



Hamilton Township (Mercer County)
Stormwater Outfall Assessment Summary
Addendum (Year 2)

Developed by the Rutgers Cooperative Extension Water Resources Program
Funded by Hamilton Township, Mercer County, New Jersey
December 2017

Acknowledgements

The Hamilton Township (Mercer County) Stormwater Outfall Assessment has been produced by the **Rutgers Cooperative Extension (RCE) Water Resources Program**. The principal authors were **Jeremiah Bergstrom, LLA, ASLA**, Senior Research Project Manager; **Matthew Leconey**, Program Associate; and **Elizabeth Pyshnik**, Program Associate. Field work for the assessments was conducted by the RCE Water Resources Program interns **Tianshui Yu, Gerardo Quiles, and William Lin**.

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Introduction

Hamilton Township, located in Mercer County, New Jersey, maintains over 400 stormwater outfalls that drain directly into waterways. This document is a summary of the outfall pipe inspection program conducted in 2017. The purpose of the program is to provide a baseline assessment of existing conditions related to stream scouring at stormwater outfall discharge locations in streams and waterways. This assessment evaluates the physical condition of outfall structures, erosion caused by the outfalls, structural integrity, and other factors.

The outfalls assessed are in addition to the previous assessment conducted in 2015. It was not the intent of this program to be a complete and comprehensive inventory of all stormwater outfalls in the MS4 system. All efforts for this project were for the purpose of mapping and inventorying outfall pipes that discharge directly to mapped streams.

The assessments were performed in August 2017 by the Rutgers Cooperative Extension (RCE) Water Resources Program.

Methods and Procedures

A multi-part approach was taken to assess stormwater outfalls that discharge directly to waterways in Hamilton Township. A geographic information system (GIS) was created to visualize the location of mapped outfall locations. A GIS data layer was created to be compatible with the ESRI Collector Application. The Collector Application software was used to develop a mobile assessment tool that could record information collected in the field using hand-held tablet computers. Field staff then used the tablet computers and ESRI Collector Application software to photograph, record data, and geotag the location of each stormwater outfall assessed. RCE Water Resources Program staff visited and assessed accessible stormwater outfalls mapped by the GIS and Collector Application software. A total of 57 outfalls were located and assessed in 2017. This is in addition to the 261 outfalls assessed in 2015. Information about the condition, material, diameter, and other factors was recorded for each assessed outfall.

A maintenance prioritization was developed using the field data collected for the 57 stormwater outfalls. Priority was given to outfalls that showed significant signs of deterioration, were causing downstream erosion, were unstable due to erosion, or showed signs of illicit connections. Consideration was also given to the amount of vegetation growth in and around the outfall, quantity of sediment deposits, areas of known commercial or industrial uses, and other factors.

Summary of Key Findings

The following conclusions were formed after reviewing data for the 57 outfalls assessed. A total of 11% of assessed outfalls were designated as high priority locations in need of maintenance, 23% were designated as medium priority, and 66% were designated as low maintenance priority sites. Approximately 33% of outfalls were found to be showing signs of significant deterioration. An estimated 32% of the outfalls were found to be causing downstream erosion, and 18% of outfalls

were noted to be unstable due to erosion. Information about each outfall assessed can be found in the Tabular Data section of this document. Summary maps of this information can be found in the Summary Maps section.

Description of Summary Maps

A series of four summary maps were created illustrating the key findings noted above. These maps include, “Outfall Maintenance Prioritization”. This map represents a prioritization for maintenance of stormwater outfalls. Higher priority was given to damaged outfalls, outfalls that are causing erosion, outfalls that are unstable due to erosion, areas with floatables, and unknown sources of odors. The “Outfall Pipe Condition” map identifies outfall structures with visible cracking, spalling, corrosion, and peeling. There were 19 stormwater outfalls identified as having a degraded physical condition. The “Downstream Erosion” map represents outfall locations where downstream erosion was noted due to the outfall discharge. There are a total of 18 outfalls identified to be causing downstream erosion. The final summary map, “Outfall Stability,” identifies those outfalls that are unstable due to erosion in and around the outfall structure. There are 10 outfalls that have been identified as having questionable overall outfall structural stability.

