



## EPA Region 7 TMDL Review

TMDL ID:IA 01-NEM-0060\_1

State: IA

Document Name: DUCK CREEK

Basin(s): NORTHEAST UPPER MISSISSIPPI RIVER BASIN

HUC(s): 07080101

Water body(ies): DUCK CR, DUCK CREEK

Tributary(ies): CANDLELIGHT CREEK, GOOSE CREEK, PHEASANT CREEK, ROBIN CREEK, SILVER CREEK, STAFFORD CREEK

Pollutant(s): E. COLI

Submittal Date:3/23/2010

Approved:Yes

### Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

This TMDL was formally submitted by the Iowa Department of Natural Resources to the U.S. Environmental Protection Agency on March 23, 2010. Revisions to this document were received by email on July 18, 2011.

### Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

The TMDL was written for Duck Creek segments, IA 01-NEM-0060\_1 and IA 01-NEM-0060\_2, and three tributaries Goose Creek, Pheasant Creek and Silver Creek. Contact recreation designated uses are impaired due to the pollutant, *Escherichia coli* (*E. coli*). Digestive waste, also referred to as fecal material, derived from warm-blooded animals and contain many microorganisms. These microorganisms are known to cause illness or disease if ingested by humans. Microorganisms are also referred to as the term pathogen, which indicates a disease causing microorganism and may include bacteria, viruses and other microscopic organisms. If water containing pathogens are ingested by humans, they risk the possibility of becoming ill. To limit the labor of testing for every possible pathogen that may be present in a water body, water quality assessments typically test for an organism from fecal material. Organisms include total coliform, fecal coliform or *E. coli*. *E. coli* is a type of fecal coliform, that indicates the presence of pathogens. For this TMDL, *E. coli* was used as the indicator bacteria for two reasons; 1) the EPA considers *E. coli* to be the preferred bacterial indicator and 2) the department's water quality standards are written for *E. coli*.

According to the 2006 and 2008 Section 305(b) water quality assessments, primary contact recreation in segment IA 01-NEM-0060\_1 of Duck Creek is "not supported" as the result of continuous exceedances of the WQS with high levels of indicator bacteria (*E. coli*). The 2008 305(b) assessment also states the same for segment IA 01-NEM-0060\_2. Intensive grab sampling completed in 2008 for the three Duck Creek tributaries (Pheasant Creek, Goose Creek and Silver Creek) also revealed that increased levels of *E. coli* routinely exceeded state WQS. This TMDL was written due to the continuous exceedances of *E. coli* present in Duck Creek, resulting in the impairment of designated uses.

The loading capacity for *E. coli* is calculated by both the geometric mean of 126 colony forming unit per 100 milliliters and for a single sample maximum of 235 cfu/100 mL. The LC is expressed through a load duration curve which uses stream discharge and a WQS target to define the LC at all percentiles of flow exceedance. WQS will be achieved for the two Duck Creek segments and three tributaries when the SSM and GM criterion are met.

The load duration curve using *E. coli* concentrations and mean daily flows were used to calculate the LC on a daily basis. The LDC approach involves developing flow duration curves that represent the percent of mean daily flows that equal or exceed a given flow value. Duration curves are categorized into five hydrologic conditions: high, moist, mid-range, dry and low. The LDC in this TMDL represents the LC across a range of flow conditions.

As an example, the LC for the three monitoring stations are listed below. The following LC examples are under moist flow range.

**Flow Variable LC Organisms/Day (orgs/day)**

	110th Avenue (DC-16)	Golf Course (DC-10)	Devils Glen Road (DC-12)
SSM Load	6.32E+10	2.47E+11	2.71E+11
GM Load	3.39E+10	1.45E+11	1.45E+11
Midpoint Flow (cfs)	11	43	47.2

\*cfs = cubic feet per second

The LC for the three tributaries, Pheasant Creek, Goose Creek and Silver Creek are listed below. The LC are listed under the moist flow range.

