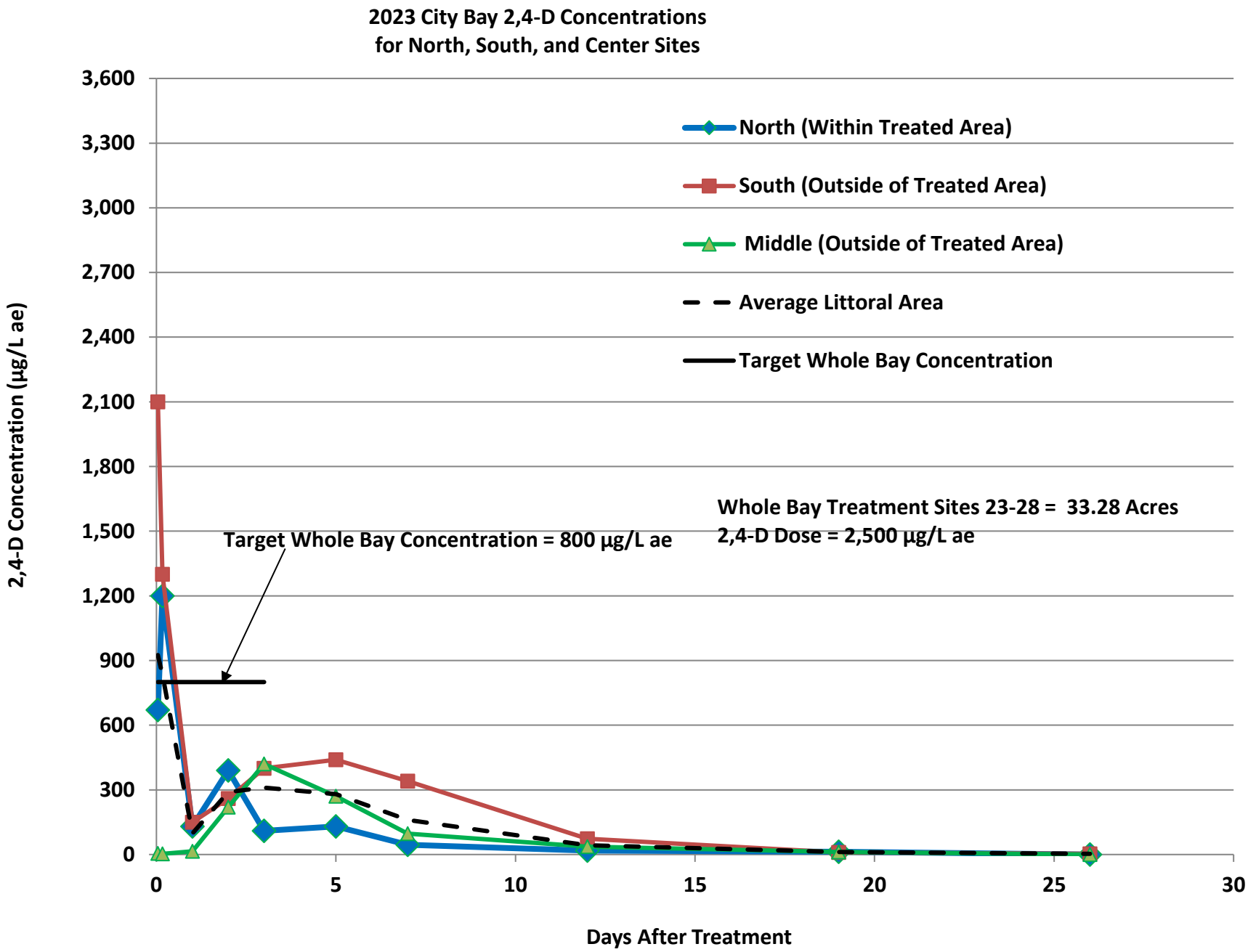
Feet

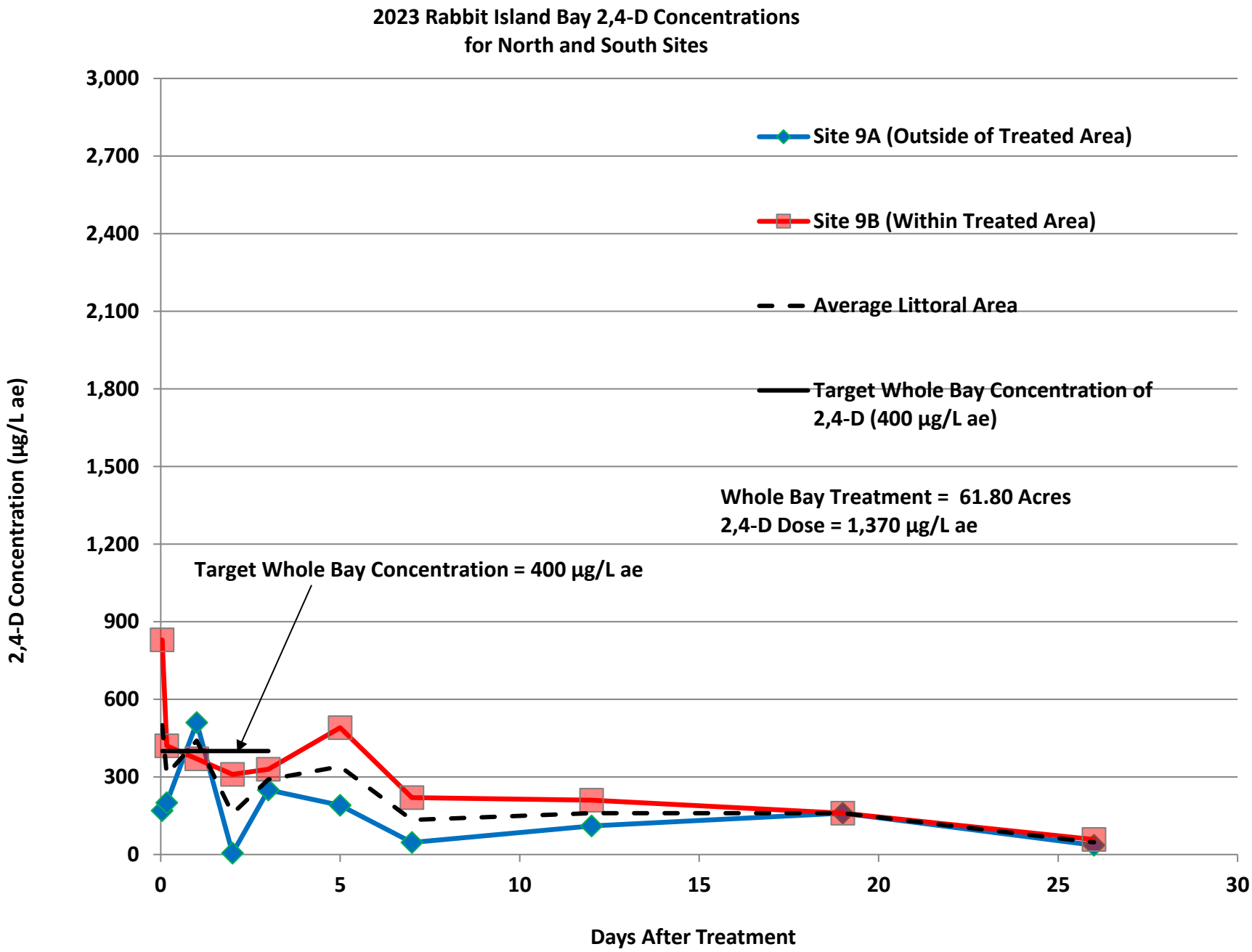
BARR

PROPOSED 2021 EWM TREATMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS
Beaver Dam and Library Lake
Barron County, WI

M-108


2023 Cemetery Bay 2,4-D Concentrations
for North and South Sites
2,4-D Concentration (µg/L ae)
3,600
3,300
3,000
2,700
2,400
2,100
1,800
1,500
1,200
900
600
300
0
0
5
10
15
20
25
30
Days After Treatment
North (Within Treated Area)
South (Outside of Treated Area)
Average Littoral Area
Target Whole Bay Concentration
of 2,4-D (400 µg/L ae)
Whole Bay Treatment Sites 29-30 = 30.29 Acres
2,4-D Dose = 750 µg/L ae
Target Whole Bay Concentration = 400 µg/L ae


2023 City Bay 2,4-D Concentrations
for North, South, and Center Sites
2,4-D Concentration (µg/L ae)
3,600
3,300
3,000
2,700
2,400
2,100
1,800
1,500
1,200
900
600
300
0
0
5
10
15
20
25
30
Days After Treatment
North (Within Treated Area)
South (Outside of Treated Area)
Middle (Outside of Treated Area)
Average Littoral Area
Target Whole Bay Concentration
Target Whole Bay Concentration = 800 µg/L ae
Whole Bay Treatment Sites 23-28 = 33.28 Acres
2,4-D Dose = 2,500 µg/L ae


2023 Rabbit Island Bay 2,4-D Concentrations
for North and South Sites
3,000
2,700
2,400
2,100
1,800
1,500
1,200
900
600
300
0
2,4-D Concentration (µg/L ae)
0
5
10
15
20
25
30
Days After Treatment
Site 9A (Outside of Treated Area)
Site 9B (Within Treated Area)
Average Littoral Area
Target Whole Bay Concentration of
2,4-D (400 µg/L ae)
Whole Bay Treatment = 61.80 Acres
2,4-D Dose = 1,370 µg/L ae
Target Whole Bay Concentration = 400 µg/L ae

Treatment Area 21
1.04 acres
Average Depth: 15.50 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 22
1.65 acres
Average Depth: 8.75 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 14
1.17 acres
Average Depth: 2.2 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 15
3.16 acres
Average Depth: 8.42 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 24
6.68 acres
Average Depth: 2.54 ft
2,4-D Dose: 2.5 ppm