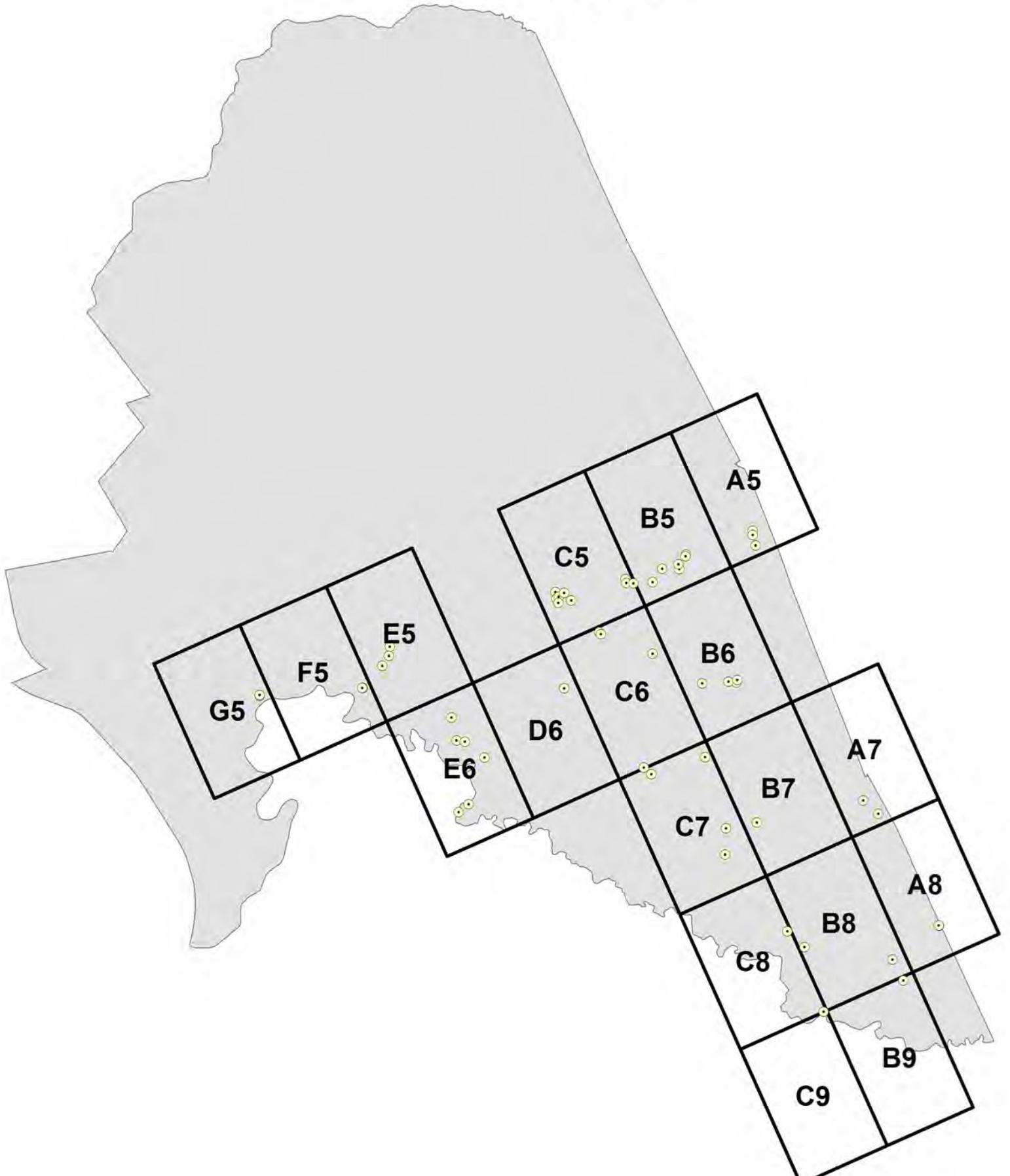
Recommendations

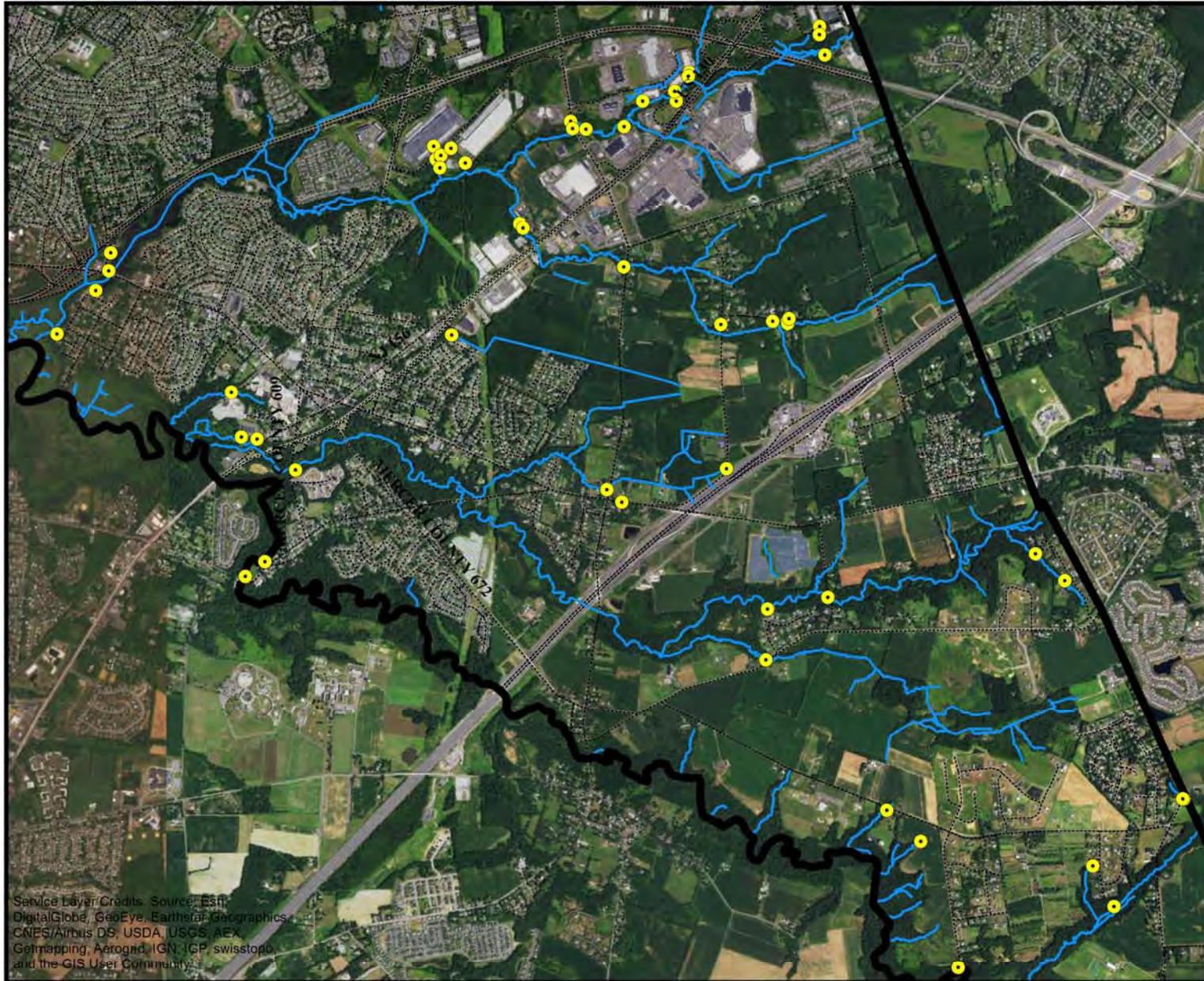
Based on the assessment and summary findings, preliminary recommendations for remediation and maintenance include the following:

1. The six (6) outfalls identified as high priority for maintenance should be visited by Township personnel, and a plan and schedule should be developed to take necessary corrective actions as soon as possible.
2. A complete maintenance plan and schedule should be developed for all stormwater outfalls to address the deficiencies noted in this assessment in a timely manner.

This assessment was not intended to be a complete and comprehensive inventory of all stormwater outfalls in the MS4 system. Efforts for this project focused solely on mapping and inventorying known outfall pipes discharging directly to mapped streams. Other outfalls in the MS4 system exist and may need to be investigated at a later time.

Hamilton Outfall Assessment Grid Index



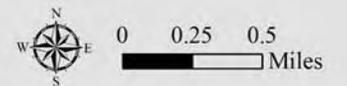


Service Layer Credits. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Hamilton

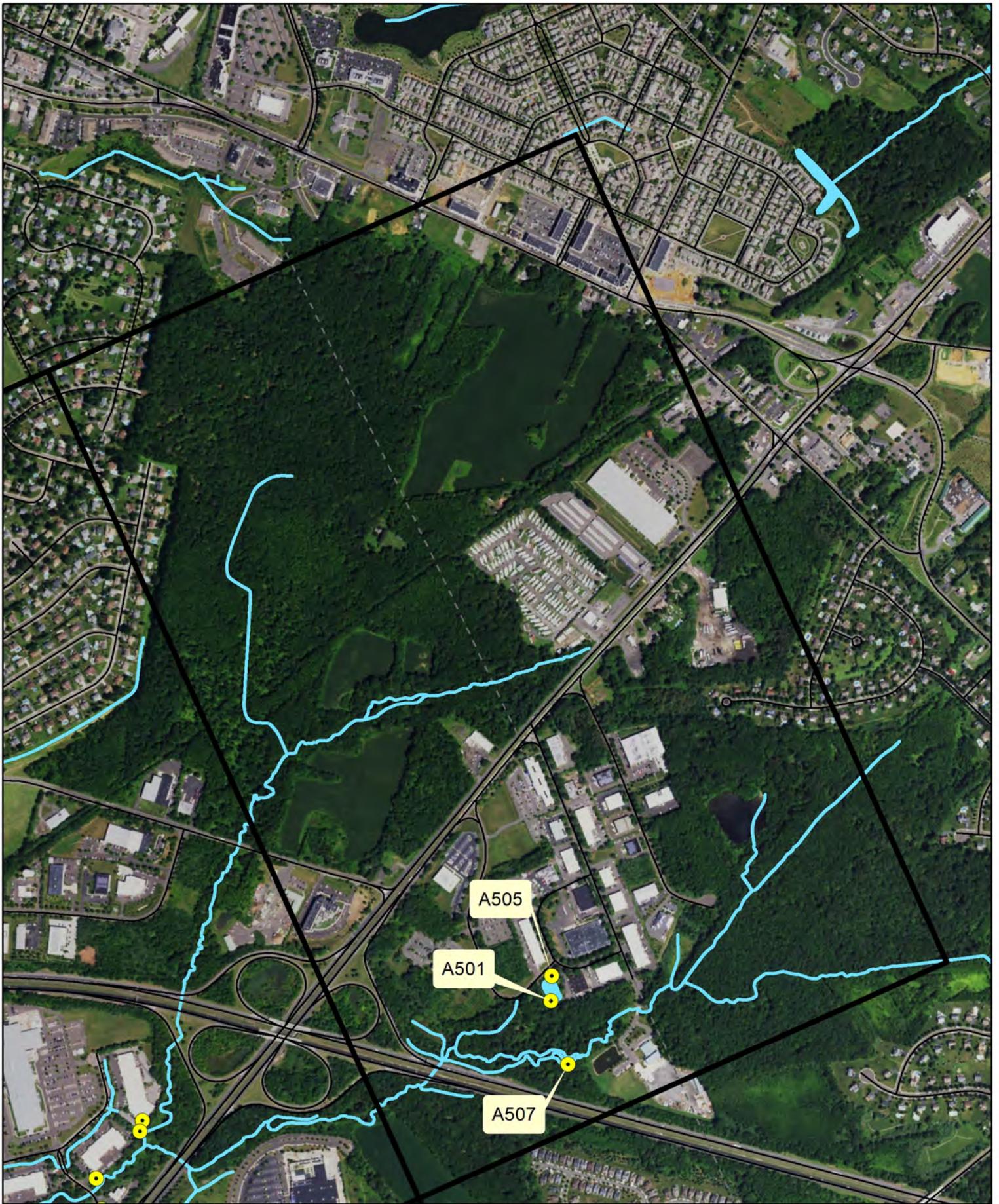
Assessed Stormwater Outfalls

-  Hamilton
 -  Stream
 -  Road
 -  Assessed Outfall
- Outfalls Assessed: 57



Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



Grid ID: A5

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



0 500 1,000 Feet

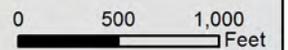
Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



