

20 LAKES REPORT

1990

LAKE: ALLENTOWN	TOWN: ALLENTOWN
LAKE: ASSUNPINK	TOWN: MILLSTONE
LAKE: PERRINEVILLE	TOWN: MILLSTONE
LAKE: WEAMACONK	TOWN: ENGLISHTOWN
LAKE: LEFFERTS	TOWN: MATAWAN
LAKE: MATAWAN	TOWN: MATAWAN
LAKE: TREASURE	TOWN: CLIFFWOOD BEACH
LAKE: NATCO	TOWN: UNION BEACH
LAKE: RISING SUN	TOWN: MILLSTONE
LAKE: MILLHURST MILLS	TOWN: MANALAPAN
LAKE: TOPANEMUS	TOWN: FREEHOLD
LAKE: MARLU	TOWN: MIDDLETOWN
LAKE: SWIMMING RIVER	TOWN: MIDDLETOWN
LAKE: SHADOW	TOWN: MIDDLETOWN
LAKE: WAMPUM	TOWN: EATONTOWN
LAKE: TURKEY SWAMP	TOWN: FREEHOLD
LAKE: ALDRICH	TOWN: HOWELL
LAKE: ECHO	TOWN: HOWELL
LAKE: ALLAIRE-BRISBANE	TOWN: WALL
LAKE: OSBORNE-TRIMMERS	TOWN: WALL

1990

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20 LAKES SAMPLING: Chart 1, Figure 1, Tables 1a-1c

Bulk sediments in 20 lakes in Monmouth County were sampled for Total Petroleum Hydrocarbons, (TPH), Heavy Metals, PCB's and Pesticides by the Monmouth County Health Department (see Figure 1). This report details this data, graphs trends, and provides additional information taken from other reports, in order to present a useful, preliminary reference on the ecology of Monmouth County's surface water (see Appendix A for the inventory of the lakes that were sampled).

Aerial photographs and topographical maps supplied preliminary information detailing the twenty lakes' location, formation, surface acreage and depth.

A standardized method for determining sampling stations was used to gather comparable results between lakes of varying size. For each lake, two sampling stations were located at a distance of one quarter of the lake's length from its midpoint. One station was located towards the lake's major inlet, and the second towards the outlet. At each station, a depth transect was conducted, and a La Motte Bottom Sampling Dredge was used to collect sediments from the deepest point along the transect line, since this is where finer, organic sediments tend to accumulate. Equal amounts of sediments from the two stations were placed in a sample container and thoroughly mixed. (The exception was the Swimming River Reservoir; sampling stations were set up at the midpoint of each of the Reservoir's two major branches). Sample station depths were recorded and the physical appearance of sediments noted in the field; sediment analyses was performed by Princeton Labs. See Appendix C for site locations.

The data is reported in Tables 1A-C; and graphed in a cumulative bar chart in Chart 1 (the cover sheet is a curve graph of the same data). Additionally, in Appendix B, each individual pollutant is graphed by lake. While all lakes sediments contain various levels of heavy metals, none had PCB's detected; some also contain Total Petroleum Hydrocarbons, and only one, Wampum Lake in Eatontown, had a pesticide detected (chlordan). As indicated by the bar chart, the lakes in the southern end of the county had lower average levels of pollutants than the northern lakes. Pollutants in lakes increased with proximity to the coast, where population density also increases.

In order to assess the data, it will be useful to outline what determines the variability of the pollutant loading between lakes. In addition to the specific tables and figures each of the following sections will reference, Appendix A details various information about each lake, which was obtained from the field and from maps and reports in the Monmouth County Planning Board library. This information includes nearby population density, types of roads, watershed, outcrop and soils, sewer plants, surface acres, presence of septic systems, major agricultural uses, etc.

LAKES AND PRIORITY POLLUTANTS: Tables 2-5

Lakes act as sinks for sediments introduced and resuspended by storm events, or from atmospheric deposition. Small elongated finger lakes, with more shoreline, tend to accumulate more sediment; slow-flowing lakes also have higher rates of sediment settling. Pollutants will

absorb to mucky, fine organic silts more than to coarse sand. The amount of contaminant that is released from the sediment into the water column will depend on the redox potential of the sediments - essentially, how oxygenated the sediments are. Another important determinant is pH, how acid (0-7) or alkaline (7-14) the sediments and water are; Table 2 lists several heavy metals and under what pH conditions they mobilize into the water column.

