DELAWARE REEF GUIDE 2005

IF YOU BUILD IT

THEY WILL COME

Concrete is one of the world's best reef building materials, with a calcium carbonate composition, similar to coral reefs. The Delaware Reef Program has deployed 70,000 tons of concrete since 1995.

Delaware's Artificial Reef Program is funded under the Federal Aid in Fisheries Restoration Act by the Delaware Division of Fish and Wildlife

ABOUT THE COVER

Other reef materials like sunken vessels, Army tanks and subway cars may get more "press", but concrete products constitute the backbone of the Delaware Reef Program. Like all reef building materials, concrete is stable on the bottom, non-toxic to fish and invertebrates and very durable. Because it is continuously submerged, reef concrete is not subjected to wetting and drying or freezing and thawing that degrades structural concrete. Concrete in reef applications may last for 1,000 years. Our large, high profile patch reefs have proven to be very stable and have not subsided into the sediment despite storms and the scouring of tidal currents. Concrete may be the ideal reef building material.

Captain Jerry Blakeslee
1940-2004

The 2005 Reef Guide is dedicated to the memory of Captain Jerry Blakeslee, long-time President of the Lewes Charterboat Captains Association and a supporter of the Delaware Reef Program, from its inception. Jerry was an excellent fisherman and captain and was active in fisheries management issues. In the early 1990's, as the large weakfish declined, Jerry became concerned about considerable fishing effort being shifted to tautog. He was a leader in a citizen effort to persuade the Delaware legislature to pass legislation instituting size limits, creel limits and seasons to conserve the tautog resource, years before regional management began. Jerry was of great help to the Division of Fish and Wildlife, serving on Atlantic States Marine Fisheries Commission Advisory Panels and on the Delaware Reef Advisory Committee. Fisheries managers came to expect to see him at public hearings, when fisheries management options were being discussed. His opinions and comments were well-reasoned and respected. He was an influential voice for southern Delaware recreation fishing interests and he will be missed on a professional and personal level.

THE DELAWARE REEF PROGRAM

Delaware has eleven permitted artificial reef sites in Delaware Bay and along the Atlantic Coast. Development of these sites began in 1995 and will continue in the future. The Delaware Reef Program is one part of a comprehensive fisheries management effort and is designed to enhance fisheries habitat, benefit structure-oriented fish and provide fishing opportunities for anglers.

Reef construction is especially important in the Mid-Atlantic Region, where near shore bottom is usually featureless sand or mud. We have neither the natural rocky outcrops common in New England nor the coral reefs of our Southeastern Atlantic Coast. Durable, stable, non-toxic reef materials can develop an invertebrate community which is hundreds of times richer than adjacent bottom, providing food and physical protection for reef fish such as tautog, seabass, scup, spadefish and triggerfish. In addition, gamefish such as flounder, bluefish, striped bass weakfish, and sharks are attracted to baitfish, which congregate around reef structure.

Recycled materials have supported reef development efforts to date. Donated concrete culvert pipe and other concrete products are the primary material used at the eight Delaware Bay sites. Ballasted tire units have been deployed at the three ocean sites. To date, over 70,000 tons of concrete products, 8,000 tons of ballasted tire units and 86 decommissioned military vehicles have been deployed on our sites. Vessels on Delaware reef sites include "P3" and "Dolphin" (Site #7), "Golden Eagle" (Site #8) "Delilah" (Site #11) and Margie Ann (Site #11). The Navy barge, "YC 1479" (Site #11). The Navy barge YON 80, (Site #10), and the commercial Bucchannon barge (Site #6). A total of 619 "Red bird" subway cars have been deployed on site #11.

The reef program uses DGPS (Differential Global Positioning System) to accurately place materials on site. The site charts in the reef guide show where reef materials have been deployed from 1995 - 2003. Locations (latitude - longitude) noted for each site indicate the position of deployments of reef material from an anchored barge. In the case of large, concentrated reef deployments, a latitude or longitude range, may be given such as: N 39° 15.377'- 402'. This indicates material occurs between 39 degrees, 15.377 to 15.402 minutes north latitude. Due to variability between DGPS receivers, slight variations in readings may occur. It is suggested you use your GPS and a good fathometer to locate reef structure, then note the coordinates on your own GPS.

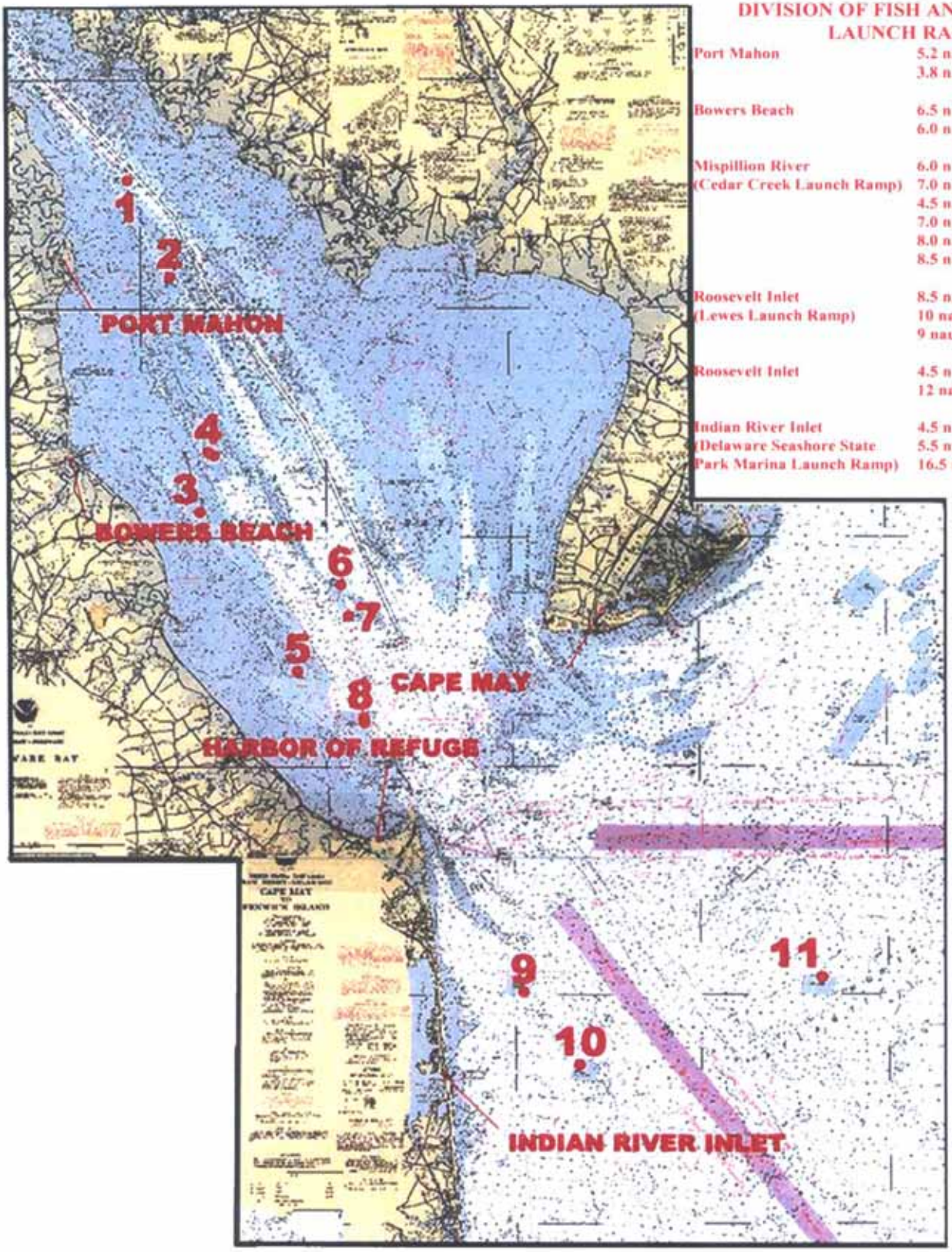
ENJOY FISHING DELAWARE'S REEFS

Key to Reading the Reef Charts.

= Reef material plotted from periodic sidescan sonar surveys

= Position of reef material on deployments made since the last sidescan survey of the site.

GENERAL LOCATION OF DELAWARE'S ELEVEN PERMITTED ARTIFICIAL REEF SITES



DIVISION OF FISH AND WILDLIFE LAUNCH RAMPS

Port Mahon	5.2 nautical miles to site #1
	3.8 nautical miles to site #2
Bowers Beach	6.5 nautical miles to site #3
	6.0 nautical miles to site #4
Mispillion River	6.0 nautical miles to site #3
(Cedar Creek Launch Ramp)	7.0 nautical miles to site #4
	4.5 nautical miles to site #5
	7.0 nautical miles to site #6
	8.0 nautical miles to site #7
	8.5 nautical miles to site #8
Roosevelt Inlet	8.5 nautical miles to site #5
(Lewes Launch Ramp)	10 nautical miles to site #6
	9 nautical miles to site #7
Roosevelt Inlet	4.5 nautical miles to site #8
	12 nautical miles to site #9
Indian River Inlet	4.5 nautical mile to site #9
(Delaware Seashore State	5.5 nautical mile to site #10
Park Marina Launch Ramp)	16.5 nautical miles to site #11

Site #1

Total area of site	-	0.41 square nautical miles
Depth range	-	17-30' (mean low water)
Distance from port	-	5.2 nautical miles from Port Mahon
Invertebrate Colonization	-	oyster, barnacle, hydroid community
Fish	-	sea bass plus pelagic species (weakfish, striped bass)

Deployments

1. 500 tons of concrete culvert deployed from an anchored barge 3/28/96. Depth about 30'.
   N 39° 15.559'
   W 075° 20.689'

