Barnegat Bay Monitoring Program Plan

NJDEP Bureau of Environmental Analysis and Restoration

New Jersey Water Monitoring Council
May 25th, 2011

Purpose of the Barnegat Bay Study

- Determine the type and extent of water quality impairments
- Identify appropriate water quality endpoints to inform restoration. May include
  - revised DO criteria
  - numeric criteria or loading targets for nutrients
- Calibrate and validate modeling tools to direct restoration of water quality in the bay

Known Impairments and TMDLs in Barnegat Bay

- Currently Barnegat Bay is listed on the 303(d) List for Dissolved Oxygen
- Shellfish TMDLS have been completed for Total Coliform in 2006
- TMDLs are required by Clean Water Act for any water body on the 303(d) List

Known Impairments and TMDLs in Barnegat Bay (cont)

- A Total Maximum Daily Load is the loading/assimilative capacity of a water body for a particular pollutant
  - TMDL=WLA + LA + MOS
- This study could identify additional parameters for which a TMDL may be required, such as nutrients

Making the Linkages

- Development of restoration measures requires an understanding of the relationships between environmental responses and pollutants.
- To identify restoration measures that will address relevant pollutant loadings, need to know linkages between
  - Land use and water quality
  - Tributary water quality and bay water quality
  - Hydrodynamics and water quality

TMDLS, Models and Restoration

- By linking pollutant loadings and water quality concentrations and knowing the endpoint that will protect designated uses, pollutant load reductions can be calculated to attain standards and uses

- Knowing the relative contribution of sources, the pollutant loads that will achieve the target condition can be allocated among the sources and used to guide restoration efforts

- There are 2 basic pieces of a dynamic modeling effort
  - Hydrodynamic Model
    - How does water flow in/through/out of the water body?
  - Water Quality Model
    - How does water flow affect water quality parameters ?
    - How do water quality parameters behave through physical, chemical and biological processes?

Why More Data ?

- Water quality data has been collected over the years for specific project objectives; these data sets have varied time frames, parameter sets, spatial extents, field collection and analytical methods etc.
- To model the relationship between pollutant loads and observed water quality requires data that are comprehensive and contemporaneous
- This plan will create a unique data set which will meet the needs of a thorough water quality assessment and model calibration and validation
- A valid model of the bay can simulate the effect of various restoration scenarios so that a suite of management measures can be selected

What Factors Affect Sampling Plan Design?

- Design depends on:
  - The objective of the study—assessment, modeling?
  - Type of impairments) to be addressed—conservative, dynamic?
  - The spatial extent and characteristics of the study area—freshwater, salt water, tidal, non-tidal?
  - The modeling approach—mass balance, dynamic?
  - Specific data needs of the model(s) that will be used.
- This sampling program has been prepared to address multiple objectives using dynamic models in a tidal estuarine setting with freshwater and ocean boundaries
- There still are unknowns that may result in a need to revise the plan and require an adaptive approach

Barnegat Bay Monitoring Plan Components

- Phase 1
  - Continuous in-situ water quality monitoring
  - Grab water quality monitoring
  - Flow monitoring
    - Continuous gages
    - Instantaneous Flow
  - Bathymetric survey
- Phase 2
  - Phase 1 Elements Plus:
    - Sediment quality
    - Two (5-day) intensive sampling events

The Need for a Phased Approach

- Due to time restrictions initial monitoring will not cover the entire growing season
  - Ex: Flow gaging stations not operational until fall
- Monitoring/Data needs may be adjusted once modeling tools are selected
- Test the concept of utilizing multiple partners and labs for data collection and analysis

