



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4  
ATLANTA FEDERAL CENTER  
61 FORSYTH STREET  
ATLANTA, GEORGIA 30303-8960

SEP 28 2010

Ms. Kathy Stecker  
Supervisor, Modeling and TMDL Unit  
Division of Water Quality  
North Carolina Department of Environment  
and Natural Resources  
Post Office Box 29535  
Raleigh, North Carolina 27699-1617

Re: Approval of the Addendum to B. Everett Jordan Reservoir Total Maximum Daily Load (TMDL) for Chlorophyll-*a* {Waterbody IDs 16-18-(1.5)a, 16-18-(1.5)-b, 16-27-(2.5)b and 16-41-2-(1.5)}

Dear Ms. Stecker:

The United States Environmental Protection Agency (EPA) has completed a review of the Chlorophyll-*a* Total Maximum Daily Load (TMDL) addendum for B. Everett Jordan Reservoir {Waterbody IDs 16-18-(1.5)a, 16-18-(1.5)-b, 16-27-(2.5)b, and 16-41-2-(1.5)} in Alamance, Orange and Chatham Counties, North Carolina, that was submitted to EPA on August 30, 2010. Based upon our review, we have determined that the statutory requirements of the Clean Water Act, Section 303(d) have been met and hereby approve this TMDL.

The enclosed Decision Document summarizes the elements of the review which were found to support EPA's approval of the TMDLs. If you have any questions or comments, please feel free to contact Mrs. Alya Singh-White of my staff at (404) 562-9339.

Sincerely,

A handwritten signature in blue ink, appearing to read "J. Giattina".

James D. Giattina  
Director  
Water Protection Division

Enclosure

**TMDL Review Checklist**

**Final TMDL**

**TMDL Document Name:**

Addendum to B. Everett Jordan Reservoir TMDL for Impaired Segments in the B. Everett Jordan Reservoir Watershed, North Carolina

**County/State:** Alamance, Orange and Chatham Counties, North Carolina

**Reviewer:** Alya Singh-White

**HUC:** 030300020300, 030300020500 and 030300020600

**Date of Submittal:** August 30, 2010

**Use Classification:** NSW – Nutrient Sensitive Waters

**Pollutant(s):** Total Phosphorus and Total Nitrogen

**ESA / EJ Issues?** No

**Type of TMDL(Point / Nonpoint /Both):** Both

**Waters Addressed By TMDL:**

Waterbody	Assessment Unit (AU)
Back Creek (Graham-Mebane Reservoir)	16-18-(1.5)a , 16-18-(1.5)b
Cane Creek (Cane Creek Reservoir)	16-27-(2.5)b
Morgan Creek (University Lake)	16-41-2-(1.5)

**Additional National TMDL Tracking System Entry Parameters**

**TMDL doc ID:** to be created

**EPA Developed?** No

**303(d) List ID:** (See Above)

**Lead State:** NC

**TMDL Target:** The TMDL target was based on the NC freshwater quality standard for chlorophyll-a in Class C waters.

**303(d) List Cycle (Yr):** 2010

**Pollutant ID:** 511 & 515

**Impacted PCS NPDES Permit IDs:**

NC0047597, NC0025241, NC0026051, NC0056413, NC0051314, NC0043257, NC0042803, NC007446, NC0048429, NC0025305, NC0081591, NC0082210, NC0084093, NC0086827, NC0047384, NC0024325, NC0023868, NC0023876, NC0024881, NC0021211, NC0021474, NC0020354, NC0066966, NC0022691, NC0022675, NC0042285, NC0046043, NC0077968, NC0042528, NC0038156, NC0073571, NC0035866, NC0029726, NC0065412, NC0046809, NC0060259, NC0031607, NC0046019, NC0045161, NC0045144, NC0038172, NC0022098, NC0045152, NC0055271, NC0038164, NC0036994, NC0066010, NC0045128, NC0003671, NC0071463, NC0003913, NC0001210, NC0001384, NC0048241, NCS000248, NCS000401A, NCS000402, NCS000403, NCS000404, NCS000405, NCS000408, NCS000428, NCS000463, NCS000477, NCS000483, NCS000508, NCS000446, NCS000250, NCS000427, NCS000433A, NCS000249, NCS000414, NCS000450, NCS000465

**Impacted Non-PCS Permit IDs:**

None.