2. 500 tons of concrete culvert deployed from an anchored barge 9/15/98. Depth about 29'.
   N 39° 15.377' - .402'
   W 075° 20.750' - .777'

3. 1,690 tons of concrete culvert deployed from an anchored barge 1/09/03.
   N 39° 15.685'
   W 075° 21.032'
4. 782 tons of concrete culvert deployed from an anchored barge 7/3/04.
   N 39° 15.685'
   W 075° 21.032'

5. 1,582 tons of concrete culvert deployed from and anchored barge 7/10/04.
   N 39° 15.788'
   W 075° 21.177'

Notes

Delaware Artificial Reef
Site 1 Material Distribution

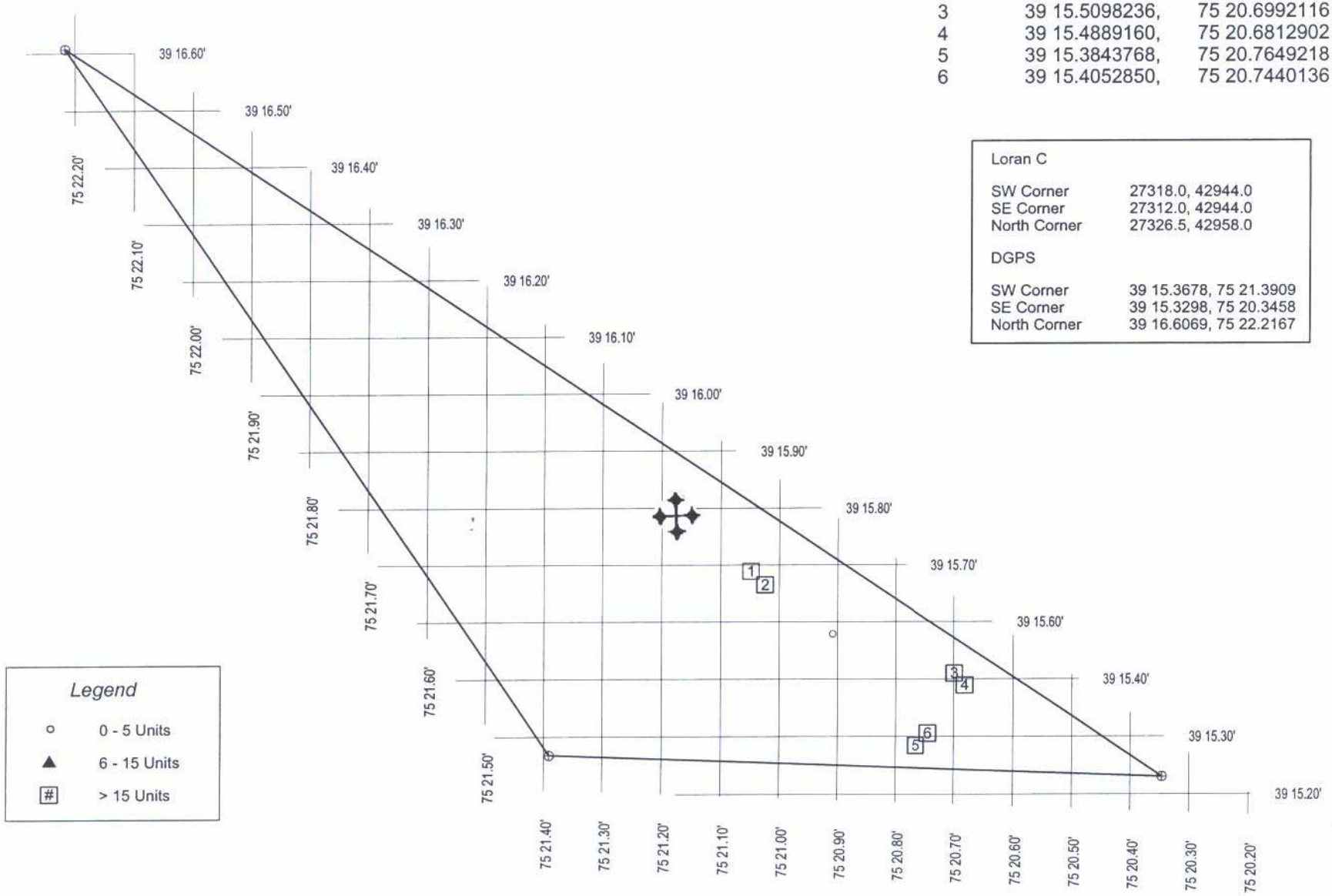
ID	Latitude,	Longitude
1	39 15.6890328,	75 21.0486696
2	39 15.6651384,	75 21.0247752
3	39 15.5098236,	75 20.6992116
4	39 15.4889160,	75 20.6812902
5	39 15.3843768,	75 20.7649218
6	39 15.4052850,	75 20.7440136

Loran C

SW Corner	27318.0, 42944.0
SE Corner	27312.0, 42944.0
North Corner	27326.5, 42958.0

DGPS

SW Corner	39 15.3678, 75 21.3909
SE Corner	39 15.3298, 75 20.3458
North Corner	39 16.6069, 75 22.2167



Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2004

Site #2

Total are of site	-	0.71 square nautical miles
Depth range	-	16-28' (mean low water)
Distance from port	-	3.8 nautical miles from Port Mahon
Invertebrate Colonization	-	oyster, barnacle, hydroid community
Fish	-	sea bass plus pelagic species (weakfish, striped bass)

Deployments

1. 500 tons of concrete culvert deployed 3/28/96. Depth about 22'.
   N 39° 11.335'
   W 075° 18.379'

2. 500 tons of concrete culvert deployed 9/15/98. Depth 26'.
   N 39° 11.038'
   W 075° 18.033'

3. 886 tons of concrete culvert deployed 6/20/00. Depth 28.5'.
   N 39° 10.565 - 70'
   W 075° 17.774 - 86'

4. 1,100 tons of concrete culvert deployed 5/11/02. Depth 28'.
   N 39° 11.265'
   W 075° 18.097'

5. 1,000 tons of concrete culvert deployed 12/23/02. Depth 28'.
   N 39° 11.181'
   W 075° 18.146'

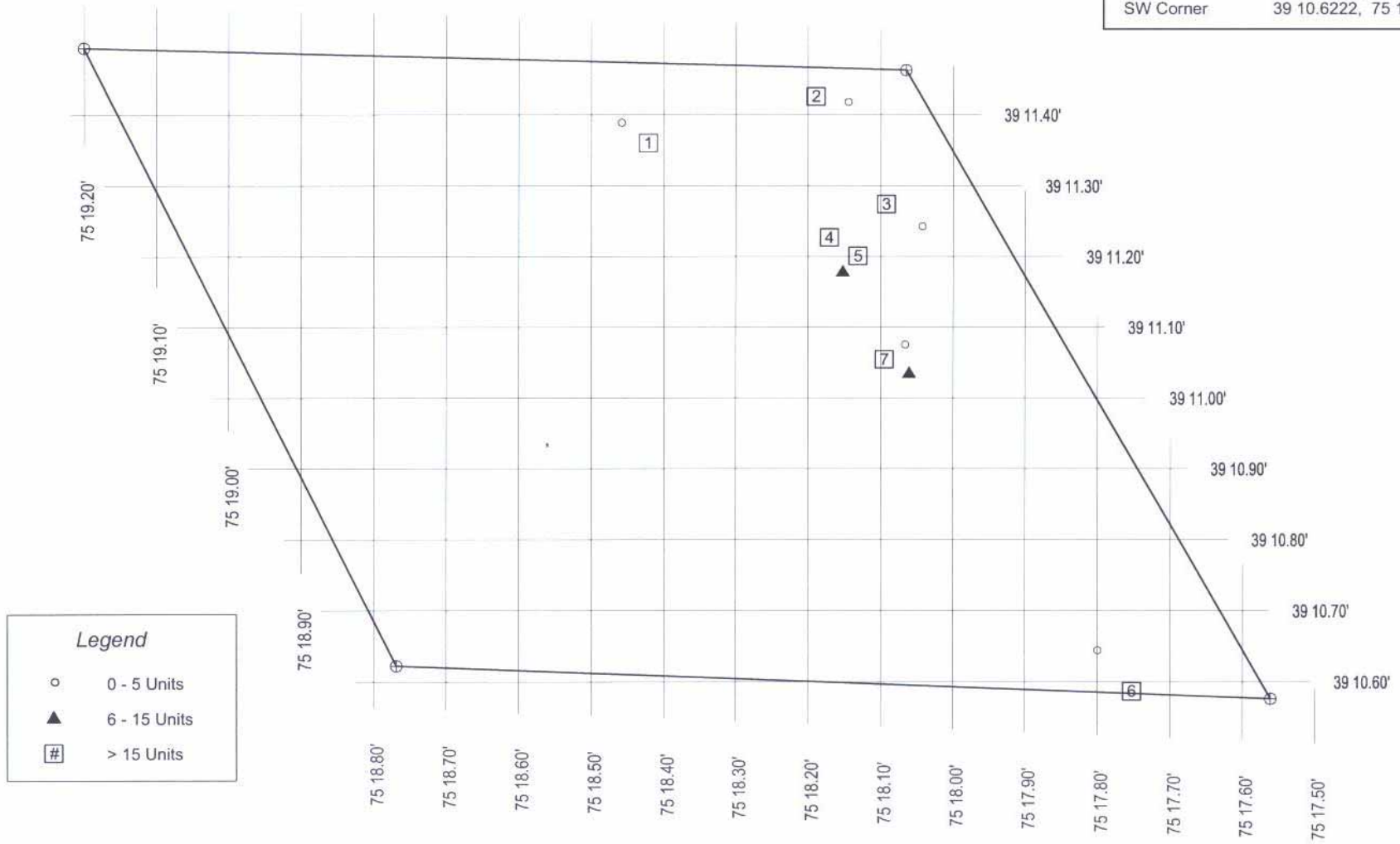
6. 1,610 tons of concrete culvert deployed 11/07/03.
   N 39° 11.426'
   W 075° 18.177'