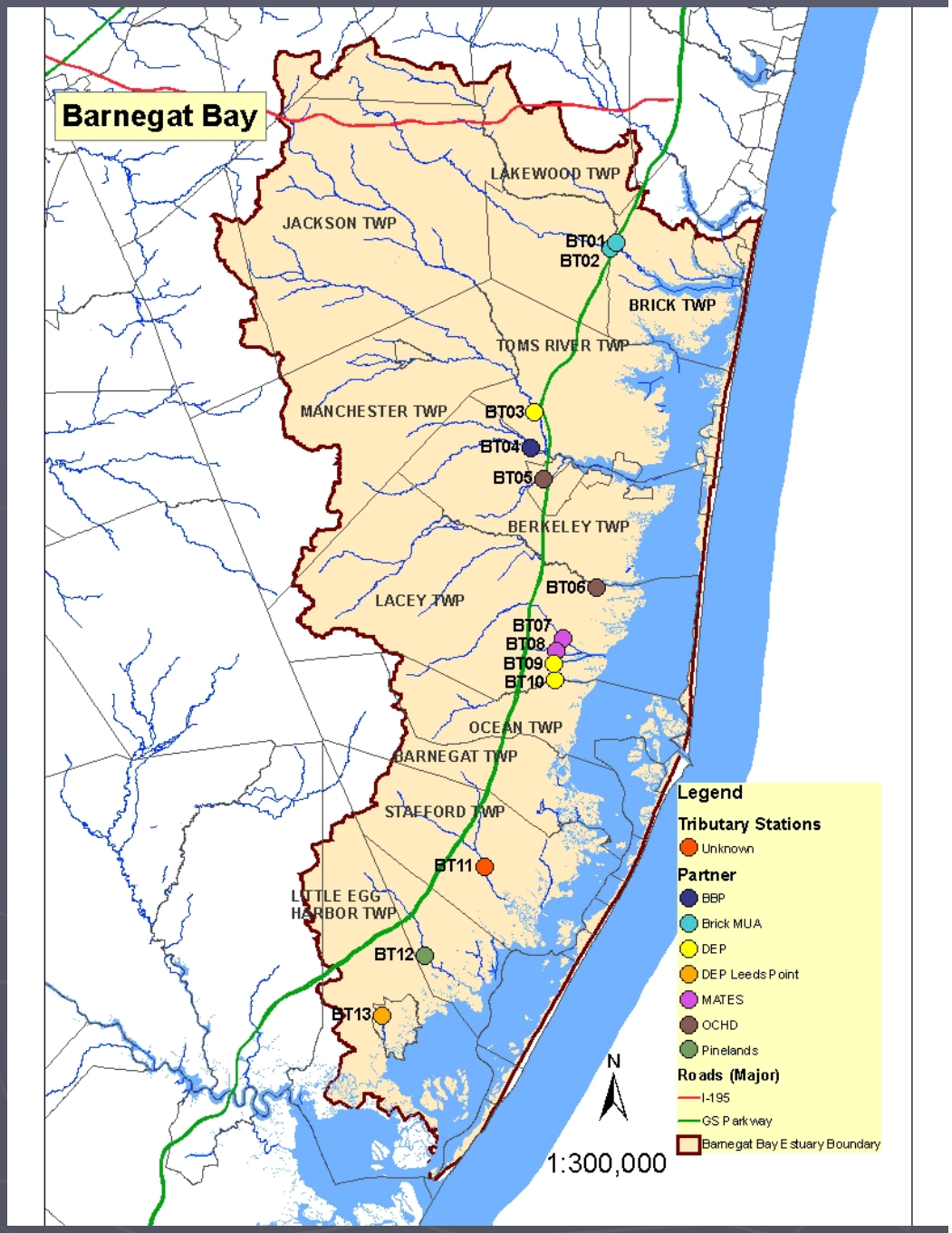
Phase Approach

- Phase 1
  - 6 months
  - June-December 2011
- Phase 2
  - Minimum of 12 months
  - December 2011- December 2012
  - May require additional time frame based on model selection and/or weather conditions

Barnegat Bay Monitoring Plan Summary

- Fresh Water Tributaries
  - 13 water quality grab sample locations at major tribs
  - 3 new flow stations in addition to 3 existing ones
  - Continuous WQ monitoring at Toms River gaging station (01408500)
- In Bay Water Quality
  - 1 fixed continuous WQ monitoring station at Mantoloking
  - 4 to 6 (phase 1/phase 2) in bay continuous water quality buoys
  - 14 in bay water quality grab sample locations
- In Bay Flow Monitoring
  - 3 continuous flow stations at ocean inlets
  - 3 in bay continuous flow stations
- Bathymetry Survey