## TMDL Review Checklist

Review Element	Required	Included ( <i>check if yes</i> )
Submittal Letter	Yes	X
Scope of TMDL	Yes	X
Applicable Water Quality Standards and Numeric Targets*	Yes	X
Loading Capacity*	Yes	X
Wasteload Allocations (WLAs)*	Yes	X
Load Allocations (LAs)*	Yes	X
Margin of Safety (MOS)*	Yes	X
Seasonal Variation*	Yes	X
Public Participation	Yes	X
Other Considerations	As necessary	X
Recommended Action	APPROVAL	X

\*These elements are required by statute and implementing regulations.

## TMDL Review Checklist Supporting Rationale and Comments

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 CFR §130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under §303(d) and EPA regulations. When the information listed below uses the verb "must" or "require," this denotes information that is needed by EPA to review elements of the TMDL required by the CWA and by regulation.

*Submittal Letter*

### Considerations:

- Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under §303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute.

### Conclusions:

This final TMDL document was received by EPA for review and approval by letter on August 30, 2010 and signed by Kathy Stecker, Modeling/TMDL Unit Supervisor.

**Considerations:**

- **The TMDL should describe the waterbody as it is identified on the State/Tribe's §303(d) list, the pollutant(s) of concern, and the applicable water quality criteria that led to impairment listing. The waters addressed by the TMDL must be identified and consistent with the 303(d) list.**
- The TMDL should include a statistical evaluation of all readily available data that was used to place the waterbody on the 303(d) list.
- The TMDL submittal must include a description of the point, nonpoint, and natural background (where possible) sources of the pollutant of concern. **Such information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation. The TMDL submittal should also contain a description of any important factors, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation, as applicable; and (3) present and future growth trends, if this is a factor that was taken into consideration in preparing the TMDL.**

