Total Maximum Daily Load (TMDL) Synopsis

State: Kentucky
Major River Basin: Green
USGS HUC8 #: 05110003
County: Muhlenberg
Pollutant(s) of Concern: *E. coli*, pH, Cadmium, Copper, Iron, Lead, Nickel and Zinc

Table S.1 Impaired Waterbodies and Pollutants Addressed in this TMDL Document

Waterbody	GNIS Number[(1)]	Pollutant	Suspected Sources	Impaired Use[(2)] (Support Status)[(3)]
Bat East Creek 0.0 to 3.4	KY486462_01	*E. coli*	Source Unknown	PCR (NS)
		Copper	Legacy Coal Extraction	WAH (PS)
		Lead	Legacy Coal Extraction	WAH (PS)
Beech Creek 0.0 to 3.9	KY486697_01	Cadmium	Surface Mining	WAH (NS)
		Iron	Surface Mining	WAH (NS)
		Nickel	Surface Mining	WAH (NS)
		Zinc	Surface Mining	WAH (NS)
Boggess Creek 0.0 to 3.0	KY487614_01	*E. coli*	Loss of Riparian Habitat; Non-point Source	PCR (NS)
Caney Creek 0.0 to 3.6	KY488838_01	*E. coli*	Non-point Source; Urban Runoff/store Sewers	PCR (NS)
		Cadmium[(4)]	Source Unknown	WAH (PS)
Caney Creek 3.6 to 7.6	KY488838_02	*E. coli*	Non-point Source	PCR (NS)
		Cadmium[(4)]	Legacy Coal Extraction	WAH (NS)
		Lead[(4)]	Legacy Coal Extraction	WAH (NS)
Carters Creek 0.0 to 3.1	KY489022_01	*E. coli*[(4)]	Agriculture	PCR (PS)
Opossum Run 0.0 to 1.6	KY499964_01	*E. coli*[(4)]	Non-point Source	PCR (NS)
Plum Creek 0.0 to 1.65	KY500964_01	*E. coli*	Upstream Source; Inappropriate Water Disposal	PCR (NS)
		Cadmium	Non-point Source; Legacy Coal Extraction	WAH (NS)
Plum Creek 1.65 to 3.9	KY500964_02	*E. coli*	Non-point Source; Upstream Source	PCR (NS)
		pH	Legacy Coal Extraction	PCR (NS), SCR (NS), WAH (NS)
		Cadmium	Non-point Source	WAH (NS)
		Nickel	Non-point Source	WAH (NS)
		Zinc	Non-point Source	WAH (NS)
Pond Creek 0.0 to 5.0	KY501042_01	Iron[(4)]	Surface Mining; Legacy Coal Extraction	WAH (NS)

Total Maximum Daily Load (TMDL) Synopsis

Waterbody	GNIS Number[1]	Pollutant	Suspected Sources	Impaired Use[2] (Support Status)[3]
Pond Creek 5.0 to 7.5	KY501042_02	*E. coli*	Non-point Source; Upstream Source	PCR (PS)
		Cadmium	Legacy Coal Extraction	WAH (NS)
		Iron	Legacy Coal Extraction	WAH (NS)
Pond Creek 7.5 to 11.7	KY501042_03	*E. coli*	Non-point Source	PCR (PS)
		Cadmium	Petroleum /Natural Gas Production Activities; Non-point Source; Legacy Coal Extraction	WAH (NS)
		Iron	Petroleum /Natural Gas Production Activities; Non-point Source; Legacy Coal Extraction	WAH (NS)
Pond Creek 11.7 to 14.4	KY501042_04	Cadmium[4]	Surface Mining; Legacy Coal Extraction; Petroleum /Natural Gas Production Activities	WAH (NS)
		Iron[4]	Surface Mining; Legacy Coal Extraction; Petroleum /Natural Gas Production Activities	WAH (NS)
Pond Creek 14.4 to 18.1	KY501042_05	*E. coli*	Non-point Source	PCR (NS)
		Lead	Upstream Source	WAH (NS)
Pond Creek 18.1to 18.7	KY501042_06	*E. coli*	Non-point Source	PCR (NS)
Saltlick Creek 0.0 to 3.7	KY502844_01	*E. coli*	Non-point Source	PCR (NS)
Sandlick Creek 0.0 to 4.05	KY502963_01	*E. coli*	Non-point Source	PCR (PS)
		Iron[4]	Source Unknown	WAH (PS)
		Lead[4]	Source Unknown	WAH (PS)
UT of Bat East Creek 0.0 to 1.9	KY486462-6.1_01	*E. coli*	Non-point Source	PCR (NS)
UT of Bat East Creek 0.0 to 3.55	KY486462-1.6_01	*E. coli*	Non-point Source	PCR (NS)
UT of Caney Creek 0.0 to 2.6	KY488838-2.3_01	*E. coli*	Municipal (Urbanized High Density Area); Urban Runoff / Store Water; Upstream Source	PCR (PS)
		Lead[4]	Source Unknown	WAH (PS)
UT of Caney Creek 0.0 to 2.3	KY488838-1.8_01	*E. coli*	Loss of Riparian Habitat; Non-point Source	PCR (NS)
		Lead[4]	Source Unknown	WAH (NS)

