MALCOLM PIRNIE

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April 19, 2011

Robert M. Nyman, Director
New York - New Jersey Harbor Estuary Program Office
U.S. Environmental Protection Agency
290 Broadway, 24th Floor
New York, NY 10007

Barbara Hirst, Bureau Chief
N.J. Department of Environmental Protection
Bureau of Environmental Analysis and Restoration
PO Box 409
401 E. State Street
Trenton, NJ 08625-0409

Re: BCUA LHR Phase II Nutrient TMDL Study – Update

Dear Mr. Nyman and Ms. Hirst:

As you are aware, representatives of Malcolm Pirnie, Inc. (Malcolm Pirnie), Najarian Associates (Najarian) and Hampton-Clarke/Veritech (HCV) met with Marco Alebus and Helen Pang of the New Jersey Department of Environmental Protection (NJDEP) on March 7, 2011 in the NJDEP's Trenton NJ Office. At the meeting, Malcolm Pirnie presented an update of the implementation of the Bergen County Utilities Authority (BCUA) Lower Hackensack River Phase II Nutrient TMDL Study Water Quality Sampling and Monitoring Workplan, dated March 2010, Revised July 2010 and Amended August 2010 (Sampling/Monitoring Workplan). During the meeting, we presented an issue that was brought to our attention by HCV regarding a portion of the data. This issue resulted in a data gap for three parameters over a portion of the study. Our presentation included a recommended approach to address the data gap. We plan on presenting this Study update to the United States Environmental Protection Agency (USEPA), the Model Evaluation Group (MEG) and NJDEP in a meeting that is scheduled for May 9, 2011. In response to the USEPA and NJDEP request for a report regarding the update and data issue, we have prepared the following summary.

Sampling and Monitoring Workplan
In the Summer of 2010, Malcolm Pirnie implemented the Workplan as discussed below:

Long-Term Continuous In-Situ Water Quality Monitoring
Malcolm Pirnie's subcontractor Alden Research Laboratory Inc. (Alden) calibrated, installed and maintained continuous monitoring instrument sondes (YSI Model 6920V2-1) in six locations in

the Lower Hackensack River (LHR) from just upstream of Newark Bay to 19 miles upstream at Fairliegh Dickinson University and one location in the New Jersey Meadowlands. At the lower five LHR locations, sondes were installed at two depths. At the Fairleigh Dickinson University and Meadowlands location, only one sonde was installed. The units were in place for six months (from the first week in June 2010 to the first week in December 2010). Measurements were recorded every 15 minutes for Dissolved Oxygen (DO), Conductivity, Salinity, Turbidity, pH and Temperature. On a weekly basis, the units were removed from the water, data downloaded to a computer, serviced and recalibrated.

For the same time period, four tide gages and two velocity meters (ADCPs) were installed at LHR locations. The tide gages recorded tide elevation every 6 minutes while the velocity meters recorded LHR velocity profiles every 15 minutes.

Due to the strict maintenance schedule, probes were operational and collected data for approximately 95% of the overall deployment period. An average of 16,600 water quality continuous monitoring measurements were recorded at each depth monitored, totaling over 200,000 measurements. Over 43,000 tidal measurements were recorded per monitoring location.

Weekly Water Quality Sampling and Monitoring

During the weekly servicing and recalibration of the continuous monitoring sondes in June through November 2010, Malcolm Pirnie collected water samples from five locations in the LHR and Overpeck Creek. The samples were collected at 1/3 and 2/3 water depth for the LHR locations and ½ depth for Overpeck Creek. The samples were analyzed by HCV for Ammonia, Total Kjedahl Nitrogen, Nitrate, Nitrite, Total Phosphorus (TP), Ortho-Phosphate (Ortho-PO4), 5-Day Carbonaceous Biochemical Oxygen Demand (CBOD5), Total Suspended Solids (TSS), Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC) and Chlorophyll-a. In addition, HCV used portable sondes (similar to continuous monitoring units) to measure DO, Conductivity, Salinity, Turbidity, pH and Temperature for the same locations and depths during each water quality sampling event.

Over 250 water quality samples were collected as scheduled during the weekly sampling. All sampling events were completed as scheduled.

5 Day Intensive Water Quality Sampling and Monitoring

Malcolm Pirnie performed two, 5 day intensive water quality sampling and monitoring events: Event 1: August 9-14, 2010 and Event 2: October 4-9, 2010. Water samples were collected from 9 locations in the LHR, Overpeck Creek and Coles Brook. The samples were collected at 1/3 and 2/3 water depth for the lower five LHR locations and ½ depth for Overpeck Creek, LHR at Fairleigh Dickinson and Oradell Ave. and Coles Brook. The samples were analyzed by HCV for Ammonia, Total Kjedahl Nitrogen, Nitrate, Nitrite, TP, Ortho-PO4, CBOD5, TSS, TOC, DOC

and Chlorophyll-a. In addition, HCV used portable sondes (similar to continuous monitoring units) to measure DO, Conductivity, Salinity, Turbidity, pH and Temperature for the same locations and depths during each water quality sampling event. The sampling and monitoring were performed every three hours at all locations, except Overpeck Creek, LHR at Oradell Avenue and Coles Brook, where they were collected every 12 hours. The BCUA Little Ferry WPCF, Secaucus MUA WWTP and North Bergen MUA Central WWTP discharges were sampled using ISCO automatic samplers to generate daily composites. The three plants and Public Service Electric and Gas Hudson Generating Facility discharge were monitored using YSI sondes installed and calibrated by Alden.

For each event, approximately 460 water quality samples were collected. Only two water quality samples were not collected out of the 920 samples scheduled.

Sediment Oxygen Demand Testing

Malcolm Pirnie, Alden and Environmental Compliance Laboratory (ECM) collected sediment samples from three locations in the LHR in two separate events - Event 1: August 16-20, 2010 and Event 2: October 11-15, 2010. For each location, the goal was to collect 5 cross-sectional samples in triplicate - 15 samples per location, 45 total samples. For Event 1, only 43 sediment samples were collected due to conditions near the shore of one location. For Event 2, 45 sediment samples were collected. Once collected, the samples were transported to ECM's laboratory where they underwent sediment oxygen demand (SOD) and nutrient uptake testing for seven continuous days. The draft final testing report of the Event 1 is being prepared.

Water Quality Data Compilation and Review

The water quality monitoring data collected by the installed and portable monitoring sondes and laboratory analytical data have been compiled and are being reviewed. Also, the monitoring and laboratory data are currently undergoing QA/QC review/data validation.

Laboratory Issue

On October 7, 2010, HCV notified Dominic DiSalvo of the non-performance of an analyst for the Phosphorus analyses for the TMDL project. Reportedly, during the internal laboratory audit of their Wet Chemistry Department records for the August 2010 five day event, HCV discovered that the analyst performing Ortho-PO4 and TP analyses did not analyze the required continuing calibration verification (CCV) or continuing calibrations blank (CCB) checks. The analyst admitted his non-performance and was terminated by HCV.

HCV reviewed the Wet Chemistry records of the analyst which showed that the analyst did not perform the CCV and CCB checks for Ortho-PO4 and TP for all the weekly and 5 day samples collected from August 5 through September 22, 2010. In addition, HCV also found that the analyst had not analyzed sample duplicates for 100 of the 276 TSS samples collected from August

9 through 11, 2010. A review of the analyst's records prior to August 5, 2010 indicated no deviation from method protocols.

In response to this non-performance issue, HCV reportedly added two full time QA/QC personnel to augment the data entry and review process during the second 5 day event. In addition, HCV stated it would conduct daily audits of the Wet Chemistry records for several months.

As a result of the above non-performance, the affected data for Ortho-PO4, TP and TSS does not meet the analytical and QA/QC requirements of the Sampling/Monitoring Workplan. It is our understanding that NJDEP QA/QC regulations will not allow such data to be used within any TMDL or NJPDES related study. Due to this non-conformance with the Sampling/Monitoring Workplan, a data gap exists for 2 months of weekly and one 5 day intensive sampling. Malcolm Pirnie has since initiated additional QA/QC review of the HCV and its subcontract laboratory data.

Impact of Data Gap

Upon notification of the non-performance issue, Malcolm Pirnie met with Najarian Associates to discuss the issue and its impact on the modeling effort, as described within the Lower Hackensack River Phase II Nutrient TMDL Study Modeling Workplan (revised March 2010)(Modeling Workplan). As you may recall, comments from the NJDEP, USEPA, MEG and HydroQual resulted in the revision of the sampling/monitoring and modeling workplans to address requests for additional nutrient sampling and algal productivity modeling. Thus, it was proposed that the NJDEP-approved Najarian Model would be "enhanced" to provide this dynamic linkage. As presented in our May 11, 2009 meeting, this approach would involve modifying the model's existing nitrogen module to simulate phytoplankton growth (as chlorophyll-a) and diurnal dissolved oxygen variations. Once enhanced, the model would be initially calibrated using the 1988 Water Quality data, and verified using data from the two 5-day intensive surveys conducted during 2010. Also, the model would be validated for seasonal trends based on the six months of weekly sampling and continuous monitoring data.

As the presented modeling approach will simulate phytoplankton nitrogen (and thereby chlorophyll-a), the input of phosphorus concentrations is not required. However, it is envisioned that phosphorus concentrations would be utilized within secondary analyses (such as the determination of limiting nutrient, development of nutrient budget, assessment of algal composition, etc.). These secondary analyses would provide additional support and justification for the selected model approach and model development process. Of course, work related to these secondary analyses would be limited by the lack of phosphorus data, particularly the lack of summer phosphorus data.

In addition, it was required that the enhanced model be linked with the USEPA SWEM model and, thus, allow for the interaction of water quality species between the LHR (Najarian Model) and NY/NJ Harbor (SWEM). It is anticipated that this linkage will involve the transfer of nutrient fluxes (including phosphorus concentrations) at the LHR/Newark Bay boundary. The extent of the phosphorus database will be an important part of this undertaking.

While the model study can proceed based on the currently limited phosphorus data, there may be some loss of study defensibility due to the lack of a portion of the summer nutrient data and the limitations placed on the above (secondary) analyses. Thus, we request guidance from the MEG on this matter. We believe our options are as follows:

a. Proceed with the study using only the data that has been collected to date. Our concern with this option is that, during the latter study phases, comments may arise that we would not be able to address due to the lack of summer phosphorus data.

b. Proceed with an additional data collection effort. In this case, we would recommend a one-for-one replacement of the impacted dataset. This effort would allow us to better address any issues related to the data gap and phosphorus concentrations in the river.