There are no definite federal guidelines relating the total amount of pollutants in aquatic sediments to impacts on the environment and public health. The Army Corp of Engineers, when reviewing an application for dredge disposal, generally requires only a limited analysis of the sediments (TPH is rarely required). Instead they rely on an acute bioassay of the sediment, which exposes test organisms to the sediment and then times how long it takes for half of them to die. Chronic bioassays can also be required, which measures damage in addition to death. Table 3 is a preliminary classification of aquatic sediments compiled by the EPA for the Great Lakes Commission in 1977.

Total Petroleum Hydrocarbons includes straight-chain hydrocarbons. Natural sources of these elements, such as from decomposition of leaves, probably represent a small amount of the analyses; the bulk is from petroleum compounds found in oil and gasoline. Heavy metals are naturally present in soil; Table 4 has been prepared from seven sources to provide a baseline for comparing the metals found in the lake sediments. The man-made sources of the metals are variable; for example, mercury was used in pesticides and thermometers; selenium is used in photo-electric cells; copper (sulfate) is a popular algicide. However, they are all commonly found in oil; Table 5 lists the various amounts of metals found in used and virgin oil. Many metals are also trace elements in various alloys and pigments.

No PCB's were detected. The only pesticide found, Chlordane, in Wampum Lake in Eatontown, was previously used as a termaticide. In the past, Chlordane was sold over the counter for routine lawn care - it is now banned. Any pesticides applied to lawns, shrubs or foundations will be washed off the ground surface by rain; or driven into the groundwater - which eventually discharges into the lakes - by rain and irrigation.

GEOLOGY: Figures 2-5 Tables 4-7

The twenty lakes are categorized into three groups, according to their predominant geological outcrop. The geological formation, as well as the predominant soil groups, determine the chemistry of the sediments. The lakes in northern and western Monmouth County are in clay soils, while in the south and east they are in sandy soils; see Figure 2 and Table 6. Clay adsorbs more metals and other pollutants than sandy soils. Table 4 lists typical metal levels found in soils in the eastern United States and in New Jersey. Figure 3 shows through well logs the various depths of these outcrops across the county. For example, in Matawan, Lake Matawan is located in the basal Englishtown outcrop - a clay formation. This outcrop is known for its pyrite (iron sulfide) deposits in this part of the county - and this is why Lake Matawan has the lowest pH (3) of all twenty lakes, and is lime colored because it is dominated by an acid tolerant green algae. In Wall, Allaire/Brisbane Lake is located in another

outcrop, the Kirkwood/Cohansey - a sand formation; here, the Englishtown formation is a major aquifer about six hundred feet deep. The geological outcrop also determines what vegetation will grow around the lake; Figure 4 shows where the two major Pine Barren regions are in Monmouth County; one in southern Monmouth, on the Kirkwood/Cohansey sands; and a second smaller one in northern Monmouth, on the Englishtown sands. For predominant soil types, refer to Figures 5a and 5b, and Table 7.

AIR POLLUTION: Figures 6-9

Air Pollution is water pollution. Atmospheric deposition of pollutants to surface water occurs during dry and wet weather; dry deposition of large particles from nearby sources, such as traffic, and precipitation scavenging of the finer particulates and gases from distant sources.

The most widely acknowledged effect of atmospheric deposition is acid rain - attributed to nitrogen and sulfur produced by industrial burning of fossil fuels, that is acidifying lakes in the northeast U.S. Figure 6 shows an acidic plume (pH 4.2) moving from the industrialized midwest to the east coast, where the plume is slightly less acidic (pH 4.5). Figures 7 and 8 are averages of wind movement in New Jersey in stations in Newark and Atlantic City. The majority of the time, the wind is from the west in New Jersey; so the air in Monmouth County is routinely impacted by discharges originating from the west.

Sulfur and nitrogen are only one indicator of what comes out the smokestack from industrial and power plants - so do heavy metals, base neutrals etc. The New Jersey Public Interest Group recently determined from Right to Know information that 7,398,230 pounds of industrial and power plant emissions were released into the air from Middlesex County alone in 1987. During certain atmospheric events, like inversions, these pollutants are more likely to accumulate in the surface air and water. Figure 9 shows an inversion - when a layer of warm air is formed over colder surface air, and prohibits vertical mixing of the more polluted surface air (this can be observed most often at night, when the plume from a smokestack stops rising and trails along under a "ceiling").

The United States Canadian Commission currently studying the Great Lakes has estimated that the amount of lead deposited to all the Great Lakes from the atmosphere ranges from 50% to 90% of the total input. Another recent study attributed the major source of nitrogen in the N.Y. Bight to atmospheric deposition from air pollution produced by industries, residences and transportation.

WATERSHED AND STORM RUNOFF Figures 10-14 Table 8-9

Figure 10 is a map of the drainage basins in Monmouth County; there are four watersheds the 20 lakes can drain into, depending on their location: Raritan Bay, the ocean, Barnegat Bay, or Delaware Bay. Figure 11 is a map of the major surface water divides in Monmouth County. Figures 12 and 13 also show the various surface water classifications in the county.