**Flow Variable LC (orgs/day)**

	Pheasant Creek	Goose Creek	Silver Creek
SSM Load	2.93E+10	4.34E+10	4.97E+10
GM Load	1.57E+10	2.33E+10	2.66E+10
Midpoint Flow (cfs)	5.1	7.6	8.6

The EPA agrees attainment of the LCs should result in the attainment of WQS.

**Numeric Target(s)**

*Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.*

The designated uses for the impaired segments covered by this TMDL are given in the table below.

Segment ID	Designated Uses	Impaired Use
IA 01-NEM-0060_1	Class A3, Class B(WW-2)	Class A3
IA 01-NEM-0060_2	Class A1	Class A1
Pheasant Creek	Class A3	Class A3
Goose Creek	Presumptive Class A1	Presumptive Class A1

Silver Creek	Class A3	Class A3
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All impairments are the result of pathogen indicator, *E. coli*, the pollutant for this stream. Attainment of water quality standards will be met when the criteria for Class A1 use, which is equal to Class A3 criteria, is met and fully support designated uses at all three Duck Creek locations. The use attainability analysis proposed that secondary contact recreation (Class A2) be established for a portion of the upstream segment. A more stringent criterion is applied to this upstream segment as well. The more stringent criterion is due to short travel time to the Class A3 use reach that does not allow significant die-off of *E. coli*. This assumption provides partial basis for the implicit margin of safety.

Table 3-2 of the TMDL quotes applicable water quality standards from Chapter 61 of the Iowa Administrative Code for impairments to primary contact and children's recreation. WQS states that maximum daily loads for *E. coli* concentrations are based on a single sample maximum criterion of 235 cfu/100 mL; all facilities operating under a national pollutant discharge elimination system permit must meet the 30-day geometric mean of 126 cfu/100 mL.

The TMDL states that primary benefits of this watershed include recreation, aquatic and riparian wildlife habitat, aesthetic qualities and storm drainage. Humans, specifically children, are known to recreate regularly in and near the stream. All 303(d) list designated uses are impaired due to the *E. coli* pollutant.

Appendix G of the TMDL contains excerpts from 305(b) assessments relevant to the bacteria impairments on Duck Creek. The entire assessment is available on the following web address:  
<http://programs.iowadnr.gov/adbnet/index.aspx>.

A load duration curve using *E. coli* concentrations and mean daily flows were used to calculate the loading capacity on a daily basis. The LDC approach involves developing flow duration curves that represent the percent of mean daily flows that equal or exceed a give flow value. Duration curves are categorized into five hydrologic conditions: high, moist, mid-range, dry and low. The LDC in this TMDL represents the LC across a range of flow conditions.

#### **Pollutant(s) of concern**

*An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.*

The criteria for *E. coli* is a direct link to water quality standards. *E. coli* loads are allocated for the major contributors to mitigate impairment. The allocations are state WQS, based on the geometric mean of 126 cfu/100 mL and the single sample maximum of 235 cfu/100 mL so a daily maximum load can be quantitatively determined.

#### **Source Analysis**

*Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.*

The headwaters of Duck Creek are in rural Scott County, west of Davenport. The stream runs west to east flowing through the cities of Bettendorf and Davenport before discharging into the Mississippi River. Major tributaries are Pheasant Creek, Goose Creek and Silver Creek. Smaller contributing streams include Candlelight Creek, Stafford Creek, Robin Creek and several unnamed tributaries. Duck Creek is almost evenly divided among rural and urban land uses, with the upstream (west) half of the watershed designated to agricultural use and the downstream (east) half in urban areas. The total drainage of the watershed is approximately 64 square miles. Land use for this watershed is composed of 40.4 percent row crops, 21.5 percent grassland, 11.6 percent

residential, 8.2 percent roads, 6.8 percent commercial/industrial, 5.4 percent timber, 4.4 percent pasture, 0.6 percent water/wetlands and 1.1 percent designated to other entities. The landscape characterization of Duck Creek are outcroppings of bedrock, steep slide slopes and narrow stretches of bottom land. Upland portions consist of glacial till plains covered with loess. This watershed has three soil associations: the Tama, Muscatine-Tama-Garwin and Downs-Fayette associations. Of the three, Tama comprises the largest portion of the watershed.

