

Water Quality Standards
for the
Great Swamp Watershed

June 2002



**Ten Towns Great Swamp
Watershed Management Committee**

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For the Great Swamp Watershed

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Prepared For:

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1.0 Introduction

According to the Environmental Protection Agency, “nutrient enrichment frequently ranks as one of the top causes of water resource impairment” (EPA, 2000b). Nutrients are essential for plant growth, but overenrichment can lead to the excess growth of algae and aquatic plants, can alter the composition and species diversity of the aquatic community, and can even lead to human health problems. However, despite the extent of the nutrient enrichment problem across the country, most states have little more than vague language that recommends that they maintain natural nutrient levels and avoid nutrient enrichment. In response to this lack of recommended criteria for nutrients and suspended solids, one of the objectives of the Ten Towns Great Swamp Watershed Management Committee’s Water Quality Monitoring Program has been to develop nutrient and total suspended solids standards for the streams in the Great Swamp Watershed. The development of these standards will assist in the planning process, guide restoration activities, and serve as a benchmark for the success of watershed management activities. A glossary of the technical terms used in this report can be found in Appendix A.

2.0 New Jersey Water Quality Standards

The New Jersey Water Quality Standards address nutrients both quantitatively and qualitatively for different waterbodies and different water quality parameters. The criteria for the higher quality “FW1” waters are qualitative, while “FW2” waters have quantified limits for some nutrients that are based partly on toxicity and partly on ecological health. “FW1” waters are fresh waters “that are to be maintained in their natural state of quality (set aside for posterity) and not subjected to any man-made wastewater discharges or increases in runoff from anthropogenic activities” (NJDEP, 1998). However, the DEP does not offer any reference concentrations that represent this natural state. “FW2” is the general surface water classification for most other surface water bodies in the state, and includes all of the Great Swamp tributaries. Within the FW2 classification, a distinction is made between trout production and nontrout waters. The Passaic River upstream of Osborne Pond and Primrose Brook upstream of the Lees Hill Road Bridge are both considered to be trout production waters. The numeric criteria include limits for bacteria, metals, toxic substances, sediments, and some nutrients.

The New Jersey Water Quality Standards make another distinction between Category One and Category Two waters. All reaches of stream within the Great Swamp National Wildlife Refuge Boundary are considered to be Category One waters. According to the water quality standards, “Category One waters shall be protected from any measurable changes to the existing water quality. Water quality characteristics that are generally worse than the water quality criteria, except as due to natural conditions, shall be improved to maintain or provide for the designated uses where this can be accomplished without adverse impacts on organisms, communities, or ecosystems of concern” (NJDEP 1998). However, because the natural condition varies from region to region, there are no numeric criteria that quantify exactly what those conditions should be.

The list of New Jersey surface water quality criteria includes limits for total phosphorus, nitrates, and total suspended solids. According to these standards, total phosphorus should not exceed

0.05 mg/l in lakes, ponds, reservoirs, or in tributaries at the point where they enter lakes, ponds, or reservoirs, except where site-specific criteria are developed. Total phosphorus concentrations should not exceed 0.1 mg/l in all other streams, unless it can be proven that total phosphorus is not the limiting nutrient. The limit for total suspended solids is 25.0 mg/l in trout production waters and 40.0 mg/l in nontrout waters. The nitrate limit is 10 mg/l and is based on human health standards (NJDEP 1998). There are no listed limits for total Kjeldahl nitrogen or total nitrogen in the New Jersey Water Quality Standards. Additionally, there is no mention as to whether the standards apply to baseflow or stormflow nutrient and sediment concentrations.

3.0 United States Environmental Protection Agency Reference Nutrient Criteria

The EPA is advocating the development of refined numeric criteria to reduce ambiguity and provide distinct interpretations of acceptable and unacceptable nutrient conditions. The EPA is in the preliminary stages of developing ecoregional nutrient criteria for different types of water bodies, including lakes and reservoirs, rivers and streams, and wetlands. Ecoregional recommendations for rivers and streams have been made for the two causal variables, total phosphorus and total nitrogen. The EPA intends that the criteria be used to develop nutrient management programs for watersheds that are contributing to water quality problems.