Grid ID: A7

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program
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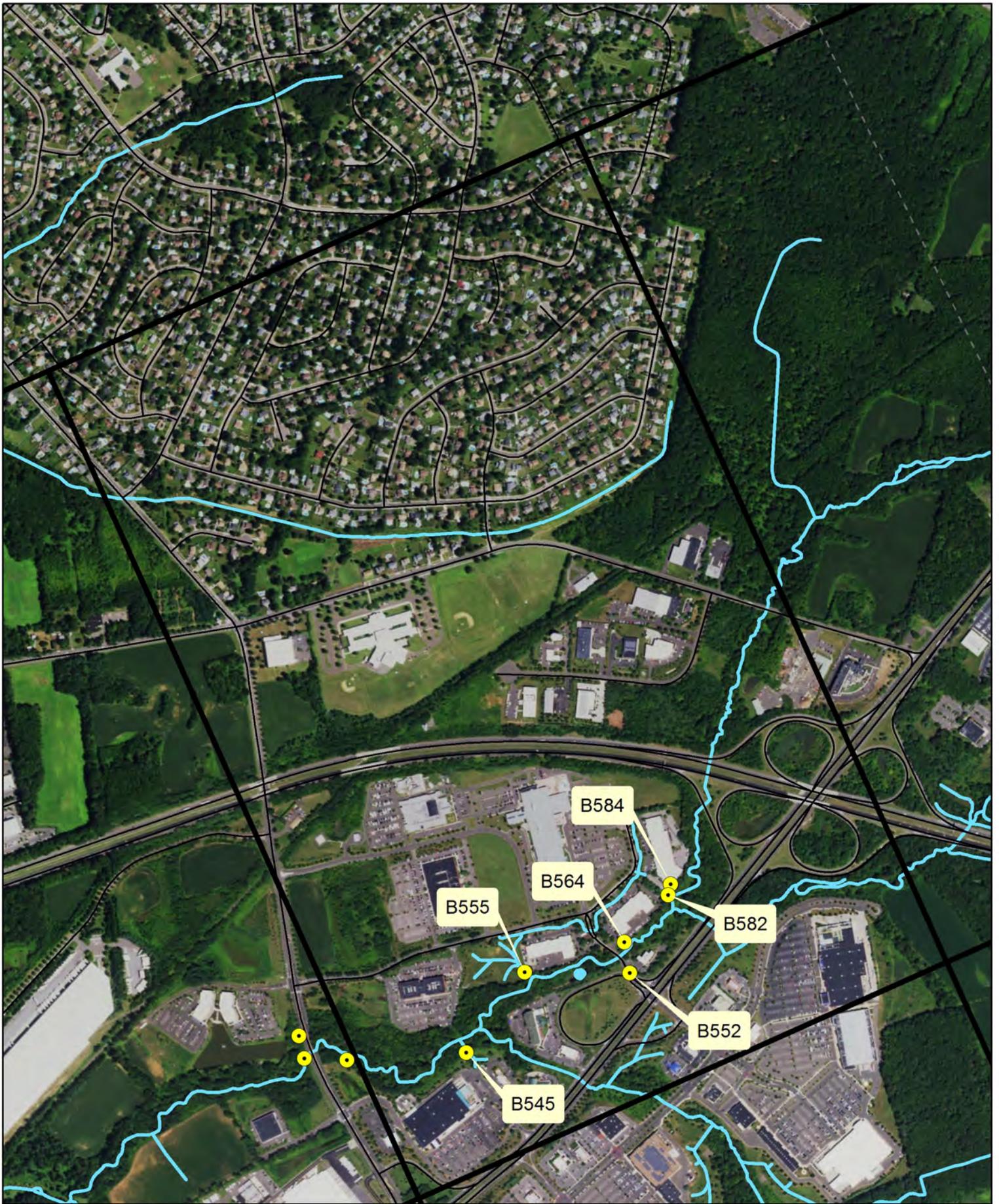
Grid ID: A8

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



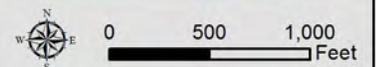
0 500 1,000 Feet

Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program
 This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



Grid ID: B5

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



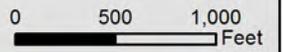
Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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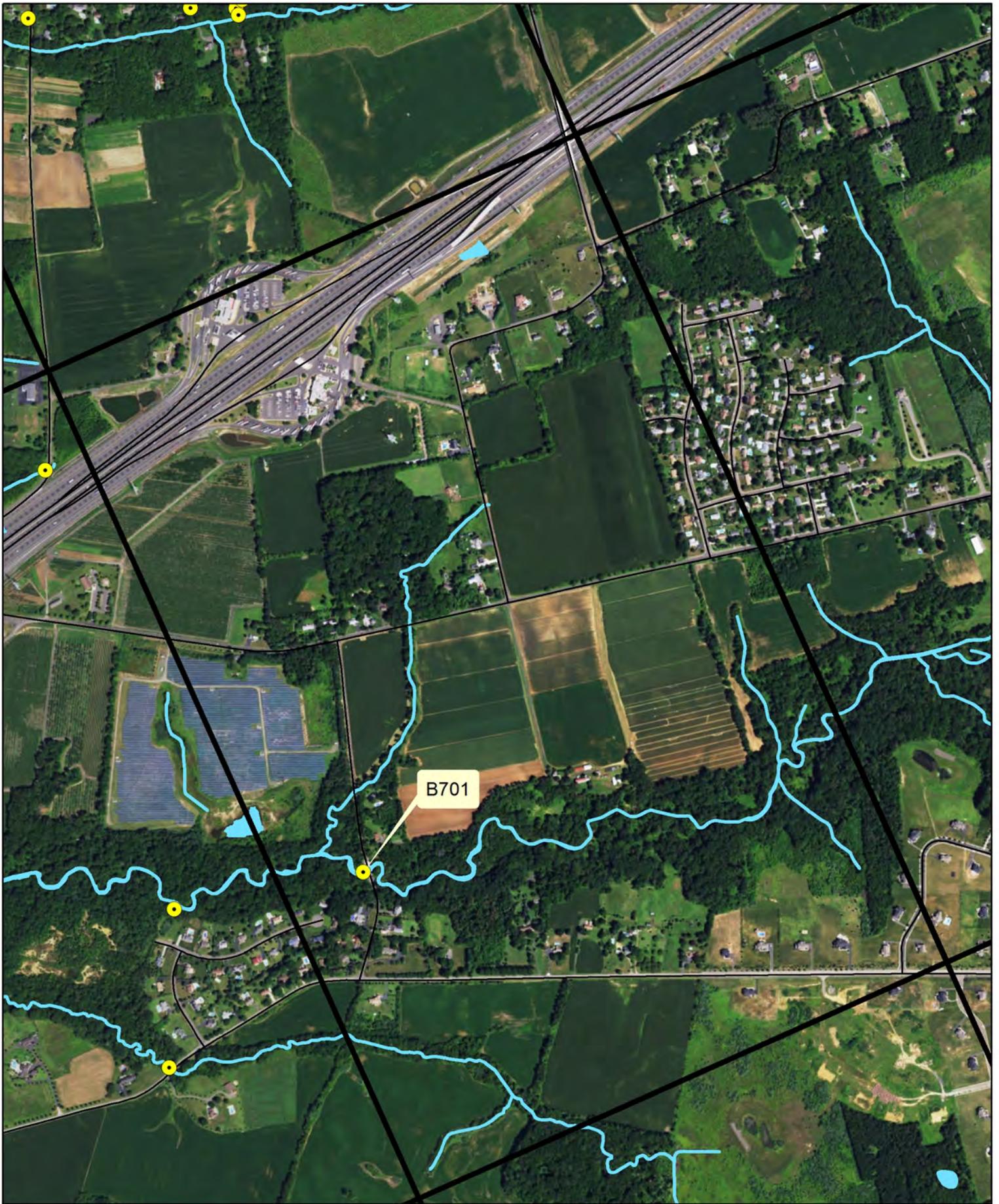
Grid ID: B6

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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Grid ID: B7

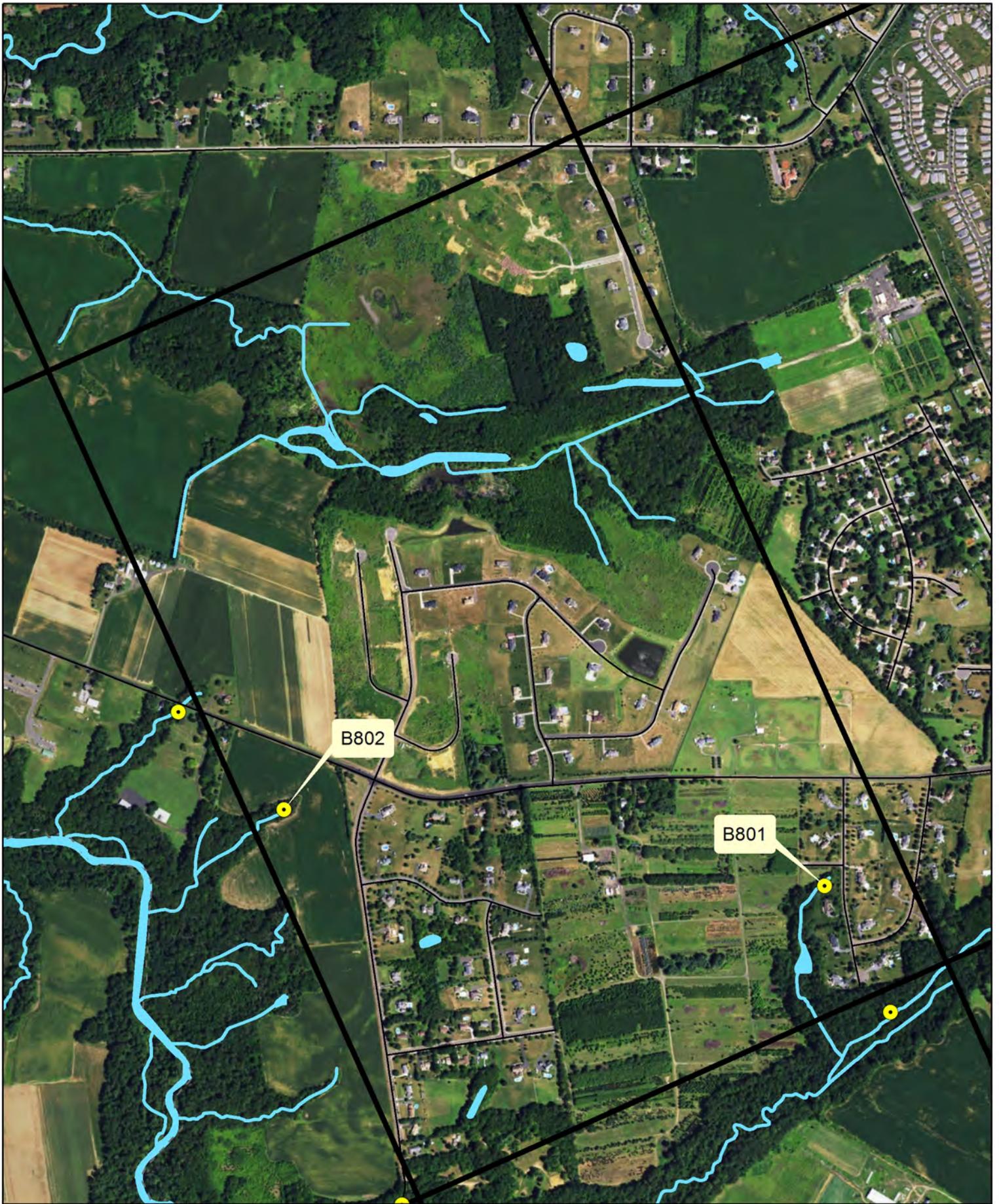
- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