Recommended Monitoring Plan

The intent in developing the Sampling/Monitoring and Modeling Workplans was to provide the MEG, NJDEP and USEPA with a high quality product in terms of data and model analyses. The Ortho-phosphate and TP data gap caused by the non-performance issue has raised a concern as to whether this goal has been achieved. As noted above, a one-for-one replacement sampling plan is recommended to best ensure study defensibility. Thus, it is proposed that two additional months of continuous monitoring and weekly sampling; with an intermixed 5 day intensive sampling/monitoring event be performed. Therefore, we recommend a re-performance of the weekly and 5 day sampling/monitoring conducted in August and September 2010 according to the Sampling/ Monitoring Workplan as follows:

<u>June 1 – July 31, 2011</u>

- Continuous In-Situ Monitoring at the 7 locations previously monitored using installed YSI Instruments, with weekly calibration, data download and maintenance.
- Weekly Water Quality Sampling and Monitoring (using Portable YSI Instruments) at the 5 locations previously sampled and monitored. Samples will be analyzed by the laboratory.
- Tidal Elevation Monitoring at the 3 locations previously monitored.
- LHR Velocity Monitoring at the 2 locations previously monitored.

July 2011 (Target 2nd week)

- 5 Day Intensive Sampling and Monitoring at the 9 locations previously sampled and monitored.

Schedule Impact

The recommended approach will have an impact on the schedule of the deliverables for the TMDL Study. As included in the Sampling /Monitoring Workplan, the sampling and monitoring was to be completed by November 30, 2010, with a Preliminary Sampling and Monitoring Report submitted to the NJDEP by June 1, 2011. The additional QA/QC initiated by Malcolm Pirnie will delay the Preliminary Report submittal date past June 1, 2011.

The sampling and monitoring schedule and preliminary report submittal dates will depend on the recommendations of the MEG. If the recommended approach is implemented, the sampling/ monitoring would be completed by July 31, 2011 and the preliminary report submitted to the NJDEP by February 1, 2012. Several modeling tasks will be similarly affected with model verification being delayed through the Spring of 2012.

We will provide an overview of the information provided above during the webinar scheduled on May 9, 2011 and look forward to the webinar as a medium to discuss the issue at hand. Since the NJDEP, USEPA and MEG are providing guidance and oversight of this TMDL Study, it is critical that the above non-performance issue and recommended re-performance activities be reviewed and addressed at this time. Subsequent to the webinar, we ask that the MEG provide their guidance and recommendations to us as soon as possible in a formal communication. If re-performance this Summer is recommended, we would like to start in June 2011.

Please feel free to contact me if you need additional information or have any questions/comments.

Very truly yours,

MALCOLM PIRNIE, INC.

Dominic L. DiSalvo, PE, BCEE
Project Manager

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B. Manhas, NJDEP
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S. Sinisi, BCUA Special Counsel
R. Schneider, Malcolm Pirnie
H. Shahabian, Malcolm Pirnie
M. Sadowski, Malcolm Pirnie
T. Najarian, Najarian
H. Litwack, Najarian
S. Gilewicz, HCV
File

Status of the Implementation of the BCUA LHR Nutrient Phase II TMDL Study Sampling & Monitoring Workplan

May 9, 2011

MALCOLM PIRNIE

Najarian Associates

Engineers, Planners, Scientists, Surveyors

Sampling/Monitoring Work Plan

- **Implement comprehensive sampling program:**
  - **Long-Term Continuous River Monitoring**
  - **Weekly River Sampling**
  - **Two 5-Day Intensive Sampling Events**
  - **Two Sediment Oxygen Demand Studies**

LHR Sampling/Monitoring Locations

Station	Description	Distance Upstream of (River Miles)	Tidally Influenced?
W1	Route 1& Pier	1.3	Y
W2	RR Bridge	5.1	Y
W3	Conrail RR Bridge	7.1	Y
W4	Upstream of Confluence w/ Bellman's Creek	10.8	Y
W5	Route 46 Bridge/Hess Oil Co. Pier	13.7	Y
W6	Footbridge	19.0	Y
W7	Oradell Road Bridge	21.7	N
W8	Coles Brook	(tributary)	N
W9	Overpeck Creek	(tributary)	N
W10	Saw Mill Creek @ NJ Turnpike (Western Spur)	(tributary)	Y

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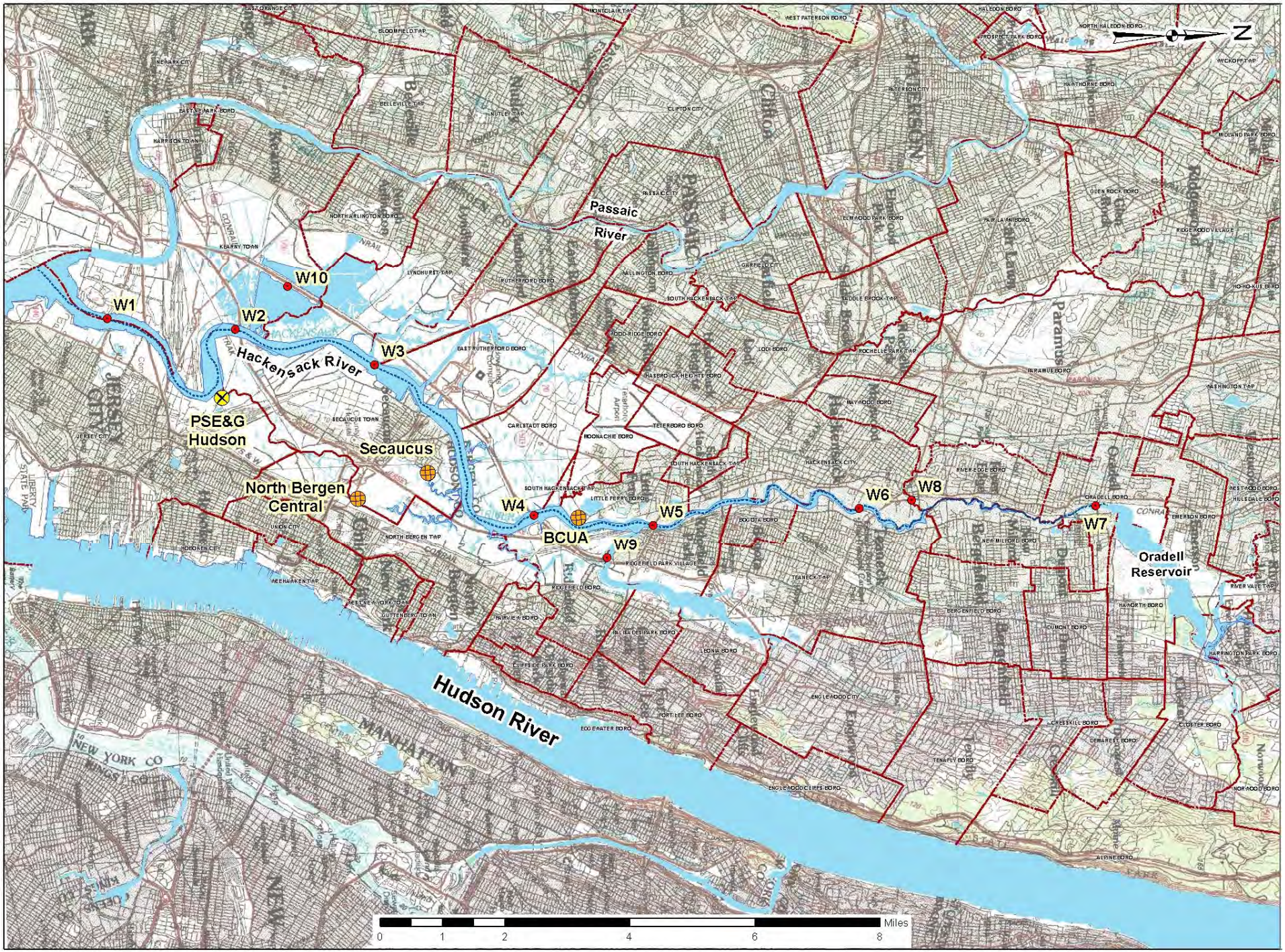
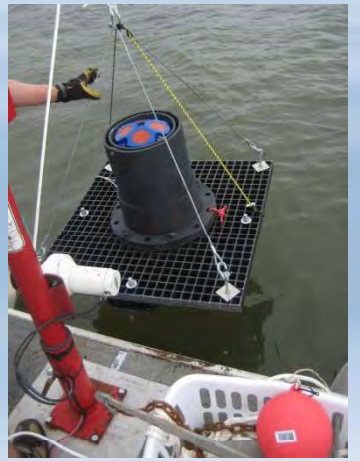

W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
PSE&G Hudson
Secaucus
North Bergen
Central
BCUA
Oradell Reservoir
Hackensack River
Passaic River
Hudson River
N
0
1
2
4
6
8
Miles