- Fresh Water Tributaries
  - 13 water quality grab sample locations at major tribs



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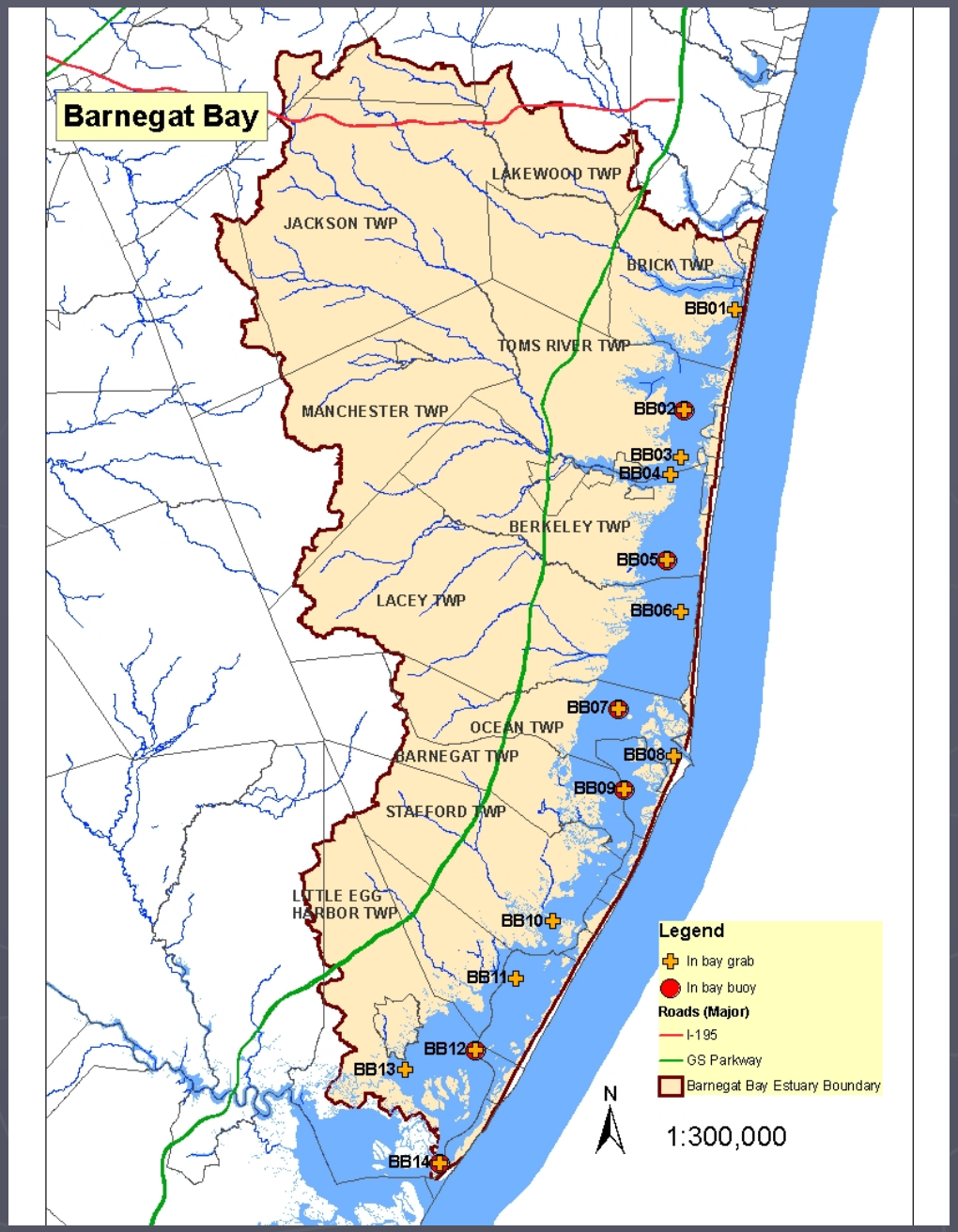