0 500 1,000 Feet

Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



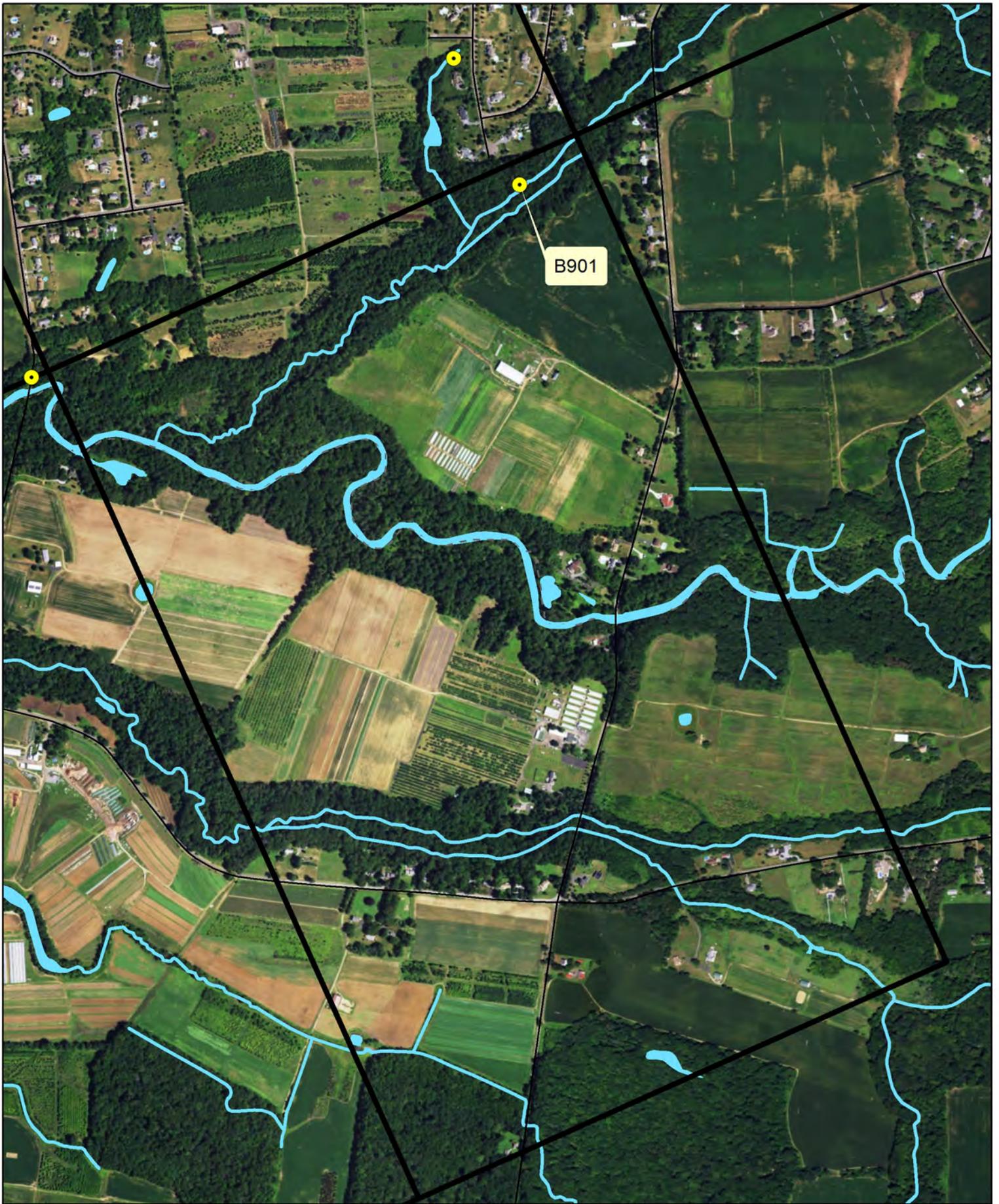
Grid ID: B8

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



Grid ID: B9

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



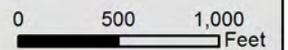
Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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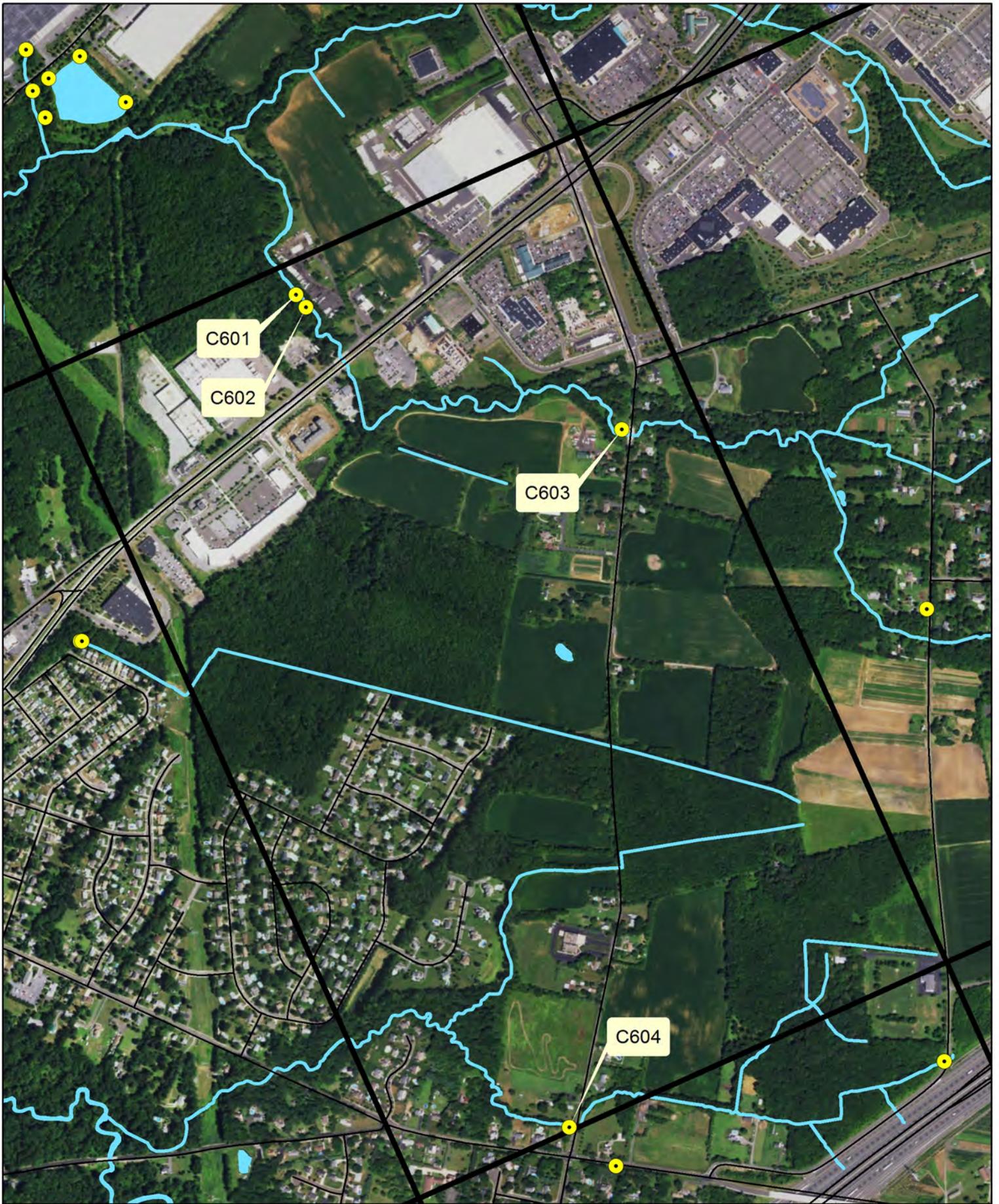
Grid ID: C5