The EPA has divided the country into fourteen aggregate ecoregions. Each of these ecoregions is then divided into numerous smaller level III ecoregions. The Great Swamp Watershed is located in EPA's Aggregate Ecoregion IX – Southeastern Temperate Forested Plains and Hills and in Level III Ecoregion 64 – Northern Piedmont. The Northern Piedmont is a transitional region of low rounded hills, irregular plains, and open valleys in contrast to the low mountains to the north and west and the flat coastal plains of the ecoregion to the east (EPA 2000a).

EPA's *Technical Guidance Manual for Developing Nutrient Criteria for Rivers and Streams* describes two methods for establishing reference conditions. Reference streams are those that are relatively undisturbed and are believed to represent the natural condition of the region. Both of the EPA's methods for establishing reference conditions use percentiles of sample data. Percentiles divide a set of data into one hundred equal parts that can then be used to group or classify elements of the data set. For example, the 50th percentile of a data set corresponds to the median value. Half of the values in the data set are greater than the median and half of the values are less than the median.

The EPA's first and preferred method is to identify reference streams in the ecoregion and use only the data from those streams to establish a reference condition. In this method the upper 25th percentile (75th percentile) of a reference population of streams represents the reference concentration. This means that 75% of the sampled concentrations in reference streams are less than the defined reference criterion. The 75th percentile was chosen by the EPA since it is likely associated with minimum impact conditions, will be protective of designated uses, and provides management flexibility. When reference streams cannot be identified in the ecoregion, the alternative method is to use the lower 5th to 25th percentile of the population of all streams within the region, depending on the overall quality of the streams in the region. The 5th percentile is used to determine the reference condition in a region with fairly degraded streams. In this case, only 5% of the sampled concentrations are less than the defined reference criterion. The 25th

percentile assumes somewhat better overall stream quality in the ecoregion's streams. In this case, 25% of the sampled concentrations are less than the reference value. The lower (5th to 25th) percentile of the entire population was chosen by EPA to represent a surrogate for an actual reference population in their development of many ecoregional reference conditions.

Ambient Water Quality Recommendations for Rivers and Streams in Nutrient Ecoregion IX provides reference concentrations for total phosphorus, total nitrogen, total Kjeldahl nitrogen, and nitrates in the Level III ecoregions. The concentrations were derived using the 25th percentile of all streams. Table 1 contains a summary of the reference conditions for the level III ecoregion in which the Great Swamp Watershed is located.

Table 1: EPA Reference Nutrient Concentrations for Aggregate Ecoregion IX – Level III Ecoregion 64

Nutrient Parameters	Aggregate Nutrient Level III Ecoregion 64 Reference Conditions
Total Phosphorus (mg/l)	0.04
Total Nitrogen – calculated (mg/l)	1.295
Total Nitrogen – reported (mg/l)	2.225
Total Kjeldahl Nitrogen (mg/l)	0.3
Nitrate/Nitrite (mg/l)	0.995

4.0 United States Geological Survey Background Nutrient Concentrations

The United States Geological Survey (USGS) is undertaking the National Water-Quality Assessment (NAWQA) program to provide long-term data on streams, groundwater, and aquatic ecosystems and to develop an understanding of the natural and human factors that affect water quality.

The USGS has not developed any criteria or geographically specific reference concentrations, but they have compiled background concentrations that represent nutrient concentrations in areas that are considered to be minimally affected by agriculture, urbanization, and human activity. According to the USGS report on background concentrations, “background nutrient concentrations can vary considerably from region to region, or even within watersheds, because of differences in hydrology and in naturally occurring nutrient levels in soils, rocks, and the atmosphere.” Although the USGS has collected a large volume of data in association with NAWQA, the data were insufficient to define background nutrient concentrations on a regional basis (USGS, 1999). The lack of geographic specificity makes the applicability of these concentrations questionable; however, they provide another point of reference for the development of Great Swamp Water Quality Standards.

Table 2: USGS Background Nutrient Concentrations in Streams and Shallow Groundwater

Nutrient	Background Concentration (mg/l)
Total Phosphorus in streams	0.1
Orthophosphate in shallow groundwater	0.02
Total Nitrogen in streams	1.0
Nitrate in streams	0.6
Nitrate in shallow groundwater	2.0

5.0 Great Swamp Watershed Water Quality Standards

Great Swamp Watershed Water Quality Standards have been developed based on the standards and reference conditions available from the state and national sources, as well as the stream sampling conducted by the Ten Towns Committee. These standards are guidelines and goals and may be refined and changed more data are obtained from the tributary streams and as water quality monitoring and vegetation mapping are conducted within the Great Swamp National Wildlife Refuge. The standards may also change based on new DEP or EPA water quality criteria.