Notes

Delaware Artificial Reef Site 2 Material Distribution

ID	Latitude,	Longitude
1	39 11.3601486,	75 18.4218708
2	39 11.4254856,	75 18.1892724
3	39 11.2739046,	75 18.0925740
4	39 11.2268616,	75 18.1709778
5	39 11.2007274,	75 18.1317762
6	39 10.5865620,	75 17.7528228
7	39 11.0543730,	75 18.0951876

Loran C	
NW Corner	27294.0, 42900.0
NE Corner	27287.5, 42900.0
SE Corner	27282.0, 42890.0
SW Corner	27289.0, 42890.0
DGPS	
NW Corner	39 11.4938, 75 19.2003
NE Corner	39 11.4623, 75 18.0655
SE Corner	39 10.5760, 75 17.5611
SW Corner	39 10.6222, 75 18.7686



Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2004

Site #3

Total area of site	-	0.68 square nautical miles
Depth range	-	18-28' (mean low water)
Distance from port	-	6.5 nautical miles from Bowers Beach 6.0 nautical miles from Mispillion River
Invertebrate Colonization	-	blue mussel, sulfur sponge community
Fish	-	sea bass, weakfish, striped bass, bluefish

Deployments

1. 500 tons of concrete culvert deployed 1/15/96.

2. 1,000 tons of concrete culvert deployed from an anchored barge 5/14/97. Water depth about 32'.
   N 39° 01.054' - .087'
   W 075° 16.882' - .895'

3. 807 tons of concrete culvert deployed 6/1/00. Depth 30'.
   N 39° 00.881' - .84'
   W 075° 16.749' - .772'

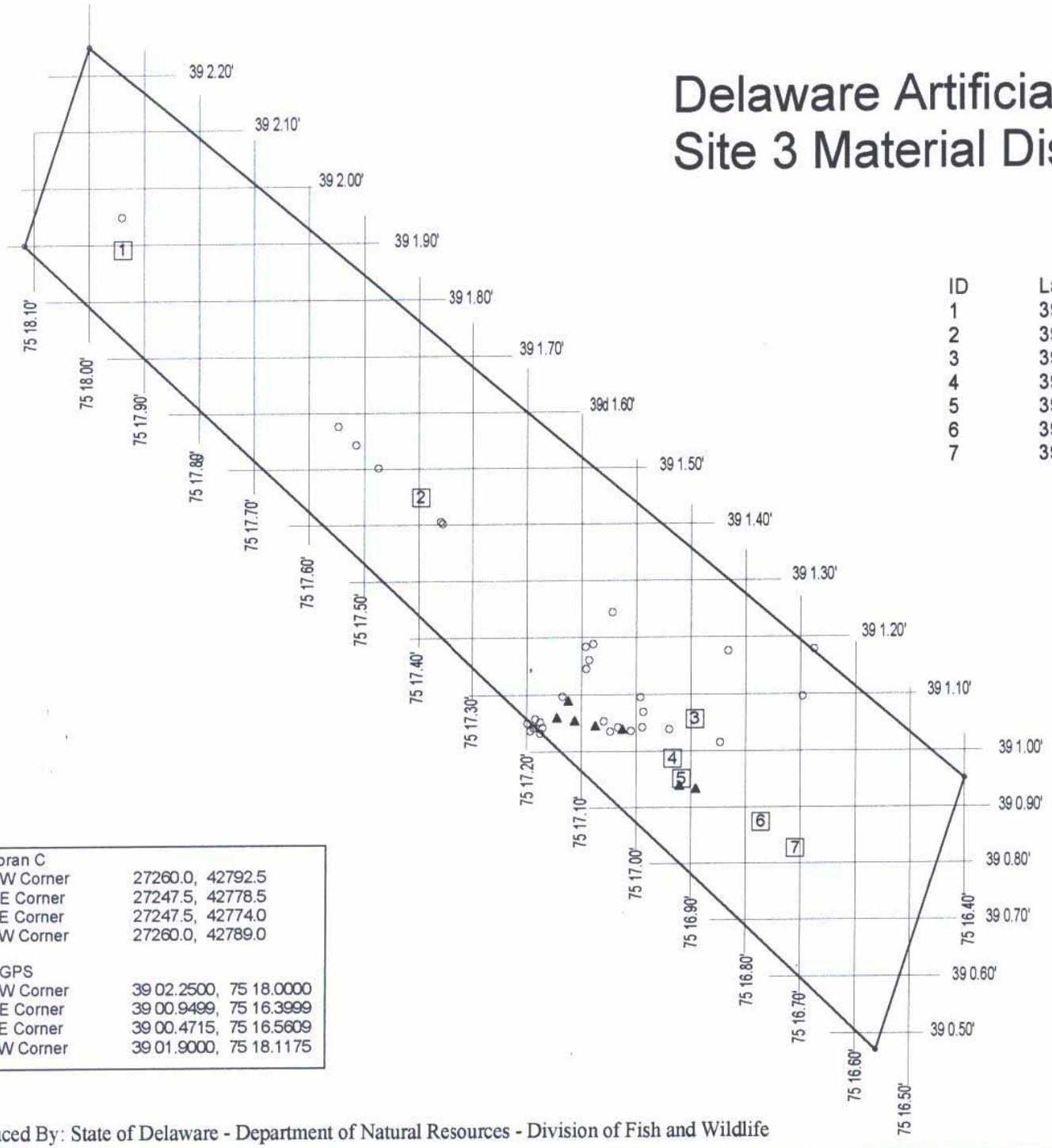
4. 961 tons of concrete culvert deployed 7/7/00. Depth 34'.
   N 39° 00.928' - .81'
   W 075° 16.914' - .29'

5. 1,300 tons of concrete deployed 7/15 / 01.
   N 39° 01.888'
   W 075° 17.936'
6. 1,000 tons of concrete deployed 6/10/02. Depth 28'.
   N 39° 01.449'
   W 075° 17.395'

7. 1,092 tons of concrete deployed 4/14/03. Depth 26.
   N 39° 01.730'
   W 075° 17.640'

Notes

Delaware Artificial Reef
Site 3 Material Distribution



ID	Latitude	Longitude
1	39 01.890,	75 17.938
2	39 01.449,	75 17.395
3	39 01.056,	75 16.892
4	39 00.987,	75 16.933
5	39 00.951,	75 16.917
6	39 00.873,	75 16.772
7	39 00.826,	75 16.709

Loran C	
NW Corner	27260.0, 42792.5
NE Corner	27247.5, 42778.5
SE Corner	27247.5, 42774.0
SW Corner	27260.0, 42789.0

DGPS	
NW Corner	39 02.2500, 75 18.0000
NE Corner	39 00.9499, 75 16.3999
SE Corner	39 00.4715, 75 16.5609
SW Corner	39 01.9000, 75 18.1175

Legend

- ○ 0 - 5 Units
- ▲ 6 - 15 Units
- □ > 15 Units

Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2002

Site #4

Total area of site	-	0.63 square nautical miles
Depth range	-	30-38' (mean low water)
Distance from port	-	6 nautical miles from Bowers Beach 7 nautical miles from Mispillion River
Invertebrate Colonization	-	blue mussel community
Fish	-	sea bass, weakfish, striped bass, tautog

Deployments

1. 500 tons of concrete culvert deployed from a moving barge.

2. 900 tons of concrete culvert deployed from an anchored barge on 2/12/97. Depth about 38'.
   N 39° 03.712'
   W 075° 16.051'

3. 1,000 tons of concrete deployed on 10/2/97. Approximate depth 35'.
   N 39° 03.560'
   W 075° 16.070'

4. 1,100 tons of concrete deployed on 3/21/99. Depth 37'.
   N 39° 03.358 – 386'
   W 075° 5.990 – 16.031'