Total Maximum Daily Load (TMDL) Synopsis

Waterbody	GNIS Number[(1)]	Pollutant	Suspected Sources	Impaired Use[(2)] (Support Status)[(3)]
UT of Plum Creek 0.0 to 2.45	KY500964-1.65_01	pH	Legacy Coal Extraction	PCR (NS), SCR (NS), WAH (NS)
		Cadmium	Legacy Coal Extraction	WAH (NS)
		Iron[(4)]	Legacy Coal Extraction	WAH (NS)
		Nickel	Legacy Coal Extraction	WAH (NS)
		Zinc	Legacy Coal Extraction	WAH (NS)
UT of Pond Creek 0.0 to 2.4	KY501042-6.9_01	Iron	Surface Mining; Legacy Coal Extraction	WAH (NS)
UT of Pond Creek 2.4 to 4.2	KY501042-6.9_02	*E. coli*	Non-point Source; Rural Residential Areas	PCR (NS)
		pH	Surface Mining; Legacy Coal Extraction	PCR (NS), SCR (PS), WAH (NS)
		Cadmium[(4)]	Surface Mining; Legacy Coal Extraction	WAH (NS)
UT of Pond Creek 0.0 to 1.4	KY501042-11.1_01	Cadmium	Upstream Source; Legacy Coal Extraction	WAH (NS)

[(1)] It is a combination of the Geographic Names Information System (GNIS) number and a 2-digit suffix denoting the segment. Any additional numbers following the GNIS number but before the segment number denote the river miles of unnamed tributaries.
[(2)] PCR: Primary Contact Recreation; SCR: Secondary Contact Recreation; WAH: Warm Water Aquatic Habitat
[(3)] NS: Non-Support; PS: Partial Support
[(4)] Included in 2016 303(d) List