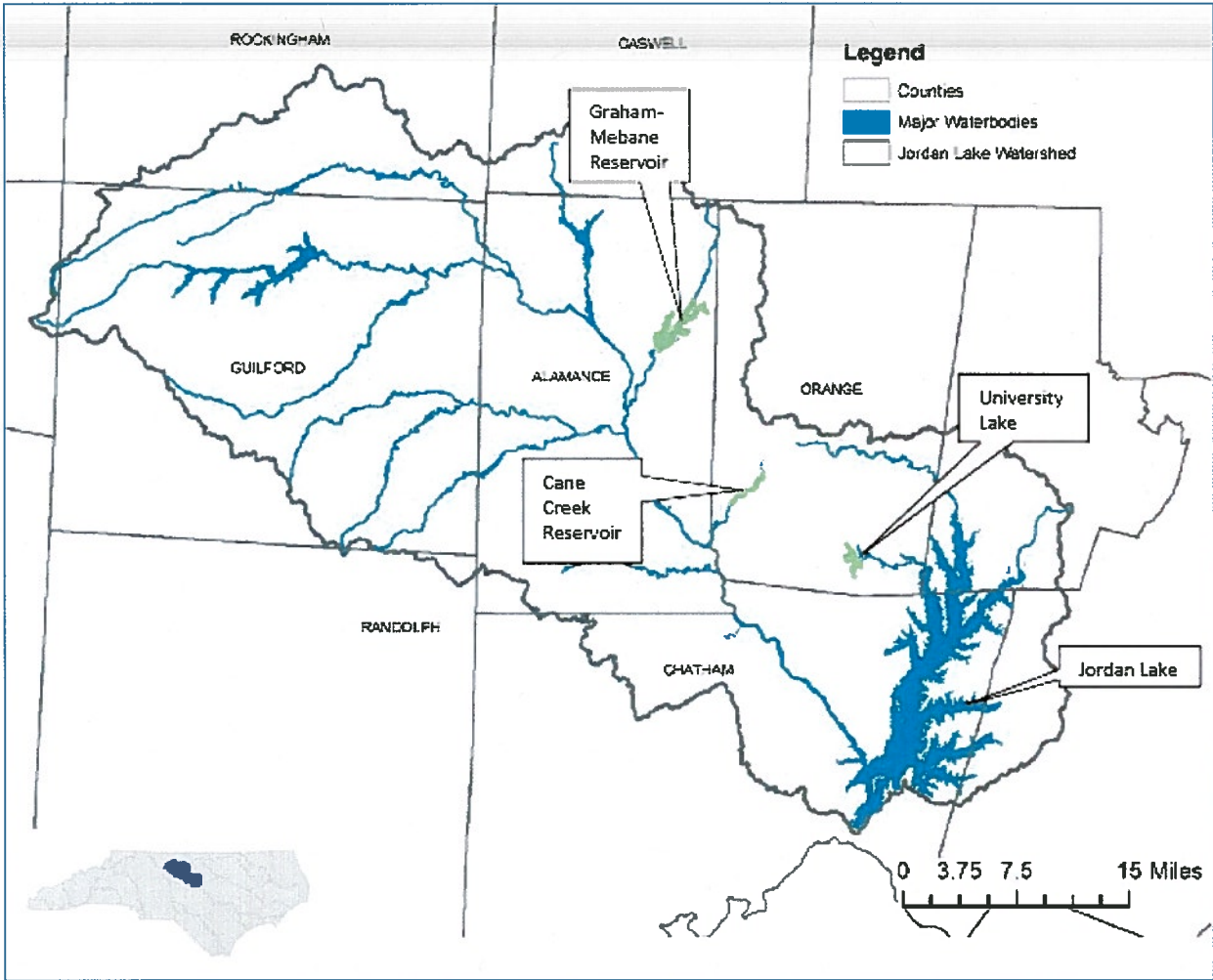
**Conclusions:**

Waterbody IDs (WBID) 16-18-(1.5)a, 16-18-(1.5)-b, 16-27-(2.5)b, 16-41-2-(1.5) are listed as impaired for chlorophyll-a on the State's 2008 §303(d) list. Appendix B in the TMDL document contains summary statistics for each station from the May-October 2008 collection period.

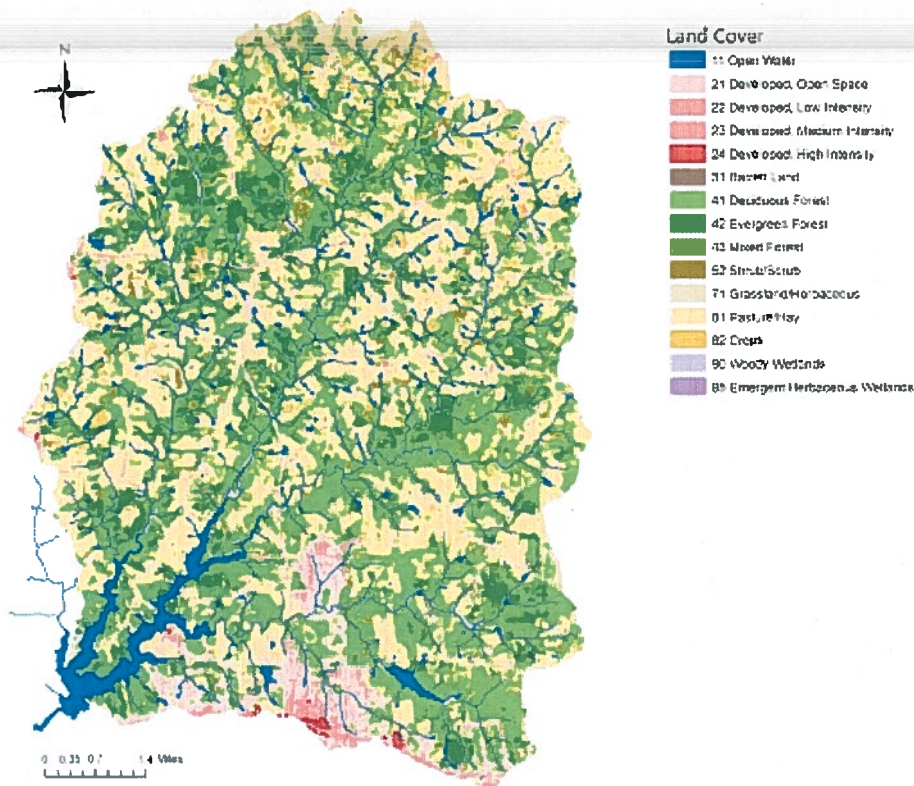
Sources include both point (NCDOT MS4) and nonpoint sources; nonpoint source waste from urban and agricultural runoff and failing septic systems.

The distribution of land use is shown in the maps and tables below.