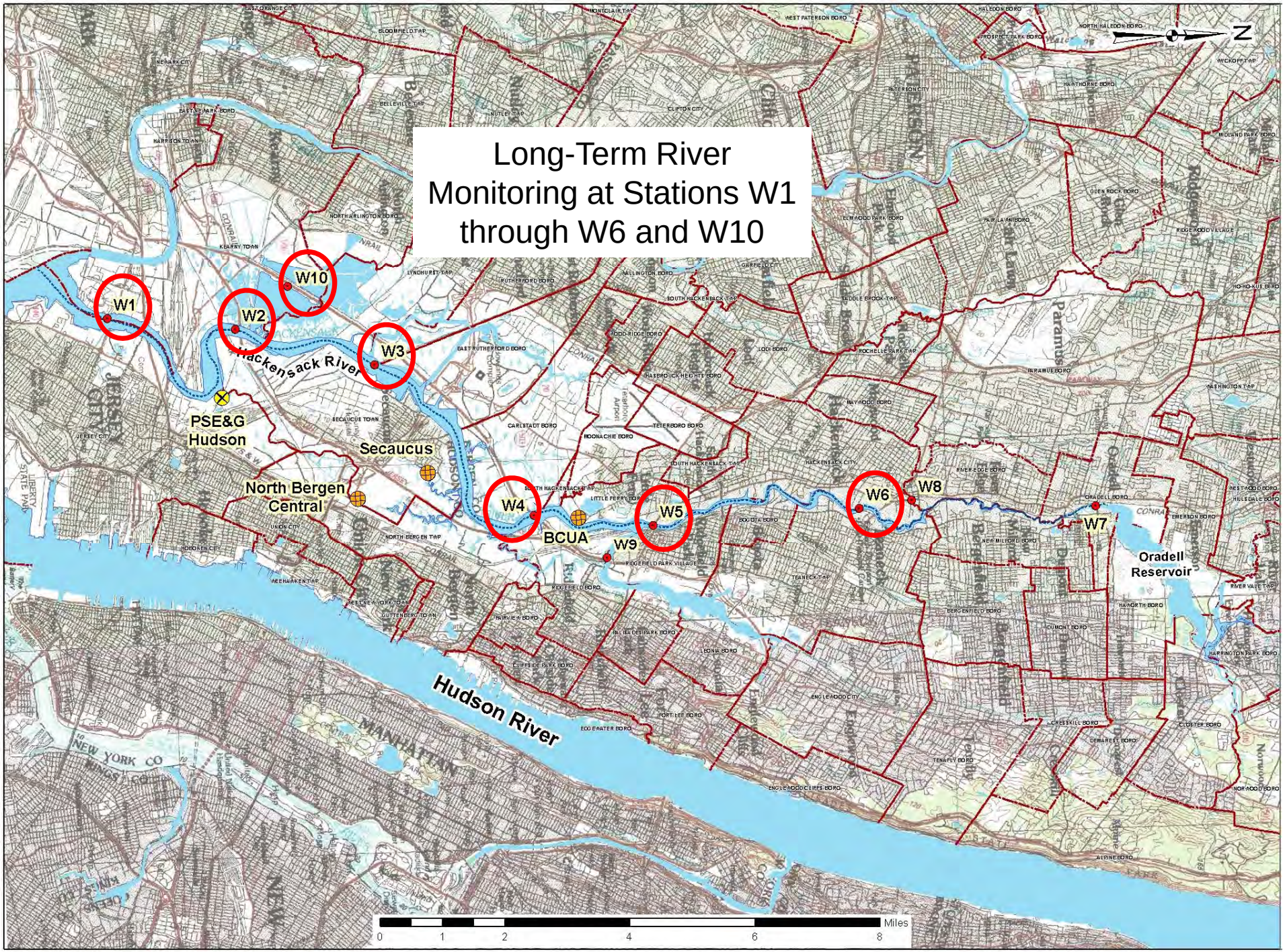
Facility Sampling/Monitoring Locations

- BCUA Little Ferry WPCF
- Secaucus MUA WWTP
- North Bergen MUA Central WWTP
- PSE&G Hudson Generating Facility

Long Term Continuous LHR Monitoring

- **Duration: 6 months (June – November 2010)**
- **Water Quality (Every 15 minutes)**
  - **DO, Temp, Turbidity, Conductivity, Salinity, and pH**
  - **Stations W1 through W6 and W10 @ MLLW**
    - **W1 – W5: 1/3 & 2/3 Depths**
    - **W6: 1/2 depth**
    - **W10: 1/3 depth**
- **Tidal Current Monitoring (Every 15 minutes)**
  - **Stations W1 and W4**
- **Tide Gages (Every 6 minutes)**
  - **Stations W1, W3, and W5 (duplicate at W1)**




Long-Term River Monitoring at Stations W1 through W6 and W10
W1
W2
W3
W10
W4
W5
W6
W7
W8
W9
PSE&G Hudson
Secaucus
North Bergen Central
BCUA
Oradell Reservoir
Hackensack River
Hudson River
Miles
0
1
2
4
6
8

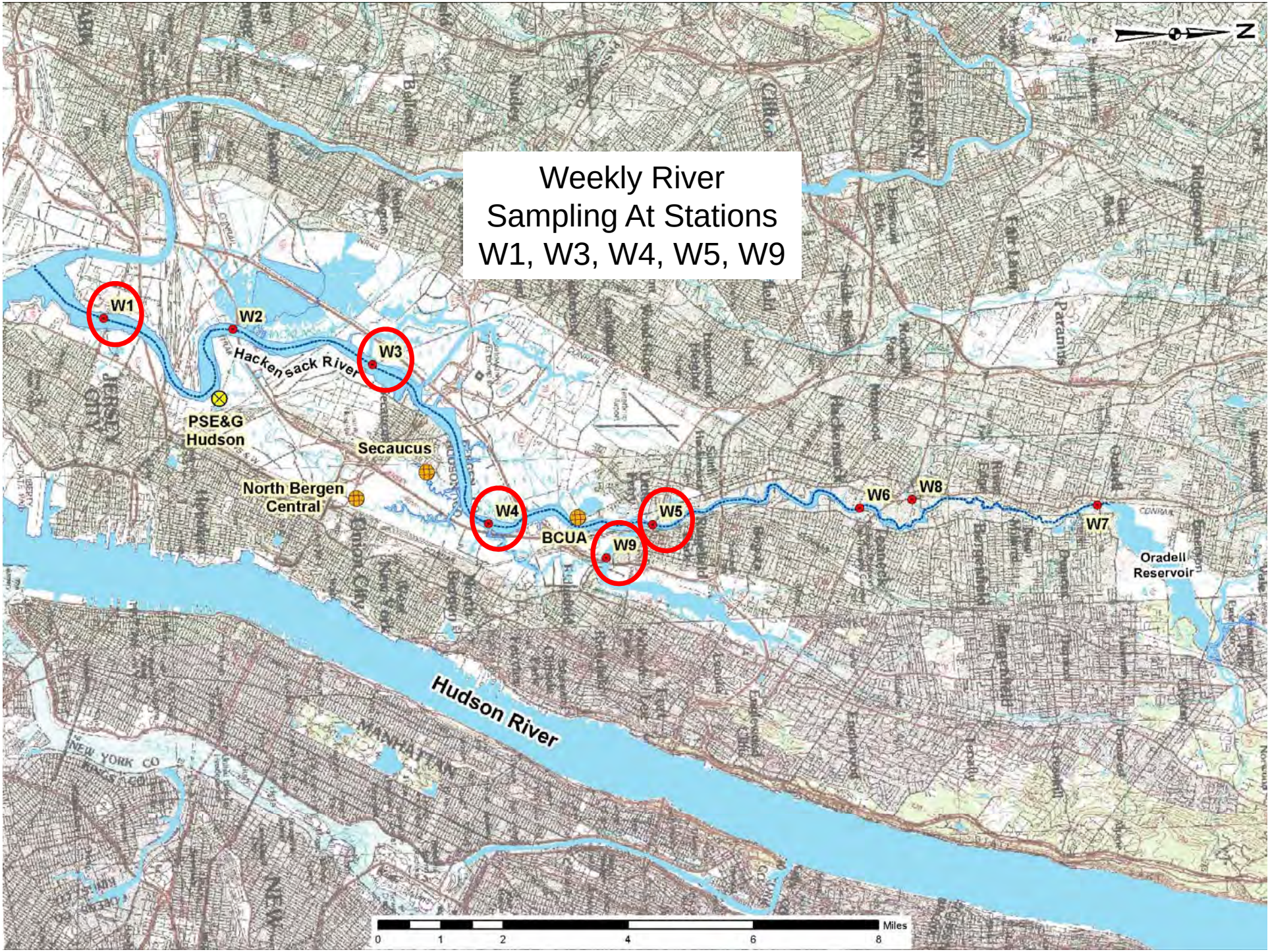
Weekly Sampling

- **Duration: 6 months (June – November 2010)**
  - **Once per week**
- **Stations W1, W3, W4, W5 & W9*: 1/3 & 2/3 Depth**
  - **Samples analyzed for the following parameters:**

Ammonia	**Nitrate**	**TKN**	**Conductivity**	**Temperature[1]**
CBOD5-nitrogen inhibited	**Nitrite**	**TOC**	**D.O.[1]**	**Turbidity[1]**
Chlorophyll-a	**OP**	**TP**	**pH[1]**	
DOC	**Secchi Depth**	**TSS**	**Salinity[1]**	

* ½ Depth

[1] Insitu measurement performed by HCV


Weekly River
Sampling At Stations
W1, W3, W4, W5, W9
W1
W2
W3
W4
W5
W6
W7
W8
W9
Hackensack River
PSE&G
Hudson
Secaucus
North Bergen
Central
BCUA
Oradell
Reservoir
Hudson River
Miles
0
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5-Day WQ Sampling

- **Two Events: August 2010 & October 2010**
- **5-consecutive day, 24-hour events**
- **The samples analyzed for the following:**

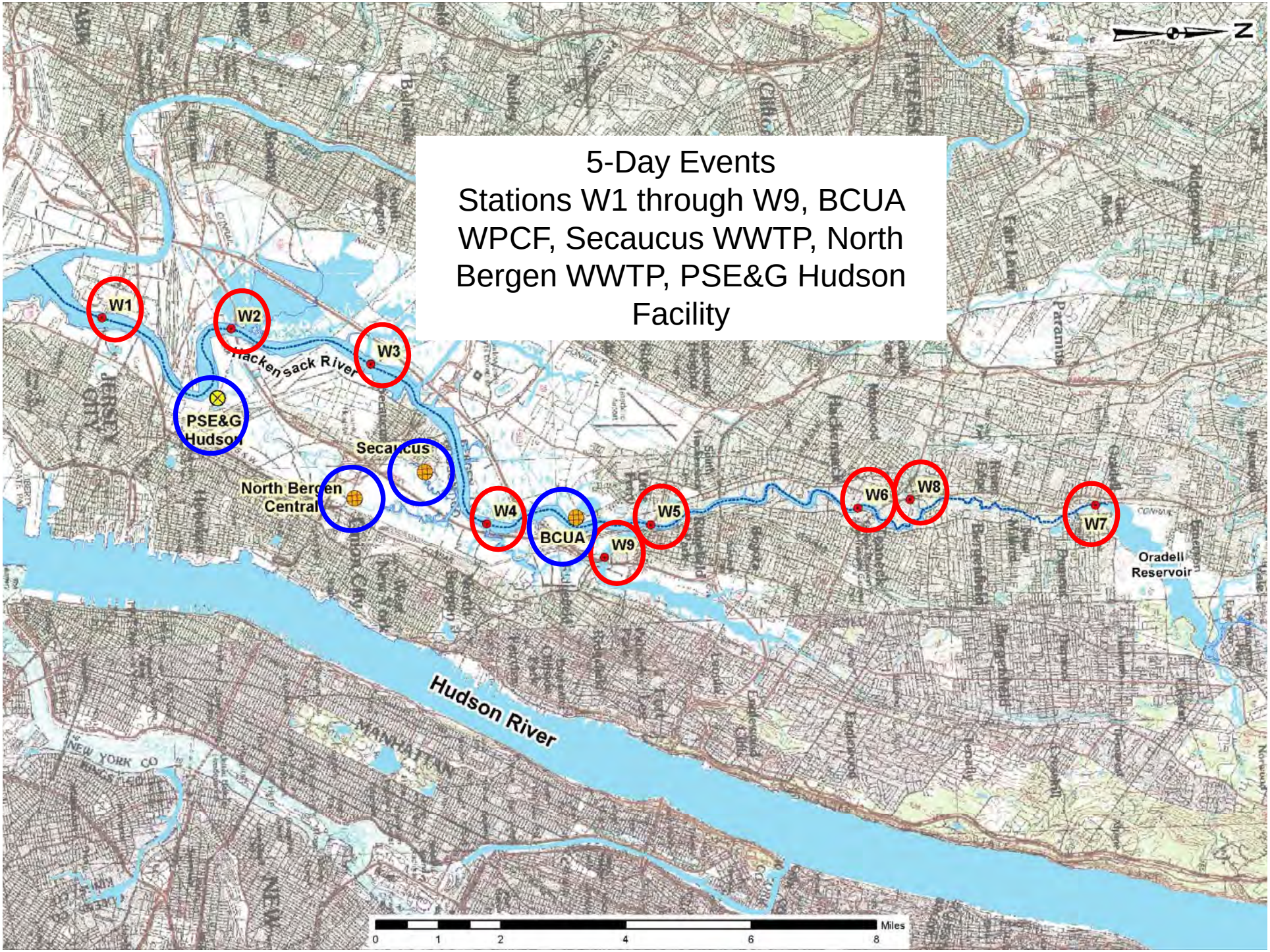
Ammonia	Nitrate	TKN	Conductivity[4]	Temperature[3,4]
CBOD5-nitrogen inhibited	Nitrite	TOC	D.O.[3,4]	Turbidity[4]
Chlorophyll-a[2]	OP	TP	pH[3,4]	
DOC	Secchi Depth[1,2]	TSS	Salinity	

[1]Measured once, between 10:00am – 2:00pm, each day
[2]Not collected at the treatment plants
[3]In-situ measurements taken by HCV in the River.
[4]Monitored continuously at the treatment plants and PSE&G via temporarily installed YSIs.