Since the 1930s, Duck Creek has endured significant alterations including stream channelization that affects hydrology. As a result, the stream exhibits "flashy" hydrologic behavior and is prone to large and quick increases in flow during moderate rainfall events. To monitor conditions within the stream, the U.S. Geological Survey maintains two streams gages on the main stem of Duck Creek. Water quality monitoring site DC-16 is located at USGS Station 05422560 (110th Ave.), and site DC-10 is located at Station 05422600 (DC Golf Course).

Point sources for Duck Creek include two municipal separate storm sewer systems, also known as MS4, three wastewater treatment facilities, sanitary sewer over flows, over 90 permitted onsite wastewater systems, and animal feeding operations large enough to require permits. Bettendorf and Davenport are regulated under National Pollutant Discharge Elimination Systems municipal separate storm sewer systems permits. Both Bettendorf and Davenport are considered point sources regardless of loading processes.

**NPDES Permitted Facilities in the Duck Creek Watershed.**

<b>NPDES No.</b>	<b>Facility Name</b>
IA0076261	West Locust-Lagoon
IA0064432	West Kimberly Mobile Home Park
IA0067695	Lakewood Estates Mobile Home Park
IA0043052	City of Davenport Sewage Treatment Plant
IA0078191	City of Bettendorf MS4
IA0078808	City of Davenport MS4
IA0074110	Flying J Travel Plaza
IA0076139	Iowa Department of Transportation Maintenance Garage
IA0059501	John Deere Davenport Works
General Permit #4	Discharging Onsite Wastewater Systems
-	Multiple AFOs

Iowa WQS states that the maximum daily load is based on the single sample maximum of 235 cfu/100 mL and all facilities operating under a NPDES permit must meet the 30-day geometric mean *E. coli* of 126 cfu/100 mL. The GM is used instead of an arithmetic mean because it handles highly skewed data or data with large variation/outliers more efficiently. The GM is calculated and based on the following permitting protocols:

- A minimum of five *E. coli* samples must be collected by all facilities in one calendar month during each three-month period during the appropriate recreation season associated with the receiving stream designation
- Samples must be collected during the time span of one calendar month
- No more than one sample can be collected in one day
- Two days, minimum, should be between each sample
- In seven consecutive days, no more than two samples may be collected
- All valid samples collected during a month must be used to calculate the GM.

The GM formula is as follows:

$$\frac{(\text{Sample 1} * \text{Sample 2} * \text{Sample 3} \dots \text{Sample N})}{(1/N)}$$

"N" is the number of samples collected over given sampling period.

Nonpoint sources include wildlife, manure application to row crops (according to the "Swine-Fresh Manure" classification located in the Soil Water Assessment Tool 2005 database, all manure is applied as hog manure), grazing livestock, small feeding operations, direct deposition by livestock in streams and non-permitted (non-discharging) onsite wastewater systems. Due to the widespread use of onsite wastewater treatments systems (septic systems) throughout the watershed, many systems in the Duck Creek watershed discharge to surface water

under NPDES General Permit #4. For purposes of this TMDL, discharging septic systems operating under an NPDES permit are considered point sources whereas non-discharging systems are considered nonpoint sources.

The assumption that livestock with direct access defecate in streams a portion of the time during the grazing season of May 15 to October 15 was stated in the TMDL. This assumption was a result of the Soil and Water Conservation District's watershed assessment that included reconnaissance efforts to estimate the number of livestock with direct access to streams. Results also indicated that cattle spent the highest amount of time instream during hot weather. The EPA Bacteria Indicator Tool calculated direct deposition by multiplying the fraction of time spent in streams by accepted defecation rates and manure bacteria concentrations. Via daily point source discharge tables on a subwatershed basis, inputs were entered into the Soil and Water Assessment Tool. Livestock populations that were identified as having direct stream access contributed to direct deposition into the SWAT model. The SWAT modeling indicated that 75 percent of all manure deposited within this 100-foot corridor is directly delivered into the stream. The number of cattle with stream access was added to the total number of grazing cattle causing an overestimate of the number of cattle in the watershed.

