EXHIBIT B

Maryland Department of the Environment
Water Management Administration
1800 Washington Boulevard
Baltimore, Maryland 21230

MONITORING PROTOCOL FOR WETLAND MITIGATION PROJECTS

A. Compensatory mitigation projects required as a condition of a State Nontidal Wetlands and Waterways Permit for wetland impacts must achieve the goals and objectives established in the approved Phase II Mitigation Plan. Within the five year monitoring period, or other time period as required by the Department in the Phase II Mitigation Plan Approval Letter, it shall be demonstrated that the mitigation site has become a nontidal wetland. Additionally, mitigation projects shall conform to the following Project Standards by the end of the five year monitoring period, unless otherwise determined by the regulatory agencies. If the mitigation site does not meet the Project Standards, the Permittee or Authorized Person is responsible to remediate the mitigation site or otherwise satisfy their mitigation requirement to the satisfaction of the Department. The Corps and MDE will use best professional judgment, visual observations, and monitoring reports to evaluate attainment of performance standards and in determining whether part of or the entire site is successful or whether corrective actions are warranted. Success will be determined on a plot, well, field, or cell basis.

1) Greater than 85% of the wetland mitigation site shall be vegetated (either by planted or naturally revegetated plants) by native wetland species similar to those found in the nontidal wetland lost or by a species composition acceptable to the Wetlands and Waterways Program. Vegetative communities not acceptable to the Program would include those communities dominated by common reed (*Phragmites australis*) or other nuisance vegetation, or communities which are dominated by facultative upland or upland species.
2) Living native plant density in forested and shrub/scrub wetland areas of at least 600 living woody stems with a minimum height of 10 inches per acre with an indicator of FAC or wetter shall be maintained through the end of the monitoring period.
3) The entire wetland restoration, creation, and enhancement area must have wetland hydrology, defined as 14 or more consecutive days of flooding or ponding, or a water table 12 inches or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability). For the purpose of this determination, the growing season is based on two indicators of biological activity that are readily observable in the field: (1) above ground growth and development of vascular plants and (2) soil temperature as an indicator of soil microbial activity. These indicators of biological activity shall be used for determinations of growing season (as related to the hydrological indicator) and are more fully described in the appropriate regional supplement to the Corps of Engineers Wetland Delineation Manual.
4) The entire wetland restoration, creation, or enhancement area shall have active hydric soil conditions that meet the Hydric Soil Technical Standard (HSTS) developed by the National Technical Committee for Hydric Soils (Technical Note 11). The HSTS requires documentation of anaerobic conditions and saturated conditions for a soil to be considered hydric:
    i. For a soil to meet the Saturated Conditions part of the HSTS, free water must exist within 10 inches (25 cm) of the ground surface for at least 14 consecutive days; and

ii. Anaerobic conditions must exist within 10 inches (25 cm) of the ground surface for at least 14 consecutive days. Anaerobic conditions may be determined by one of the following methods, as detailed in the HSTS:
   (1) Positive reaction to alpha-alpha-Dipyridyl, determined at least weekly.
   (2) Reduction of iron determined with IRIS tubes installed for 30 days.
   (3) Measurement of redox potential (Eh) using platinum electrodes, determined at least weekly.

5) In-stream structures must be stable and in good condition. Stream restoration should be meeting project purpose, including providing grade control to stop the headcut from migrating upstream.
6) The site shall provide the functional goals and objectives established in the Phase II mitigation plan approval letter.

B. An as-built design plan shall be submitted to the Mitigation and Technical Assistance Section of the Wetlands and Waterways Program within 120 days of the completion (this includes grading, planting and/or vegetative stabilization) of the mitigation project. If the project was built as planned, a notification stating that can substitute for the "as-built" plan. Any modifications to the Approved Phase II Mitigation Plan must be approved by the Department prior to construction.