The stream sampling data have been used to develop reference concentrations based on the method described in EPA's *Technical Guidance Manual for Developing Nutrient Criteria for Rivers and Streams*. In this method, reference concentrations are established using one of two percentile selections of data. The 75th percentile of reference streams can be identified and used to develop the criteria. If reference streams cannot be identified, the 5th to 25th percentile of the general population of a class of streams can be identified and used to develop the criteria.

As mandated by the New Jersey Water Quality Standards, particularly with respect to the protection of Category One waters, there should be an antidegradation policy throughout the watershed. Water quality should not decline from the baseline conditions established during the first two years of study even if the concentrations are lower than the established standards. If the streams do not meet the standards, priority should be placed on implementing Best Management Practices that improve the quality of the water in those streams.

The following sections provide the baseflow and stormflow water quality criteria for each stream and each parameter along with descriptions of how the criteria were developed. Tables of the standards include the median measured baseflow and stormflow concentrations in each of the streams to provide a comparison of the measured water quality to the water quality standard. Appendices B and C provide full tables of water quality data that include the New Jersey Standards and the EPA reference criteria, in addition to the average, median, and ranges of concentrations for all of the streams.

5.1 Total Phosphorus Standards

Average baseflow concentrations should meet the lower of the following two criteria: the 75th percentile of baseflow concentrations obtained during the monitoring program or the New Jersey total phosphorus standard for streams flowing into lakes, ponds, or reservoirs. Stormflow concentrations should meet the 75th percentile of Passaic River stormflow total phosphorus concentrations of 0.1 mg/l.

Table 3: Great Swamp Total Phosphorus Standards

Stream	Baseflow Criterion (mg/l)	Median Measured Baseflow (mg/l)	Stormflow Criterion (mg/l)	Median Measured Stormflow (mg/l)
Black Brook	0.05	0.077	0.1	0.42
Loantaka Brook	0.05	0.247	0.1	0.38
Great Brook	0.05	0.060	0.1	0.16
Primrose Brook	0.04	0.036	0.1	0.19
Passaic River	0.04	0.034	0.1	0.078

5.2 Dissolved Reactive Phosphorus Standards

There are no established criteria or reference data for dissolved reactive phosphorus. The USGS data include a background concentration of 0.02 mg/l for orthophosphate in shallow groundwater, however the study did not provide a concentration for dissolved orthophosphate in streams. However, based on the 25th percentile data from Black Brook and Great Brook and the 75th percentile data from Passaic River and Primrose Brook, 0.02 mg/l seems to be an appropriate standard for both baseflow and stormflow dissolved reactive phosphorus concentrations.

Table 4: Great Swamp Dissolved Reactive Phosphorus Standards

Stream	Baseflow Criterion (mg/l)	Median Measured Baseflow (mg/l)	Stormflow Criterion (mg/l)	Median Measured Stormflow (mg/l)
Black Brook	0.02	0.037	0.02	0.080
Loantaka Brook	0.02	0.164	0.02	0.115
Great Brook	0.02	0.025	0.02	0.024
Primrose Brook	0.02	0.020	0.02	0.021
Passaic River	0.02	0.012	0.02	0.014

5.3 Nitrates Standards

With the exception of Loantaka Brook, all of the Great Swamp Tributaries have average nitrate concentrations that are lower than the EPA ecoregional criterion of 0.995 mg/l and the USGS-identified background concentration of 0.6 mg/l. Based on these comparisons, it does not seem that nitrate concentrations present a problem in these four streams. The antidegradation policy should be applied to protect the streams from degradation. Each of these four streams' baseflow nitrate standards is based on the 75th percentile of the existing baseflow conditions in the stream. Likewise, the stormflow nitrate standard is based on the 75th percentile of the existing stormflow conditions in the stream.