# Watershed Map of White Oak River

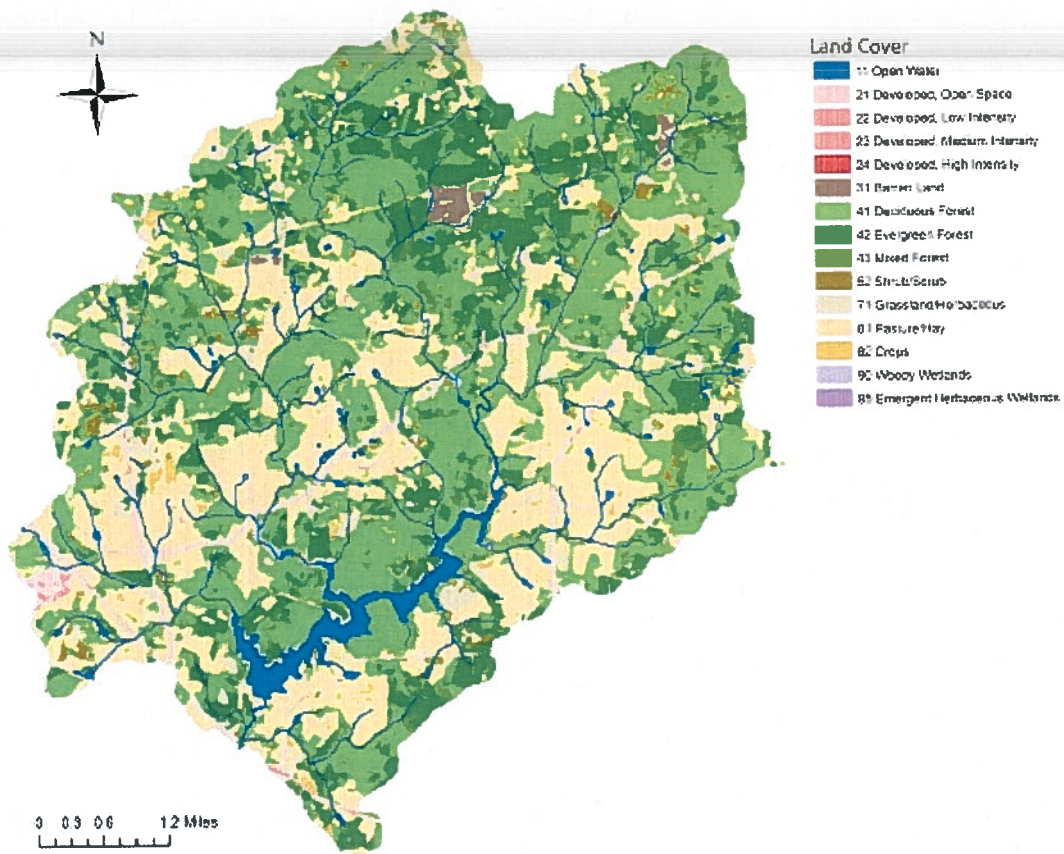


**Graham-Mebane Reservoir (HUCs 03030002030060, 03030002030070)**



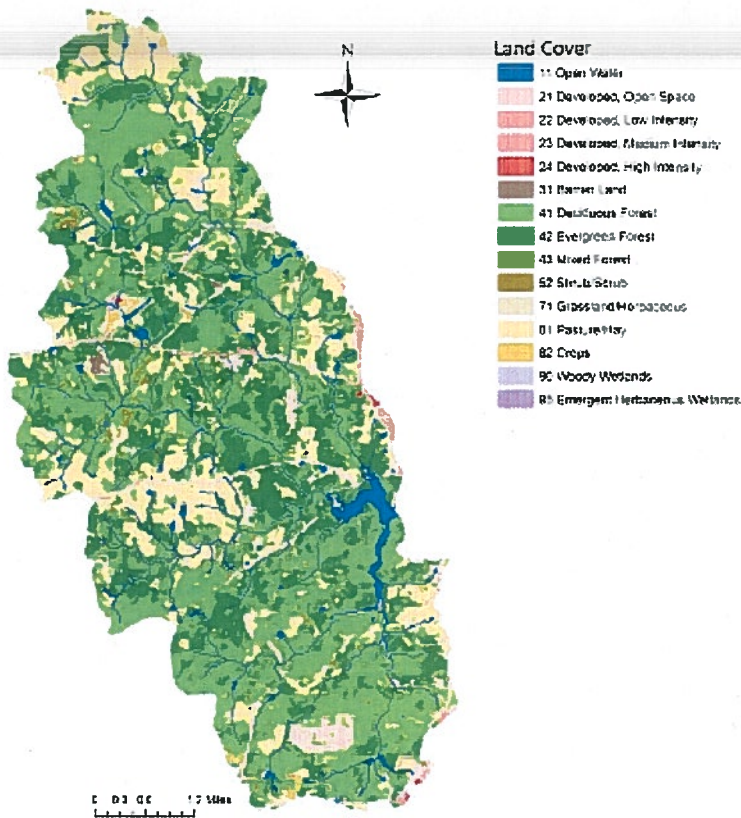
Land Cover Category	Sq.Miles	%
Deciduous Forest	24.81	39.2%
Pasture/Hay	19.48	30.8%
Developed, Open Space	4.79	7.6%
Evergreen Forest	4.58	7.2%
Grassland/Herbaceous	2.09	3.3%
Mixed Forest	1.67	2.6%
Open Water	1.41	2.2%
Developed, Low Intensity	1.37	2.2%
Cultivated Crops	1.33	2.1%
Shrub/Scrub	1.07	1.7%
Woody Wetlands	0.29	0.5%
Developed, Medium Intensity	0.20	0.3%
Developed, High Intensity	0.09	0.1%
Barren Land	0.03	0.0%
Emergent Herbaceous Wetlands	0.02	0.03%
<b>Total</b>	<b>63.2</b>	<b>100%</b>