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



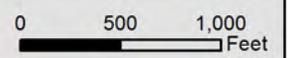
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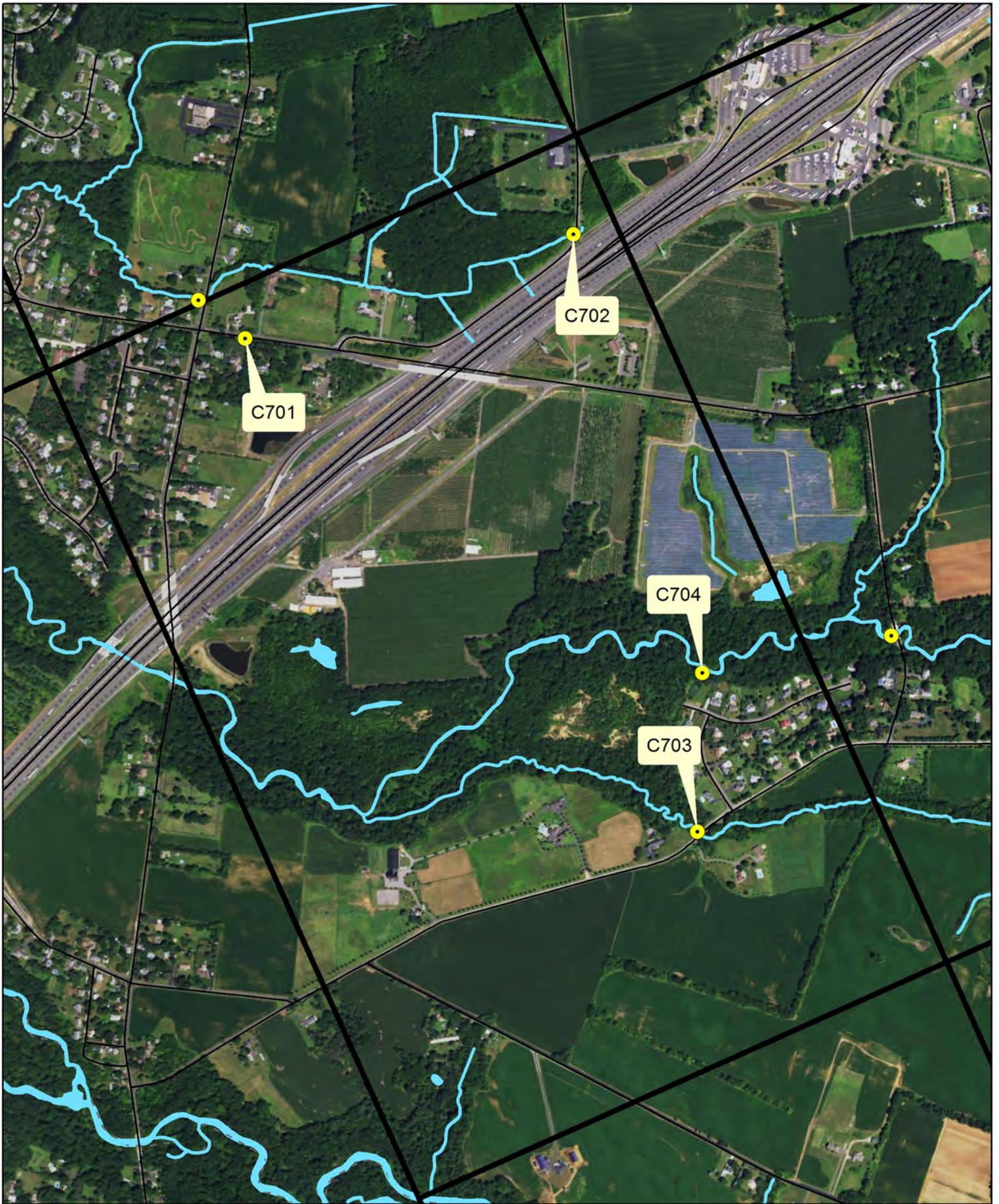
Grid ID: C6

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



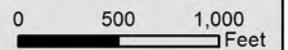
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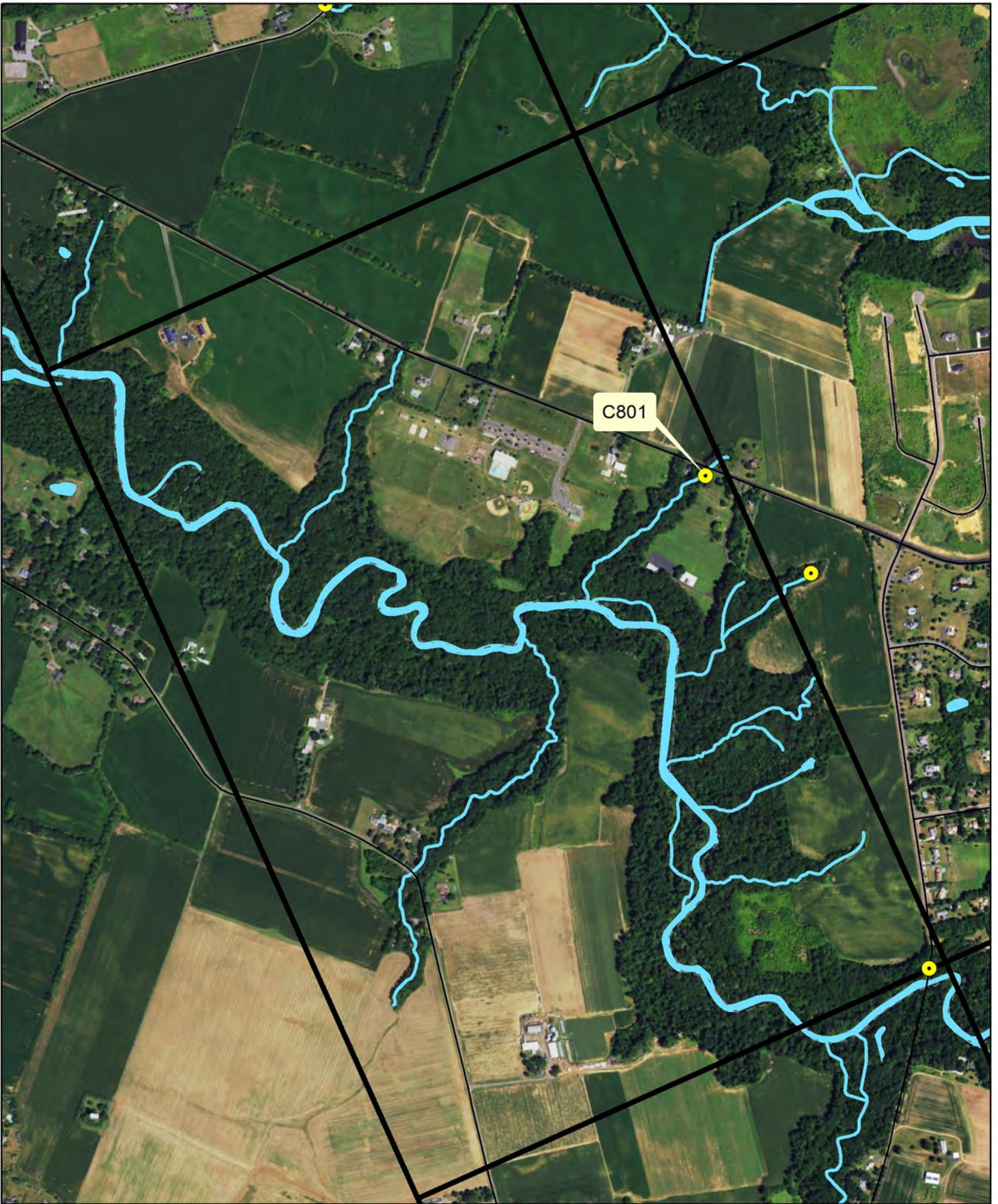
Grid ID: C7

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



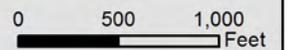
Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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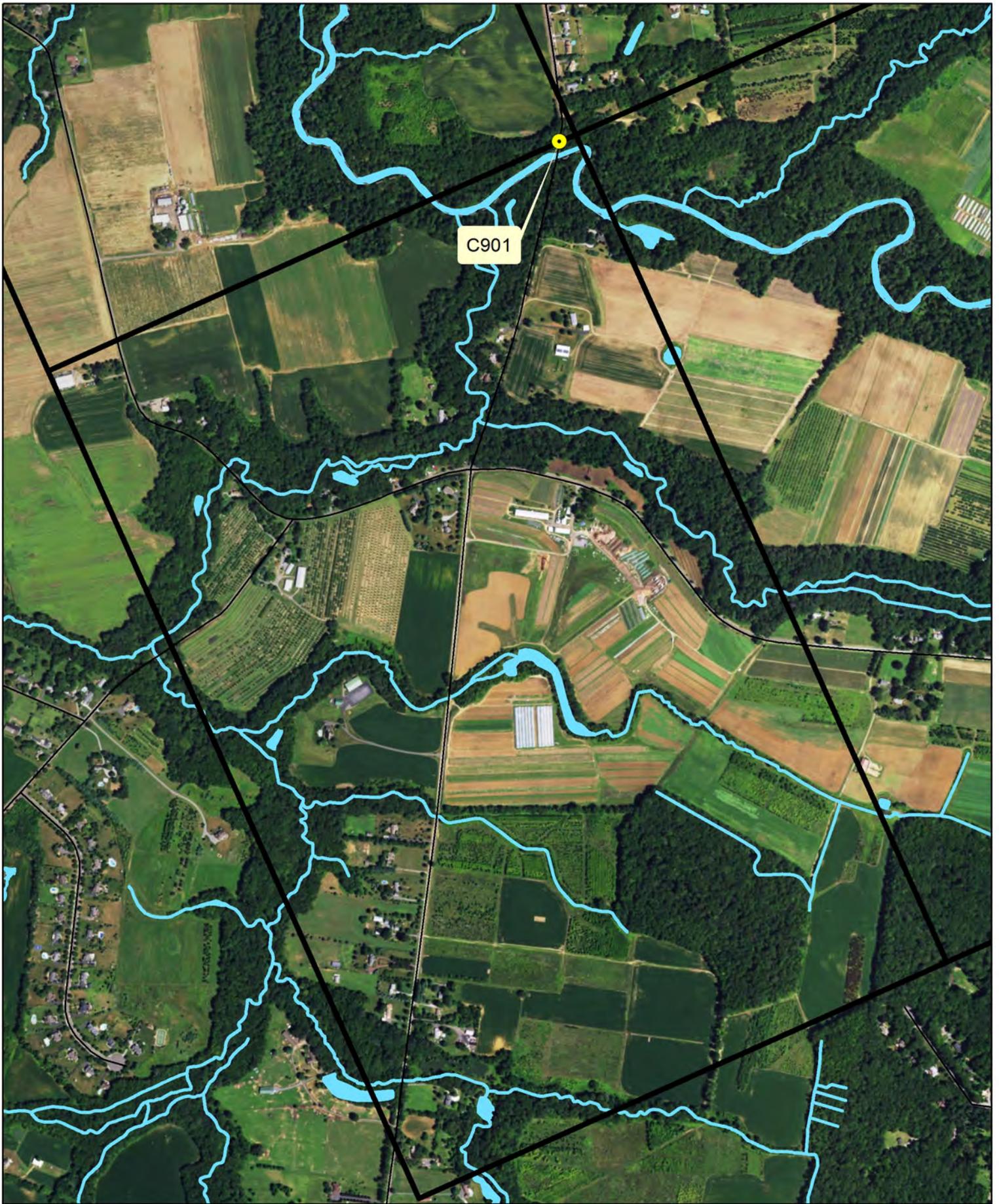