Table 8 lists various air pollutants and levels in Monmouth County from 1970 to 1979. Note that the last column shows the trends in particulate emissions (this category includes heavy metals, base neutrals, etc.) in sites in Asbury Park, Red Bank and Millstone. The least amount of atmospheric particulates were in rural Millstone, and rose as the sampling

stations approached the coast; this is the same trend for the pollutants found in the twenty lake sediments. Figure 14 shows where municipal water and sewer are available; this is an preliminary indicator of population density, and urban runoff.

Urban runoff accounted for an estimated 10,500 pounds per day of petroleum discharged into the Delaware estuary. This is not oil from large spills, but is the accumulation of the myriad iridescent slicks that flow along the curb when it rains. During dry weather, the roadside deposition is not apparent; it is only obvious when it rains, or after fresh snow along roads becomes sooty and grey from the particulates in exhaust, the leaking crankcase oil, brake wear, tire wear, etc. Table 5 lists the difference in heavy metal content in virgin and used motor oil. For example, in virgin oil, lead ranged from 1.7 to 4.1 ppm; in used motor oil, it ranged from 800 to 11,200 ppm (it is also interesting that phosphate, a limiting nutrient in algae blooms, goes from 0 ppm in virgin oil to 500 to 2000 ppm in used motor oil). Table 9 lists common pollutants found in urban runoff; note that heavy metals are all higher in drainage from an eight-lane highway than from industrial sites.

On April 22, 1990, the Asbury Park Press reported that there are now 508,000 cars in operation in Monmouth County. Each car is driven an average of 15,000 miles a year; 4 grams of hydrocarbons, and .1 grams of benzene (as well as other parameters) are reportedly emitted by an average automobile for each mile driven. This means that 1,676,400 lbs. of benzene and 67,056,000 lbs. of hydrocarbons are discharged yearly along roads in Monmouth County, from emissions alone. This figure underestimates the total vehicles in Monmouth County, because it does not include buses, trucks, etc. Commuter traffic and summer tourism also bring up the volume. For instance, the Garden State Parkway reports the annual average daily volume of cars for 1988 at the North bound lane of the Asbury Park toll plaza is 57,000 vehicles. In July of 1988, 74,520 vehicles per day passed through this toll plaza. The need for accessible mass transportation is a water quality issue, as well as energy and air pollution issues.

Perhaps the best example of the pervasive effects of atmospheric deposition was presented in a PBS program (Innovation): the average blood lead in people living in the United States is down 38% since the reduction of lead in gasoline in the 1970's. Improving local use of mass transportation and encouraging car pooling is evidently warranted.

CONCLUSION

This report is a presentation of data and a preliminary acknowledgement of areas of concern. Controlling site specific sources, like spills, leaking underground tanks etc., is the main focus of environmental regulation. Storm runoff - of nutrients and pesticides from lawns and oil, gas and metals from highways - is virtually uncontrolled. The Sewage Infrastructure Act is a major attempt to control pollution from storm drains, starting with sewer interconnections, and eventually non point sources.

Public education programs, like the Water Watch Program must be encouraged. So should government sponsored events, like special days that residents can turn in their old pesticides and other hazardous wastes to the Health Department for proper disposal. These events were

sponsored by the Monmouth County Health Department and the NJDEP in 1989 and 4 Hazardous Waste Days are proposed for 1990. The Monmouth County Health Department hopes that planning boards, environmental commissions and local citizen groups will find this report useful. We will forward copies of this report to the NJDEP Division of Science and Research, so they can consider expanding their toxicity testing of fish in Newark Bay and the ocean to include these fresh water lakes. It is important to determine the potential health hazards of these pollutants in sediment for anyone who consumes fish from fresh water lakes. We would also encourage students and teachers to make use of the data in this report to develop new ideas on controlling non point pollution.

APPENDIX A: LAKE INVENTORY

ALLENTOWN LAKE (1)

PUBLIC SURFACE ACRES: 26.5 NJDEP CLASS: FW2

pH RANGE: 6.8-7.1 SAMPLING DEPTH RANGE (m): 2.3-3

MAJOR FEEDER STREAMS: Doctor's Creek, Negro Run. Entire drainage area of Doctor's Creek is 18.96 sq mi.