**Cane Creek Reservoir (HUC 03030002050030)**



Land Cover Category	Sq.Miles	%
Deciduous Forest	14.11	42.0%
Pasture/Hay	8.80	26.2%
Evergreen Forest	4.33	12.9%
Developed, Open Space	1.56	4.7%
Mixed Forest	1.52	4.5%
Grassland/Herbaceous	1.49	4.4%
Open Water	0.66	2.0%
Shrub/Scrub	0.51	1.5%
Cultivated Crops	0.25	0.7%
Barren Land	0.17	0.5%
Developed, Low Intensity	0.12	0.4%
Woody Wetlands	0.04	0.1%
Emergent Herbaceous Wetlands	0.01	0.02%
<b>Total</b>	<b>33.6</b>	<b>100%</b>

University Lake (HUC 03030002060070)



Land Cover Category	Sq.Miles	%
Deciduous Forest	13.91	46.4%
Evergreen Forest	5.98	19.9%
Pasture/Hay	4.37	14.6%
Developed, Open Space	1.91	6.4%
Mixed Forest	1.68	5.6%
Grassland/Herbaceous	1.00	3.3%
Open Water	0.36	1.2%
Developed, Low Intensity	0.23	0.8%
Shrub/Scrub	0.21	0.7%
Cultivated Crops	0.15	0.5%
Developed, Medium Intensity	0.09	0.3%
Barren Land	0.06	0.2%
Woody Wetlands	0.05	0.2%
Developed, High Intensity	0.02	0.1%
Emergent Herbaceous Wetlands	0.01	0.03%
<b>Total</b>	<b>30.0</b>	<b>100%</b>



**Considerations:**

- EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards [40 CFR §130.2(f)]. The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure [40 CFR § 130.2(i)]. **The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant. To the degree it is known, it should also describe the cause and effect relationship between the identified pollutant sources, the numeric target (narrative target if appropriate), and achievement of water quality standards.**
- **Supporting documentation for the TMDL analysis must also be contained in the submittal. This should include a description of the analytical process used, results from water quality modeling, assumptions, etc.** The TMDL submittal should also contain a description of other important factors, such as an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable.
- **Critical conditions must be considered as part of the analysis of loading capacity [40 CFR § 130.7(c)(1)].** Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that result in attaining and maintaining the water quality criterion and have an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

**Conclusions:**

Tetra Tech assisted DWQ in enhancing the Jordan Reservoir model for use in TMDL development and lake management, and developing additional watershed nutrient loading analysis tools. Data from an extensive modeling study conducted by DWQ was used for additional validation testing and calibration of the Jordan Reservoir Nutrient Response Model. A spreadsheet based model was developed that combines Generalized Watershed Loading Function (GWLf) model simulation of seasonal nutrient loads coupled with a stream transport and delivery model that can estimate both the point and nonpoint source component nutrient delivery to the lake.

Nutrient controls are the most common focus of management schemes for reducing excessive algal growth and chlorophyll-a concentrations. Therefore, the Jordan Lake TMDL was written for total nitrogen (TN) and total phosphorus (TP) loads to the lake.