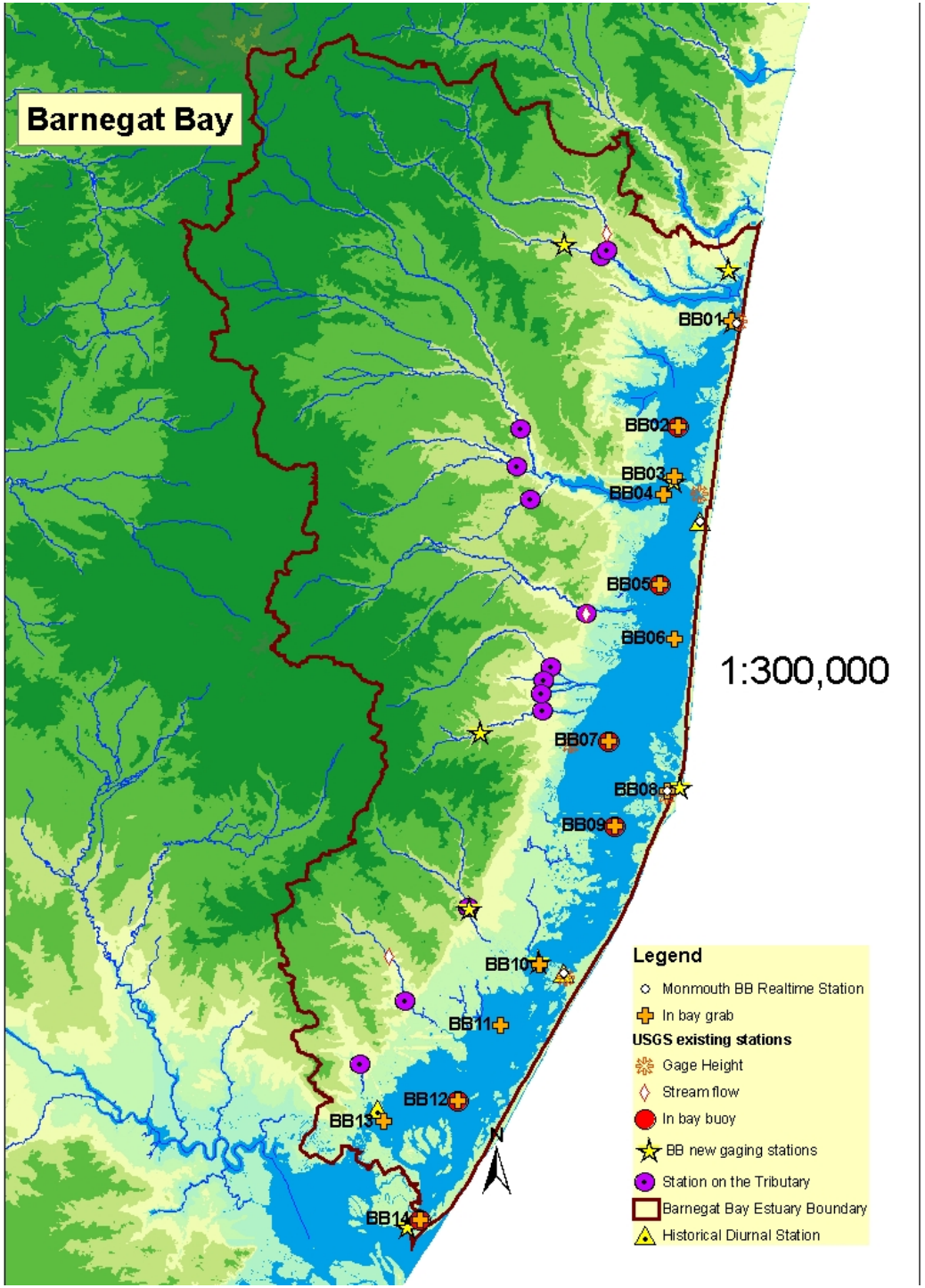
Barnegat Bay
BB01
BB02
BB03
BB04
BB05
BB06
BB07
BB08
BB09
BB10
BB11
BB12
BB13
BB14
1:300,000
Legend
Monmouth BB Realtime Station
In bay grab
USGS existing stations
Gage Height
Stream flow
In bay buoy
BB new gaging stations
Station on the Tributary
Barnegat Bay Estuary Boundary
Historical Diurnal Station