Any concentrated animal feeding operation that does not obtain a NPDES permit must operate as a no discharge operation. Any discharge from an unpermitted CAFO is a violation of Section 301. It is the EPA's position that all CAFOs should obtain a NPDES permit because it provides clarity of compliance requirements, authorization to discharge when the discharges are the result of large precipitation events (e.g., in excess of 25-year and 24-hour frequency/duration) or are from a man-made conveyance. However, many large CAFOs (mostly the poultry and swine sectors) contend that they do not discharge nor propose to discharge therefore are not required to obtain an NPDES permit. It is the EPA's opinion that many of the "no discharge" CAFOs do not have adequate land application area to ensure the agronomic uptake of land applied waste or are not designed, constructed, operated or maintained so that they do not discharge or propose to discharge. Furthermore, there are many animal feeding operations that meet the definition of a medium CAFO (i.e., discharge via a man-made conveyance) but are unpermitted and have not limited their impact on waters by applying best professional judgment to effluent reductions.

Permitted CAFOs identified in this TMDL are part of the assigned wasteload allocation. The animal feeding operations and unpermitted CAFOs are considered under the load allocation because we do not currently have enough detailed information to know whether these facilities are required to obtain NPDES permits. This TMDL does not reflect a determination by the EPA that such facility does not meet the definition of a CAFO nor that the facility does not need to obtain a permit. To the contrary, a CAFO that discharges or proposes to discharge has a duty to obtain a permit. If it is determined that any such operation is an AFO or CAFO that discharges, any future WLA assigned to the facility must not result in an exceedance of the sum of the WLAs in this TMDL as approved.

In the absence of an NPDES permit, the discharges associated with sources were applied to the LA, as opposed to the WLA for purposes of this TMDL. The decision to allocate these sources to the LA does not reflect any determination by the EPA as to whether these discharges are, in fact, unpermitted point source discharges within this watershed. In addition, by establishing these TMDLs with some sources treated as LAs, the EPA is not determining that these discharges are exempt from NPDES permitting requirements. If sources of the allocated pollutant in this TMDL are found to be, or become, NPDES-regulated discharges, their loads must be considered as part of the calculated sum of the WLAs in this TMDL. WLA in addition to that allocated here is not available.

The EPA agrees this submittal considers all known sources.

#### Allocation - Loading Capacity

*Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.*

The loading capacity for both impaired segments, IA 01-NEM-0060\_1 and IA 01-NEM-0060\_2, and three tributaries (Pheasant Creek, Goose Creek and Silver Creek) requires a geometric mean of 126 cfu/100 mL and a single sample maximum no greater than 235 cfu/100 mL.

Segment or Tributary	Single Sample Maximum WLA	Geometric Mean WLA
IA 01-NEM-0060-1 (Golf Course/DC-10)	3.51E+09 orgs/day	8.22E+08 orgs/day

IA 01-NEM-0060-1 (Devils Glen/DC-12)	3.51E+09 orgs/day	8.22E+08 orgs/day
IA 01-NEM-0060-2	2.40E+07 orgs/day	1.29E+07 orgs/day
Pheasant Creek	Zero	Zero
Goose Creek	4.94E+07 orgs/day	2.65E+07 orgs/day
Silver Creek	6.30E+07 orgs/day	3.38E+07 orgs/day

Segment or Tributary	Single Sample Maximum LA	Geometric Mean LA
IA 01-NEM-0060-1 (Golf Course/DC-10)	2.22E+10 orgs/day	1.20E+10 orgs/day
IA 01-NEM-0060-1 (Devils Glen/DC-12)	2.22E+10 orgs/day	1.20E+10 orgs/day
IA 01-NEM-0060-2	8.44E+10 orgs/day	4.63E+10 orgs/day
Pheasant Creek	1.57E+10 orgs/day	8.41E+09 orgs/day
Goose Creek	2.27E+10 orgs/day	1.22E+10 orgs/day
Silver Creek	2.90E+10 orgs/day	1.55E+10 orgs/day

The WLA for National Pollutant Discharge Elimination System permits are provided in the WLA section of this document.