5-Day Sampling cont.

- **Stations W1 through W5**
  - **1/3 and 2/3 depths (every 3 hours)**
- **Station W6**
  - **1/2 depth (every 3 hours)**
- **Stations W7 through W9**
  - **1/2 depth (every 12 hours)**

- **BCUA Little Ferry WPCF, Secaucus & North Bergen Central WWTPs**
  - **Daily Composites**


5-Day Events
Stations W1 through W9, BCUA WPCF, Secaucus WWTP, North Bergen WWTP, PSE&G Hudson Facility
W1
W2
W3
W4
W5
W6
W7
W8
W9
BCUA
PSE&G Hudson
Secaucus
North Bergen Central
Hackensack River
Hudson River
Oradell Reservoir
Miles
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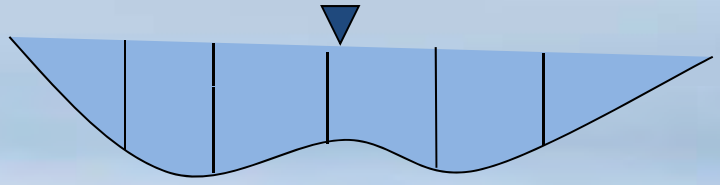
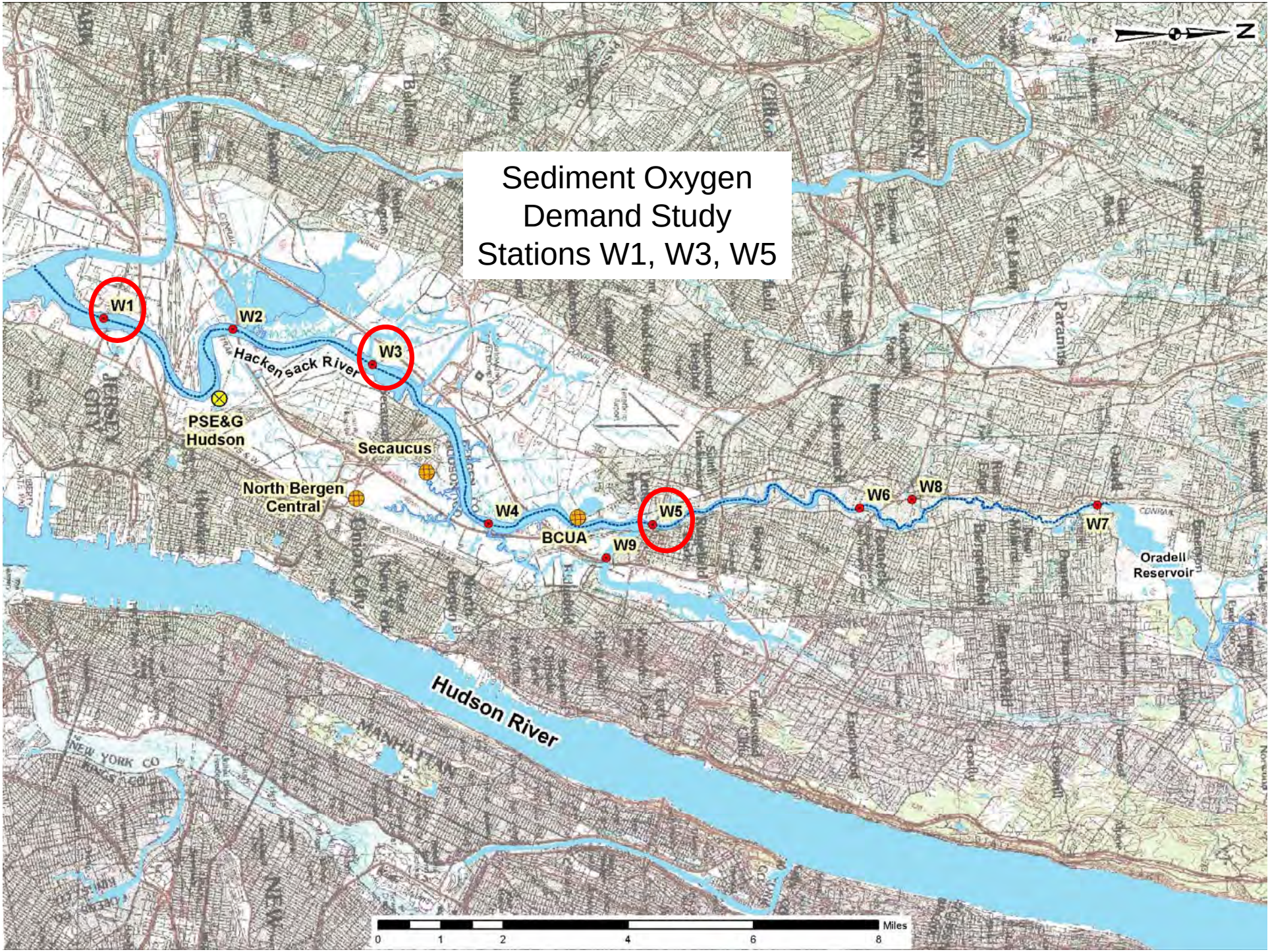
Sediment Oxygen Demand Study

- **Two Separate Events**
  - **August 2010**
  - **October 2010**



- **River Stations W1, W3, and W5**
  - **5 locations per Station**
  - **Each location collected in triplicate**

- **SOD and Nutrient Uptake Analysis**
  - **7 continuous days**


Sediment Oxygen Demand Study Stations W1, W3, W5
W1
W2
W3
W4
W5
W6
W7
W8
W9
Hackensack River
PSE&G Hudson
Secaucus
North Bergen Central
BCUA
Oradell Reservoir
Hudson River
JERSEY CITY
MANHATTAN
NEW YORK CO
Miles
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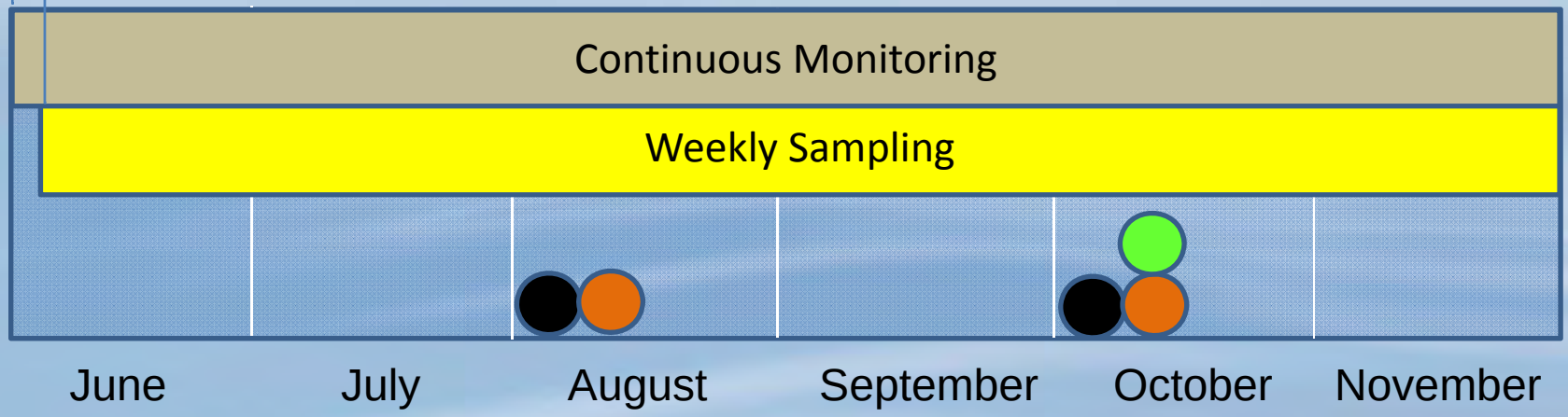
Workplan Implementation

Continuous Monitoring Instruments Installed June 1 – 6, 2010

Long-term Weekly Sampling intitiated June 9, 2010



5-Day Intensive Sampling: August 9 – 14 & October 4 – 9, 2010

SOD Sampling: August 16 – 20 & October 11 – 15, 2010

Additional ADCPs deployed mid-October to mid-November, 2010

Sampling/Monitoring

One of the most comprehensive WQ sampling/ monitoring programs performed to date:

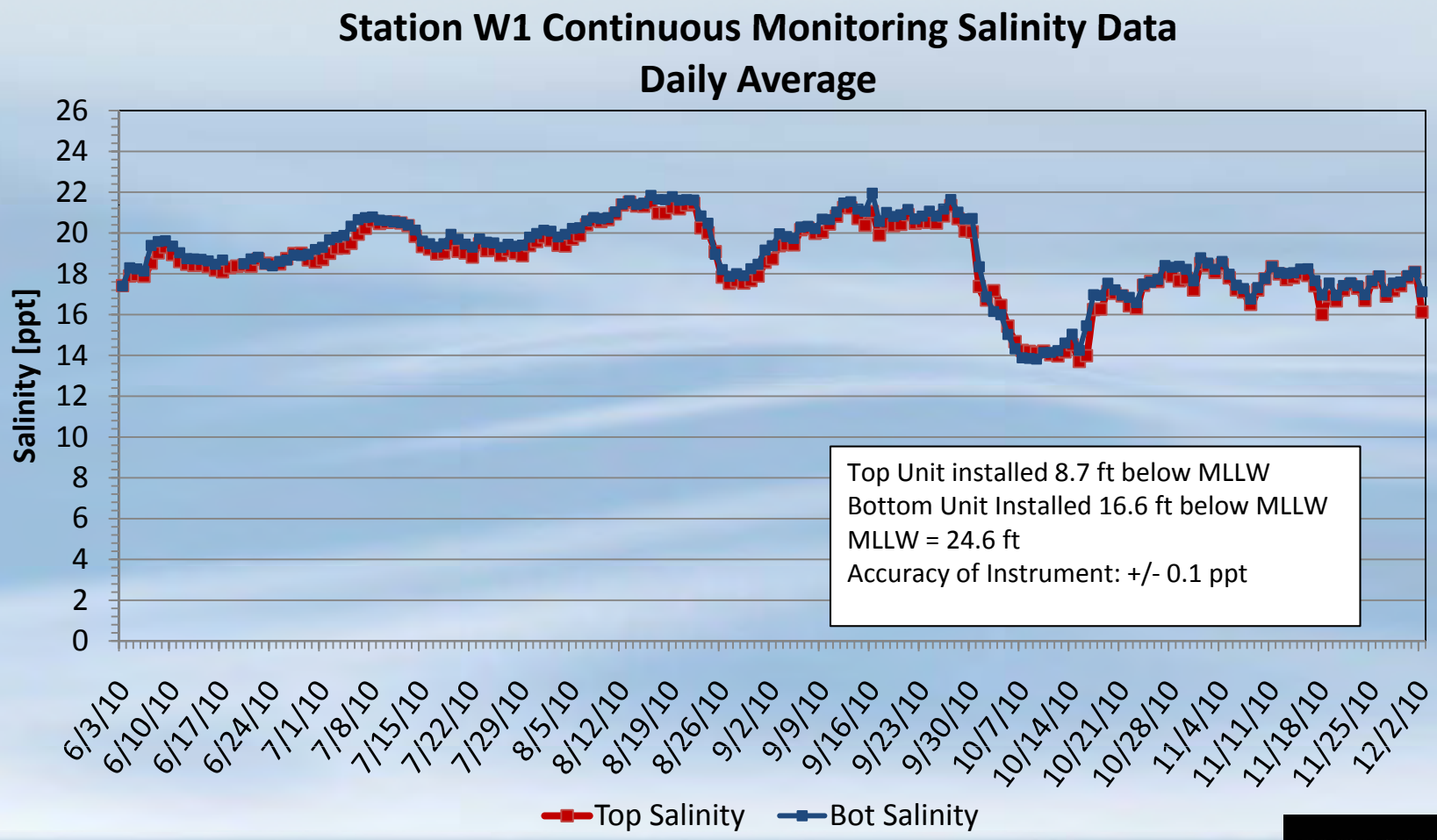
- **>1,200 WQ samples collected for 11 parameters**
- **>16,600 real-time WQ measurements collected per location per depth**
  - **Total of 7 locations: >200,000 measurements**
- **>43,200 real-time tidal measurements collected per location**
  - **Total of 3 locations: 129,600 measurements**

Data Reported to Malcolm Pirnie

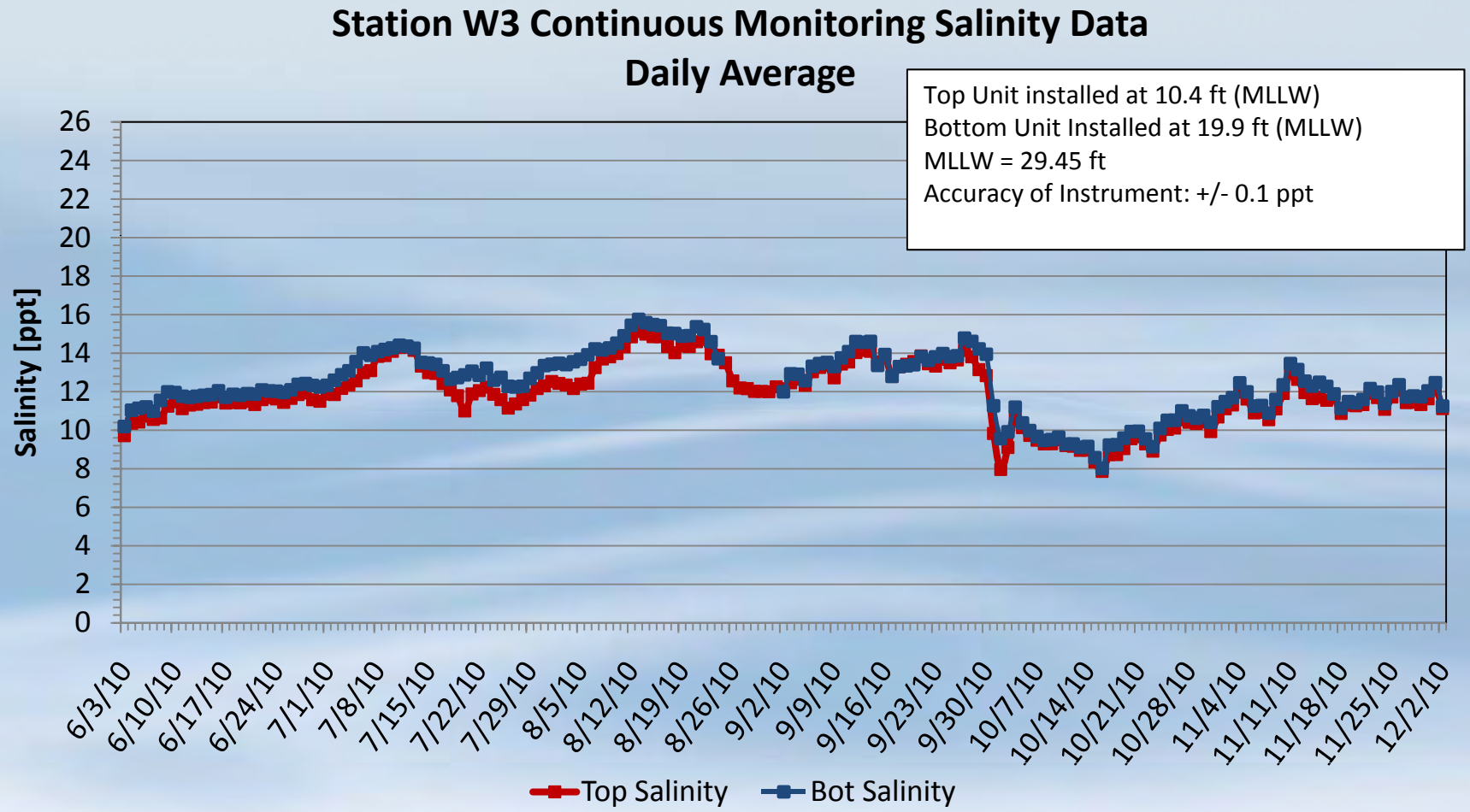
- **Weekly Sampling (HCV)**
  - **Lab Analytical and Monitoring:**
    - **June 9 – November 30, 2010***
- **5 – Day Events (HCV)**
  - **Lab Analytical and Monitoring:**
    - **August and October events***
- **Long-term Instruments (Alden)**
  - **Continuous Monitoring with YSI Sondes:**
    - **June 1 – December 3, 2010***