The daily load calculations of the TMDL are as follows:

Upper New Hope Arm	Haw River Arm
TN: 175.4 lbs/day	TN: 7032.88 lbs/day
TP: 227 lbs/day	TP: 3985.32 lbs/day

Lower New Hope Arm  
 TN: 608.02 lbs/day  
 TP: 72.81 lbs/day

Seasonality was considered in determining the critical conditions. The years on which the model is developed are somewhat biased toward drier conditions, which tend to promote algal growth by increasing residence time. The TMDL is based on an annual LA necessary to achieve the chlorophyll-a target during the critical conditions, which are determined to be May through September.

**Considerations:**

- EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources [40 CFR §130.2(h)].
- Wasteload allocations must be assigned to each point source discharging the pollutant of concern [40 CFR 130.2(i)]. WLAs can be expressed as lumped or aggregate allocations if appropriate.
- If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero.
- The wasteload allocations should be sufficient, in consideration of nonpoint source loads, to ensure that the point sources will not cause or contribute to excursions of water quality standards [40 CFR §122.44(d)(1)].

**Conclusions:**

The table below provides the total poundage of nitrogen and phosphorous that continuous point sources may contribute. This loading is the load delivered to the lake, versus the load generated at the wastewater treatment facility. The load generated at the wastewater treatment facility naturally attenuates and a reduced load is delivered to Jordan Lake. Non-nutrient bearing loads are not included in the allocations.

	% Point Source Load	WLA (lbs/yr)	TMDL Reduction
Upper New Hope Arm			
Total Nitrogen	52%	336,079	35%
Total Phosphorus	28%	23,106	5%
Lower New Hope Arm			
Total Nitrogen	3%	6,836	0%
Total Phosphorus	2%	498	0%
HaW River Arm			
Total Nitrogen	35%	895,127	8%
Total Phosphorus	29%	106,001	5%

**Load Allocations (LAs)**

**Considerations:**

- EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background [40 CFR §130.2(g)]. Load allocations may range from reasonably accurate estimates to gross allotments [40 CFR §130.2(g)]. Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.
- If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero.

**Conclusions:**

The load allocations for Jordan Reservoir is in the table below.

	LA (lbs/yr)	TMDL Reduction
Upper New Hope Arm		
Total Nitrogen	304,942	35%
Total Phosphorus	59,777	5%
Lower New Hope Arm		
Total Nitrogen	215,093	0%
Total Phosphorus	26,076	0%
HaW River Arm		
Total Nitrogen	1,671,873	8%
Total Phosphorus	253,640	5%

**Margin of Safety (MOS)**

**Considerations:**

- The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality [CWA §303(d)(1)(C), 40 CFR § 130.7(c)(1)]. EPA guidance explains that the MOS may be implicit, i.e. incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e. expressed in the TMDL as loadings set aside for the MOS.
- If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

**Conclusions:**

The TMDL incorporates an explicit MOS used to account for uncertainty in the relationship between pollutant loads and receiving water quality. The MOS was incorporated by reducing the maximum chlorophyll-a exceedances from 10% to 8% when evaluating nutrient load reduction scenarios.

***Seasonal Variation***

**Considerations:**

- The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for considering seasonal variations in the TMDL must be described [CWA §303(d)(1)(C), 40 CFR §130.7(c)(1)].

**Conclusions:**

The variability in this TMDL is accounted for by the use of a continuous flow gage and the use of all water quality data collected in the watershed, which includes data collected from all seasons.

***Public Participation***

**Considerations:**

- EPA regulations require public review [40 CFR §130.7(c)(1)(ii), 40 CFR §25] consistent with State or Tribe's own continuing planning process and public participation requirements. In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments.

**Conclusions:**

The TMDL was made available to the public for review and comment on April 1, 2007. The TMDL addendum was made available to the public for review and comment on August 20, 2010. Copies of comments received and response to those comments are included in the TMDL submittal package (Appendix D). All comments were appropriately addressed by NCDENR.

***Other Considerations***

**Considerations:**

- This section may be needed in the TMDL review in order to describe unique factors or information specific to the TMDL under review, which help explain the basis for EPA's decision.

**Conclusions:**

None.

***Final Recommendation/Comments***

The Pollution Control and Implementation Branch recommends that the TMDL be **APPROVED**.