NJ HMD
(Hydrologic Modeling Database)

Helping NJ Manage and Maintain its Stormwater Infrastructure

Presented by:

John E. Showler, P.E.

NJ Department of Agriculture
I. A little (very little) Background...

Pre-1976 – Erosion and Sediment Control was only the domain of agriculture.

Little thought was given to emerging concepts of stormwater runoff-related erosion from new development.
Erosion control on development sites became a priority in 1976 with the adoption of the **NJ Soil Erosion and Sediment Control Act and Sediment and Erosion Control Standards**. 32 Design Standards – 10 vegetative, 22 engineering/structural
Program Stats-

**Since 1976:**
- 168,000 applications
- 978,000 acres of land
- 4.4M staff hours
- 2.4M physical inspections
- 16,000 stormwater basins in the database
Erosion Control Evolution-

Basic, Temporary Controls:
- Filters
- Barriers
- Rip rap outlets
- Vegetative stabilization
- Inlet protection
- Grass waterways
- Diversions

However, over time, plan requirements became more sophisticated and expanded upon emerging engineering practices of detention basin design, watershed modeling, unit hydrograph theory etc.
In 1986, Hunter Birckhead, P.E. State Erosion Control Engineer (ret.) instituted the collection of hydrologic and hydraulic site and basin design information which was being submitted to Districts for plan approval.

Post-development stormwater basin and site hydrology was captured on forms and site plans submitted to Districts for building complex models.

His vision preceded the available technology limits by about 20 years...
II. Fast-Forward 20 years: NJ Hydrologic Modeling Database

Publicly available database searchable by location: https://hydro.Rutgers.edu

- Site hydrology and basin hydraulic design data uploaded
  - CN, Tc, DA, % impervious, rating tables, outlet hydraulics, SSD Tables
- Paper plans converted to electronic images and uploaded
- Locations of sites and basins geo-located by the application
- Land use (Anderson 4 digit code) change recorded
- Capability to record basin inspections with documents and images
- Everything needed to recreate the project in a hydrologic runoff model
New Jersey Department of Agriculture
Hydrologic Modeling Database

Outfall Location

Basin Location & Hydraulic Design info

Anderson Land Use Code, stormwater management modeling data recorded
NJ Hydrologic Modeling Database – NJHMD
“H&H” as we call it – hydrology and hydraulics

- Searchable
- Zoom to location
- Turn on different layers
- “Find my location”
- Dots represent numbers of projects in that area
- Narrow map focus by county area

https://hydro.Rutgers.edu
Mobile-Friendly

* Search by address
* Search by current position
* All data is accessible
* Can be used to perform basin inspections on site
Viewing Records – Zoom and Click

- Clicking on a marker reveals a mini-widow with project name and a button to open the data window for that project.
- Administrators have an additional button for direct data editing.
Project Window

- Aerial View showing project, basin and discharge locations.
- Main data – ownership, land use, location
Scroll Down-

- Basin information
  - Design
  - Type
  - Dam class
  - Notes
  - Location
- Outlet information
- Drainage area information
  - CN
  - Tc
  - DA
  - % imp.
New Jersey Hydrologic Modeling Database

Stage-Storage Discharge

<table>
<thead>
<tr>
<th>Elevnment (ft)</th>
<th>Storage (cfs/m</th>
<th>Discharge (cfs/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>605</td>
<td>0.000</td>
<td>0.00</td>
</tr>
<tr>
<td>610</td>
<td>0.121</td>
<td>0.62</td>
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<tr>
<td>615</td>
<td>0.402</td>
<td>2.71</td>
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<tr>
<td>620</td>
<td>0.063</td>
<td>1.50</td>
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<tr>
<td>625</td>
<td>0.223</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Best Management Practices

No best management practices were added to this project.