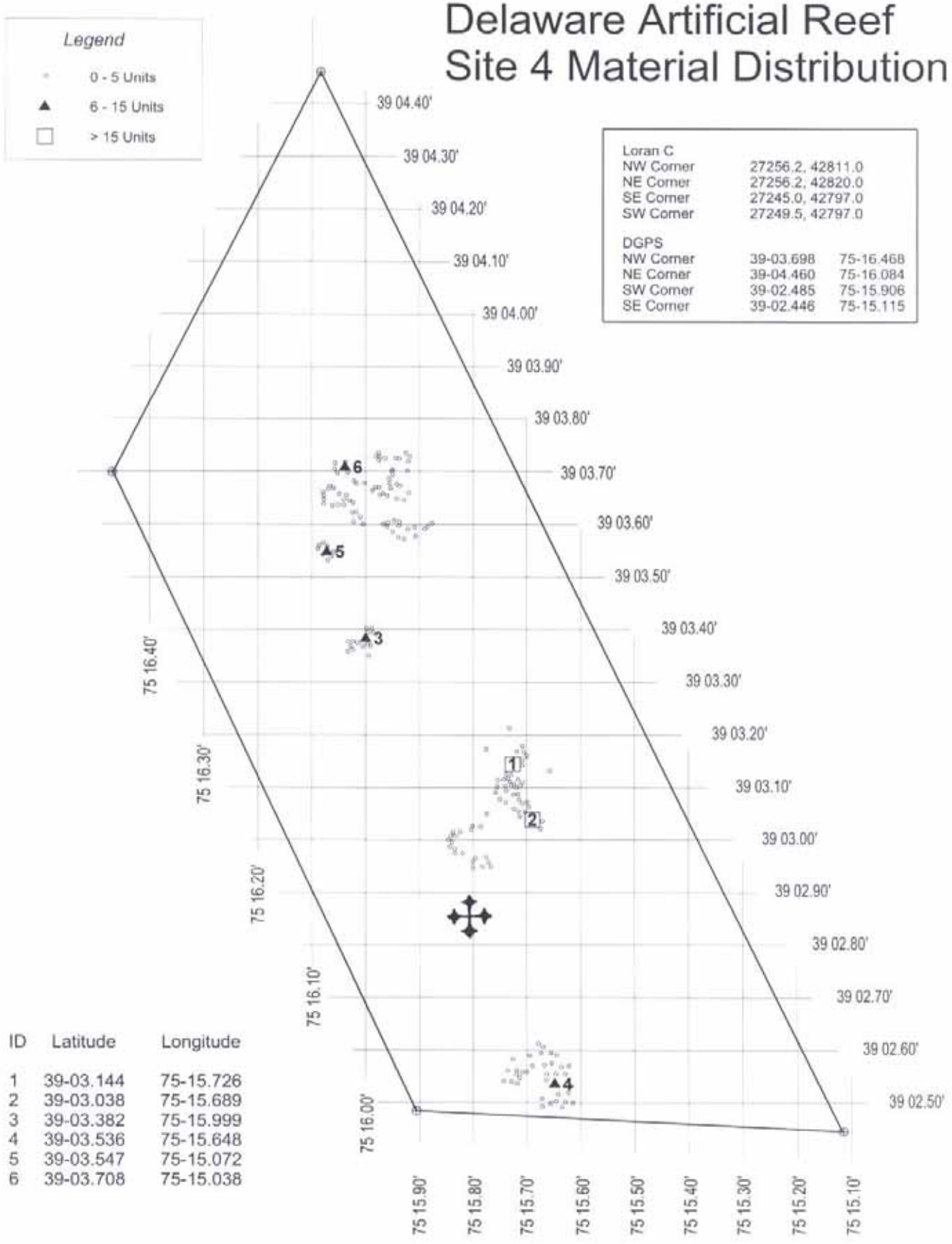
5. 850 tons of concrete deployed on 4/8/99. Depth 42'.
   N 39° 02.621'
   W 075° 15.695'

6. 1,192 tons of concrete deployed 3/28/03. Depth 38.
   N 39° 03.065'
   W 075° 15.724'

7. 1,511 tons of concrete deployed 7/7/04.
   N 39° 02.853'
   W 075° 15.805'

Notes

Delaware Artificial Reef Site 4 Material Distribution



Loran C		
NW Corner	27256.2, 42811.0	
NE Corner	27256.2, 42820.0	
SE Corner	27245.0, 42797.0	
SW Corner	27249.5, 42797.0	
DGPS		
NW Corner	39-03.698	75-16.468
NE Corner	39-04.460	75-16.084
SW Corner	39-02.485	75-15.906
SE Corner	39-02.446	75-15.115

ID	Latitude	Longitude
1	39-03.144	75-15.726
2	39-03.038	75-15.689
3	39-03.382	75-15.999
4	39-03.536	75-15.648
5	39-03.547	75-15.072
6	39-03.708	75-15.038

Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2003

Site #5

Total area of site	-	0.65 square nautical miles
Depth range	-	18-24' (mean low water)
Distance from port	-	4.5 nautical miles from Mispillion River 8.5 nautical miles from Roosevelt Inlet
Invertebrate Colonization	-	blue mussel, sulfur sponge community
Fish	-	sea bass, tautog, scup, weakfish

Deployments

1. 91 large rectangular concrete structures deployed from a moving barge 7/6/95. Depth about 22'.

2. 1,000 tons of concrete culvert deployed on 8/17/97. Approximate depth 25'.
   N 38° 54.095'
   W 075° 11.670'

3. 997 tons of concrete culvert deployed on 7/12/00. Depth 26'.
   N 38° 54.476 – 96'
   W 075° 12.224 - 59'

1,100 tons of concrete deployed on 6/11/01.
   N 38° 54.218'
   W 075° 11.952'

1,300 tons of concrete deployed on 8/10/01.
   N 38° 54.092'
   W 075° 11.732'

6. 1,098 tons of concrete deployed on 7/29/02.
   N 38° 54.850'
   W 075° 12.715'

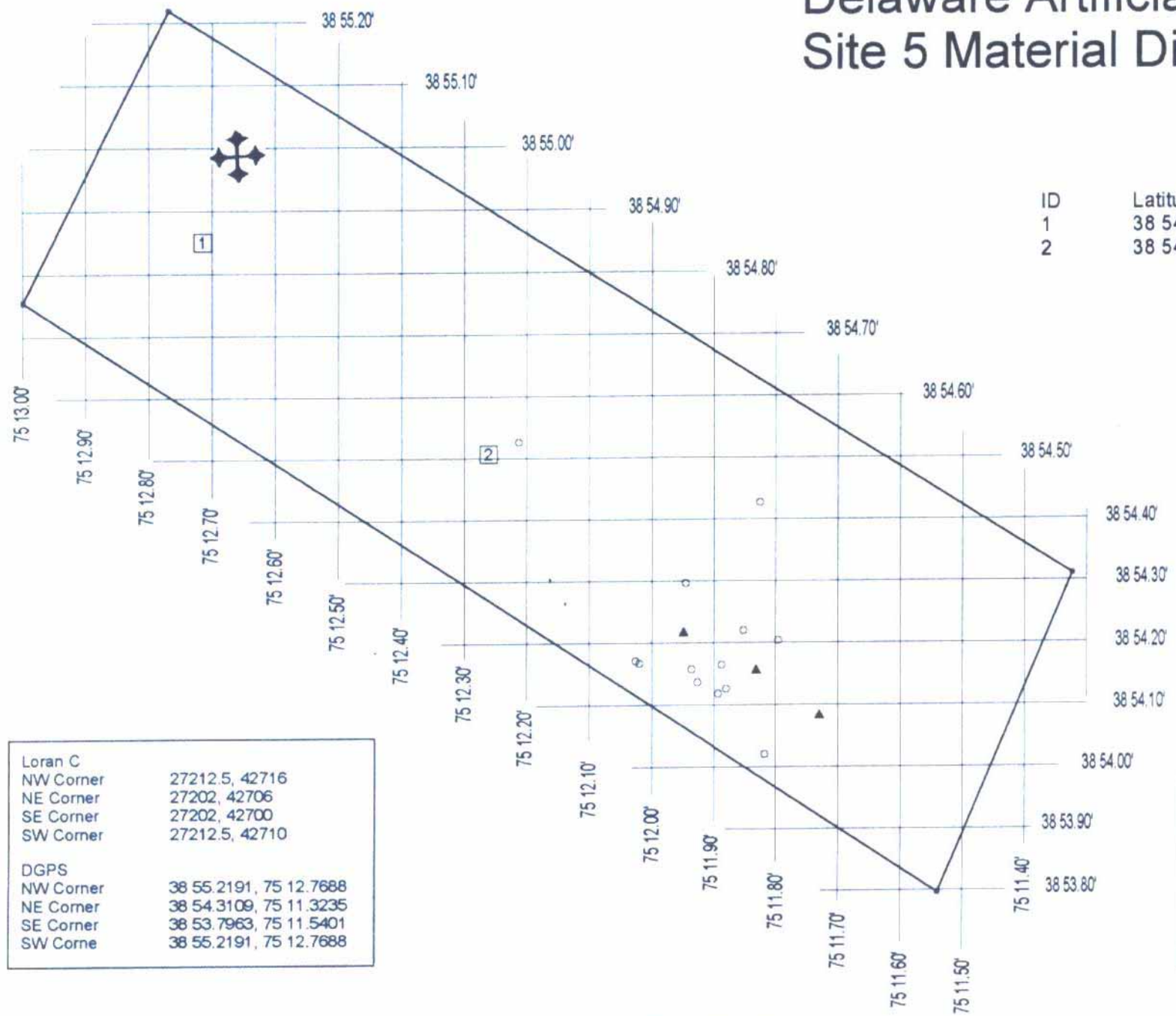
7. 1,087 tons of concrete deployed on 12/29/02.
   N 38° 54.638'
   W 075° 12.567'

8. 1,085 tons of concrete deployed on 4/25/03.
   N 38° 54.303'
   W 075° 11.684'

9. 1,588 tons of concrete deployed on 8/24/04.
   N 38° 54.983'
   W 075° 12.657'

Notes

Delaware Artificial Reef
Site 5 Material Distribution



ID	Latitude,	Longitude
1	38 54.850,	75 12.715
2	38 54.507,	75 12.261

Loran C	
NW Corner	27212.5, 42716
NE Corner	27202, 42706
SE Corner	27202, 42700
SW Corner	27212.5, 42710
DGPS	
NW Corner	38 55.2191, 75 12.7688
NE Corner	38 54.3109, 75 11.3235
SE Corner	38 53.7963, 75 11.5401
SW Corne	38 55.2191, 75 12.7688

Legend

- ○ 0 - 5 Units
- ▲ 6 - 15 Units
- □ > 15 Units

Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2002

Site #6

Total area of site	-	0.28 square nautical miles
Depth range	-	20-43' (mean low water)
Distance from port	-	7 nautical miles from Mispillion River 10 nautical miles from Roosevelt Inlet
Invertebrate Colonization	-	blue mussel community
Fish	-	sea bass, tautog, scup, weakfish, striped bass, bluefish

Deployments

1. 500 tons concrete culvert deployed from a moving barge - 10/20/95.