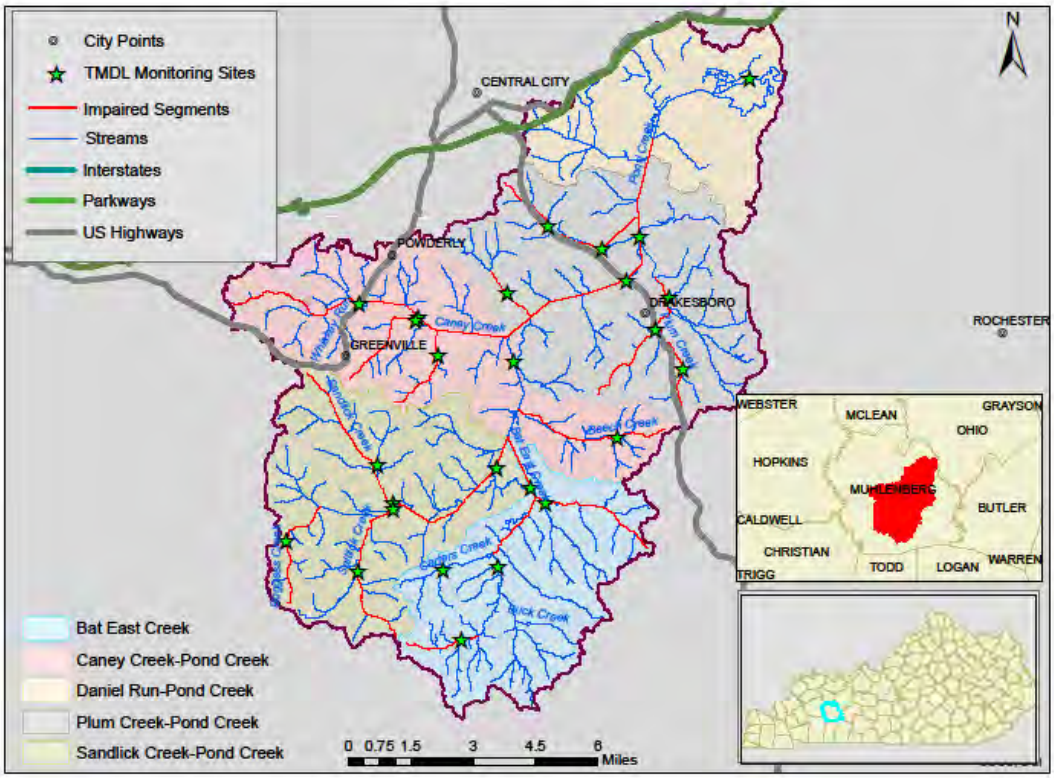

Figure S.1 Location of the Pond Creek Watershed, TMDL Sampling Stations and Impaired Stream Segments

Kentucky Water Quality Criteria (WQC) and the TMDL Endpoint (i.e. Water Quality Standard/ TMDL Target):

Table S.2 *E. coli* WQC and TMDL Endpoint

Condition	WQC, colonies/100ml[(1)]	TMDL Load, colonies/day[(2)]
Instantaneous	240	$Q_S \times 240 \times 24{,}465{,}758.4$
Geomean	130	$Q_S \times 130 \times 24{,}465{,}758.4$

[(1)] ml: milliliter
[(2)] Q_S is the flow in the stream in cubic feet per second (cfs or ft^3/s).

Table S.3 pH WQC and TMDL Endpoint

Condition	WQC, pH standard units	TMDL Load, Hydrogen Ions, pounds/day[(1)]
All Conditions	6.0 (upper limit of hydrogen ion loading)	$Q_S \times 2.060$
All Conditions	9.0 (lower limit of hydrogen ion loading)	$Q_S \times 2.060E\text{-}3$

[(1)] Q_S is the flow in the stream in cfs.

Table S.4 Iron WQC and TMDL Endpoint

Condition	WQC, mg/L[1]	TMDL Load, pounds/day[2]
Chronic- aquatic life has not been shown to be adversely affected	3.5	$Q_S \times 18.8782$
Chronic–aquatic life is adversely affected	1.0	$Q_S \times 5.3938$
Acute	4.0	$Q_S \times 21.5751$

[1] mg/L: milligram per liter
[2] Q_S is the flow in the stream in cfs.

Table S.5 Cadmium, Copper, Lead, Nickel and Zinc WQCs and TMDL Endpoints

Condition	WQC[1], µg/L[2]	TMDL Load, pounds/day[3]
Cadmium		
Chronic	$e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Acute	$e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Copper		
Chronic	$e^{(0.8545*(\ln(\text{hardness}))-1.702)}$	$Q_S \times 0.005394 \times e^{(0.8545*(\ln(\text{hardness}))-1.702)}$
Acute	$e^{(0.9422*(\ln(\text{hardness}))-1.700)}$	$Q_S \times 0.005394 \times e^{(0.9422*(\ln(\text{hardness}))-1.700)}$
Lead		
Chronic	$e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Acute	$e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$
Nickel		
Chronic	$e^{(0.846*(\ln(\text{hardness}))+0.0584)}$	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+0.0584)}$
Acute	$e^{(0.846*(\ln(\text{hardness}))+2.255)}$	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$
Zinc		
Chronic	$e^{(0.8473*(\ln(\text{hardness}))+0.884)}$	$Q_S \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+0.884)}$
Acute	$e^{(0.8473*(\ln(\text{hardness}))+0.884)}$	$Q_S \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+0.884)}$

[1] Hardness is in units of mg/L as $CaCO_3$.
[2] µg /L: microgram per liter
[3] Q_S is the flow in the stream in cfs.