The margin of safety is an explicit 10 percent and is applied to the loading capacity. Targets for instream *E. coli* concentrations are 212 cfu/100 mL for the SSM and 113 cfu/100 mL for the GM.

Refer to Table 3-20, Table 3-21 and Table 3-22 within the TMDL for a summary of stream allocations.

#### WLA Comment

*Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.*

Duck Creek contains several permitted point sources that contributes to the entire wasteload allocation. These include three wastewater lagoons, two Municipal Separate Storm Sewer Systems, and over 90 permitted onsite wastewater treatment systems that discharge to surface water. Each lagoon and MS4 is assigned an individual WLA, but permitted onsite wastewater treatment systems are given a collective WLA.

The table below are WLAs to meet the single sample maximum criterion of 235 cfu/100 mL.

NPDES No.	Facility Name	Facility Type	WLA (orgs/day)
IA0076261	West Locust Lagoon	Municipal wastewater	2.13+E09
IA0064432	West Kimberly Mobile Home Park	Semi-public wastewater	6.67E+07
IA0067695	Lakewood Estates Mobile Home Park	Municipal wastewater	1.04E+09
IA0043052	City of Davenport STP (SSOs)	Municipal wastewater	Zero
IA0078191	City of Bettendorf	MS4	2.65E+09
IA0078808	City of Davenport	MS4	1.54E+10
IA0074110	Flying J Travel Plaza	Industrial/	Zero

		storm water	
IA0076139	Iowa DOT Maintenance Garage	Industrial/ storm water	Zero
IA0059501	John Deere Davenport Works	Industrial/ storm water	Zero
	Discharging Onsite Wastewater Systems	Private Sewage disposal systems	1.40E+08
	Multiple Animal Feeding Operations	Agricultural	Zero

The table below are WLAs to meet the geometric mean criterion of 126 cfu/100 mL.

NPDES No.	Facility Name	Facility Type	WLA(orgs/day)
IA0076261	West Locust Lagoon	Municipal wastewater	1.14+E08
IA0064432	West Kimberly Mobile Home Park	Semi-public wastewater	3.58E+07
IA0067695	Lakewood Estates Mobile Home Park	Municipal wastewater	5.25E+08
IA0043052	City of Davenport STP (SSOs)	Municipal	Zero
IA0078191	City of Bettendorf	MS4	1.42E+09
IA0078808	City of Davenport	MS4	8.26E+09
IA0074110	Flying J Travel Plaza	Industrial/ storm water	Zero
IA0076139	Iowa DOT Maintenance Garage	Industrial/ storm water	Zero
IA0059501	John Deere Davenport Works	Industrial/ storm water	Zero
	Discharging Onsite Wastewater Systems	Private Sewage disposal systems	7.51E+07
	Multiple Animal Feeding Operations	Agricultural	Zero

For TMDLs to be more beneficial in the assessment and implementation process, TMDLs should reflect adequate water quality across flow conditions rather than at a single flow event such as average daily flow. The WLAs above are considered at moist flow conditions. Pages 52-53 of the TMDL provides detailed information for all WLAs.

Examples of flow conditions, at mid-range (50-60 percent exceedance) for segments IA 01-NEM-0060\_1 (Golf Course/DC-10), IA 01-NEM-0060\_1 (Devils Glen/DC-12) and IA-NEM-0060\_2 are:

Segment or Tributary	Single Sample Maximum (Wasteload Allocation)	Geometric Mean (Wasteload Allocation)
IA 01-NEM-0060-1 (Golf Course/DC-10)	3.51E+09 orgs/day	8.22E+08 orgs/day
IA 01-NEM-0060-1 (Devils Glen/DC-12)	3.51E+09 orgs/day	8.22E+08 orgs/day
IA 01-NEM-0060-2	2.40E+07 orgs/day	1.29E+07 orgs/day
Pheasant Creek	Zero	Zero
Goose Creek	4.94E+07 orgs/day	2.65E+07 orgs/day
Silver Creek	6.30E+07 orgs/day	3.38E+07 orgs/day