2. 500 tons concrete culvert deployed from an anchored barge - 6/21/96.
   N 38° 57.776'
   W 075' 09.349'

3. 900 tons of concrete deployed from an anchored barge 9/25/99. Depth 39'.
   N 38° 57.814 – 877'
   W 075° 09.577 – 588'

4. 900 tons of concrete deployed from an anchored barge 11/19/99. Depth 43'.
   N 38° 57.900 – 913'
   W 075° 09.515 – 548'

5. 1,000 tons of concrete deployed on 8/9/02. Depth 41'.
   N 38° 58.108'
   W 075° 09.725'

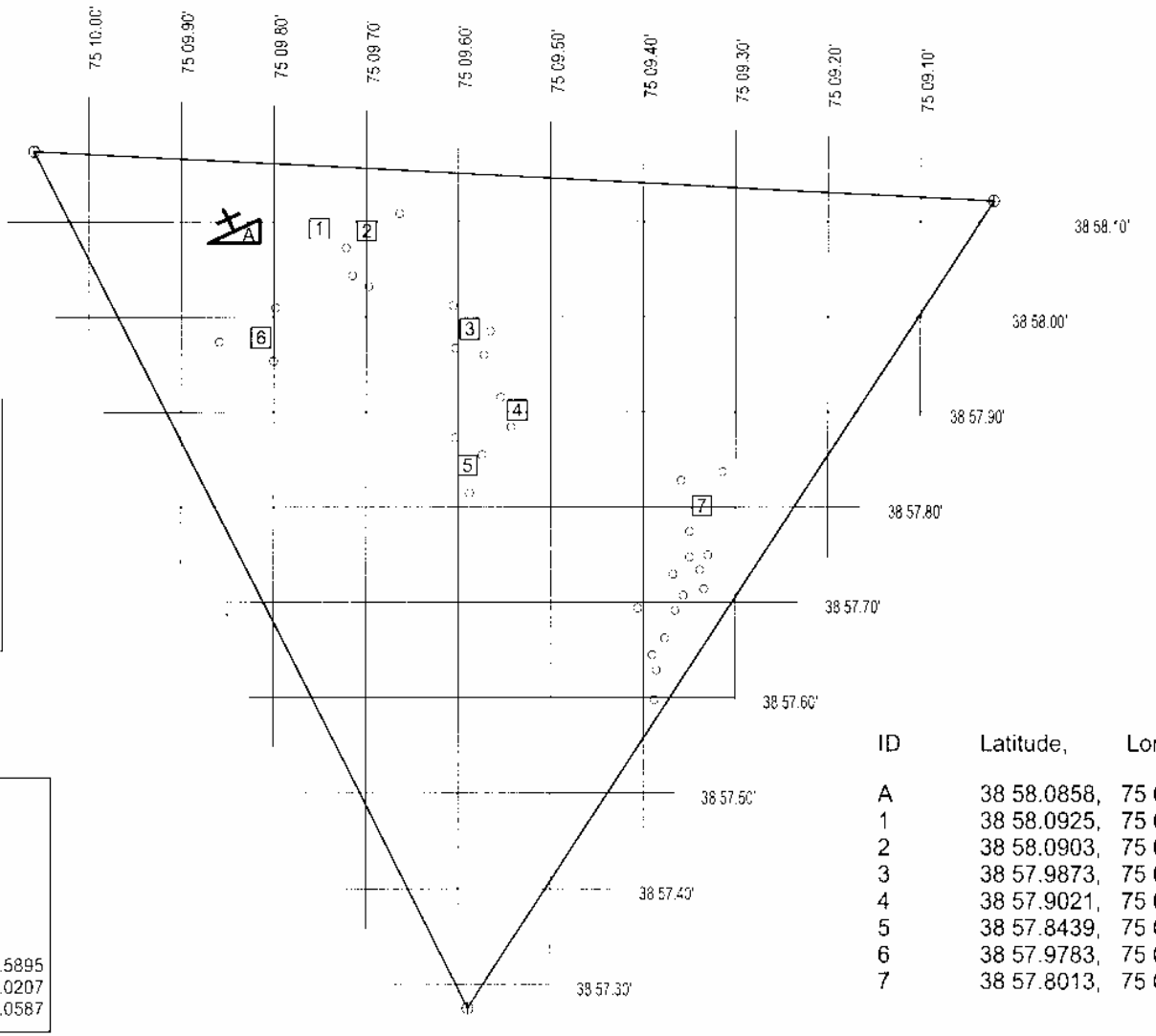
6. 1,119 tons of concrete deployed on 4/3/03. Depth 40'.
   N 38° 57.960'
   W 075° 09.842'

7. 1,636 tons of concrete deployed on 11/02/03. Depth 40'.
   N 38° 57.988'
   W 075° 09.582'

8 120' x 40' steel barge (Bucchannon) was deployed 3/18/04.
   N 38° 58.086'
   W 075° 09.825'

Notes

Delaware Artificial Reef
Site 6 Material Distribution



Legend

- ○ 0 - 5 Units
- ▲ 6 - 15 Units
- [#] > 15 Units
- Wreck

Loran C		
South Corner	27200.0, 42741.0	
NE Corner	27199.0, 42750.0	
NW Corner	27205.0, 42750.0	
DGPS		
South	38 57.2754,	75 09.5895
NE Corner	38 58.1213,	75 09.0207
NW Corner	38 58.1733,	75 10.0587

ID	Latitude,	Longitude
A	38 58.0858,	75 09.8273
1	38 58.0925,	75 09.7511
2	38 58.0903,	75 09.6996
3	38 57.9873,	75 09.5876
4	38 57.9021,	75 09.5361
5	38 57.8439,	75 09.5899
6	38 57.9783,	75 09.8139
7	38 57.8013,	75 09.3367

Site #7

Total area of site	-	0.41 square nautical miles
Depth range	-	30-40' (mean low water)
Distance from port	-	8 nautical miles from Mispillion River 9 nautical miles from Roosevelt Inlet
Invertebrate Colonization	-	blue mussel community
Fish	-	sea bass, tautog, scup, weakfish, striped bass, bluefish

Deployments

1. 500 tons of concrete culvert deployed from a moving barge 10/20/95.

2. 500 tons of concrete culvert deployed from an anchored barge 5/3/96.
   N 38° 56.511'
   W 075° 08.896'

3. 950 tons of concrete deployed from an anchored barge 8/12/98. Approximate depth 38'.
   N 38° 56.519' - .525'
   W 075° 08.535' - .545'

4. 700 tons of concrete plus 35' and 42' steel vessels ("P3" and "Dolphin") 4/19/99. Depth 42'.
   N 38° 56.460 – 467'
   W 075° 08.508 – 537'

5. 900 tons of concrete deployed from an anchored barge 7/16/99. Depth 36'.
   N 38° 56.648 – 669'
   W 075° 08.839 – 846'

1,100 tons of concrete deployed on 12/27/01.
N 38° 56.500'
W 075° 08.200'

7. 1,098 tons of concrete deployed on 8/20/02. Depth 38'.

500+ tons		500+ tons	
N	38° 56.540'	N	38° 56.470'
W	075° 08.680'	W	075° 08.680'

8. 1,085 tons of concrete deployed on 5/15/03.
   N 38° 56.828'
   W 075° 08.629'

9. 1,697 tons of concrete deployed on 11/17/03.
   N 38° 56.653'
   W 075° 08.604'

10. 1,587 tons of concrete deployed on 12/23/04.
    N 38° 56.517'
    W 075° 08.237'

Notes

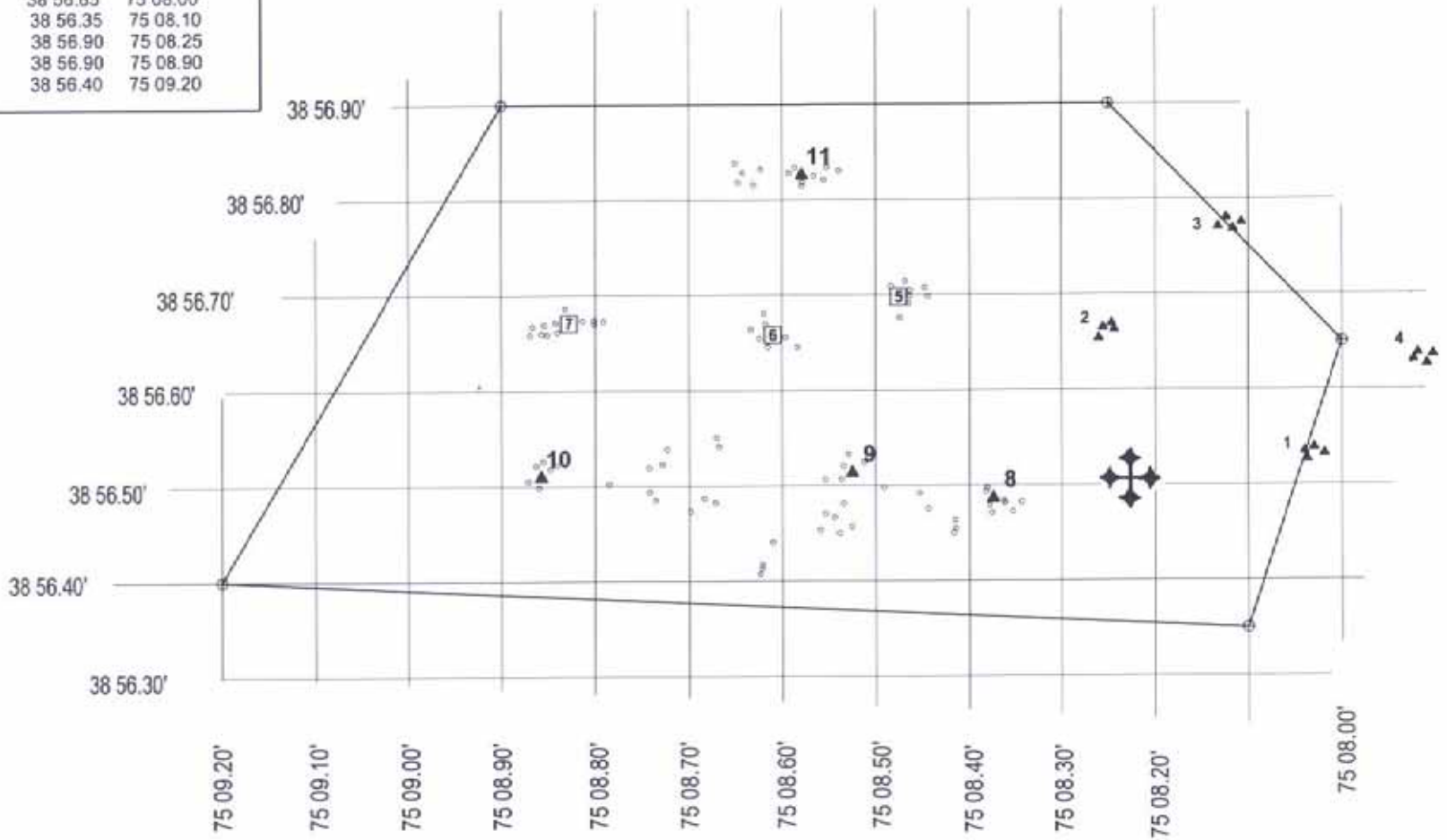
Delaware Artificial Reef
Site 7 Material Distribution