C. The permittee will be responsible for submitting annual monitoring reports to the Maryland Department of the Environment (MDE) Wetlands and Waterways Program for a period of five consecutive years from the completion of the construction of the mitigation site. If the U.S. Army Corps of Engineers (the Corps) requires a longer monitoring period, MDE may also require a longer monitoring period to maintain consistency. In such a case, reports sent to the Corps should also be sent to the MDE Wetlands and Waterways Program. In the case of longer monitoring periods, monitoring reports may not be required every year, but will be determined by the Corps and MDE (e.g. reports may be required the 1st, 2nd, 3rd, 5th, 7th, and 10th years). Annual monitoring reports must be submitted to MDE by December 31 of each monitoring year. The first monitoring report is due the year the mitigation planting occurs, unless planting occurs after April 15, in which case the first monitoring report will not be due until the end of the next year. For each monitoring report, at least one monitoring visit shall be conducted during the growing season for the vegetative monitoring (between May 1 and September 31 for forested/scrub-shrub systems and between June 15 and September 31 for emergent systems). These site visits should preferably be during a period with normal precipitation and groundwater levels. The following information should be included with the annual monitoring report:

1) Overview / Background Data:

   (a) Dates of site inspections.

   (b) A brief paragraph describing the purpose of the approved project, acreage and type of aquatic resources impacted, and mitigation acreage and type of aquatic resources authorized to compensate for the aquatic impacts. Include the dates the mitigation construction was started and the planting was completed.

   (c) A narrative description of the mitigation site addressing its position in the landscape, adjacent waterbodies, and adjacent land use.

   (d) A narrative description of existing site conditions and how the mitigation site has or has not achieved the goals, objectives and Project Standards established for the project.

(e) Take one set of photographs from established photographic points any time during May through September of each monitoring year (pictures should be taken at the same time of year when possible). Photo location points should be identified on the appropriate maps and labeled with the direction in which the photo was taken.

(f) Estimate the percent of the mitigation site that is establishing into wetland and the type of wetland system (ex: forested, scrub-shrub, emergent). If this differs from what was planned, show the boundaries of the actual wetland area/types on the plans or maps.

2) Vegetation:

(a) For each monitoring year, estimate the percent cover by dominant plant species (including volunteer plants) and any invasive plant species. Estimate percent cover by plants with a wetland indicator status of FAC or wetter. Estimate the percent survival of woody planted material and number of native trees/shrubs per acre (including volunteer woody species taller than ten inches). Please note that sites where the woody species density is inconsistent throughout the site may not meet the Project Standards (e.g. a site where some portions have high densities of woody species but other portions have low densities).

(b) Measurements of vegetation based upon performance standard criteria and methods used to assess the vegetative success of the mitigation site.

(c) For years when vegetative plots are assessed, summarize the results from the vegetation plot study, including the density trees/shrubs and percent cover of wetland species present in order of dominance and for each vegetative stratum. **Do not include the raw plot data in your monitoring report.**

3) Hydrology:

(a) Estimate percent of site that is inundated or saturated to the surface on the dates of the site visits.

(b) Monitoring data for surface water and groundwater, including hydrograph of measured depth to water table, after calibrating for above-ground height of well.

4) Soils:

(a) Monitoring data to determine if hydric soils are actively developing. This must include evidence that saturated and anaerobic soil conditions are being met.

5) Remediation:

(a) Describe any problems observed within the mitigation site, such as: excessive inundation, insufficient hydrology, seasonal drought conditions, invasion by undesirable species of plants or wildlife, disease condition for plants, poor plant establishment, adverse water quality impacts (i.e., excessive sediment loading, water pollution, etc.), human encroachment, and slope failures or erosion problems.

(b) Describe the proposed remedial measures to address the problems noted above.

D. Remedial measures proposed by the permittee are subject to review and approval by the regulatory agencies prior to implementation. In the event that remedial measures are implemented, the monitoring period may be extended on a case-by-case basis, but will not be extended for more than a three-year period. The treatment of non-native invasive plant species does not need the approval of the MDE Wetlands and Waterways Program, but should be completed at the correct time of year by someone with a current pesticide applicator certification and the required toxic materials permit.