Project Files

Best Management Practices Management Form

Type
Size
Units

Latitude (Dec. Deg.)
Longitude (Dec. Deg.)
Northing
Existing

Save BNP
Downloadable Data

- Filter by geographic location
- 16,000 individual basin records on file
- Download spatial-tabular data (Excel)
Each row is one basin record with parent site name & data with basin location & data
III. Example of Using NJHMD Basin Download Data in GIS

Goal:
- download a basin table
- import to GIS
- identify infiltration basins in proximity to streams.
Filtering for Infiltration Basins from the entire basin layer (close up of the Freehold area)
Infiltration Basins Only after filtering
All Infiltration basins selected that are within 1000 feet of the Surface Water Quality Standards Stream Network
Statewide data table (entire table) of Infiltration basins with 1,312 basins selected within 1000 feet of the stream network.
Zoom to area of interest – basin is an infiltration, class IV dam
Statewide Basin layer showing basins with infiltration component

Possible Analyses:
- basin type
- Basin age (surrogate for retrofit)
- Land use (TMDL)
- SWQS
- Flooding potential
- groundwater impacts
- H&H research (CN’s, PRF’s Tc)
- identification of possible dams
- basin maintenance records

Basin maintenance inspection services are now offered by NJ Soil Conservation Districts -
IV. Basin Maintenance Inspection Services by NJ Soil Conservation Districts

In consultation with and support of NJDEP Municipal Separate Storm Sewer System (MS4) Permit requirements for inspection and maintenance of stormwater management infrastructure
Basin Inspection Function

Locate project and select ‘edit’ (admin only)
Edit mode allows the admin (SCD or NJDA only) to change, update or remove data as well as relocate positions of the site, basin and basin outfall.

Admins can also access the maintenance inspection window from the menu above.
Maintenance Mode

- View
- Edit
- Add
- * field data
- * comment/text
- * images
- * pdf forms/docs
Maintenance Mode

- View
- Edit
- Add
- * field data
- * comment/text
- * images
- * pdf forms/docs

Each image or file can have its own comment/text descriptors
Maintenance Mode

- View
- Edit
- Add
  - * field data
  - *comment/text
  - *images
  - *pdf forms/docs

A single maintenance entry has:

1. Key fields (shown at left)
2. Comments/narrative
3. Photos with comments
4. Formal inspection form

When all components are entered a pdf report can be generated to print, save or send
This report has been prepared by the FREEHOLD Soil Conservation District in accordance with requirements set forth in the New Jersey Department of Environmental Protection Municipal Separate Storm Sewer System (MS4) permitting requirements (N.J.A.C. 7:14A et seq.) for the inspection and maintenance of public and privately owned stormwater management facilities. This inspection report provides the necessary verification by a municipality that it is ensuring post-construction operation and maintenance of stormwater facilities under its authority.

The MS4 permit requires that an owner of a stormwater management facility (retention/detention/wet pond etc.) provide an annual inspection of the operating condition of the facility as well as ensure proper maintenance of the facility has taken place.

If maintenance or repair work is identified in this inspection report, the owner has the option of correcting the problems identified by the district and requesting a re-inspection by the district to verify that the outstanding issues have been corrected and that the facility is now in compliance with MS4 regulations for the current year.

Following the initial or secondary inspection, re-inspection of the facility will be scheduled for the following year.

Contact
FREEHOLD Soil Conservation District
4000 Kozloski Road, PO Box 5033
Phone: 732-683-8500

Notes: This report only identifies the condition of the facility. No offer of service to correct any deficiencies is made, expressed or implied. The report indicates the degree of compliance with respect to general maintenance practices and does not comment on nor constitute an analysis of any aspect of structural integrity of the facility. Only maintenance or repair issues which are detectable without the aid of specialized equipment are inspected and reported by the soil conservation district. Where appropriate, the district may suggest that further investigation of the facility be conducted by licensed professionals with experience in structural engineering be engaged for further study.