Grid ID: C8

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road

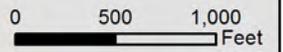


Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program
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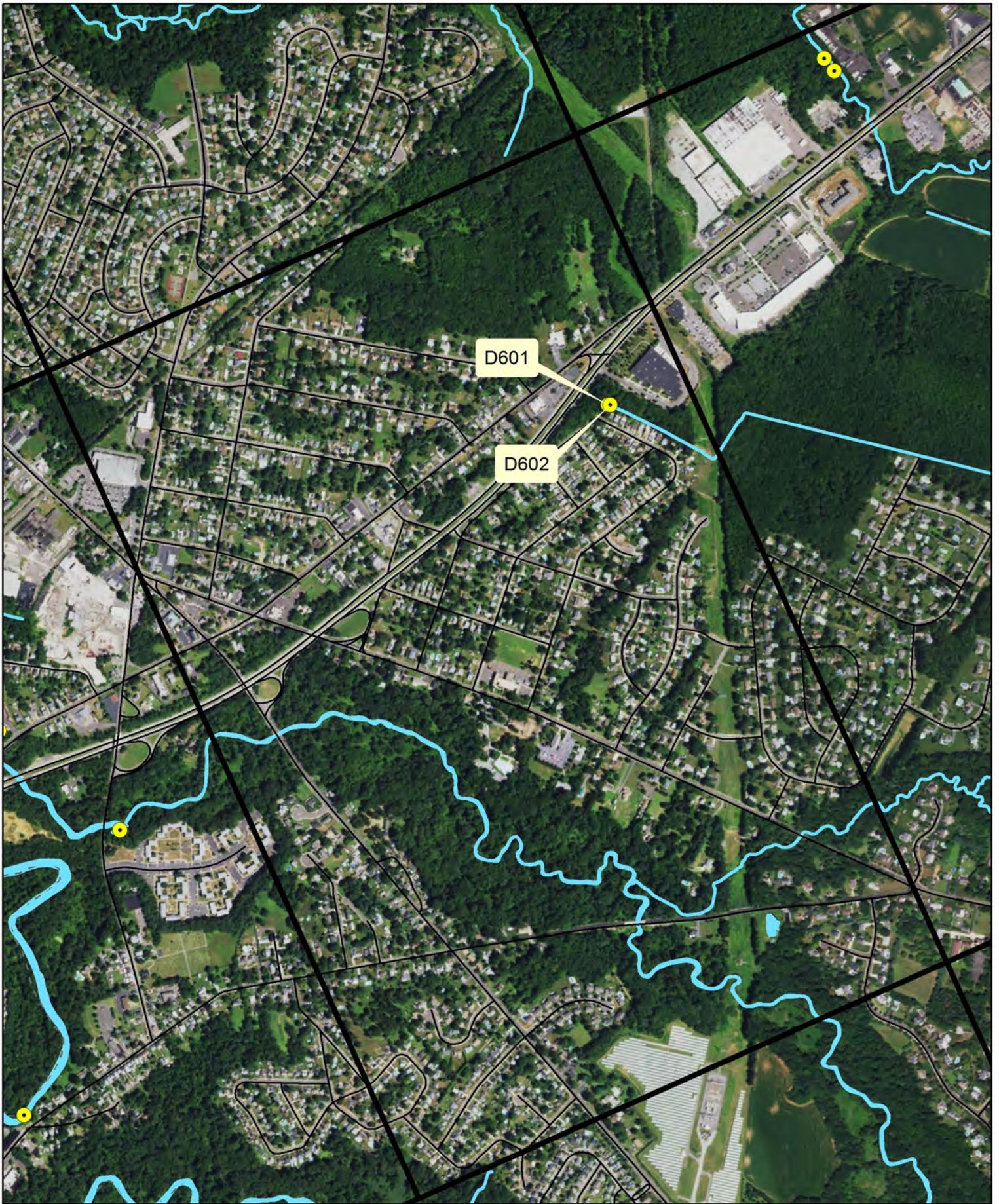
Grid ID: C9

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



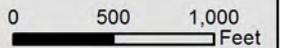
Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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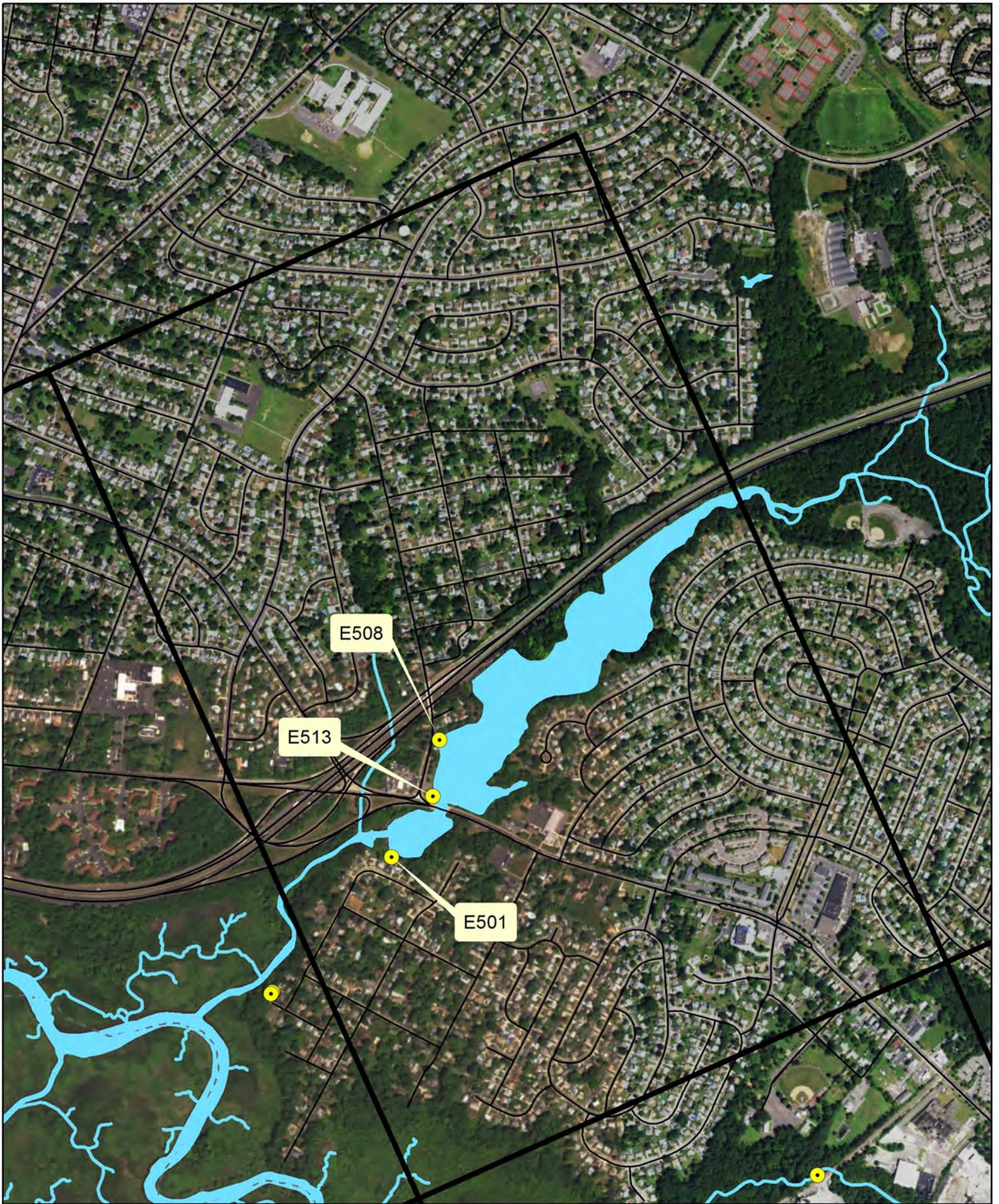