Tributary WQ Sampling Locations

ID	Site Description	LAT	LONG	Reference Site	Site Partner
BT01	North Branch Metedeconk River near Laurelton	40.081389	-74.152222	USGS-01408123	
BT02	SB Metedeconk River near Laurelton	40.078333	-74.156667	USGS-01408152	
BT03	Toms River at park footbridge near Toms River	39.976389	-74.218333	USGS-01408505	
BT04	Wrangel Brook near South Toms River	39.954722	-74.221389	USGS-01408640	
BT05	Jakes Branch at South Toms River	39.935278	-74.211667	USGS-01408710	
BT06	Cedar Creek at Lanoka Harbor	39.867500	-74.169167	USGS-01409000	
BT07	NB Forked R at Forked River	39.836111	-74.196389	USGS-01409055	
BT08	Middle Br Forked River	39.828258	-74.202029		
BT09	South Br Forked River	39.820487	-74.203280		
BT10	Oyster Creek	39.811011	-74.202657		
BT11	Mill Ck at Manahawkin	39.695278	-74.259722	USGS-01409210	
BT12	Westecunk Creek at Railroad Ave at West Creek	39.640278	-74.308056	USGS-01409281	
BT13	Tuckerton Creek at Tuckerton	39.602778	-74.341944	USGS-01409310	

In Bay Water Quality Locations

Project ID	Site Description	Type: Grab/ Buoy/Fixed	Long	Lat	Site Reference ID
BB01	Barnegat Bay at Mantoloking	G,F (B?)	-74.052222	40.0400000	USGS-01408168; MU-Mantoloking?
BB02	Barnegat Bay between Silver Bay and Goose Creek	G,B	-74.098470	39.9776200	BMWM1622
BB03	Barnegat Bay by Route 37 Bridge	G	-74.101530	39.9481700	BMWM1629B
BB04	Barnegat Bay near the Mouth of Toms River	G	-74.110140	39.9376200	BMWM1623B
BB05	Barnegat Bay above Cedar Creek	G,B*	-74.112910	39.8845600	BMWM1645E
BB06	Barnegat Bay below Cedar Creek and above Forked River	G	-74.102080	39.8526200	BMWM1651D
BB07	Barnegat Bay below Oyster Creek and above Barnegat Inlet	G,B	-74.153190	39.7926200	BMWM1691A
BB08	Barnegat Bay by Barnegat Inlet	G,B	-74.108014	39.7633528	MU-Barnegat Inlet
BB09	Barnegat Bay below Barnegat Inlet and close to Long Beach	G,B*	-74.147920	39.7426200	BMWM1674B
BB10	Barnegat Bay by Route 72 Bridge	G	-74.206530	39.6609500	BMWM1703C
BB11	Barnegat Bay above Westecunk Creek	G	-74.235700	39.6254000	BMWM1719E
BB12	Barnegat Bay in Little Egg Harbor	G,B	-74.268750	39.5815100	BMWM1834A
BB13	Barnegat Bay near Tuckerton Creek	G	-74.324590	39.5690100	BMWM1818D
BB14	Little Egg Harbor Inlet near Beach Haven Heights	G,B	-74.297370	39.5112300	BMWM1824B

New Flow Stations

SITE_NAME	LAT	LONG
Point Pleasant Canal at Point Pleasant, NJ	40.070278	-74.059722
Barnegat Bay at Mantoloking Bridge at Mantolokin	40.040000	-74.057222
Barnegat Bay at Route 37 Bridge near Bay Shore,	39.946111	-74.103056
Barnegat Inlet at Barnegat Light, NJ	39.766389	-74.099167
Barnegat Bay at Route 72 Bridge near Ship Bottom	39.663333	-74.206944
Little Egg Harbor Inlet near Beach Haven Heights	39.507500	-74.307500
Oyster Creek near Brookville, NJ	39.798333	-74.250556
S.B. Metedeconk River near Lakewood, NJ	40.085833	-74.185556
Mill Creek at Manahawkin, NJ	39.695278	-74.260000