Stormwater Management Facility Inspection Report Ownerships and Design Data

Project Development Information
Project Name: Tuscan Dr and Harrington St
District Application Number: freeholdscd_1988_unknown
Street Address if known: Tuscan Drive
County: MONMOUTH
Municipality: Freehold Township
Zipcode: 07728
Build Date if known: 1988-01-01
Project Location Coordinates: (State Plane Feet)
North: 522354.56086144 East: 562958.59447851

Developed Anderson Land Use Code:
1120: Residential (Single Unit, Medium Density)

Stormwater Management Facility Information
Facility Database ID: 114055
Facility 'name': detention basin
Facility type: Detention
Construction: Excavated
Dam Classification: Not Applicable
Height of dam: 0
Width of dam at top: 0
Notes: adding basin from field inspection, no hxx data available. tax records show dev't built in 1988. basin located at block 38.19, lot 19

Facility Discharge Location Coordinates:
Name: os1, North: 521766.68808121, East: 562617.54738174
Maintenance Inspection Report

Facility Database ID: 114855
Inspector Name: J. Showler
Inspector Organization: NJDAM
Repair Status: Satisfactory
Mosquitoes: None

Date of Inspection: 04/21/2017
Maintenance Status: Maintenance Needed
Retract: Yes

Comments & Recommendations:
Bassin inspected while doing nearby basin inspections. Clean, well vegetated, could be retrofitted with a water quality office plate and removal/replacement of the low flow channel to promote infiltration. Minor cleaning of the low flow channel needed at this time.

Interpretation of Inspection Status Codes and Comments:

Maintenance Needed: The facility was found to be below an acceptable level of maintenance. Examples of maintenance failure include: vegetation overgrowth or barrier, erosion present inside or outside of basin, basin appurtenance structures such as low flow channels, outlet control structures, trash racks and anti-surge (rip rail) protection damage, silted in or missing. Presence of accumulated trash, ponding water (upstream designed as a wet pond) and/or visible presence of mosquitos.

In the case of an infiltration basin which is holding water, the basin floor may require the removal of the surface layer of silt and sediment, followed by deep tilling with lightweight equipment to restore infiltration capacity. It is recommended that a licensed professional engineer be retained to evaluate continued ponding which may be the result of structural failure, soil failure, high groundwater tables etc. Additional inspection information may be found on the attached inspection checklist form.

Repair Needed: The facility or certain aspects of the facility were found to be damaged or broken where physical repair is needed to restore functionality. Examples of repairs needed include broken or missing trash racks, damaged outlet control structures, damaged or collapsed pipes or curvets, eroded or otherwise missing rip rap erosion protection at pipe outlets, damaged or failing headwalls at discharge points, etc. In such cases it may be necessary to retain the services of a licensed engineer or contractor familiar with construction techniques to restore the facility to properly functioning conditions.

Mosquitoes: Presence of standing water, aquatic vegetation with water or actual presence of mosquitos may be noted and will require immediate attention. Local and/or state mosquito control agencies should be contacted to ensure that no pathogenic species of mosquitos are present and appropriate action is taken to eliminate current or future infestations.

Retract: Independent of other status determinations, a facility which is inalterable may be a "candidate" for retrofitting outlet controls, appurtenance structures etc. to improve the functionality for flood control, water quality control or other environmental benefits (such as infiltration) etc.

Retrofitting is not a requirement and is noted for information only.

Stormwater Facility Photographs

Facility ID: 114855 Inspection date: 04/21/2017
Photo ID: 114855-44

Outlet structure: Some leaf accumulation, little or no trash. Outlet could be modified to better capture WW storm event.