WATERSHED: Doctor's Creek - Delaware R - Delaware Bay

PRE-QUARTENARY OUTCROP: Englishtown, Marshalltown

SOIL GROUPS: Sassafrass - Downer - Woodstown

PREDOMINANT TOWN: Allentown (3387); Upper Freehold (62)
(1985 POP/SQ MILE)

LAND USE: Urban, rural, agricultural MAJOR ROADS: Rt 539, Rt 524

1984 AGRICULTURAL LAND USE: Field crops, nursery-greenhouse

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

NOTE: One of the oldest man-made lakes in the U.S.; dredged in mid 1980's

ASSUNPINK LAKE (2)

PUBLIC SURFACE ACRES: 200 NJDEP CLASS: FW2

pH RANGE: 7-7.45 SAMPLING DEPTH RANGE (m): 2.3-3.6

MAJOR FEEDER STREAMS: Chestnut Brook, Horse Brook, Assumpink Creek. Entire drainage area of Assumpink Creek is 13.42 sq mi.

WATERSHED: Assumpink Creek - Delaware R - Delaware Bay

PRE-QUARTENARY OUTCROP: Wenonah, Marshalltown

SOIL GROUPS: Sassafrass-Downer- Woodstown; Freehold- Shrewsbury-Tinton

PREDOMINANT TOWN: Upper Freehold (62); Millstone (118)
(1985 POP/SQ MILE)

LAND USE: State park, rural, agricultural MAJOR ROADS: Rt 571

1984 AGRICULTURAL LAND USE: Field crops, sod

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): Roosevelt (.2)

NOTE: Wildlife Management area.

PERRINEVILLE LAKE (3)

PRIVATE SURFACE ACRES: 16 NJDEP CLASS: FW2

pH RANGE: 6.96-7.08 SAMPLING DEPTH RANGE (m): 1.9-2.0

MAJOR FEEDER STREAMS: Rocky Brook

WATERSHED: Rocky Brook - Millstone R- Raritan R - Raritan Bay

PRE-QUARTENARY OUTCROP: Kirkwood; Red Bank/Tinton

SOIL GROUPS: Freehold- Shrewsbury - Tinton

PREDOMINANT TOWNS: Millstone (118)
(1985 POP/SQ MILE)

LAND USE: Rural, suburban, agricultural MAJOR ROADS: Rt 526,
Rt 571, Sweetman's Lane

1984 AGRICULTURAL LAND USE: Horse, Field crops, Ornamentals

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

WEAMACONK LAKE (4)

PUBLIC SURFACE ACRES: 12 NJDEP CLASS: FW2

pH RANGE: 6.88-7.12 SAMPLING DEPTH RANGE (m): .7-2.1

MAJOR FEEDER STREAMS: Weamaconk Creek, Wemrock Brook, Middle
Brook. Entire drainage area of Weamaconck Creek is 6.79 sq mi.

WATERSHED: Weamaconck Brook - South R - Raritan R - Raritan Bay

PRE-QUARTENARY OUTCROP: Englishtown, Marshalltown

SOIL GROUPS: Freehold-Shrewsbury-Tinton

PREDOMINANT TOWNS: Englishtown (1674); Manalapan (773)
(1985 POP/SQ MILE)

LAND USE: Urban, Suburban, rural, agricultural, State Park MAJOR
ROADS: Rt 527, Rt 522, Rt 33, Rt 9

1984 AGRICULTURAL LAND USE: Field crops, Livestock, Ornamentals,
Fruits

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

OTHER USES: Proposed potable water withdrawal from Matchaponix Brook; Freehold Raceway; Railroad right-of-way

LAKE LEFFERTS (5)

PUBLIC SURFACE ACRES: 69 NJDEP CLASS: TW1

pH RANGE: 4.3-6.63 SAMPLING DEPTH RANGE (m): 2.6-4.1

MAJOR FEEDER STREAMS: Matawan Creek, 2 unnamed tributaries

WATERSHED: Matawan Creek - Raritan Bay

PRE-QUARTENARY OUTCROP: Woodbury, Englishtown, Magothy

SOIL GROUPS: Klej-Keyport-Urban land; Atsion

PREDOMINANT TOWNS: Matawan (4047) Marlboro (797) Old Bridge (1345)
(1985 POP/SQ MILE)

LAND USE: Urban, Suburban MAJOR ROADS: Rt 34, Rt 516, Main St.