Treatment Area 23
9.94 acres
Average Depth: 5.52 ft
2,4-D Dose: 2.5 ppm

City Bay North

Treatment Area 25
3.83 acres
Average Depth: 4.54 ft
2,4-D Dose: 2.5 ppm

Treatment Area 20
1.37 acres
Average Depth: 7.58 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 16
1.56 acres
Average Depth: 9.75 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 26
3.72 acres
Average Depth: 4.04 ft
2,4-D Dose: 2.5 ppm

City Bay Middle

Treatment Area 17
2.87 acres
Average Depth: 6.39 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 28
2.55 acres
Average Depth: 3.28 ft
2,4-D Dose: 2.5 ppm

City Bay South

Treatment Area 27
6.56 acres
Average Depth: 4.48 ft
2,4-D Dose: 2.5 ppm

Treatment Area 18
1.53 acres
Average Depth: 5.7 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 19
3.33 acres
Average Depth: 5.95 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Cemetery Bay North

Treatment Area 29
28.23 acres
Average Depth: 4.46 ft
2,4-D Dose: 0.75 ppm

Cemetery Bay South

Treatment Area 30
2.06 acres
Average Depth: 3.83 ft
2,4-D Dose: 0.75 ppm

Imagery Source: USDA-FSA NAIP Imagery (2020)

Proposed 2023 EWM Treatment Areas

Herbicide Residue Monitoring Locations

EWM Observed

No EWM Present

Treatment Zones

East Lake (Spot Treatment with ProcellaCOR at 4 PDU/ac ft)

City Bay (Whole bay 2,4-D concentration 0.8 ppm)

Cemetery Bay (Whole bay 2,4-D concentration 0.4 ppm)

Norwegian Bay (Spot Treatment with ProcellaCOR at 4 PDU/ac ft)

N

0 450 900 1,800

Feet

BARR

PROPOSED 2023 EURASIAN WATERMILFOIL MANAGEMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS
East Beaver Dam Lake
Barron County, WI
M-112

Barr Footer: ArcGIS 10.8.1, 2023-03-17 08:22 File: I:\Projects\49\03\011\GIS\Maps\2022\Fall 2022 Survey\Proposed 2023 Eurasian Watermilfoil Management Areas and Herbicide Residue Monitoring Locations - East Beaver Dam Lake.mxd User: kac2

Treatment Area 1
2.03 acres
Average Depth: 9.75 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 2
1.46 acres
Average Depth: 8.5 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 3
1.65 acres
Average Depth: 8.67 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 4
0.93 acres
Average Depth: 11.55 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 5
1.20 acres
Average Depth: 10.5 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 6
3.28 acres
Average Depth: 9.82 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 7
7.31 acres
Average Depth: 6.88 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 8
3.12 acres
Average Depth: 5.17 ft
ProcellaCOR Dose: 4 PDU/ac-ft

Treatment Area 9
61.18 acres
Average Depth: 5.8 ft
2,4-D Dose: 1.37 ppm

9A

9B

Library Lake Inset Map

Treatment Area 10
0.69 acres
Average Depth: 2.77 ft
ProcellaCOR Dose: 6 PDU/ac-ft

Treatment Area 11
0.35 acres
Average Depth: 2.39 ft
ProcellaCOR Dose: 6 PDU/ac-ft

Treatment Area 12
0.53 acres
Average Depth: 6.04 ft
ProcellaCOR Dose: 6 PDU/ac-ft

Treatment Area 13
0.32 acres
Average Depth: 0.53 ft
ProcellaCOR Dose: 6 PDU/ac-ft

N 0 200 400
Feet

Imagery Source: USDA FSA NAIP Imagery (2020)

Proposed 2023 EWM Treatment Areas

Herbicide Residue Monitoring Locations

EWM Observed

No EWM Present

Treatment Zones

Library Lake (Spot Treatment with ProcellaCOR at 6 PDU/ac-ft)

Rabbit Island Bay (Whole bay 2,4-D concentration 0.4 ppm)

West Lake (Spot Treatment with ProcellaCOR at 4 PDU/ac-ft)

Williams Bay (Spot Treatment with ProcellaCOR at 4 PDU/ac-ft)

N

0 750 1,500 3,000
Feet

BARR

PROPOSED 2023 EURASIAN WATERMILFOIL MANAGEMENT AREAS AND HERBICIDE RESIDUE MONITORING LOCATIONS
West Beaver Dam Lake
and Library Lake
Barron County, WI
M-113

Barr Footer: ArcGIS 10.8.1, 2023-02-06 10:26 File: I:\Projects\49\03011\GIS\Maps\2022\Fall 2022 Survey\Proposed 2023 Eurasian Watermilfoil Management Areas and Herbicide Residue Monitoring Locations - West Beaver Dam and Library Lake.mxd User: kac2