Table S.6 Net Alkalinity TMDL Endpoint

Condition	Net Alkalinity[1], pounds/day
All Conditions	≥ 0

[1] Net alkalinity is defined as the alkalinity in mg/L as $CaCO_3$ minus the calculated acidity; the calculated acidity is determined using the following equation: Calculated Acidity, mg/l as $CaCO_3 = 50 \times ((10^{(3-pH)}) + (3 \times \text{Fe mg/L}/55.8) + (2 \times \text{Mn mg/L}/54.9) + (3 \times \text{Al mg/L}/27))$.

Total Maximum Daily Load (TMDL) Synopsis

TMDL Equation and Calculations:

A TMDL calculation is performed as follows:

$$TMDL = WLA + LA + MOS$$

Equation S.1

Where:

TMDL: the WQC, expressed as a load.

MOS: the Margin of Safety, which can be an implicit or explicit additional reduction applied to sources of pollutants that accounts for uncertainties in the relationship between effluent limits and water quality. For this TMDL, the MOS is implicit.

WLA: the Wasteload Allocation, which is the allowable loading of pollutants into the stream from Kentucky Pollutant Discharge Elimination System (KPDES) permitted sources.

KPDES-WLA: the WLA for the existing KPDES-permitted facilities which have discharge limits for the pollutants of concern.

MS4-WLA: the WLA for KPDES-permitted municipal separate stormwater sewer systems (MS4) (including cities, counties, roads and right-of-ways owned by the Kentucky Transportation Cabinet, universities and military bases). There is no MS4 community within this watershed area.

LA: the Load Allocation, which is the allowable loading of pollutants into the stream from sources not permitted by KPDES and from natural background.

Seasonality: yearly factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses.

Critical Condition: the time period when the pollutant conditions are expected to be at their worst.

Existing Conditions: the load that exists in the watershed at the time of TMDL development (i.e., sampling) and is causing the impairment.

Load: concentration * flow * conversion factor.

Concentration: colonies per 100 milliliter (*E. coli*), milligrams per liter (mg/L) (iron, alkalinity, acidity), micrograms per liter (µg/L) (cadmium, copper, lead, nickel, zinc) or standard units (pH).

Flow (i.e., stream discharge): cubic feet per second (cfs).

Table S.7 TMDLs and Allocations by Impaired Segments

Pollutant	Units	TMDL[1]	MOS[2]	KPDES-WLA[3]	LA[4]
Bat East Creek 0.0 to 3.4					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Copper (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.8545*(\ln(\text{hardness}))-1.702)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.8545*(\ln(\text{hardness}))-1.702)}$	$Q_{LA} \times 0.005394 \times e^{(0.8545*(\ln(\text{hardness}))-1.702)}$
Copper (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(0.9422*(\ln(\text{hardness}))-1.700)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.9422*(\ln(\text{hardness}))-1.700)}$	$Q_{LA} \times 0.005394 \times e^{(0.9422*(\ln(\text{hardness}))-1.700)}$
Lead (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Lead (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$
Beech Creek 0.0 to 3.9					
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Nickel (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+ 0.0584)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+ 0.0584)}$	$Q_{LA} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+ 0.0584)}$
Nickel (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$	$Q_{LA} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$
Zinc (Acute and Chronic)[6]	pounds/day	$Q_S \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+ 0.884)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+ 0.884)}$	$Q_{LA} \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+ 0.884)}$
Boggess Creek 0.0 to 3.0					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Caney Creek 0.0 to 3.6					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$

Total Maximum Daily Load (TMDL) Synopsis

Pollutant	Units	TMDL[1]	MOS[2]	KPDES-WLA[3]	LA[4]
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Caney Creek 3.6 to 7.6					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Lead (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Lead (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$
Carters Creek 0.0 to 3.1					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Opossum Run 0.0 to 1.6					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Plum Creek 0.0 to 1.65					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Plum Creek 1.65 to 3.9					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
pH[7]	standard units	$6.0 \leq pH \leq 9.0$	Implicit	$6.0 \leq pH \leq 9.0$	$6.0 \leq pH \leq 9.0$
Alkalinity, Acidity[8]	mg/L as $CaCO_3$	Net Alkalinity ≥ 0	Implicit	Net Alkalinity ≥ 0	Net Alkalinity ≥ 0
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$