**LA Comment**

*Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.*

The load allocation at mid-range for segments IA 01-NEM-0060\_1 and IA 01-NEM-0060\_2 are:

Segment or Tributary	Single Sample Maximum (Load Allocation)	Geometric Mean (Load Allocation)
IA 01-NEM-0060-1 (Golf Course/DC-10)	2.22E+10 orgs/day	1.20E+10 orgs/day
IA 01-NEM-0060-1 (Devils Glen/DC-12)	2.22E+10 orgs/day	1.20E+10 orgs/day
IA 01-NEM-0060-2	8.44E+10 orgs/day	4.63E+10 orgs/day
Pheasant Creek	1.57E+10 orgs/day	8.41E+09 orgs/day
Goose Creek	2.27E+10 orgs/day	1.22E+10 orgs/day
Silver Creek	2.90E+10 orgs/day	1.55E+10 orgs/day

**Margin of Safety**

*Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.*

The margin of safety is an explicit 10 percent. Targets for instream *E. coli* concentrations, with the 10 percent MOS applied, are 212 cfu/100 mL for the single sample maximum and 113 cfu/100 mL for the geometric mean. The implicit MOS were based off of these conservative assumptions:

- Instream sources such as failed septic systems, permitted onsite wastewater treatment systems, cattle in streams and wildlife in streams are assumed to discharge continuously throughout the timeframe in which they contribute.
- Pet waste is assumed to be dog waste, which has a higher level of *E. coli*.
- For sanitary sewer overflows *E. coli* concentrations, a literature value for raw wastewater was utilized.
- The number of cattle residing in the watershed is likely to be over-estimated.
- Bacteria die-off on soil particles and in soil solution was considered negligible.
- The upstream segment of Duck Creek requires compliance with the Class A1/A3 criteria, rather than the less stringent Class A2 criteria.

The MOS at mid-range for segments IA 01-NEM-0060\_1(Golf Course/DC-10), IA 01-NEM-0060\_1 (Devils Glen/DC-12) and IA-NEM-0060\_2 are:

Segment or Tributary	Single Sample Maximum (Margin of Safety)	Geometric Mean (Margin of Safety)
IA 01-NEM-0060-1 (Golf Course/DC-10)	9.77E+09 orgs/day	5.24E+09 orgs/day
IA 01-NEM-0060-1 (Devils Glen/DC-12)	1.07E+09 orgs/day	5.76E+08 orgs/day
IA 01-NEM-0060-2	2.47E+07 orgs/day	1.33E+09 orgs/day

Pheasant Creek	1.74E +09 orgs/day	9.34E+08 orgs/day
Goose Creek	2.53E+09 orgs/day	1.36E+09 orgs/day
Silver Creek	3.23E+09 orgs/day	1.73E+09 orgs/day

### Seasonal Variation and Critical Conditions

*Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.*

The water quality standards target for this TMDL applies during the recreation season of March 15 to November 15. Allocations were developed for a range of flow conditions that account for wet and dry periods during the recreation season.

*E. coli* samples were collected and analyzed for one 10-day and one 14-day period in 2008 to evaluate *E. coli* levels during both wet and dry conditions. Initial concentrations showed *E. coli* samples to be higher during wet weather. The second samples displayed a flush effect at the end of September when a runoff event followed 13 days of dry weather. The results showed that *E. coli* concentrations appear to be correlated to flow. It is incorrect to assume that observations made during these two periods adequately describe water quality trends over the wide range of seasonality conditions within this water body.

Seasonality and any critical conditions have been addressed in the submittal.

### Public Participation

*Submittal describes required public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].*

A public meeting was held on November 25, 2008, in Bettendorf, Iowa. Two formal public meetings were held on February 22, 2010; the first meeting was held in Bettendorf, Iowa, and the second meeting was held in Davenport, Iowa.