Grid ID: D6

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road

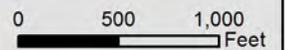


Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program
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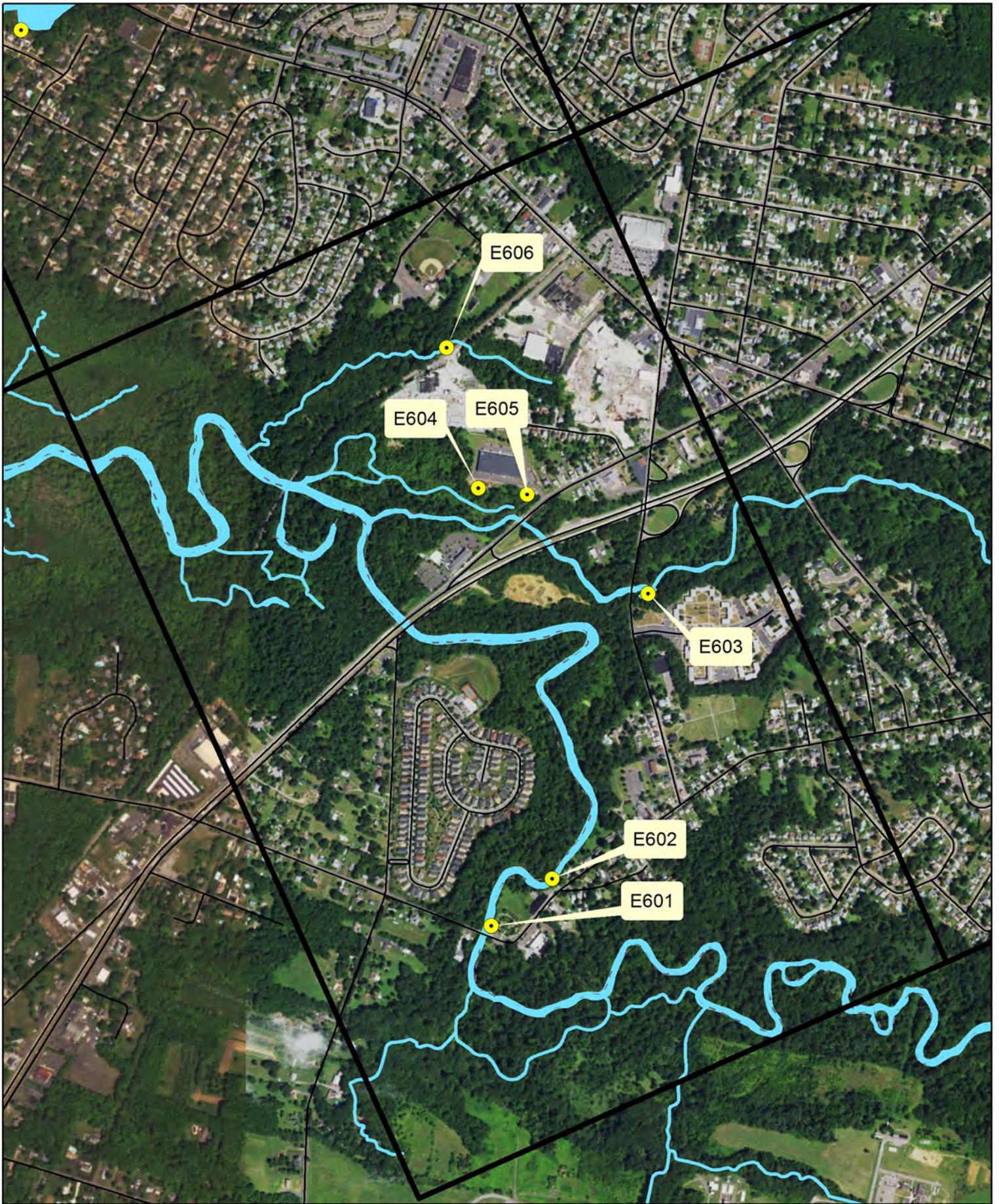
Grid ID: E5

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



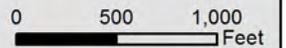
Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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Grid ID: E6

- Stormwater Outfall
- Municipal Border
- Grids
- Waterbody
- Road



Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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Grid ID: F5

- Stormwater Outfall
- - - Municipal Border
- ▭ Grids
- Waterbody
- Road



0 500 1,000 Feet

Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

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Grid ID: G5

-  Stormwater Outfall
-  Municipal Border
-  Grids
-  Waterbody
-  Road



0 500 1,000 Feet

Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program
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GENERAL INFORMATION		Site ID:
Name(s) person inspecting the outfall:		Date:
Location Address and Cross Streets:	Watershed:	
Name of Creek, Stream, or area into which the outfall discharges:	Property Owner / Tax Parcel Block & Lot:	
Contact information:		
STRUCTURAL COMPONENTS		
Outfall description:	Is the outfall accessible to maintain? Yes / No	
Outfall Material:	Is it maintained: Mowed, clear of woody plants, blockages?	
Weather over past 24 Hours:	Outlet diameter:	

GENERAL OBSERVATIONS	YES	NO	NOTES/REMARKS
1) Any reports on the outlet not functioning?			
2) Are there any unauthorized or malfunctioning structures connected to the outfall?			



OUTLET	YES	NO	NOTES/REMARKS
1) Known industrial or commercial uses in drainage area?			
2) Odor? (Sewage, Sulfide, Oil, Gas, Rancid or Sour, Other)			
3) Color? (None, Yellow, Brown, Green, Gray)			
4) Turbidity? (Clear, Cloudy, Opaque)			
5) Floatables? (Petroleum Slick, Raw Sewage, Trash)			
6) Deposits? (Sediment, Oil, Other)			
7) Vegetation? (Normal, Excessive, Inhibited)			
8) Outfall Pipe Condition? (No Damages, Cracking, Spalling, Corrosion, Peeling Paint)			
9) Has Erosion Undermined the stability of the outfall?			
10) Extent of Erosion Damage in square feet? (None, Under 100, Between 100 and 500, Over 500)			

SUMMARY AND NOTES: Identify unique characteristics and/or opportunities

Outfall ID	Diameter in Inches	Weather over past 24 hours?	Priority	Pipe Material	Known industrial or commercial uses in drainage area	Odor	Color	Turbidity	Floatables	Deposits	Vegetation	Outfall pipe condition	Has erosion undermined the stability of the outfall?	Extent of erosion damage in square feet
A501	16	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	None	Excessive	Cracking	No	Under 100
A505	32	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
A507	24	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	None
A701	38	Cloudy	Low	Concrete	Uknown	None	Red/Orange	Cloudy	None	None	Normal	Cracking	No	Under 100
A702	15	Cloudy	Low	Concrete	Uknown	None	Brown	Clear	None	None	Normal	Normal	No	Under 100
A801	24	Sunny	Low	Concrete	Uknown	None	Brown	Clear	None	None	Excessive	Normal	No	Under 100
A802	21	Sunny	High	Concrete	Uknown	None	Brown	Clear	None	None	Normal	Normal	Yes	Under 100
B545	38	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	Petroleum slick	Sediment	Normal	Normal	No	Under 100
B552	5	Sunny	Low	Clay	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Cracking	No	None
B555	52	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	None	Excessive	Normal	No	Under 100
B564	22	Sunny	Low	Concrete	Uknown	None	No Water	No Water	None	Sediment	Excessive	Normal	No	Under 100
B582	16	Sunny	Low	Concrete	Uknown	None	No Water	No Water	Trash	None	Excessive	Normal	No	None
B584	18	Sunny	Low	Concrete	Uknown	None	Gray	Cloudy	Trash	Sediment	Excessive	Normal	No	None
B609	16	Sunny	Low	Metal	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
B610	16	Sunny	Medium	Metal	Uknown	None	Brown	Opaque	None	None	Excessive	Corroding	No	Under 100
B611	0	Sunny	Medium	Concrete	Uknown	None	No Water	No Water	None	Sediment	Excessive	Spalling	Yes	Under 100
B615	0	Sunny	Low	Metal	Uknown	None	No Water	No Water	None	Sediment	Inhibited	Corroding	No	Under 100
B616	18	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	Trash	Sediment	Normal	Normal	No	Under 100
B701	15	Cloudy	Low	Concrete	Uknown	None	Brown	Clear	None	None	Normal	Normal	No	Under 100
B801	32	Sunny	Medium	Concrete	Uknown	None	Brown	Clear	None	Sediment	Normal	Normal	No	Under 100
B802	0	Sunny	Low	Concrete	Uknown	None	Brown	Clear	Trash	None	Excessive	Spalling	Yes	Under 100
B901	12	Sunny	Medium	Concrete	Uknown	None	No Water	No Water	None	None	Excessive	Normal	No	Under 100
C502	0	Sunny	Medium	Concrete	Uknown	None	Brown	Cloudy	Trash	None	Excessive	Normal	No	Under 100
C506	48	Sunny	Medium	Concrete	Uknown	None	Brown	Cloudy	Trash	Sediment	Excessive	Normal	No	Under 100
C510	55	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	Trash	Sediment	Normal	Spalling	No	Under 100
C515	44	Sunny	Low	Concrete	Uknown	None	Brown	Clear	None	None	Excessive	Cracking	No	Under 100
C516	34	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
C520	14	Sunny	Medium	Clay	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
C521	32	Sunny	Low	Concrete	Uknown	None	Brown	Clear	None	Sediment	Normal	Normal	No	Under 100
C526	32	Sunny	Low	Concrete	Uknown	Rancid or sour odor	Orange/Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
C527	15	Sunny	Medium	Plastic	Uknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
C601	30	Cloudy	High	Concrete	Uknown	None	Brown	Cloudy	Trash	Sediment	Excessive	Cracking	Yes	Under 100
C602	16	Cloudy	High	Concrete	Uknown	None	Brown	Cloudy	Trash	Sediment	Excessive	Cracking	Yes	Under 100
C603	34	Cloudy	Low	Concrete	Uknown	None	Brown	Clear	Trash	Sediment	Excessive	Cracking	No	Under 100
C604	2	Sunny	Low	Plastic	Uknown	None	Brown	Cloudy	None	None	Normal	Normal	No	Under 100
C701	18	Cloudy	Medium	Concrete	Uknown	None	Brown	Clear	None	Sediment	Normal	Cracking	No	Under 100
C702	30	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	None	Excessive	Normal	No	Under 100
C703	27	Sunny	Low	Concrete	Uknown	None	Brown	Cloudy	None	None	Normal	Normal	No	Under 100
C704	24.5	Sunny	High	Concrete	Uknown	None	Brown	Clear	None	None	Excessive	Cracking	Yes	Under 100