***Data undergoing QA/QC.**

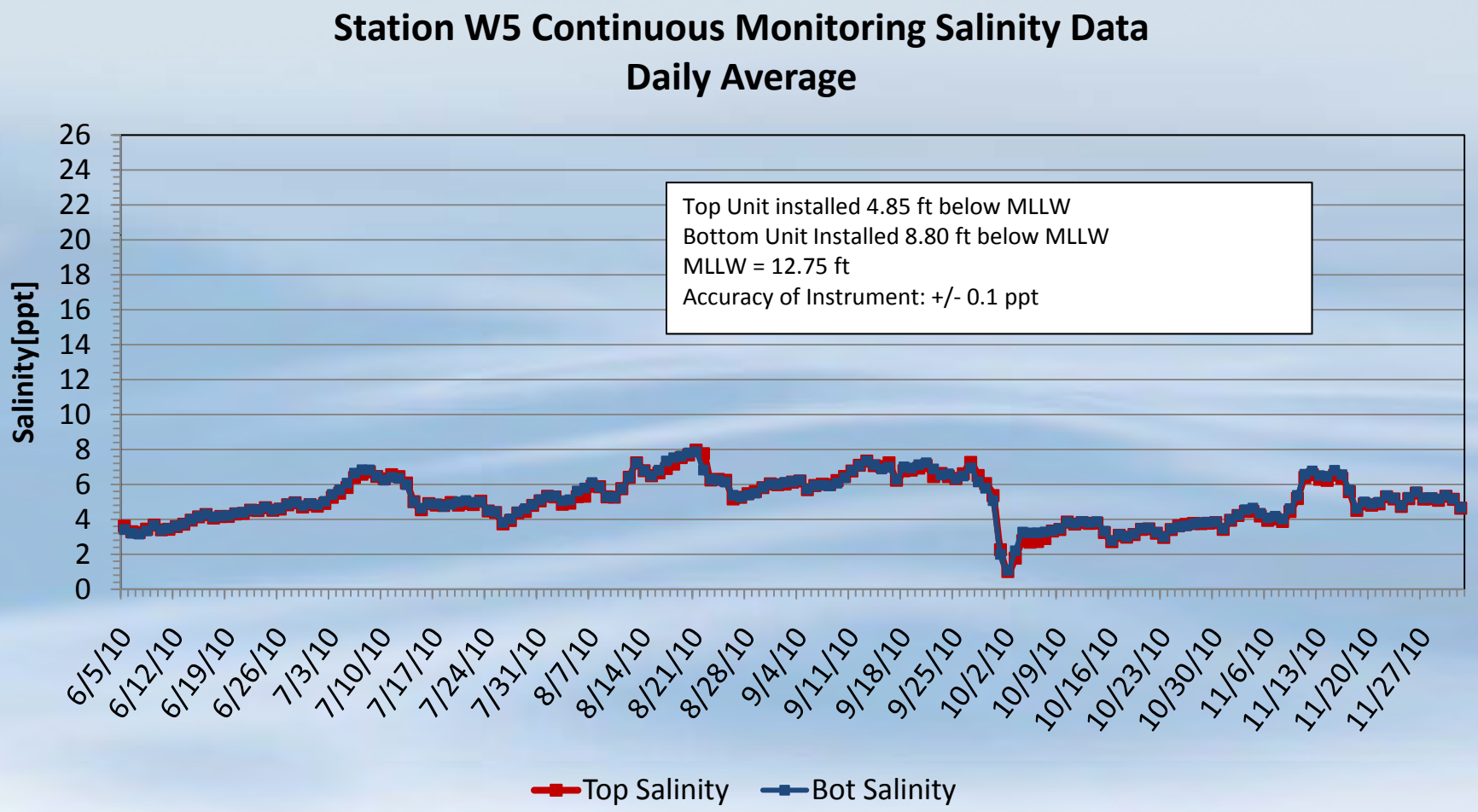
Continuous Monitoring Preliminary Data



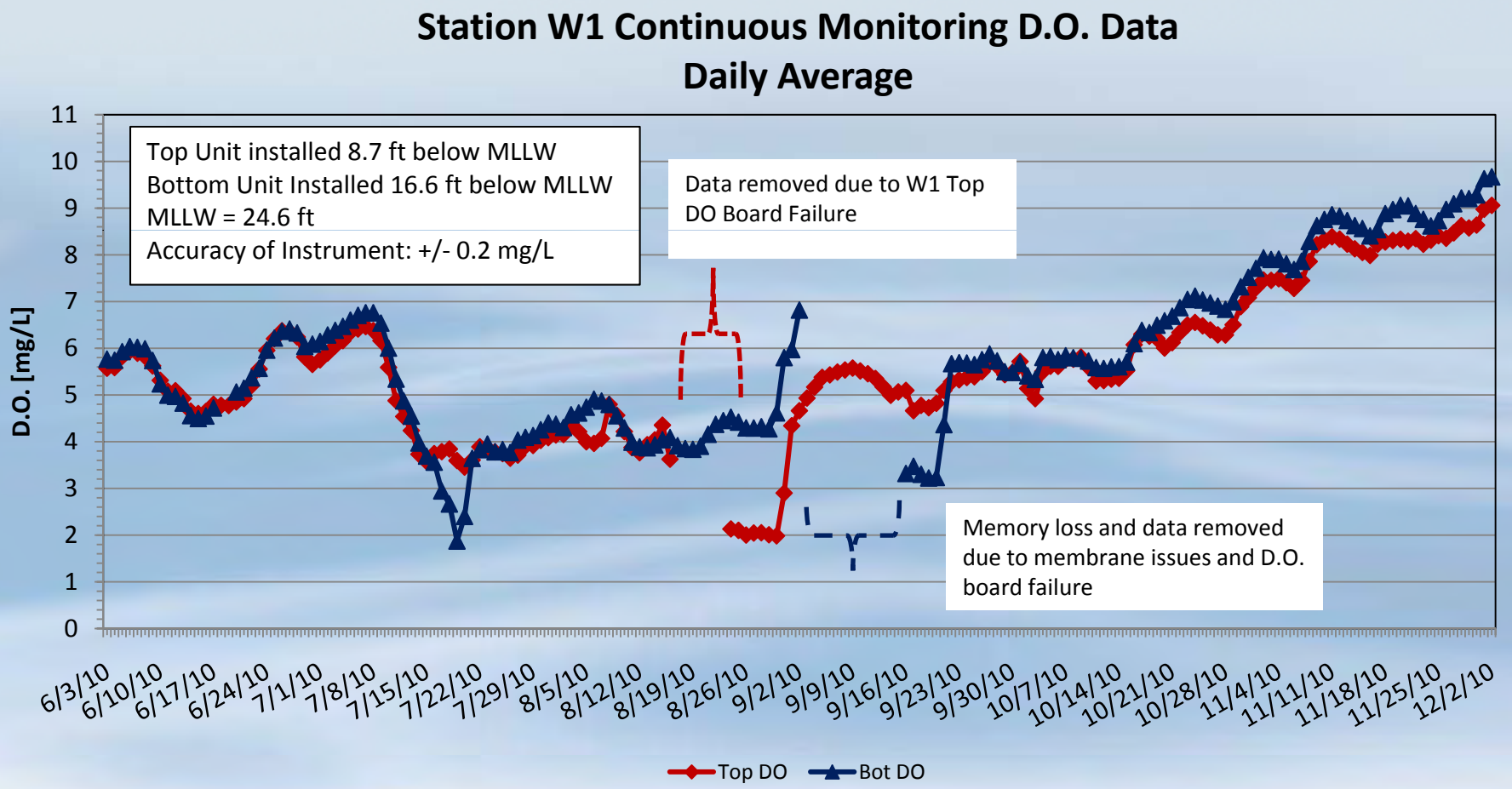
Continuous Monitoring Preliminary Data



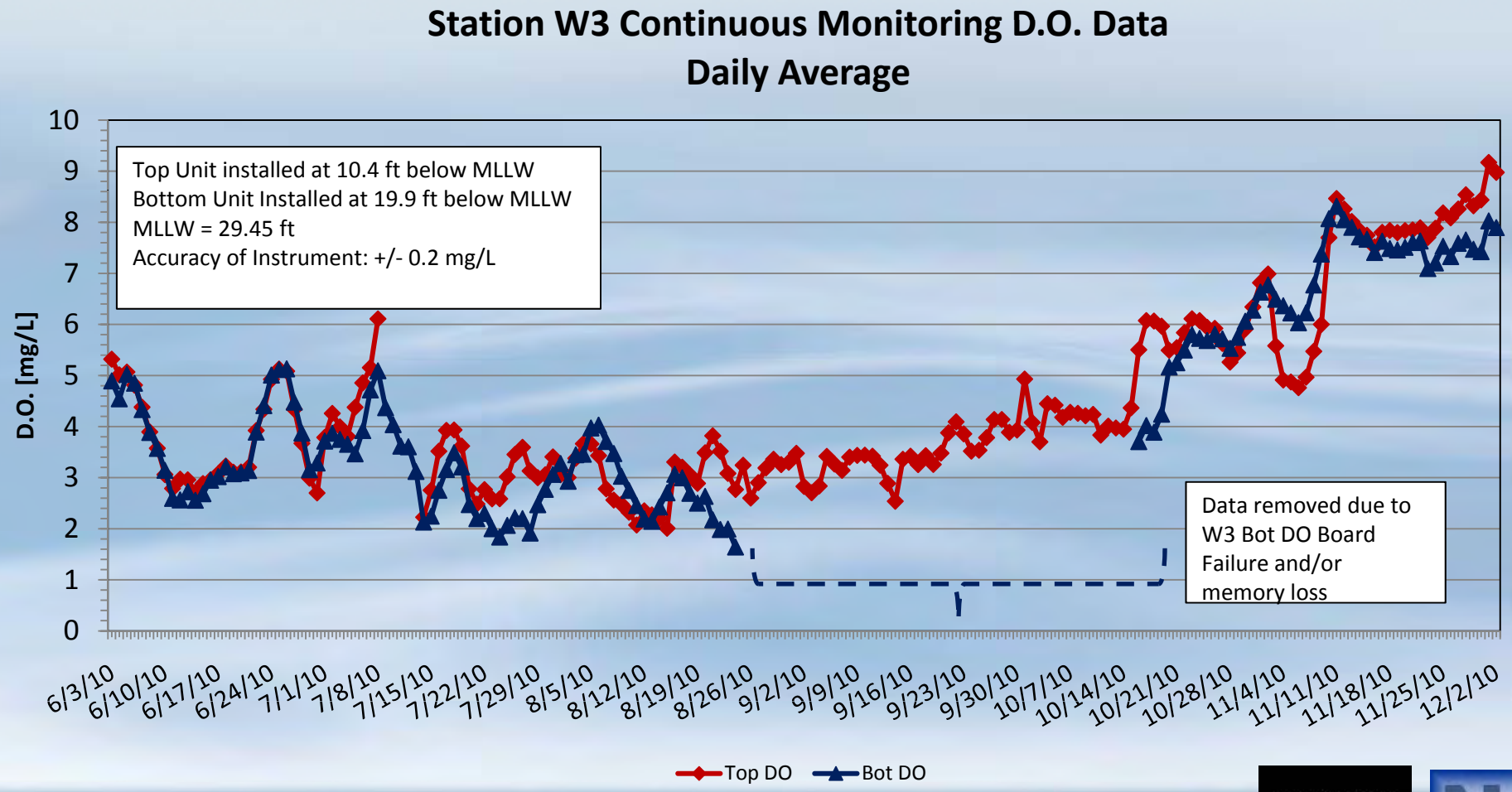
Continuous Monitoring Preliminary Data



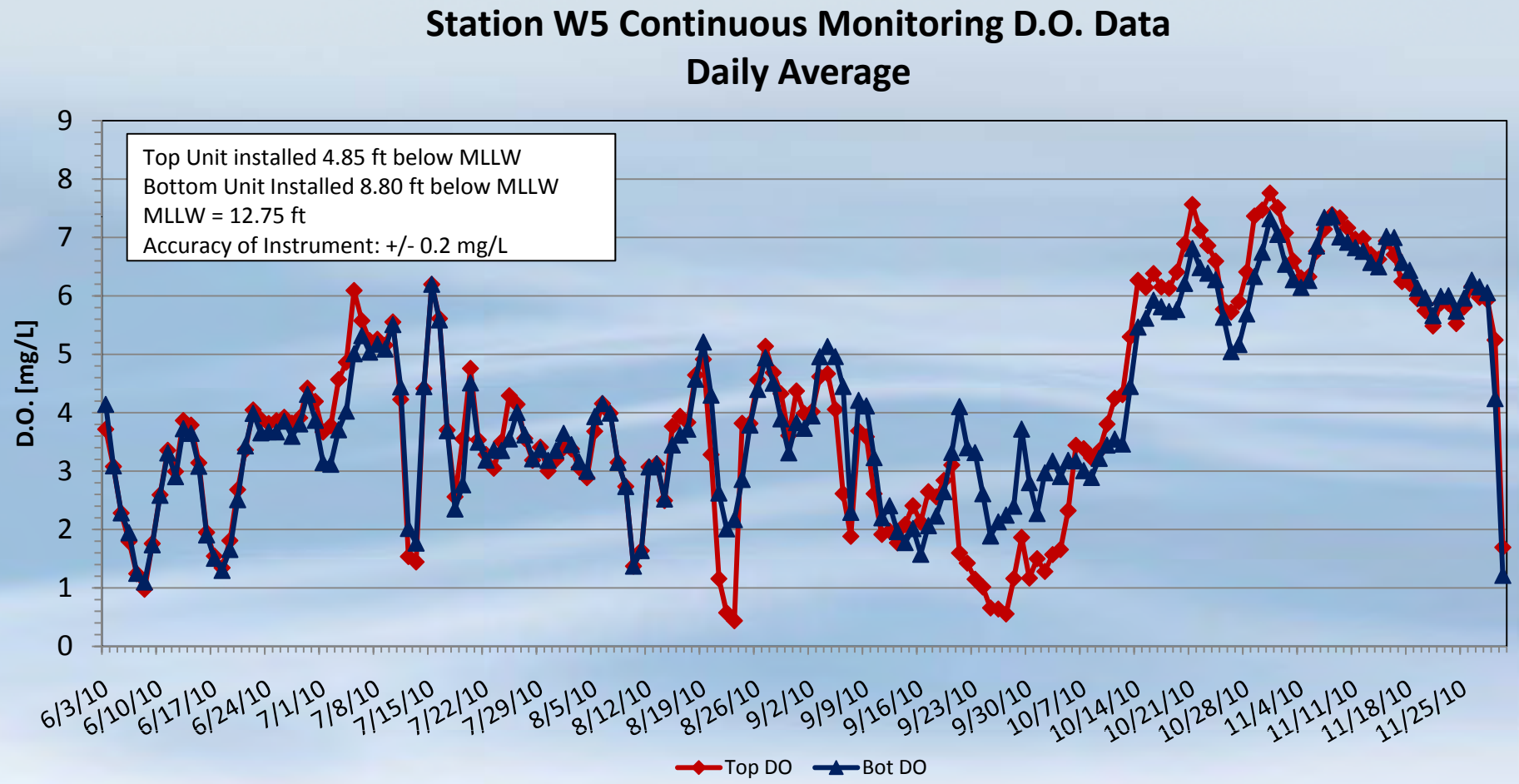
Continuous Monitoring Preliminary Data



Continuous Monitoring Preliminary Data



Continuous Monitoring Preliminary Data



Current Activities/Status

- **Performing QA/QC and Evaluating:**
  - **Weekly and 5-day Laboratory and Monitoring Data**
  - **Six-month Continuous Monitoring Data**
- **Reviewing/Compiling data from other sources**
- **Addressing an issue with laboratory data**

Laboratory Data Issue

- **October 7, 2010 – Hampton Clarke/Veritech notified Malcolm Pirnie of lab data issue**
- **HCV Lab Technician did not run QA/QC samples**
- **Parameters Impacted: TP, OP, TSS**
- **Samples Impacted:**
  - **Weekly Sampling: August 5 – September 22, 2010**
  - **August 2010 5-day event**
- **Impacted TP, OP, and TSS data not defensible**

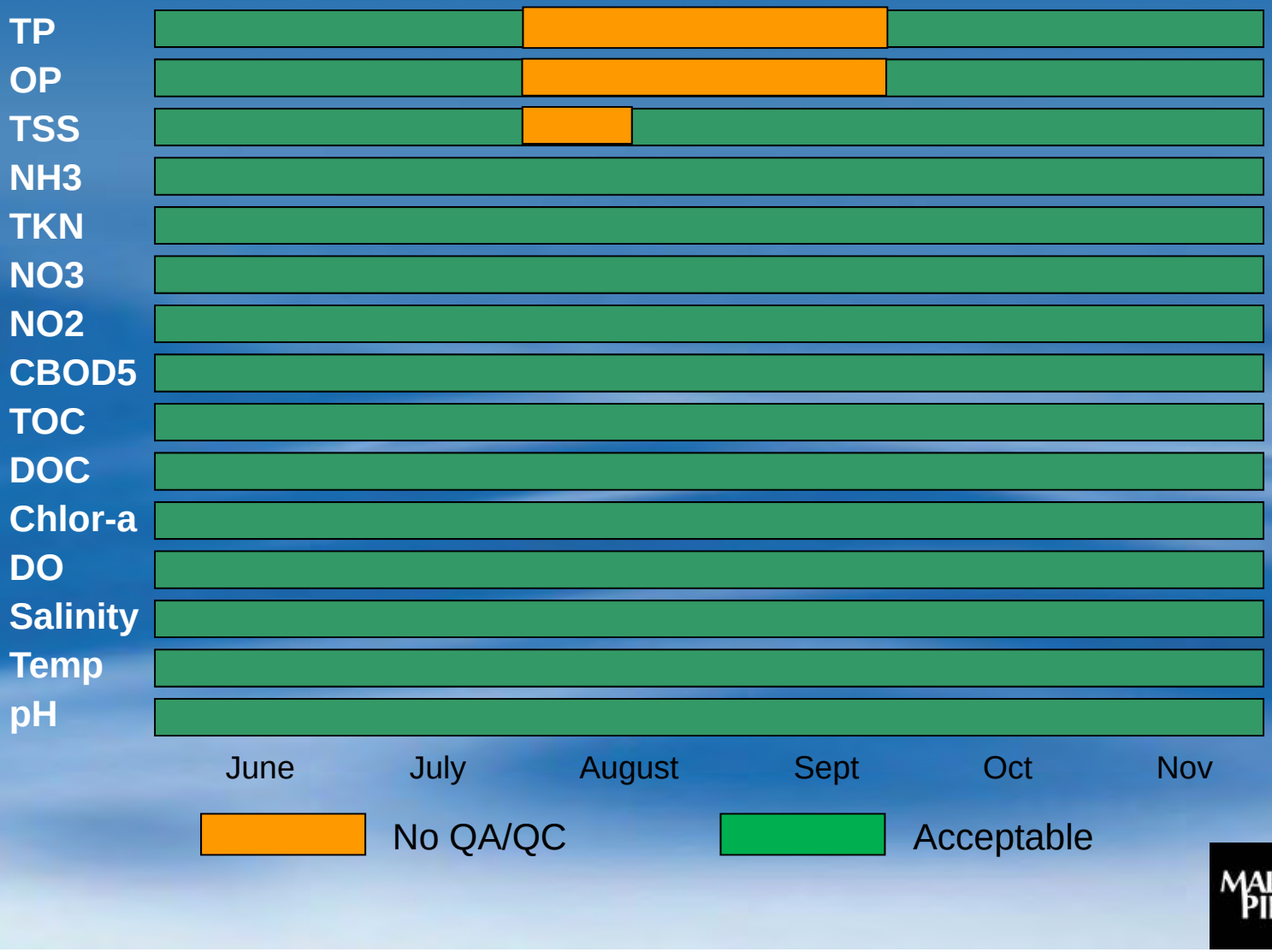
Laboratory Data Issue

- **HCV reviewed previous TP, OP, TSS data sets performed by the terminated analyst for this and other projects**