Legend	
◦	0 - 5 Units
▲	6 - 15 Units
□	> 15 Units

ID	Latitude	Longitude
1	38 56.542	75 08.058
2	38 56.675	75 08.275
3	38 56.772	75 08.155
4	38 56.651	75 08.938
5	38 56.698	75 08.476
6	38 56.658	75 08.610
7	38 56.671	75 08.828
8	38 56.488	75 08.374
9	38 56.515	75 08.525
10	38 56.511	75 08.857
11	38 56.828	75 08.579

Loran C	
East Corner	27188.5, 42733.0
SE Corner	27189.0, 42730.0
NE Corner	27191.5, 42736.0
NW Corner	27195.0, 42736.0
SW Corner	27195.0, 42730.0

DGPS		
East Corner	38 56.65	75 08.00
SE Corner	38 56.35	75 08.10
NE Corner	38 56.90	75 08.25
NW Corner	38 56.90	75 08.90
SW Corner	38 56.40	75 09.20



Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2003

Site #8

Total area of site	-	0.96 square nautical miles
Depth range	-	29-72' (mean low water)
Distance from port	-	4.5 nautical miles from Roosevelt Inlet 8.5 nautical miles from Mispillion River
Invertebrate Colonization	-	blue mussel community
Fish	-	tautog, seabass, scup, weakfish, striped bass, bluefish

Deployments

1. 550 tons of donated concrete and steel material donated by STAR Enterprise deployed from a moving barge 3/1/95.

2. 500 tons of concrete culvert deployed from a moving barge 8/25/95.

3. 980 tons of donated concrete and steel material donated by STAR Enterprise deployed from an anchored barge 1/23/96.
   N 38° 51.892'
   W 075° 08.054'

4. 70' commercial tugboat "Golden Eagle" sunk 8/96 at
   N 38° 52.080'
   W 075° 08.094'

5. 800 tons of concrete deployed from an anchored barge 6/18/98. Approximate depth 28'.
   N 75° 08.491' - .495'
   W 038° 51.887' - .892'

6. 800 tons of concrete deployed from an anchored barge 6/5/99. Depth 41'.
   N. 38° 51.948 – 963'
   W 075. 08.184 – 193'

7. 935 tons of concrete deployed from an anchored barge 7/8/99. Depth 37'.
   N 38° 52.157 – 168'
   W 075° 08.400 – 418'

8. 1,000 tons of concrete deployed on 4/24/01.
   N 38° 52.100'
   W 075° 08.800'

9. 1,010 tons of concrete deployed on 9/13/02. Depth 32'
   N 38° 52.176 – 261'
   W 075° 09.024 – 102'

10. 1,000 tons of concrete deployed on 12/13/02. Depth 30'.
    N 38° 52.066'
    W 075° 08.663'

11. 1,138 tons of concrete deployed on 5/21/03.
    N 38° 51.749'
    W 075° 08.191'

12. 1,091 tons of concrete deployed on 8/7/03.
    N 38° 52.356'
    W 075° 09.350'

Notes

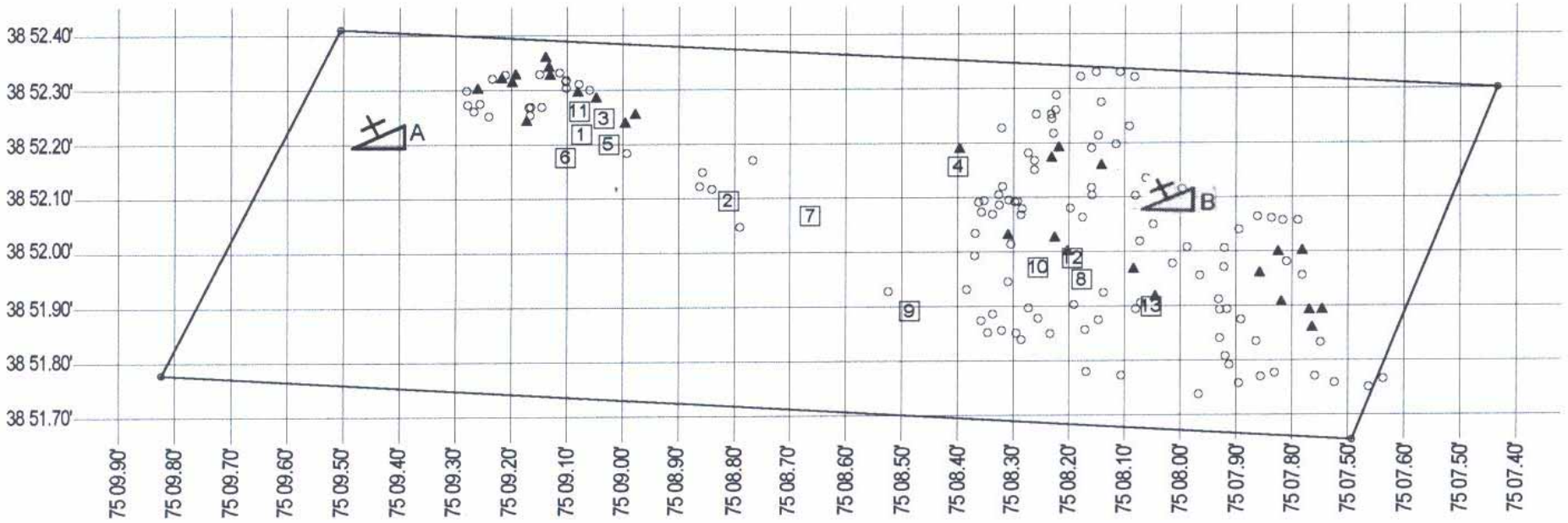
Delaware Artificial Reef
Site 8 Material Distribution

Loran C	
NW Corner	27187, 42685
NE Corner	27175, 42685
SE Corner	27175, 42678
SW Corner	27187, 42678
DGPS	
NW Corner	38 52.4108, 75 09.5059
NE Corner	38 52.3011, 75 07.4332
SE Corner	38 51.6536, 75 07.6930
SW Corner	38 51.7775, 75 09.8236

Legend

- ○ 0 - 5 Units
- ▲ 6 - 15 Units
- □ > 15 Units
- Wreck

ID	Latitude	Longitude
A	38 52.215,	75 09.436
B	38 52.082,	75 08.107
1	38 52.220,	75 09.070
2	38 52.095,	75 08.811
3	38 52.247,	75 09.033
4	38 52.156,	75 08.399
5	38 52.200,	75 09.024
6	38 52.176,	75 09.102
7	38 52.066,	75 08.663
8	38 51.948,	75 08.176
9	38 51.891,	75 08.485
10	38 51.971,	75 08.255
11	38 52.261,	75 09.077
12	38 51.988,	75 08.193
13	38 51.899,	75 08.051



Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2002

Site #9

Total area of site	-	0.63 square nautical miles
Depth range	-	52-63' (mean low water)
Distance from port	-	12 nautical miles from Roosevelt Inlet 4.5 nautical miles from Indian River Inlet
Invertebrate Colonization	-	blue mussel community
Fish	-	tautog, seabass, scup, weakfish, bluefish, striped bass

Deployments

1. 500 tons of concrete culvert - deployed from a moving barge 8/25/95.