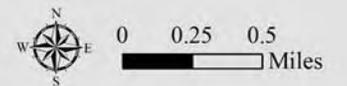
Outfall ID	Diameter in Inches	Weather over past 24 hours?	Priority	Pipe Material	Known industrial or commercial uses in drainage area	Odor	Color	Turbidity	Floatables	Deposits	Vegetation	Outfall pipe condition	Has erosion undermined the stability of the outfall?	Extent of erosion damage in square feet
C801	29	Sunny	Medium	Concrete	Unknown	None	Brown	Cloudy	None	None	Excessive	Normal	Yes	Under 100
C901	0	Sunny	Low	Concrete	Unknown	None	Brown	Clear	None	None	Excessive	Cracking	Yes	Under 100
D601	18	Cloudy	Low	Concrete	Unknown	None	No Water	No Water	Trash	Woody deb	Normal	Cracking	No	Under 100
D602	15	Cloudy	Low	Plastic	Unknown	None	No Water	No Water	Trash	None	Normal	Cracking	No	Under 100
E501	36	Sunny	High	Metal	Unknown	None	Brown	Cloudy	None	Oil	Normal	Corroding	Yes	Over 500
E508	16	Sunny	Low	Concrete	Unknown	None	No Water	No Water	None	Sediment	Excessive	Normal	No	Under 100
E513	12	Sunny	Medium	Concrete	Unknown	None	No Water	No Water	Petroleum slick	Sediment	Excessive	Normal	No	Under 100
E601	16	Cloudy	Low	Concrete	Unknown	None	Brown	Cloudy	None	None	Normal	Cracking	No	Under 100
E602	18	Cloudy	Medium	Concrete	Unknown	None	Brown	Clear	Trash	Sediment	Normal	Normal	No	Under 100
E603	18	Cloudy	Low	Concrete	Unknown	None	Brown	Clear	None	None	Normal	Normal	No	Under 100
E604	16	Cloudy	Low	Concrete	Unknown	None	Brown	Cloudy	None	Sediment	Excessive	Normal	No	Under 100
E605	16	Cloudy	Low	Concrete	Unknown	None	Brown	Cloudy	None	Oil	Excessive	Normal	No	Under 100
E606	40	Cloudy	High	Metal	Unknown	None	Brown	Clear	Trash	None	Excessive	Normal	No	Under 100
F502	4	Sunny	Low	Plastic	Unknown	None	No Water	No Water	None	None	Normal	Normal	No	Under 100
F503	4	Sunny	Low	Clay	Unknown	None	No Water	No Water	None	Sediment	Normal	Normal	No	Under 100
F504	4	Sunny	Low	Plastic	Unknown	None	No Water	No Water	None	None	Normal	Normal	No	Under 100
G505	22	Sunny	Medium	Concrete	Unknown	None	Brown	Cloudy	Petroleum slick	Sediment	Excessive	Normal	Yes	Under 100
G506	24	Sunny	Low	Concrete	Unknown	None	Brown	Cloudy	None	Sediment	Normal	Normal	No	Under 100



Hamilton

Outfall Maintenance Prioritization

- High: 6
- Medium: 13
- Low: 38



Data Sources: NJOIT, NJDOT, NJDEP,
RCE Water Resources Program

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Service Layer Credits. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

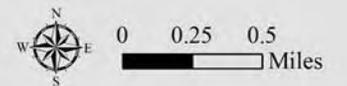


Service Layer Credits. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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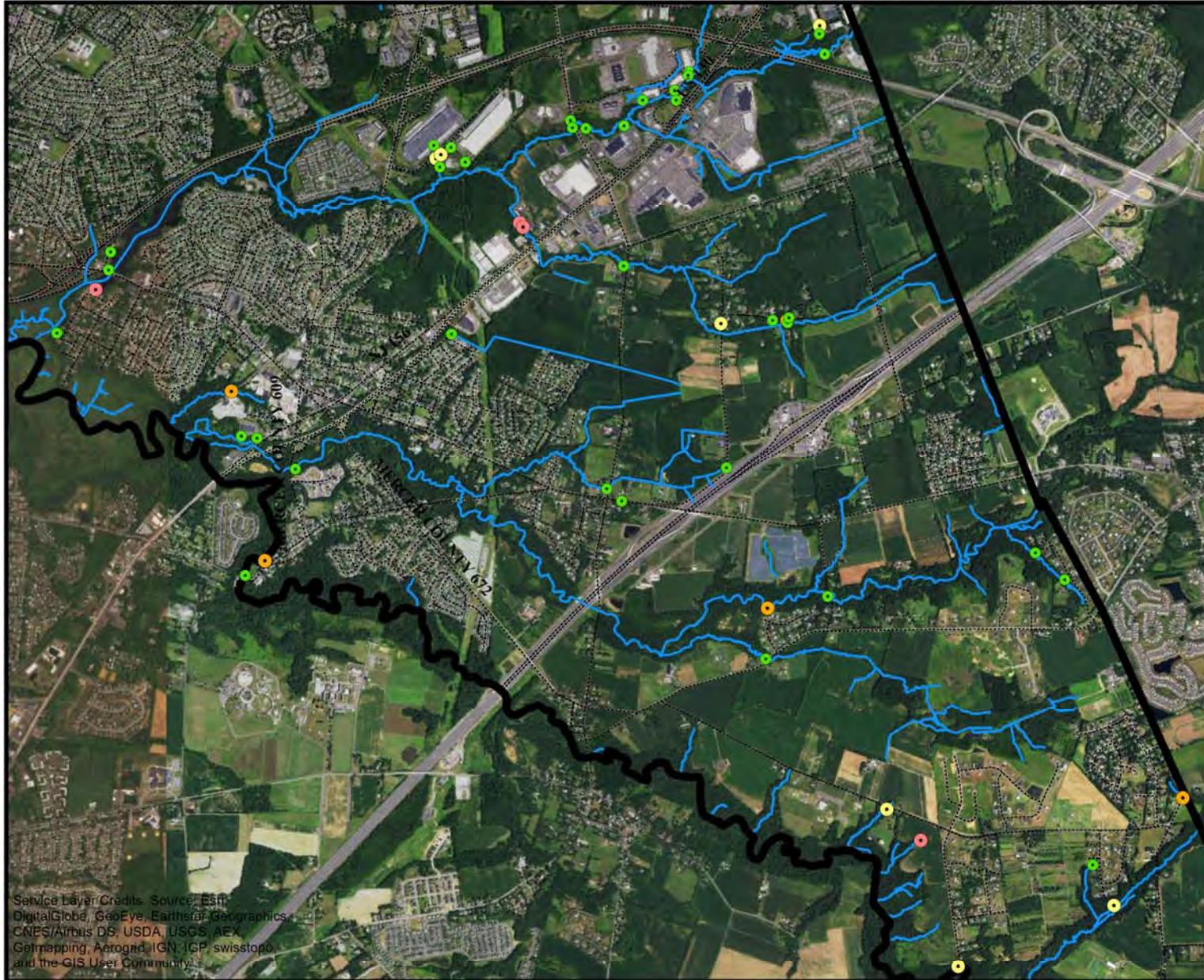
Outfall Pipe Condition

- Cracking: 13
- Peeling: 0
- Corrosion: 3
- Spalling: 3
- Normal: 38



Data Sources: NJOIT, NJDOT, NJDEP, RCE Water Resources Program

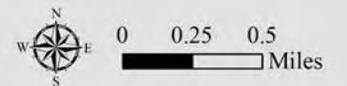
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Outfall Erosion

- High: 4
- Medium: 5
- Low: 9
- None: 39



Data Sources: NJOIT, NJDOT, NJDEP,
RCE Water Resources Program

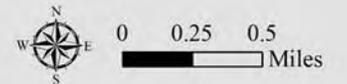
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Outfall Stability

- Unstable: 10
- Stable: 47



Data Sources: NJOIT, NJDOT, NJDEP,
RCE Water Resources Program

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