  - **Found no deviation from method protocol prior to August 5, 2010**
- **HCV instituted real-time data QA/QC oversight for the October 2010 5-day event**

Related Actions

- **Malcolm Pirnie**
  - **Met with Najarian to discuss impact on project and plan for moving forward**
  - **Performing more intensive QA/QC of Laboratory data**

Impact of Lab Issue on Data Set



Sampling/Monitoring Workplan Goals

- **Long-Term Continuous Monitoring**
  - **6 months YSI data collected** ✓
- **Weekly Sampling/Monitoring**
  - **6 months data collected**
    - **Lab results for TP and O-PO4 (4 months)**
- **5 day intensive events**
  - **Summer Event - except TP and O-PO4**
  - **Fall Event** ✓

Impact of the Data Gap

- **Sampling and Monitoring Workplan**
  - **Data collection goals partially met**
- **Modeling Workplan**
  - **What is the impact on Modeling effort?**

Modeling Overview

Model Adaptation Schedule*

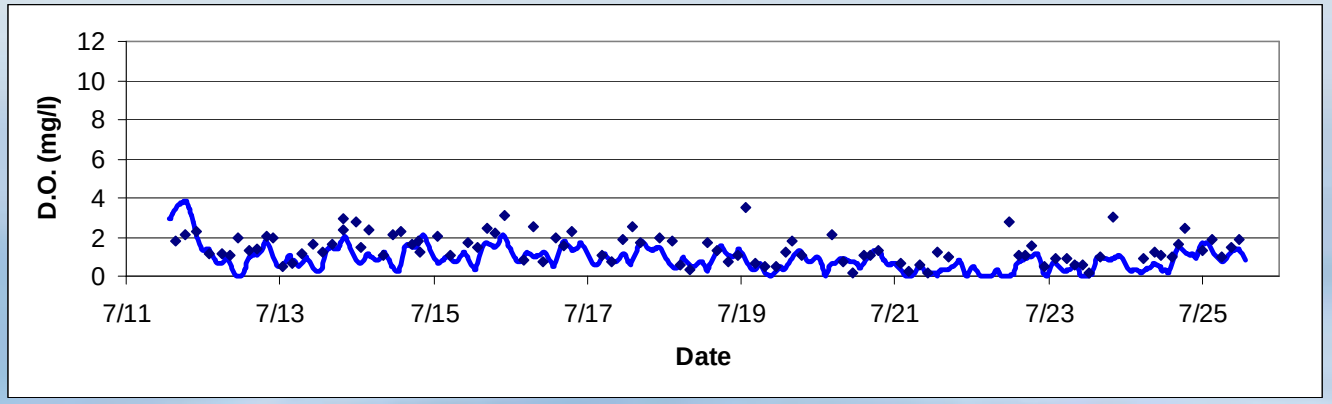
- **Pre-calibration based on 1988 data**
- **Re-calibration on one 5-day survey**
- **Verification based on another 5-day survey**
- **Validation for seasonal trends based on six month of weekly/continuous monitoring data**

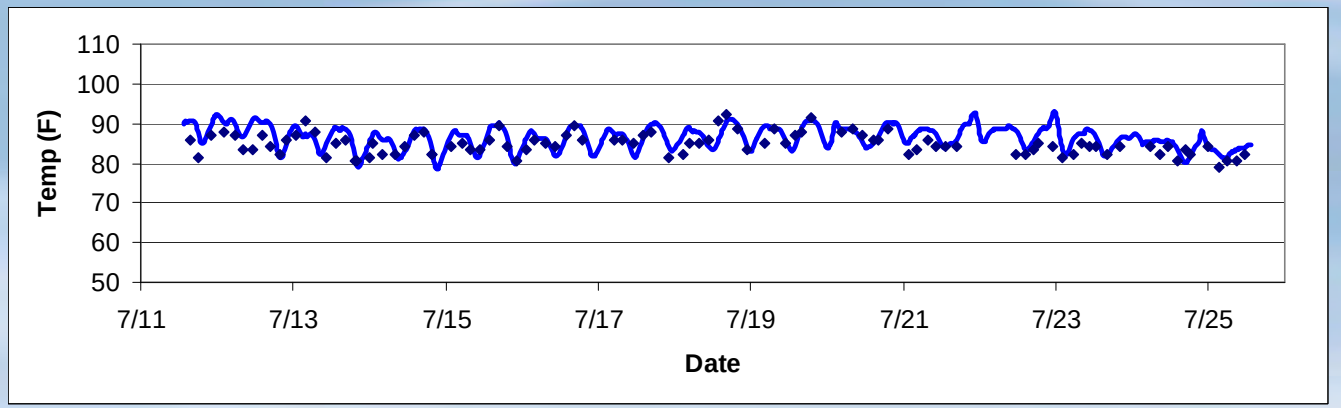
*** As stated in Section 3.7 of Modeling Workplan**