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Pollutant	Units	TMDL[1]	MOS[2]	KPDES-WLA[3]	LA[4]
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Nickel (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+0.0584)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+0.0584)}$	$Q_{LA} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+0.0584)}$
Nickel (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$	$Q_{LA} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$
Zinc (Acute and Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+0.884)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+0.884)}$	$Q_{LA} \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+0.884)}$
Pond Creek 0.0 to 5.0					
Iron (Chronic)[9]	pounds/day	$Q_S \times 18.878$	Implicit	$Q_{KPDES} \times 18.878$	$Q_{LA} \times 18.878$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Pond Creek 5.0 to 7.5					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Pond Creek 7.5 to 11.7					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$

Total Maximum Daily Load (TMDL) Synopsis

Pollutant	Units	TMDL[1]	MOS[2]	KPDES-WLA[3]	LA[4]
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Pond Creek 11.7 to 14.4					
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Pond Creek 14.4 to 18.1					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Lead (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Lead (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$
Pond Creek 18.1 to 18.7					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Saltlick Creek 0.0 to 3.7					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Sandlick Creek 0.0 to 4.05					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Lead (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Lead (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$

Total Maximum Daily Load (TMDL) Synopsis

Pollutant	Units	TMDL[1]	MOS[2]	KPDES-WLA[3]	LA[4]
UT of Bat East Creek 0.0 to 1.9					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
UT of Bat East Creek 0.0 to 3.55					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
UT of Caney Creek 0.0 to 2.6					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Lead (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Lead (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$
UT of Caney Creek 0.0 to 2.35					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Lead (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-4.705)}$
Lead (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$	$Q_{LA} \times 0.005394 \times e^{(1.273*(\ln(\text{hardness}))-1.460)}$
UT of Plum Creek 0.0 to 2.45					
pH[7]	standard units	$6.0 \leq pH \leq 9.0$	Implicit	$6.0 \leq pH \leq 9.0$	$6.0 \leq pH \leq 9.0$
Alkalinity, Acidity[8]	mg/L as $CaCO_3$	Net Alkalinity ≥ 0	Implicit	Net Alkalinity ≥ 0	Net Alkalinity ≥ 0
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
Nickel (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+ 0.0584)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+ 0.0584)}$	$Q_{LA} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+ 0.0584)}$

Total Maximum Daily Load (TMDL) Synopsis

Pollutant	Units	TMDL[1]	MOS[2]	KPDES-WLA[3]	LA[4]
Nickel (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$	$Q_{LA} \times 0.005394 \times e^{(0.846*(\ln(\text{hardness}))+2.255)}$
Zinc (Acute and Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+ 0.884)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+ 0.884)}$	$Q_{LA} \times 0.005394 \times e^{(0.8473*(\ln(\text{hardness}))+ 0.884)}$
UT of Pond Creek 0.0 to 2.4					
Iron (Chronic)[5]	pounds/day	$Q_S \times 5.3938$	Implicit	$Q_{KPDES} \times 5.3938$	$Q_{LA} \times 5.3938$
Iron (Acute)	pounds/day	$Q_S \times 21.575$	Implicit	$Q_{KPDES} \times 21.575$	$Q_{LA} \times 21.575$
UT of Pond Creek 2.4 to 4.2					
E. coli	colonies/day	$Q_S \times WQC \times 24{,}465{,}758.4$	Implicit	$Q_{KPDES} \times WQC \times 24{,}465{,}758.4$	$Q_{LA} \times WQC \times 24{,}465{,}758.4$
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$
pH[7]	standard units	$6.0 \leq pH \leq 9.0$	Implicit	$6.0 \leq pH \leq 9.0$	$6.0 \leq pH \leq 9.0$
Alkalinity, Acidity[8]	mg/L as $CaCO_3$	Net Alkalinity ≥ 0	Implicit	Net Alkalinity ≥ 0	Net Alkalinity ≥ 0
UT of Pond Creek 0.0 to 1.4					
Cadmium (Chronic)	pounds/day	$Q_S \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$	$Q_{LA} \times 0.005394 \times e^{(0.7409*(\ln(\text{hardness}))-4.719)}$
Cadmium (Acute)	pounds/day	$Q_S \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	Implicit	$Q_{KPDES} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$	$Q_{LA} \times 0.005394 \times e^{(1.0166*(\ln(\text{hardness}))-3.924)}$