1984 AGRICULTURAL LAND USE: Field crops, Horses, Ornamentals,

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

OTHER USES: Proposed reservoir use for Matawan; Imperial Oil Superfund Site on Matawan Creek

LAKE MATAWAN (6)

PUBLIC SURFACE ACRES: 24 NJDEP CLASS: TW1

pH RANGE: 3.3 SAMPLING DEPTH RANGE (m): 3.9-5

MAJOR FEEDER STREAMS: Gravelly Brook

WATERSHED: Matawan Creek - Raritan Bay

PRE-QUARTENARY OUTCROP: Woodbury, Englishtown

SOIL GROUPS: Klej-Keyport-Urban land

PREDOMINANT TOWNS: Matawan (4047) Marlboro (797)
(1985 POP/SQ MILE)

LAND USE: Urban, Suburban MAJOR ROADS: Lloyd Rd, Rt 34, Main St

1984 AGRICULTURAL LAND USE: None reported

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

NOTE: Lake is acidified due to iron sulfide (pyrite) deposits in the basal Englishtown outcrop, and in the Keyport and Klej soils. Railroad in watershed.

TREASURE LAKE (7)

PUBLIC SURFACE ACRES: 8 NJDEP CLASS: TW1

pH RANGE: 7.5-7.7 SAMPLING DEPTH RANGE (m): ???????

MAJOR FEEDER STREAMS: None reported

WATERSHED: Raritan Bay

PRE-QUARTENARY OUTCROP: Magothy

SOIL GROUPS: Klej-Keyport-Urban land

PREDOMINANT TOWNS: Aberdeen (3425)
(1985 POP/SQ MILE)

LAND USE: Urban, Suburban MAJOR ROADS: development

1984 AGRICULTURAL LAND USE: None reported

SEPTIC SYSTEMS: No

SEWAGE TREATMENT PLANTS (mgd): No

NOTE: Salt marsh; fossilized insects in amber nodules have been found in the Magothy formation in bayside cliffs north of the lake.

NATCO LAKE (8)

PUBLIC SURFACE ACRES: 59.2 NJDEP CLASS: TW1

pH RANGE: 8.56 SAMPLING DEPTH RANGE (m): 1.6-2.6

MAJOR FEEDER STREAMS: None reported

WATERSHED: Raritan Bay

PRE-QUARTENARY OUTCROP: Merchantville, Woodbury

SOIL GROUPS: Klej-Keyport-Urban land; Sulfaquents-Sulfihemists-Hooksan

PREDOMINANT TOWNS: Union Beach (3683) Keansburg (11,347) Hazlet (4298)
(1985 POP/SQ MILE)

LAND USE: Urban MAJOR ROADS: Rt 36

1984 AGRICULTURAL LAND USE: None reported

SEPTIC SYSTEMS: No

SEWAGE TREATMENT PLANTS (mgd): No

NOTE: Tidal salt marsh; most northern pine barren island in Monmouth County. Next to International Flavors and Fragrances; railroad in watershed.

RISING SUN POND (9)

PUBLIC SURFACE ACRES: 38 NJDEP CLASS: FW2

pH RANGE: 6.82-7.07 SAMPLING DEPTH RANGE (m): 3.8-6.0

MAJOR FEEDER STREAMS: Chestnut Brook

WATERSHED: Assunpink Creek - Delaware R - Delaware Bay

PRE-QUARTENARY OUTCROP: Kirkwood, Red Bank/Tinton, Hornerstown

SOIL GROUPS: Freehold - Shrewsbury - Tinton.

PREDOMINANT TOWN: Millstone (118)
(1985 POP/SQ MILE)

LAND USE: State park, rural, agricultural MAJOR ROADS: Rt 571, Rt 524

1984 AGRICULTURAL LAND USE: Dairy cattle, nursery-greenhouse

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

NOTE: Wildlife Management area.

MILLHURST MILLS (10)

PRIVATE SURFACE ACRES: 22 NJDEP CLASS: FW2

pH RANGE: 6.3-8.25 SAMPLING DEPTH RANGE (m): 1.4-1.6

MAJOR FEEDER STREAMS: Manalapan Brook. Entire drainage area of Manalapan Brook is 19.04 square miles.

WATERSHED: Manalapan Brook - Raritan R - Raritan Bay

PRE-QUARTENARY OUTCROP: Red Bank, Navesink

SOIL GROUPS: Freehold - Urban Land - Collington

PREDOMINANT TOWN: Manalapan (773) Freehold Twp (569)
(1985 POP/SQ MILE)

LAND USE: Rural, agricultural MAJOR ROADS: Rt 537, Rt 527

1984 AGRICULTURAL LAND USE: Livestock, apples, blueberries

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

OTHER USES: Former Manalapan Mills lumbermill

LAKE TOPANEMUS (11)

PUBLIC SURFACE ACRES: 21 NJDEP CLASS: FW2

pH RANGE: 6.91-7.82 SAMPLING DEPTH RANGE (m): 2.1-2.5

MAJOR FEEDER STREAMS: McGelliards Brook. Entire drainage area of McGelliards Brook is 14.34 sq mi.