Photo ID: 114855-45
Low flow channel showing some debris that could be cleared out.
New Jersey Department of Agriculture – Soil Erosion and Sediment Control Program
Stormwater Basin Inspection Program – Inspection Checklist

Date: 4/21/2017
Inspector: J. Showler
Organization: NIDA
Current Weather: sun/clouds, 60s
Weather, past 72 hours: rain < 1”
Basin Database ID: det basin
Approximate basin Location: Tuscan Drive, Freehold NJ
Basin Type: ☑ Detention ☐ Infiltration ☐ Infiltration/Detention combo ☐ Wet Pond ☐ Subsurface ☐ Other

<table>
<thead>
<tr>
<th>DEF Item #</th>
<th>Inspection Criteria</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forebay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1.1</td>
<td>Inlet scour or erosion</td>
<td></td>
</tr>
<tr>
<td>A1.2</td>
<td>Clotted pipes or excessive sediment</td>
<td></td>
</tr>
<tr>
<td>A1.3</td>
<td>Damaged outlet/overflow structure</td>
<td></td>
</tr>
<tr>
<td>MTD (pretreat) A2</td>
<td>inspect as able</td>
<td></td>
</tr>
<tr>
<td>BMP (pretreat) A5</td>
<td>inspect as able</td>
<td></td>
</tr>
<tr>
<td>Pond Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>Standing Water/algae/flotables/vegetation present</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>Sediment/debris/emergent vegetation función failure</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>Erosion/Channelization/Rip Rap damaged</td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td>Animal burrows/wildlife/waterfowl present</td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td>Uneven mud (dry basis)</td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>Sink holes or subsidence – dry or wet basin</td>
<td></td>
</tr>
<tr>
<td>B7</td>
<td>Low flow channel damaged or needs cleaning</td>
<td>low flow channel has some sediment and organics not very bad but needs cleaning</td>
</tr>
<tr>
<td>B8</td>
<td>Basin front or siltation damaged</td>
<td></td>
</tr>
<tr>
<td>Vegetation</td>
<td>Note if vegetation is being maintained including desirable sap</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Excessive bare soil – erosion and water quality problem</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Overflowing/invasive/design vegetation present</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>Tree growth in basin</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>Are grass clippings collected or left? unknown but doubt they are collected</td>
<td></td>
</tr>
<tr>
<td>Embankment D1</td>
<td>Basin side slopes – erosion, slides, seeps, bare soil etc</td>
<td></td>
</tr>
<tr>
<td>Outlet</td>
<td>Note outlet structure and discharge point(s)</td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Outlet trash accumulation (20%)</td>
<td>actually clean but an accumulation of leaves in front of rack (chain link fence enclosure, see pics)</td>
</tr>
<tr>
<td>L2</td>
<td>Damaged/failed/obstructed/eroded spillway</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Outlet Orif damaged or non-functioning/retrofit?</td>
<td></td>
</tr>
<tr>
<td>L4</td>
<td>Outlet COP damaged or erosion before outlet</td>
<td></td>
</tr>
<tr>
<td>L5</td>
<td>Standing water in the outlet structure</td>
<td></td>
</tr>
<tr>
<td>Emergency Spillway</td>
<td>Note condition of spillway and spillway lining</td>
<td></td>
</tr>
<tr>
<td>F1</td>
<td>Tree on spillway</td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>Damaged/failed/obstructed/eroded spillway</td>
<td></td>
</tr>
<tr>
<td>Misc.</td>
<td>Note condition of appurtenant structures etc.</td>
<td></td>
</tr>
<tr>
<td>G1</td>
<td>Broken or missing security fence/gate</td>
<td></td>
</tr>
<tr>
<td>G2</td>
<td>Damaged/missing sign</td>
<td></td>
</tr>
<tr>
<td>G3</td>
<td>Access to basin blocked (vegetation growth, trash etc)</td>
<td></td>
</tr>
</tbody>
</table>

Overall Condition: ☑ Satisfactory ☐ Maintenance Required ☐ Needs Repair ☑ Possible Retrofit Candidate
Comments: minor cleaning needed; could be retrofitted for better water quality treatment.
Future Enhancements...
V. Recap & Questions-

- 1950s- SCD’s were Ag-Only
- 1976- Still Ag, + Regulatory Non-Ag
- 1986 – Stormwater Data collection
- 2007- H&H Database online
  - https://hydro.Rutgers.edu
- 2019-
  - 16K basins uploaded
  - SCD Basin Inspections

Thanks for hanging in there!

Questions may be addressed to:
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