2. 1000 tons of concrete culvert and stabilized tires deployed on 4/15/97 near
   N 38° 40.235'
   W 074° 59.718'

3. 900 tons of stabilized tires deployed on 6/26/97. Approximate depth 60'.
   N 38° 40.062' - .081'
   W 074° 59.561' - .581'

4. 800 tons of concrete culvert and stabilized tire units deployed on 7/31/98. Approximate depth 58'.
   N 38° 40.151'
   W 074° 59.588'
5. 500 tons of cement mixer drums deployed 7/6/01
   N 38° 40.351'
   W 074° 59.655'

6. 1,100 tons of concrete deployed 6/24/03. Depth 62'.
   N 38° 40.231'
   W 074° 59.541'

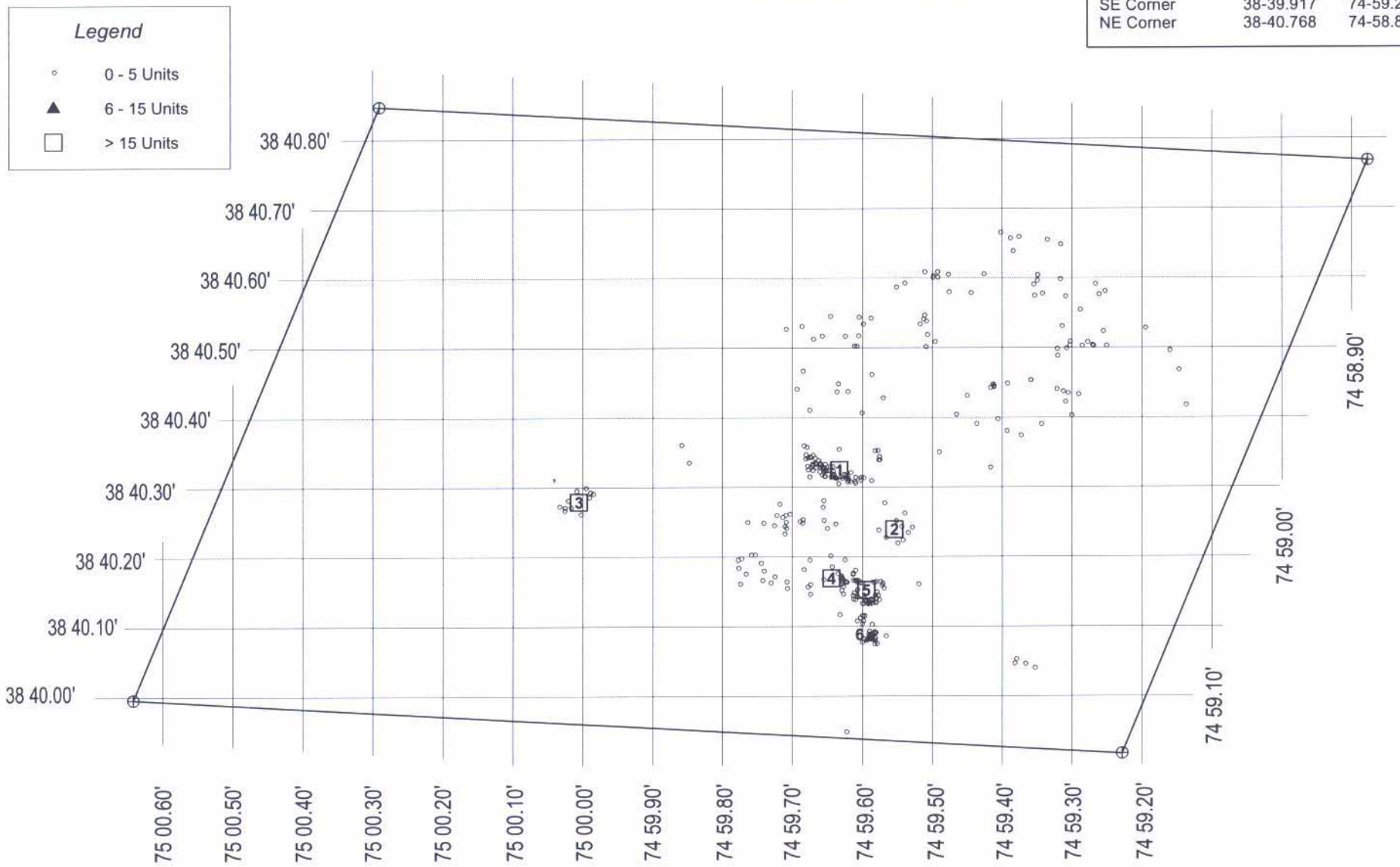
7. 1,093 tons of concrete deployed 8/21/03. Depth 60'.
   N 38° 40.277'
   W 075° 00.214'

Notes

Delaware Artificial Reef
Site 9 Material Distribution

ID	Latitude	Longitude
1	38-40.324	74-59.633
2	38-40.239	74-59.554
3	38-40.029	74-59.006
4	38-40.018	74-59.644
5	38-40.152	74-59.594
6	38-40.083	74-59.589

Loran C		
NW Corner	27108.0, 42560.0	
NE Corner	27100.0, 42560.0	
SE Corner	27100.0, 42550.0	
SW Corner	27108.0, 42550.0	
DGPS		
SW Corner	38-39.996	75-00.642
NW Corner	38-40.847	75-00 .291
SE Corner	38-39.917	74-59.229
NE Corner	38-40.768	74-58.877



Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2003

Site #10

Total area of site	-	0.69 square nautical miles
Depth range	-	56-66’ (mean low water)
Distance from port	-	5.5 nautical miles from Indian River Inlet
Invertebrate Colonization	-	blue mussel community
Fish	-	sea bass, tautog, scup, weakfish, bluefish

Deployments

1. Previously existing wreck (barge?)
   N 38° 36.934’
   W 074° 55.821’

2. 1000 tons of concrete culvert and stabilized tire units deployed from a moving barge 8/25/95.

3. 1000 tons of stabilized tire units deployed from a moving barge 11/18/95.

4. 1000 tons of concrete culvert and stabilized tire units deployed from an anchored barge 8/5/96.
   N 38° 36.890’
   W 074° 56.454’

5. 850 tons of ballasted tire units on 3/31/98. Approximate depth 60’.

6. 850 tons of concrete culvert and stabilized tire units deployed on 5/19/98. Approximate depth 61’.
   N 38° 36.365’
   W 074° 56.600’

7. 875 tons of ballasted tire units deployed from an anchored barge 8/19/99. Depth 64’.
   N 38° 36.432 – 434’
   W 074°55.871 – 874’

8. Yon 80 Navy barge sunk 6/18/02. Depth 62’.
   N 38° 36.424’
   W 074°56.498’

9. 1,190 tons of concrete deployed 11/20/02. Depth 60’.
   N 38° 36.589’
   W 074°56.469’

10. 5.6 nautical miles of marine cable deployed 5/11/03. Depth 62'
    N 38° 36.750’
    W 074°55.670’

11. 1,072 tons of concrete deployed 7/9/03.
    N 38° 36.738’
    W 074°55.965’

12. 1,039 tons of concrete deployed 7/26/03.
    N 38° 36.857’
    W 074°56.161’

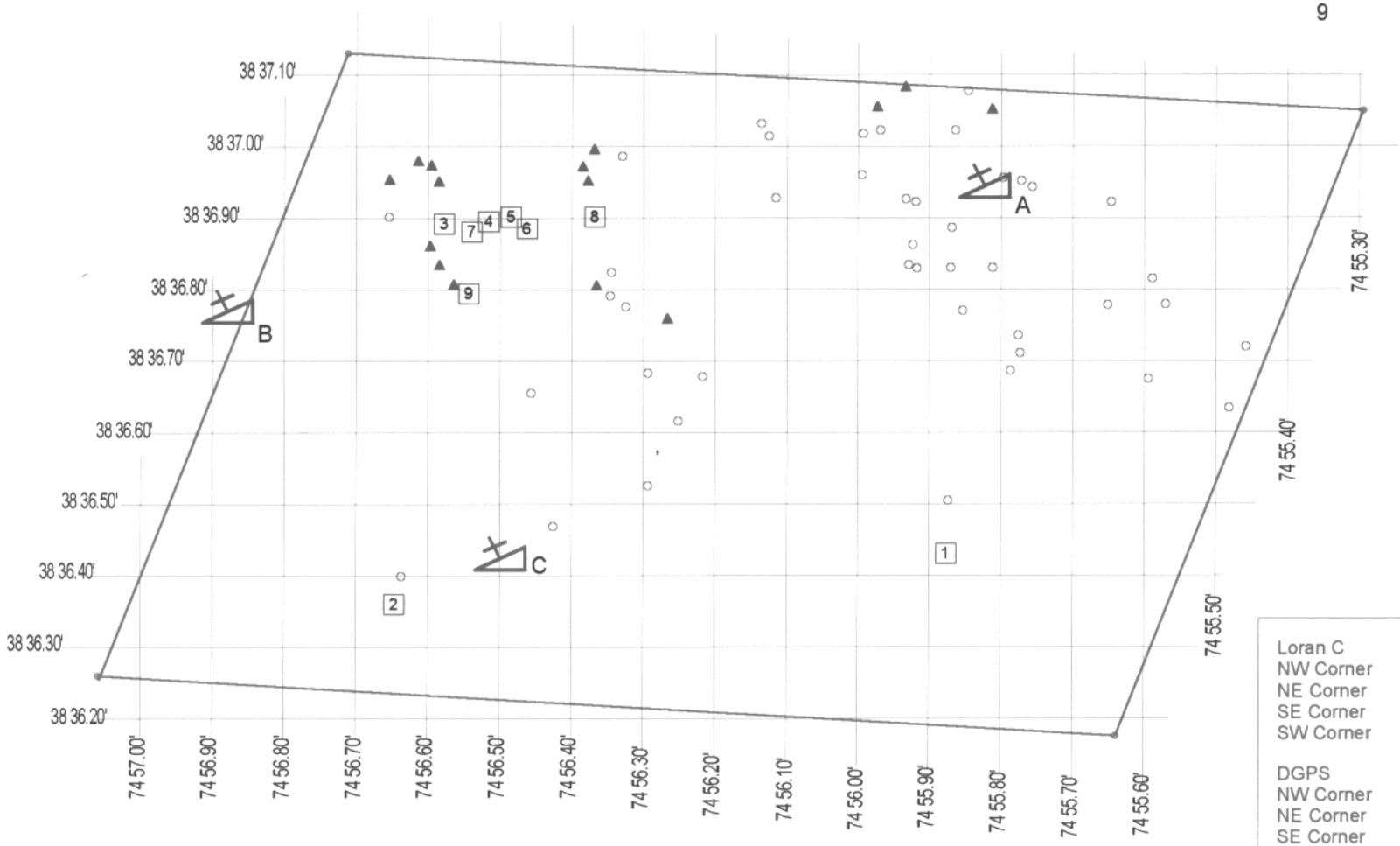
Notes

Delaware Artificial Reef
Site 10 Material Distribution

Legend

- 0 - 5 Units
- 6 - 15 Units
- > 15 Units
- Wreck

ID	Latitude,	Longitude
A	38 36.943,	74 55.819
B	38 36.769,	74 56.878
C	38 36.424,	74 56.498
1	38 36.430,	74 55.876
2	38 36.359,	74 56.646
3	38 36.891,	74 56.577
4	38 36.894,	74 56.515
5	38 36.901,	74 56.484
6	38 36.884,	74 56.462
7	38 36.880,	74 56.539
8	38 36.901,	74 56.367
9	38 36.794,	74 56.542