WATERSHED: McGelliards Brook - South R - Raritan R - Raritan Bay

PRE-QUARTENARY OUTCROP: Red Bank/Tinton

SOIL GROUPS: Tinton-Collington-Colts Neck

PREDOMINANT TOWNS: Freehold Twp (569)
(1985 POP/SQ MILE)

LAND USE: Suburban, urban, agricultural, Park

MAJOR ROADS: Rt 79, Robertsville Rd

1984 AGRICULTURAL LAND USE: Field crops

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

OTHER USES: Park

MARLU LAKE (12)

PUBLIC SURFACE ACRES: 20 NJDEP CLASS: FW2

pH RANGE: 7.34-7.35 SAMPLING DEPTH RANGE (m): 1.0

MAJOR FEEDER STREAMS: Borden's Brook

WATERSHED: Swimming River Reservoir - Navesink R - Shrewsbury R- Raritan Bay-Ocean

PRE-QUARTENARY OUTCROP: Red Bank/Tinton, Navesink

SOIL GROUPS: Freehold - Urban Land - Collington

PREDOMINANT TOWN: Holmdel (547) Middletown (1689)
(1985 POP/SQ MILE)

LAND USE: Park, rural-suburban, agricultural MAJOR ROADS: Rt 520

1984 AGRICULTURAL LAND USE: Vegetable, dairy cattle, ornamentals

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

OTHER USES: Thompson Park

SWIMMING RIVER RESERVOIR (13)

PRIVATE SURFACE ACRES: 535.6 NJDEP CLASS: FW2

pH RANGE: 8.36-8.38 SAMPLING DEPTH RANGE (m): 5.2-10.1

MAJOR FEEDER STREAMS: Willow Brook, Ramenessin Brook, Yellow Brook, Big Brook, Bucks Pond Brook. Entire drainage area of Swimming R: 51.37 sq mi

WATERSHED: Navesink R - Shrewsbury R - Raritan Bay - Ocean

PRE-QUARTENARY OUTCROP: Red Bank/Tinton, Navesink

SOIL GROUPS: Freehold-Urban Land-Collington; Tinton-Collington-Colts Neck

PREDOMINANT TOWNS: Middletown(1689); Holmdel(547); Colts Neck(263);
(1985 POP/SQ MILE) Marlboro(797)

LAND USE: Suburban-rural, agricultural MAJOR ROADS: Rt 520, Rt 537, Rt 34

1984 AGRICULTURAL LAND USE: Horse, Beef cattle, Dairy cattle, Field crops, Nursery-greenhouse, Potatoes, Apples

SEPTIC SYSTEMS: all towns

SEWAGE TREATMENT PLANTS (mgd): Holmdel - AT&T(.1); Prudential(.045); Village School(.01); Penwalt(.086); Holmdel Convalescent(.025). Colts Neck - Remington's Cafe(.028); Colts Neck Inn(.006); NWS Earle(.374). Marlboro - Marlboro State Hospital(1).

OTHER USES: NJ American Water Co.; NWS Earle road and railroad; Hominey Hill Golf Course; Brookdale Community College

SHADOW LAKE (14)

PRIVATE SURFACE ACRES: 89 NJDEP CLASS: TW1

pH RANGE: 7.2-7.3 SAMPLING DEPTH RANGE (m): 1.8-3.6

MAJOR FEEDER STREAMS: Crooked Run, Nut Swamp, Jumping Brook

WATERSHED: Navesink R - Shrewsbury R - Raritan Bay - Ocean

PRE-QUARTENARY OUTCROP: Red Bank/Tinton, Navesink

SOIL GROUPS: Freehold - Urban Land - Collington

PREDOMINANT TOWN: Middletown (1689)
(1985 POP/SQ MILE)

LAND USE: Suburban MAJOR ROADS: Rt 50, Parkway, W.Front St

1984 AGRICULTURAL LAND USE: Ornamentals

SEPTIC SYSTEMS: No

SEWAGE TREATMENT PLANTS (mgd): No

OTHER USES: Bamm Hollow Golf Course, Bell Labs, NWS Earle road, railroad in watershed. Shadow Lake condominiums built by lake.

WAMPUM LAKE (15)

PUBLIC SURFACE ACRES: 6 NJDEP CLASS: TW1

pH RANGE: 6.92-7.38 SAMPLING DEPTH RANGE (m): 1.9-2.1

MAJOR FEEDER STREAMS: Wampum Brook, Mill Brook

WATERSHED: Wampum Brook - Shrewsbury R - Raritan Bay - Ocean

PRE-QUARTENARY OUTCROP: Hornserstown

SOIL GROUPS: Freehold - Urban Land - Holmdel

PREDOMINANT TOWN: Eatontown (2341) Shrewsbury Twp (12,167) Shrewsbury Boro (1985 POP/SQ MILE) (1354)

LAND USE: Urban, Ft Monmouth MAJOR ROADS: Rt 537, Rt 51

1984 AGRICULTURAL LAND USE: None reported

SEPTIC SYSTEMS: No

SEWAGE TREATMENT PLANTS (mgd): Mid Monmouth Industrial Park, T. Falls (.025)

OTHER USES: Ft. Monmouth Golf Course, railroad in watershed.