Model Verification Scenario

- **Verification based on the two 5-day intensive river monitoring surveys**
- **Verification simulations will be of a 4-week duration encompassing the 5-day monitoring event**
- **Verification simulations will utilize continuous DO, salinity and temperature data for the 4-week period**

1988 Study - Model Calibration





Algal-Nutrient Modeling Approach*

- **Alternatives Considered:**
  - **Enhance previously adapted MIT-DNM model to address algal dynamics**
  - **Link previously adapted MIT-DNM model hydrodynamics to WASP for water quality**

*** As presented to the MEG on May 11, 2009**

Algal-Nutrient Modeling Approach

- **River Conditions:**
  - **Excess concentrations of nitrogen/phosphorus**
  - **High turbidity/2-foot Secchi depth**
  - **Probable light limitation**

Algal-Nutrient Modeling Approach*

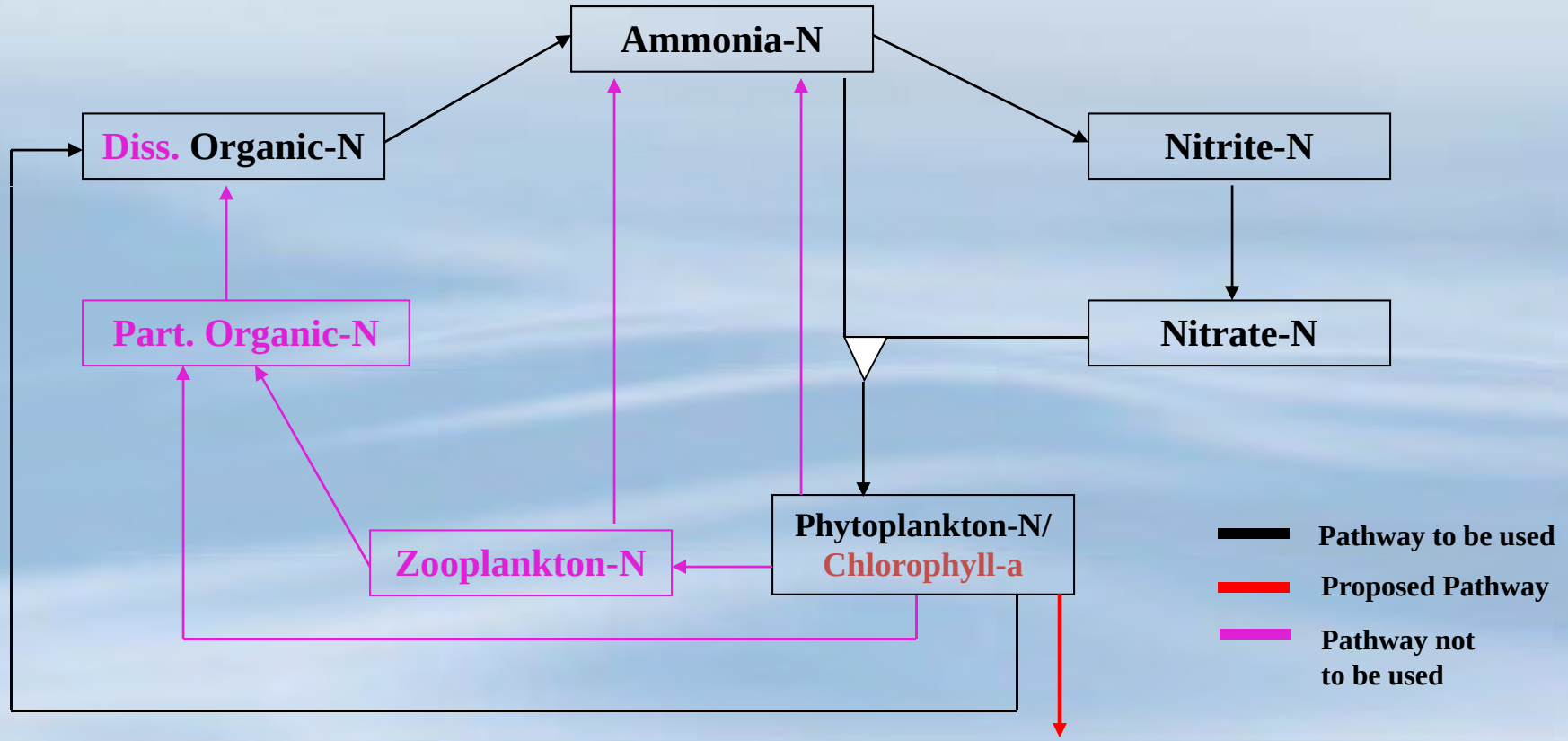
- **Recommendation:**
  - **Use MIT-DNM to provide proper transport, dilution and reaeration throughout the River and Meadowlands**
  - **Re-verify model hydrodynamics and transport using 2010 data**
  - **Modify the model's nitrogen cycle module to provide the requested simulation of algae (chlorophyll a) and diurnal DO impacts**
  - **Calibrate and verify water quality and algal model using newly collected intensive and long-term data**

*** As presented to the MEG on May 11, 2009**

MALCOLM PIRNIE

Algal-Nutrient Modeling Approach*

Proposed use of MIT-DNM Nitrogen Cycle Module



* As presented to the MEG on May 11, 2009

Issues with Phosphorus Data Gap

- **Phosphorus not needed for proposed model**
- **Secondary uses for phosphorus data**
  - **Prediction of phosphorus export load at boundary**
  - **Assessment of algal composition/growth**
- **MEG determination needed**

Potential Options to Address Data Gap

1. **Proceed with the study using only the data that has been collected to date.**
   - **Comments may arise that we would not be able to address due to the lack of some summer phosphorus data.**
2. **Proceed with an additional data collection effort.**
   - **This effort would allow us to better address any issues related to the data gap and phosphorus concentrations in the River.**

Recommended Approach (Option 2)

- **Perform new 5-day event**
  - **July 2011 (Target 2nd week)***
  - **Same sampling Stations and frequency as August 2010 event**
- **Conduct weekly water quality sampling/monitoring**
  - **June 1, 2011 – July 31, 2011**
  - **Same sampling Stations and frequency as the 2010 Weekly Sampling and Monitoring**

***Weather Dependent**

Recommended Approach (Option 2) cont.

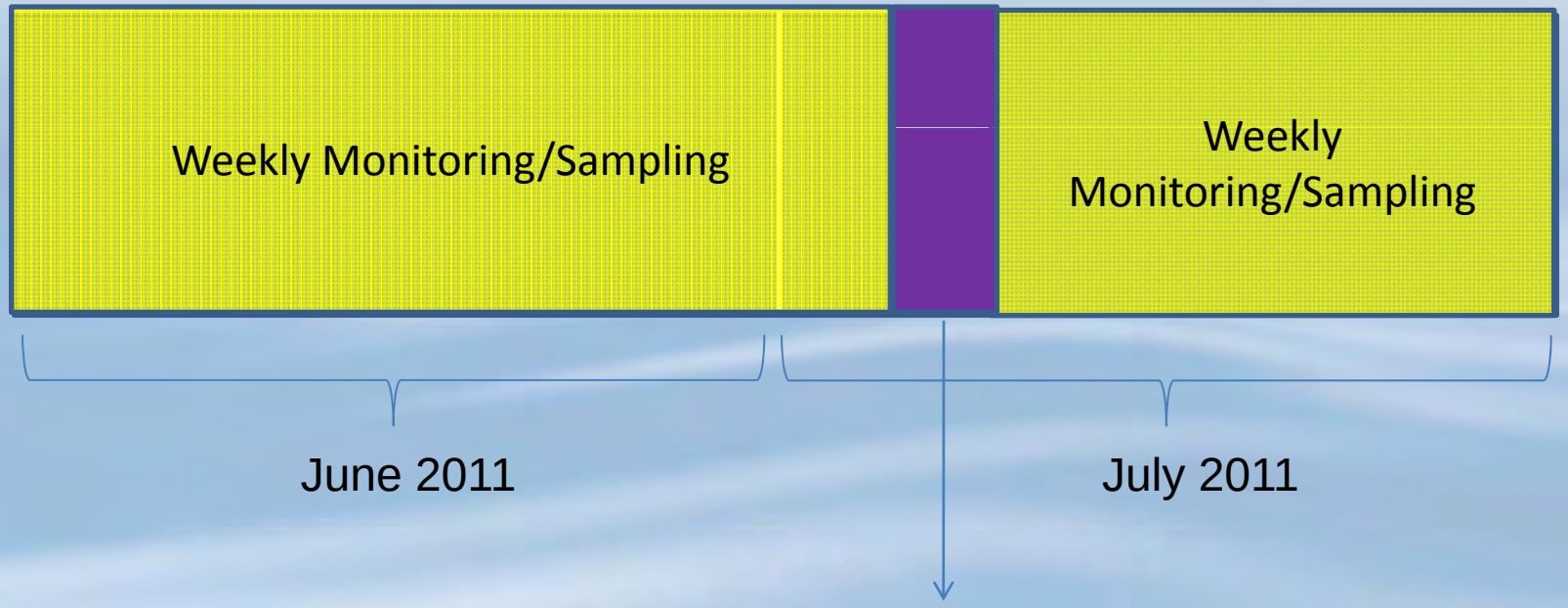
- **Conduct long-term continuous in-situ monitoring**
  - **June 1, 2011 – July 31, 2011**

  <u>YSI Instruments</u>
  - **Two depths – Stations W1 – W5**
  - **One depth – Stations W6 and W10**

  <u>ADCP</u>
  - **Stations W1 and W4**

  <u>Tide Gage</u>
  - **Stations W1, W3, W5**

Reommended Approach Timeline



Estimated Impact on Project Schedule

- **Complete Sampling/Monitoring**
  - **Original Date – November 30, 2010**
  - **Revised Date – July 31, 2011***
- **Submit Preliminary Report to DEP**
  - **Original Date – June 1, 2011**
  - **Revised Date – February 1, 2012***
- **Modeling Workplan schedule similarly effected**
  - **Model verification by Spring 2012**

***Weather Dependent**

Next Steps

- **DEP/EPA/MEG approval of approach or other guidance/recommendations:**
  - **Verbal/E-mail Communication by May 16, 2011**
  - **Formal Documentation by May 23, 2011**
- **Revise Sampling/Monitoring Workplan**
- **Implement Workplan in Summer 2011**

General Discussion