Loran C	
NW Corner	27080, 42520
NE Corner	27072, 42520
SE Corner	27072, 42510
SW Corner	27080, 42510
DGPS	
NW Corner	38 37.1300, 74 56.7113
NE Corner	38 37.0492, 74 55.2940
SE Corner	38 36.1749, 74 55.6392
SW Corner	38 36.1749, 74 55.6392

Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2002

Site 11

Total area of site	-	1.3 square nautical miles
Depth range	-	68-88’ (mean low water)
Distance from port	-	16.5 nautical miles from Indian River Inlet
Invertebrate Colonization	-	blue mussel community
Fish	-	sea bass, tautog

Deployments

1. 26 military track vehicles deployed in 3 tightly grouped clusters 1/96.
   - A N 38° 40.702’ W 074°43.531’
   - B N 38° 40.703’ W 074°43.518’
   - C N 38° 40.718’ W 074° 43.550’

2. 40 military vehicles deployed in clusters.
   - A (7 vehicles) N 38°40.648’ W 074°43.535’
   - B (13 vehicles) N 38°40.561’ - .576’ W 074°43.487’ - .511’
   - C (9 vehicles) N 38°40.618’ - .641’ W 074°43.374 - .379’
   - D (11 vehicles) N 38°40.624’ - .635’ W 074°43.430’ - .448’

3. 850 tons of ballasted off road tire units deployed 7/24/98. Approximate depth 90’.
   N 38° 40.389’ - .415’
   W 074° 43.433’ - .453’

4. 90’ commercial tug “Delilah” sunk 1/15/99. N 38° 40.433’ W 074° 43.386’

5. 1,100 tons ballasted tires deployed from a moving barge 2/11/99. N 38° 40.490 – 530’ W 074° 43.450 – 500’

6. 7. YC 1479 (160’ Navy barge) sunk 10/20/00. N 38° 40.365’ W 074° 43.818’

8. 90’ Commercial tug “Margie Ann” sunk 6/19/01. Depth 90’. N 38° 40.322’ W 074° 44.132'

	Date of Deployment	Number of cars	Latitude	Longitude
9.	8/21/01	27 Red Bird Cars	N 38° 40.704’	W 074° 43.593’
10.	8/25/01	31 Red Bird Cars	N 38° 40.128’	W 074° 44.420’
11.	9/8/01	31 Red Bird Cars	N 38° 40.553’	W 074° 44.253’
12.	9/22/01	31 Red Bird Cars	N 38° 40.180’	W 074° 44.135’
13.	10/22/01	31 Red Bird Cars	N 38° 40.564’	W 074° 43.802’
14.	11/02/01	31 Red Bird Cars	N 38° 40.575’	W 074° 44.216’
15.	1/17/02	31 Red Bird Cars	N 38° 40.553’	W 074° 43.851’
16.	1/21/02	31 Red Bird Cars	N 38° 40.324’	W 074° 44.400’
17.	1/26/02	32 Red Bird Cars	N 38° 40.246’	W 074° 43.501’
18.	2/22/02	32 Red Bird Cars	N 38° 40.246’	W 074° 43.501’
19.	3/7/02	32 Red Bird Cars	N 38° 40.220’	W 074° 43.683’
20.	2/4/02	34 Red Bird Cars	N 38° 40.435’	W 074° 44.360’
21.	8/24/02	50 Red Bird Cars	N 38° 40.155’	W 074° 44.284’
22.	4/8/02	32 Red Bird Cars	N 38° 40.207’	W 074° 43.982’
23	11/1/02	50 Red Bird Cars	N 38° 40.322’	W 074° 44.132’
24	11/10/03	52 Red Bird Cars	N 38° 40.580’	W 074° 44.155’

Notes

Delaware Artificial Reef
Red Bird Reef
Material Distribution

Legend

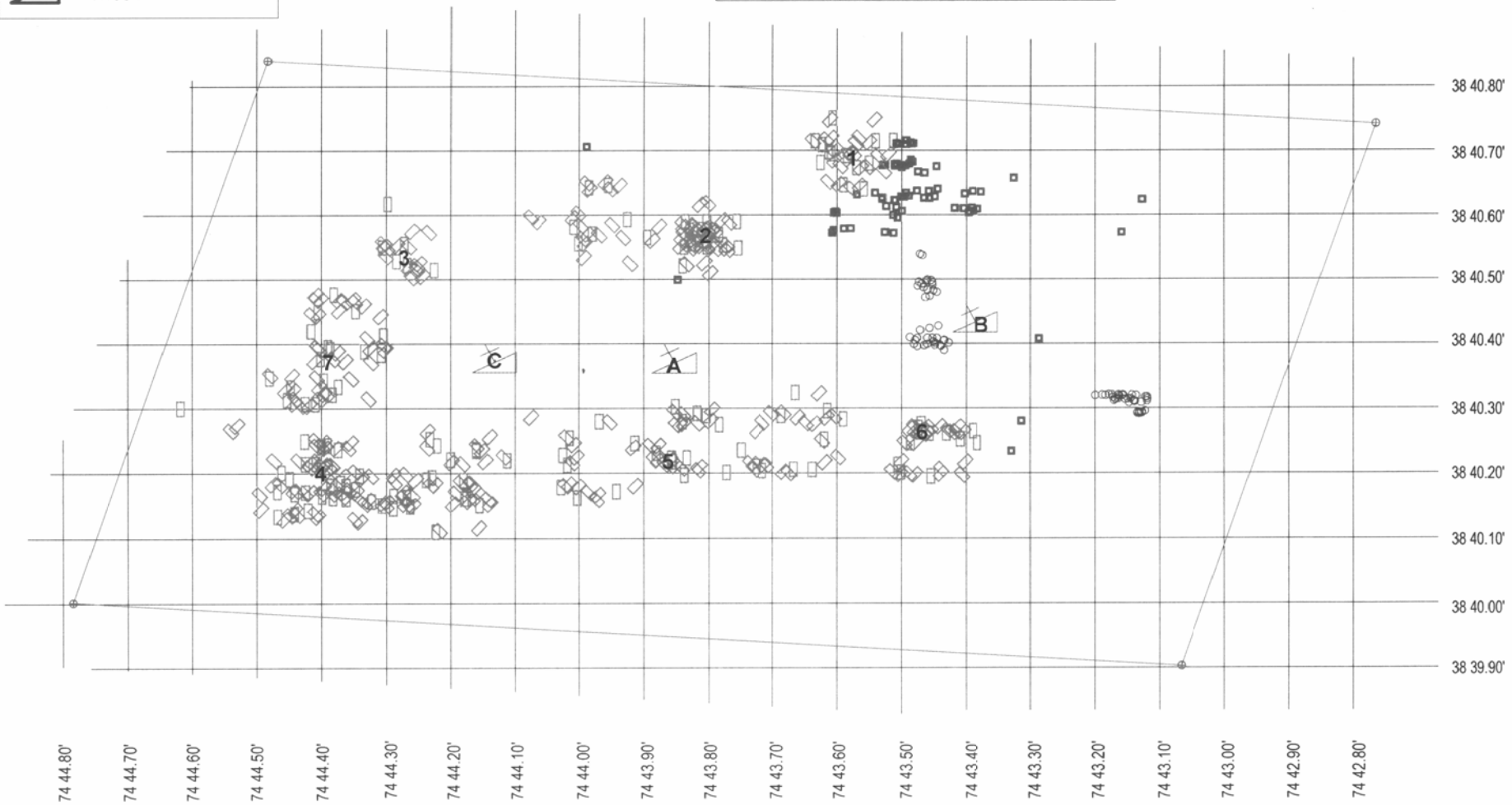
- 0 - 5 Tire Units
- Tracked Vehicle (Tank)
- Railroad Car
- Wreck

Target Positioning

ID	Longitude,	Latitude
A,	74 43.8528,	38 40.3657
B,	74 43.3768,	38 40.4288
C,	74 44.1325,	38 40.3741
1,	74 43.5764,	38 40.6875
2,	74 43.8052,	38 40.5671
3,	74 44.2718,	38 40.5340
4,	74 44.4012,	38 40.1999
5,	74 43.8624,	38 40.2179
6,	74 43.4680,	38 40.2631
7,	74 44.3892,	38 40.3715

Site Positioning

Loran C:	
NW Corner	27020.0 - 42570.0
SW Corner	27020.0 - 42560.5
SE Corner	27010.0 - 42560.5
NE Corner	27010.0 - 42570.0
DGPS:	
NW Corner	38 40.84 - 74 44.48
NE Corner	38 40.74 - 74 42.77
SE Corner	38 39.90 - 74 43.07
SW Corner	38 40.00 - 74 44.78



Produced By: State of Delaware - Department of Natural Resources - Division of Fish and Wildlife

rev-2003