Loantaka Brook has much higher nitrate concentrations than the reference streams, background streams, and the other streams in the Great Swamp Watershed, so the 75th percentile of the stream's concentration is much too high to be used as a standard. The New Jersey Water Quality Standard of 10 mg/l for nitrates is based on an important human health concern, but does not take ecological health into consideration, and is too high to be used as the standard for Loantaka Brook. However, application of the reference or background standard is unreasonable and unattainable for Loantaka Brook. A nitrate concentration of 2.0 mg/l is recommended as a goal even though it is quite low relative to measured concentrations. This concentration is between the 5th and 25th percentile of all concentrations (including baseflow and stormflow) measured in Loantaka Brook.

Table 5: Great Swamp Nitrate Standards

Stream	Baseflow Criterion (mg/l)	Median Measured Baseflow (mg/l)	Stormflow Criterion (mg/l)	Median Measured Stormflow (mg/l)
Black Brook	0.2	0.07	0.5	0.34
Loantaka Brook	2.0	6.78	2.0	2.73
Great Brook	0.7	0.50	0.8	0.48
Primrose Brook	0.5	0.43	0.6	0.41
Passaic River	0.4	0.24	0.4	0.26

5.4 Total Kjeldahl Nitrogen Standards

Although nitrate concentrations in most of the Great Swamp tributary streams are lower than reference criteria, total Kjeldahl nitrogen concentrations tend to be higher than reference concentrations, even in the Passaic River, which is considered to be a reference stream. The 75th percentile of Primrose Brook baseflow concentrations is the same as the EPA reference criterion and is the standard for that stream. The 75th percentile of the Passaic River baseflow concentrations is the standard for all other streams. A concentration slightly higher than the Passaic River 75th percentile of stormflow concentrations is the stormflow criterion for all streams.

Table 6: Great Swamp Total Kjeldahl Nitrogen Standards

Stream	Baseflow Criterion (mg/l)	Median Measured Baseflow (mg/l)	Stormflow Criterion (mg/l)	Median Measured Stormflow (mg/l)
Black Brook	0.4	0.69	1.0	1.38
Loantaka Brook	0.4	0.70	1.0	1.50
Great Brook	0.4	0.53	1.0	0.95
Primrose Brook	0.3	0.18	1.0	0.71
Passaic River	0.4	0.33	1.0	0.52

5.5 Total Nitrogen Standards

The baseflow total nitrogen standards are based on the lower of the following for all streams except Loantaka Brook: 75th percentile of baseflow concentrations obtained during the monitoring program or the EPA reference concentration. The baseflow total nitrogen concentration for Loantaka Brook is based on the sum of the nitrate and total Kjeldahl nitrogen standards. Stormflow total nitrogen concentrations for all streams are based on the sum of the nitrate and total Kjeldahl nitrogen standards.

Table 7: Great Swamp Total Nitrogen Standards

Stream	Baseflow Criterion (mg/l)	Median Measured Baseflow (mg/l)	Stormflow Criterion (mg/l)	Median Measured Stormflow (mg/l)
Black Brook	1.0	0.81	1.5	1.88
Loantaka Brook	2.4	7.49	3.0	4.58
Great Brook	1.3	1.13	1.8	1.48
Primrose Brook	0.8	0.61	1.6	1.20
Passaic River	0.8	0.57	1.4	0.75

5.6 Total Suspended Solids Standards

Baseflow total suspended solids standards are based on the 75th percentile of the Passaic River and Primrose Brook total suspended solids concentrations. Stormflow total suspended solids concentrations are based on the New Jersey Water Quality Standards for trout production and nontrout streams, as applicable.

Table 8: Total Suspended Solids Standards

Stream	Baseflow Criterion (mg/l)	Median Measured Baseflow (mg/l)	Stormflow Criterion (mg/l)	Median Measured Stormflow (mg/l)
Black Brook	4.0	3.7	40	100
Loantaka Brook	4.0	8.1	40	108
Great Brook	4.0	5.0	40	43
Primrose Brook	4.0	2.5	25	61
Passaic River	4.0	3.0	25	19