TURKEY SWAMP LAKE (16)

PUBLIC SURFACE ACRES: 18 NJDEP CLASS: FW2

pH RANGE: 7.74-8.39 SAMPLING DEPTH RANGE (m): 1.6-2.6

MAJOR FEEDER STREAMS: None reported

WATERSHED: Manasquan R - Ocean

PRE-QUARTENARY OUTCROP: Kirkwood, Hornerstown, Vincentown

SOIL GROUPS: Tinton - Collington - Colts Neck; Atsion

PREDOMINANT TOWN: Freehold Twp (569) (1985 POP/SQ MILE)

LAND USE: Turkey Swamp Parks (county and state) MAJOR ROADS: Georgia Rd

1984 AGRICULTURAL LAND USE: None reported

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

NOTE: The county park has a sphagnum swamp; 9000 year old Lenape (Delaware) Indian campsite and archeological dig.

ALDRICH LAKE (17)

PUBLIC SURFACE ACRES: 12 NJDEP CLASS: FW2

pH RANGE: 6.9 SAMPLING DEPTH RANGE (m): 1.3

MAJOR FEEDER STREAMS: Dace Creek, Snipe Creek, Plover Brook, Weasel Creek

WATERSHED: Metedeconck R - Barnegat Bay - Ocean

PRE-QUARTENARY OUTCROP: Kirkwood

SOIL GROUPS: Lakewood-Lakehurst-Evesboro-Klej

PREDOMINANT TOWN: Howell(487)
(1985 POP/SQ MILE)

LAND USE: Urban-suburban; commercial MAJOR ROADS: Rt 9, Rt 195, Aldrich Rd

1984 AGRICULTURAL LAND USE: Horse, Field crops,

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

ECHO LAKE (18)

PUBLIC SURFACE ACRES: 4 NJDEP CLASS: FW2

pH RANGE: 5.9-6.1 SAMPLING DEPTH RANGE (m): 1-3.3

MAJOR FEEDER STREAMS: Polypod Brook, Doris Av. Brook

WATERSHED: Haystack Brook - Metedeconck R - Barnegat Bay - Ocean

PRE-QUARTENARY OUTCROP: Cohansey, Kirkwood

SOIL GROUPS: Atison; Lakewood - Lakehurst - Evesboro - Klej

PREDOMINANT TOWN: Howell (487)
(1985 POP/SQ MILE)

LAND USE: suburban, rural, agricultural MAJOR ROADS: Doris Av.

1984 AGRICULTURAL LAND USE: unknown, poultry

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): No

ALLAIRE/BRISBANE LAKE (19)

PUBLIC SURFACE ACRES: 10.7 NJDEP CLASS: FW2

pH RANGE: 6.02-6.95 SAMPLING DEPTH RANGE (m): 1.7-3

MAJOR FEEDER STREAMS: Mill Run

WATERSHED: Manasquan R - Ocean

PRE-QUARTENARY OUTCROP: Kirkwood, Cohansey

SOIL GROUPS: Sassafras-Downer-Woodstown

PREDOMINANT TOWN: Wall(659)
(1985 POP/SQ MILE)

LAND USE: Allaire State Park, AB Child Treatment Center ROADS: Rt 195

1984 AGRICULTURAL LAND USE: NO

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd): Arthur Brisbane Child Treatment Center(.016)

OSBORNE/TRIMMERS LAKE (20)

PRIVATE SURFACE ACRES: 19 NJDEP CLASS: FW3

pH RANGE: 6.61-6.72 SAMPLING DEPTH RANGE (m): 1.5-1.6

MAJOR FEEDER STREAMS: Wreck Pond Brook. Entire area of Wreck Pond Brook is 7.83 square miles.