The public notice period was from February 4 to March 8, 2010. The IDNR received four official public comments on the draft TMDL. All comments were considered accordingly. Comments and the IDNR responses are included in Appendix G of the TMDL. A draft version of the TMDL was also available for comments at <http://www.iowadnr.gov/water/watershed/tmdl/publicnotice.html>.

### Monitoring Plan for TMDL(s) Under Phased Approach

*The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].*

Monitoring plans for Duck Creek include weekly snapshots of *E. coli* and flow samples. This collection will be ongoing throughout the recreation season. Snapshot microbial source tracking methods will occur twice during the recreation season, one during high flow and one during low flow. Event sampling of *E. coli* and flow will occur every 15-60 minutes throughout rising and falling limbs of the hydrograph during at least two runoff events within the recreation season. Dry weather sampling of *E. coli* and flow will be taken by snapshot at least twice during the low flow conditions within the recreation season. Biological monitoring of the Fish Index of Biotic Integrity and Benthic Macroinvertebrate Index of Biotic Integrity will be taken by snapshot at least once during the dry weather within the recreation season.

See Table 6-1 and Figure 6-2 of the TMDL for additional monitoring information.

### Reasonable Assurance

*Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.*

States are not required under Section 303(d) of the Clean Water Act to develop TMDL implementation plans and the EPA does not approve or disapprove them. However, the IDNR included an implementation plan with this TMDL to provide information regarding how point and nonpoint sources can or should be controlled to ensure implementation efforts achieve the loading reductions identified in this TMDL. The EPA recognizes that

technical guidance and support are critical to determining the feasibility of and achieving the goals outlined in this TMDL. Therefore, the discussion of reduction efforts relating to point and nonpoint sources can be found in the implementation section of the TMDL, and are briefly described below.

The IDNR has the authority to issue and enforce state operating permits. Inclusion of effluent limits into a state operating permit and requiring that effluent and instream monitoring be reported to the IDNR should provide reasonable assurance that instream water quality standards will be met. Section 301(b)(1)(C) requires that point source permits have effluent limits as stringent as necessary to meet water quality standards. However, for wasteload allocations to serve that purpose, they must themselves be stringent enough so that (in conjunction with the water body's other loadings) they meet WQS. This generally occurs when the TMDL's combined nonpoint source load allocations and point source wasteload allocations do not exceed the WQS-based loading capacity and there is reasonable assurance that the TMDL's allocations can be achieved. Discussion of reduction efforts relating to nonpoint sources can be found in the implementation section of the TMDL.

There are two general strategies for reducing pollutant loads; source control and in-drainage reduction. The primary focus needs to be on nearby sources in the watershed. These sources include cattle in streams, manure application and urban sources. Reductions in these loads will require changes in the way wildlife and horse manure is managed. Some best management practices can be identified for implementation. Implementation alternatives are shown in tables 5-1 through 5-3 in the TMDL. These alternatives are the foundation for an implementation strategy. These include:

- Manure application management
- Livestock exclusion from streams and riparian buffer creation/enhancement
- Septic system inspection, repair and maintenance activities
- Wastewater treatment facility monitoring and operations/management improvements, if necessary
- Elimination of illicit discharges and Sanitary Sewer Overflows

Specific best management practices are needed for each pollutant source to develop a successful watershed management plan.

Current guidance from the EPA states that TMDLs that allocate loads to both WLAs and LAs must demonstrate reasonable assurance that required load reductions will be implemented. Reasonable assurance is provided through NPDES permits for point sources. For nonpoint sources, allocations and proposed implementation activities must satisfy four criteria:

- They must apply to the pollutant of concern
- They will be implemented expeditiously
- They will be accomplished through effective programs
- They will be supported by adequate water quality funding

All four criteria for nonpoint source measures are met in the Duck Creek TMDL.

Funding assistance for controlling nonpoint sources of bacteria loads are available, including Section 319 grants, Watershed Improvement Review Board grants and the Water Protection Fund.