Below are the recommended techniques for monitoring mitigation sites. Alternate techniques may be considered, but must be approved in writing by the Mitigation and Technical Assistance Section of the Wetlands and Waterways Program prior to the commencement of the monitoring period.

Recommended Vegetation Density Measurement Technique

a. The following method for measuring the success of the vegetative colonization should be conducted once between May and September of the second, third, and fifth growing seasons subsequent to the completion of the construction of the mitigation project, unless an alternate schedule is agreed upon by MDE.
b. Vegetation sample plots shall be located on a stratified random basis over the site in order to sample all areas of restored/constructed wetlands at locations adjacent to each photo location marker. The following minimum numbers of samples will be required:
    i. If the site is < 5 acres, then a minimum of 3 plots/acre is necessary.
    ii. If the site is > 5 acres but less than 20 acres, then a minimum of 3 plots/acre is required for the first 5 acres, then 2 plots/acre is required for the remaining acreage.
    iii. If the site is > 20 acres, then a minimum of 2 plots/acre is required for the first 20 acres, then 1 plot/acre is required for the remaining acreage.
    iv. All cells, fields, or blocks shall be sampled. A targeted vegetation monitoring approach that correlates monitoring stations with vegetative signatures on aerial photography may be useful for larger mitigation sites.
c. Each plot shall be of a size no less than 400 square feet for woody plants and 3'x3' for herbaceous plants (or circular with approximately the same surface area). The vegetation data shall be collected during the growing season and shall include:
    i. Dominant vegetation species identification
    ii. Percent ground cover assessment
    iii. Number of woody plant stems greater than 10 inches in height (total and #/acre)
    iv. The percentage of dominant species FAC or wetter
    v. Percent survival by planted species
    vi. An invasive/noxious species assessment including percent cover

Recommended Groundwater Well Placement and Data Collection

a. Determine if this wetland is groundwater fed or has a perched water table. Soil profile descriptions must be assessed prior to well installation to identify any restrictive layers to downward water movement. Wells should be installed so they do not penetrate the restrictive layer, but are instead no deeper than the top of the restrictive layer (as discussed in the 2005 Corps document entitled *Technical Standard for Water-Table Monitoring of Potential Wetland Sites ERDC TN-WRAP-05-02*). In most cases, a standard monitoring well installed to 15 inches below the soil surface should be used. Shallower installation depths should be utilized if restrictive soil depths are located within 15 inches of the soil surface. The permittee's plan for well design and installation shall be consistent with current Corps guidance.
b. Specific details on the groundwater monitoring wells and locations shall be provided in the Phase II Mitigation Plan, and must be approved by the Department prior to the start of the monitoring period.
c. The following minimum numbers of groundwater wells will be required:
    i. If the site is < 10 acres, then a minimum of 1 well/acre is necessary.
    ii. If the site is 10 to 20 acres, then a minimum of 1 well/acre is necessary for the first 10 acres, then 1 well/2 acres is necessary for the remaining acreage.
    iii. If the site is > 20 acres, then a minimum of 1 well/acre is necessary for the first 10 acres,1

well/2 acres is necessary for the next 10 acres, and 1 well/5 acres is necessary for the remaining acreage.

iv. Hydrologic zones differentiated by a 1-foot change in elevation should have a minimum of one groundwater monitoring well installed.

v. For sites with multiple cells, each cell should have at least one well.

d. Begin the collection of groundwater well data within fourteen days of the start of the growing season and continue for at least the first two (full) growing seasons subsequent to the completion of grading. Take groundwater well readings once every 7 days for the first two months of the growing season and every 30 days for the remainder of the growing season. Record to the nearest inch.

e. The growing season (as further detailed in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual) has begun on a site in a given year when two or more different non-evergreen vascular plant species growing in the wetland or surrounding areas begin to exhibit visible aboveground growth or soil temperature measured at the 12 inch depth is 41°F (5°C).

f. Measure and record any surface water present at the monitoring wells.

g. Include a copy of the plan showing the location of the wells and surface elevation beside each well. Summarize the information regarding groundwater and surface water elevations, and, if relevant, provide monthly rainfall data for the areas.