WATERSHED: Wreck Pond Brook - Wreck Pond - Ocean

PRE-QUARTENARY OUTCROP: Kirkwood

SOIL GROUPS: Sassafras-Downer-Woodstown

PREDOMINANT TOWN: Wall(659)
(1985 POP/SQ MILE)

LAND USE: Rural, suburban agricultural

MAJOR ROADS: Rt 18, Rt 38, 18th Av, Parkway, Rt 34

1984 AGRICULTURAL LAND USE: Field crops, horses, apples, ornamentals

SEPTIC SYSTEMS: Yes

SEWAGE TREATMENT PLANTS (mgd):

NOTE: One of five interconnected lakes and ponds that drain into Wreck Pond

APPENDIX C: SITES

LAKE: ALLENTOWN TOWN: ALLENTOWN
STATION 1 54 LAKEVIEW DR
STATION 2 MIDDLE OF PARK ACROSS FROM 38 LAKEVIEW DR

LAKE: ASSUNPINK TOWN: MILLSTONE
STATION 1 2250 FT FROM CHESTNUT BROOK INLET
STATION 2 2250 FT FROM OUTLET ALIGNED WITH BOAT ACCESS PARKING LOT

LAKE: PERRINEVILLE TOWN: MILLSTONE
STATION 1 1150 FT SE OF OUTLET AT PERRINEVILLE RD
STATION 2 500 FT SE OF OUTLET AT PERRINEVILLE RD

LAKE: WEAMACONK TOWN: ENGLISHTOWN
STATION 1 25 PARK AV
STATION 2 4 PARK AV

LAKE: LEFFERTS TOWN: MATAWAN
STATION 1 1750 FT FROM INLET BETWEEN RT 34 & NEW BRUNSWICK AV
STATION 2 1750 FT FROM OUTLET BETWEEN RT 34 & RAVINE

LAKE: MATAWAN TOWN: MATAWAN
STATION 1 75 BROAD ST
STATION 2 14 JOHNSON AV

LAKE: TREASURE TOWN: CLIFFWOOD BEACH
STATION 1 81 WAYSIDE DR
STATION 2 44 WEST CONCOURSE

LAKE: NATCO TOWN: UNION BEACH
STATION 1 450 FT N OF INLET AT RT 36
STATION 2 600 FT W OF OUTLET-THORNE CREEK

LAKE: RISING SUN TOWN: MILLSTONE
STATION 1 700 FT SE OF INLET
STATION 2 700 FT SE OF OUTLET

LAKE: MILLHURST MILLS TOWN: MANALAPAN
STATION 1 800 FT FROM STREAM INLET PARRALLEL WITH BIRD WATCHER HUT
ADJACENT TO COMMUNITY PARK
STATION 2 500 FT S OF SWEETMAN LANE-OUTLET

LAKE: TOPANEMUS TOWN: FREEHOLD
STATION 1 85 TOPANEMUS LANE (SOUTH BANK ADDRESS)
STATION 2 209 POND RD (SOUTH BANK ADDRESS)

LAKE: MARLU TOWN: MIDDLETOWN
STATION 1 700 FT S OF INLET (JUST S OF NEWMANS SPRING RD)
STATION 2 700 FT N OF BOAT ACCESS IN PARK

LAKE: SWIMMING RIVER TOWN: MIDDLETOWN
STATION 1 20 HORSESHOE COURT COLTS NECK NORTH BRANCH OF RESEVOIR.OJ OFF
.OJ OFF
STATION 2 NORMANDY & LAKESIDE AVE. COLTS NECK SOUTH BRANCH OF RESEVOIR

LAKE: SHADOW

TOWN: MIDDLETOWN

STATION 1 1980 FT W OF INLET STEAMS JUMPING BK & CROOKED RUN, 200 FT W
OF PROPERTY FENCE IN LAKE

STATION 2 1470 FT W OF HUBBARD AV ADJACENT TO LOADING DOCK

LAKE: WAMPUM

TOWN: EATONTOWN

STATION 1 74 TINTON AV

STATION 2 5 LAKE AV

LAKE: TURKEY SWAMP

TOWN: FREEHOLD

STATION 1 550 FT FROM INLETS ON A NS DIAGONAL ACCROSS LAKE

STATION 2 550 FT FROM OUTLET ON A NS DIAGONAL ACCROSS LAKE

LAKE: ALDRICH

TOWN: HOWELL

STATION 1 10 BOCK BLVD

STATION 2 2 BOCK BLVD

LAKE: ECHO

TOWN: HOWELL

STATION 1 150 FT FROM INLET-450 FT W OF MAXUM SOUTHARD RD

STATION 2 150 FT W OF MAXUM SOUTHARD RD

LAKE: ALLAIRE-BRISBANE

TOWN: WALL

STATION 1 1200 FT N OF RT 524

STATION 2 400 FT N OF MILL RUN CREEK OUTLET ON RT 24

LAKE: OSBORNE-TRIMMERS

TOWN: WALL

STATION 1 1905 BARBEE LANE

STATION 2 425 FT N OF ALLAIRE RD

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