6.0 Existing Water Quality in the Great Swamp

The data gathered during the comprehensive water quality monitoring program that was initiated by the Ten Towns Committee in 1998 indicate that water quality varies widely among streams in the watershed. Both Primrose Brook and the Passaic River have good baseflow water quality and represent baseflow reference conditions for the watershed. The Passaic River also has relatively good water quality during stormflow conditions and is considered to be the watershed reference stream for stormflow conditions. Primrose Brook has relatively high stormflow concentrations of particulate nutrients and suspended solids, which are somewhat unexpected for a relatively undeveloped and otherwise good quality stream. Great Brook is slightly impaired during baseflow and stormflow conditions compared to Passaic River, Primrose Brook, New Jersey Water Quality Standards, and EPA reference criteria. Loantaka Brook is impaired during both baseflow and stormflow conditions and has some of the highest nutrient and suspended solids concentrations measured in the watershed. Loantaka Brook contributes the greatest loads of soluble inorganic nutrients, total nutrients, and total suspended solids to the Great Swamp. Black Brook is somewhat impaired during both baseflow and stormflow, although the nutrient and suspended concentrations are not as high as those in Loantaka Brook (Leib and Browne, 2002).

Appendices B and C contain tables of the baseflow and stormflow water quality data for all of the Great Swamp's tributary streams. The *Great Swamp Watershed Water Quality Monitoring Report* that was prepared for the Ten Towns Committee by F. X. Browne, Inc. in May 2002 contains detailed information and analysis about the Great Swamp Watershed monitoring data.

Table 9 shows a summary comparison of measured stream water quality to the water quality standards. As shown in this table, the water quality in Black Brook does not meet the majority of the standards, particularly during stormflow; Loantaka Brook does not meet any of the established standards; and Great Brook exceeds more standards than it meets as well. Primrose Brook and the Passaic River meet all of the baseflow water quality standards, however, while Passaic River meets all of the stormflow standards, Primrose Brook only meets half of them. This assessment indicates that management strategies described in the Great Swamp Watershed Management Plan must continue to be implemented in order to improve and/or maintain existing water quality in the Great Swamp watershed.

Table 9: Comparison of Measured Stream Water Quality to Water Quality Standards

Stream	Meets Baseflow Standard*						Meets Stormflow Standard*					
	TP	DRP	NO ₃	TKN	TN	TSS	TP	DRP	NO ₃	TKN	TN	TSS
Black Brook	No	No	Yes	No	Yes	Yes	No	No	Yes	No	No	No
Loantaka Brook	No	No	No	No	No	No	No	No	No	No	No	No
Great Brook	No	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	No**
Primrose Brook	Yes	Yes	Yes	Yes	Yes	Yes	No	No**	Yes	Yes	Yes	No
Passaic River	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Based on median water quality data collected from 1999 to present

**Median value exceeds standard by less than 10%

TP = Total Phosphorus

TN = Total Nitrogen

NO₃ = Nitrate

TKN = Total Kjeldahl Nitrogen

DRP = Dissolved Reactive Phosphorus

TSS = Total Suspended Solids

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Appendix A

Glossary of Technical Terms

Baseflow – stream flow during periods of dry weather

Limiting Nutrient – the nutrient that is in shortest supply relative to the quantities needed for plant growth, thereby controlling the growth of the plant.

Reference Concentration – concentration of nutrient or other substance in a reference or natural stream

Reference Stream – stream that best represents natural, undisturbed biological, chemical, and physical conditions

Stormflow – stream flow during and immediately following wet weather

Total Kjeldahl Nitrogen – chemical analysis that measures organic nitrogen plus ammonia in water samples

Appendix B

Table B1: Baseflow Total Phosphorus Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	0.050	–	–
EPA Reference	0.040	–	–
Black Brook	0.082	0.077	0.027 – 0.137
Loantaka Brook	0.226	0.247	0.115 – 0.35
Great Brook	0.060	0.060	0.043 – 0.084
Primrose Brook	0.046	0.036	0.016 – 0.193
Passaic River	0.040	0.034	0.023 – 0.091

Table B2: Baseflow Dissolved Reactive Phosphorus Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	not available	–	–
EPA Reference	not available	–	–
Black Brook	0.039	0.037	0.007 – 0.082
Loantaka Brook	0.152	0.164	0.035 – 0.280
Great Brook	0.024	0.025	0.008 – 0.035
Primrose Brook	0.018	0.020	0.003 – 0.035
Passaic River	0.013	0.012	0.007 – 0.027