<u>Indicator of Saturated and Anaerobic Conditions to Demonstrate the Presence of Active Hydric Soil Conditions</u>

a. The Hydric Soil Technical Standard (HSTS) developed by the National Technical Committee for Hydric Soils (Technical Note 11) requires documentation of anaerobic conditions and saturated conditions for a soil to be considered hydric:

   i. For a soil to meet the Saturated Conditions part of the HSTS, free water must exist within 10 inches (25 cm) of the ground surface for at least 14 consecutive days; and

   ii. Anaerobic conditions must exist within 10 inches (25 cm) of the ground surface for at least 14 consecutive days. Anaerobic conditions may be determined by one of the following methods, as detailed in the HSTS:

      (1) Positive reaction to alpha-alpha-Dipyridyl, determined at least weekly.

      (2) Reduction of iron determined with IRIS tubes installed for 30 days.

      (3) Measurement of redox potential (Eh) using platinum electrodes, determined at least weekly.

   Methods to demonstrate the presence of anaerobic conditions are outlined at (<u>http://soils.usda.gov/use/hydric/ntchs/tech_notes/index.html</u>).

b. For alpha-alpha Dipyridyl, soils should be measured at least weekly during the growing season, at a depth of six inches. Note that alpha-alpha Dipyridyl is also available as paper strips for easier measurement.

c. Plot locations shall be determined after baseline hydrology data are collected for two years to select areas that represent various hydroperiods. At least one soil sample plot location should be established for each hydroperiod present at the mitigation site. Soil sample plots shall be located within five feet of the monitoring well, and shall be performed during the 3rd and 5th year after construction is completed. Additional soil monitoring plots may need to be established where saturation occurs between 5% and 12.5% of the growing season to provide corroborative evidence that wetland hydrology is present.

d. Include a copy of the plan showing the location of the data collection, summarize the information, and, if relevant, provide monthly rainfall data for the areas.

Recommended Indicator of Reduction in Soils (IRIS) Tube Placement and Data Collection (summarized from the 2008 document entitled *Protocol for Using and Interpreting IRIS Tubes*).

a. IRIS Tubes should be installed during the time of the growing season anticipated to have the highest amount of soil reduction (often in the early growing season). They should be installed in a representative portion of the mitigation site, rather than in the lowest/wettest areas. Additional IRIS tube samples should be taken for larger sites and sites with higher changes in elevation.
b. Create a pilot hole in the soil using a 7/8" push probe.
c. Be sure tubes are labeled.
d. Insert the IRIS tube into the hole until the mark on the tube is at the soil surface (50 cm). If they are installed to shallower depths, mark the depth of the soil surface with a permanent marker.
e. Install five replicates, up to a meter apart, within the study area.
f. Tubes should be left in place for two to four weeks. Then should be removed and replacement tubes can be installed in the same holes for an additional two to four weeks.
g. Gently wash off any adhering soil from the tubes.
h. Estimate the amount of paint removed from each tube.
i. To improve accuracy, have two people estimate the amount of paint removed, then average the two sets of data.
j. Find a six inch area on the tube, entirely within the upper 12 inches, with the most paint removed. Estimate the percentage of paint removed from this six inch area.
k. To meet the Technical Standard for reducing soil conditions as currently specified in the National Technical Committee on Hydric Soils, 30% or more of paint within this six inch section must be removed.
l. At least three of the five replicates must show this paint removal for the soil to demonstrate that it is reducing.
m. Include a copy of the plan showing the location of the IRIS tubes, summarize the information, and, if relevant, provide monthly rainfall data for the areas.