Table B3: Baseflow Nitrates Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	10	–	–
EPA Reference	0.995	–	–
Black Brook	0.13	0.07	<0.01 – 0.42
Loantaka Brook	6.67	6.78	2.90 – 8.89
Great Brook	0.51	0.50	0.08 – 0.92
Primrose Brook	0.40	0.43	0.17 – 0.58
Passaic River	0.26	0.24	0.04 – 0.68

Table B4: Baseflow Total Kjeldahl Nitrogen Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	not available	–	–
EPA Reference	0.3	–	–
Black Brook	0.62	0.69	0.32 – 1.15
Loantaka Brook	0.75	0.70	0.21 – 1.30
Great Brook	0.62	0.53	0.33 – 1.18
Primrose Brook	0.20	0.18	0.11 – 0.30
Passaic River	0.34	0.33	0.16 – 0.83

Table B5: Baseflow Total Nitrogen Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	not available	–	–
EPA Reference	1.295	–	–
Black Brook	0.75	0.81	0.07 – 1.35
Loantaka Brook	7.42	7.49	4.20 – 9.41
Great Brook	1.13	1.13	0.48 – 2.02
Primrose Brook	0.60	0.61	0.27 – 0.87
Passaic River	0.60	0.57	0.27 – 1.23

Table B6: Baseflow Total Suspended Solids Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	25/40	–	–
EPA Reference	not available	–	–
Black Brook	4.9	3.7	1.6 – 13
Loantaka Brook	13	8.1	2.0 – 44
Great Brook	5.3	5.0	1.0 – 11
Primrose Brook	3.4	2.5	<1.0 – 7.2
Passaic River	3.6	3.0	1.2 - 16

Appendix C

Table C1: Stormflow Total Phosphorus Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	0.05	–	–
EPA Reference	0.04	–	–
Black Brook	0.41	0.42	0.16 – 0.80
Loantaka Brook	0.47	0.38	0.29 – 0.81
Great Brook	0.18	0.16	0.087 – 0.356
Primrose Brook	0.29	0.19	0.048 – 0.768
Passaic River	0.088	0.078	0.050 – 0.16

Table C2: Stormflow Dissolved Reactive Phosphorus Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	not available	–	–
EPA Reference	not available	–	–
Black Brook	0.094	0.080	0.037 – 0.254
Loantaka Brook	0.117	0.115	0.046 – 0.218
Great Brook	0.030	0.024	0.004 – 0.062
Primrose Brook	0.022	0.021	0.002 – 0.053
Passaic River	0.015	0.014	0.005 – 0.050

Table C3: Stormflow Nitrate Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	10	–	–
EPA Reference	0.995	–	–
Black Brook	0.38	0.34	0.09 – 1.11
Loantaka Brook	3.28	2.73	1.54 – 6.55
Great Brook	0.51	0.48	0.01 – 0.99
Primrose Brook	0.44	0.41	0.01 – 0.81
Passaic River	0.30	0.26	0.15 – 0.61

Table C4: Stormflow Total Kjeldahl Nitrogen Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	not available	–	–
EPA Reference	0.3	–	–
Black Brook	1.64	1.38	0.64 – 3.94
Loantaka Brook	1.63	1.50	0.69 – 3.36
Great Brook	1.01	0.95	0.56 – 2.36
Primrose Brook	1.06	0.71	0.19 – 3.86
Passaic River	0.64	0.52	0.22 – 1.21

Table C5: Stormflow Total Nitrogen Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	not available	–	–
EPA Reference	1.295/2.225	–	–
Black Brook	2.02	1.88	0.73 – 4.43
Loantaka Brook	4.91	4.58	2.29 – 8.15
Great Brook	1.52	1.48	0.89 – 3.06
Primrose Brook	1.50	1.20	0.20 – 4.48
Passaic River	0.93	0.75	0.39 – 1.78

Table C6: Stormflow Total Suspended Solids Concentrations

Stream	Average Concentration (mg/l)	Median Concentration (mg/l)	Range of Concentrations (mg/l)
NJ WQ Standard	25/40	–	–
EPA Reference	not available	–	–
Black Brook	119	100	18 – 277
Loantaka Brook	136	108	27 – 276
Great Brook	55	43	12 – 137
Primrose Brook	148	61	10 – 738
Passaic River	23	19	3 – 100