(1) TMDLs for *E. coli* are expressed as the flow in the stream, Q_S in ft^3/s, multiplied by the WQCs: i) 240 *E. coli* colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October; ii) 130 *E. coli* colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October. Then the multiple of Qs and WQC is converted into *E. coli* load (colonies/day) by multiplying the conversion factor of 24,465,758.4. TMDLs for metals are expressed as the flow in the stream, Q_S in ft^3/s, multiplied by the WQC in mg/L or µg/L and the appropriate conversion factor to convert the multiple of flow and the WQC into to units of load (pounds/day). The conversion factors are: iron, chronic = 5.3938 (when the WQC of 1.0 mg/L is applied) or 18.8782 (when the WQC of 3.5 mg/L is applied); iron, acute = 21.575; cadmium, copper, lead, nickel and zinc, chronic and acute = 0.005394. Also, pH must remain between 6.0 and 9.0 standard units, inclusive.

(2) The MOS is implicit, see Section 7.3.

(3) The KPDES-WLA for *E. coli* is expressed as the flow in the stream due to KPDES-permitted sources with *E. coli* permit limits, Q_{KPDES} in ft^3/s, multiplied by the WQCs and the conversion factor to convert the multiple of flow and the WQC into the unit of load (colonies/day). All KPDES-permitted dischargers must meet both

instantaneous and geomean *E. coli* WQCs. The KPDES-WLA for metals is expressed as the flow in the stream due to KPDES-permitted sources with permit limits for the pollutants addressed by this TMDL, Q_{KPDES}, in ft^3/s, multiplied by the WQC and the appropriate conversion factor. All KPDES-permitted dischargers must meet both the chronic and acute criteria for pollutants addressed by this TMDL whose WQCs are expressed in both chronic and acute terms. New or expanded KPDES-permitted dischargers with reasonable potential will be allowed contingent upon them meeting WQCs of the pollutants addressed in this document.

(4) The LA is expressed as the flow in the stream from natural background or due to legal but non-KPDES-permitted sources of the pollutants addressed by this TMDL, Q_{LA}, in ft^3/s, multiplied by the WQC and the appropriate conversion factor, see Section 5.2.

(5) The chronic iron WQC is 1.0 mg/L since the aquatic life is adversely affected. The acute iron WQC is not dependent on impacts to aquatic life; it is 4.0 mg/L in all streams.

(6) The chronic and acute WQCs for zinc are identical.

(7) pH can be converted to a range of allowable loads of hydrogen ions in units of g/day (gram per day); a pH of 6.0 represents a maximum allowable load of hydrogen ions equal to $Q_S \times 2.906$ g/day, and a pH of 9.0 represents a minimum allowable load of $Q_S \times 2.906E\text{-}3$ g/day, where Q_S is the flow in the stream in ft^3/s. The TMDL can then be allocated to the KPDES-WLA and the LA based on the fraction of the streamflow each contributes.

(8) Net alkalinity is defined as the alkalinity in mg/L as $CaCO_3$ minus the calculated acidity; the calculated acidity is determined using the following equation: Calculated Acidity, mg/L as $CaCO_3 = 50 \times ((10^{(3\text{-}pH)}) + (3 \times Fe\ mg/L/55.8) + (2 \times Mn\ mg/L/54.9) + (3 \times Al\ mg/L/27))$. Monitoring and reporting of net alkalinity will be required both instream and at outfalls at the same frequency as iron and manganese are monitored and reported. Aluminum must be added to KPDES mining permits as report-only in order to determine the calculated acidity. Net alkalinity must be greater than or equal to zero (in both mg/L and pounds/day) in order to buffer metals hydrolysis which can lower pH below acceptable levels.

(9) The chronic iron WQC is 3.5 mg/L since the aquatic life has not been shown to be adversely affected. The acute iron WQC is not dependent on impacts to aquatic life; it is 4.0 mg/L in all streams.

Translation of WLAs into Permit Limits

All KPDES- permitted facilities must meet permit limits based on the Water Quality Standards in 401 KAR 10:031. WLAs will be translated into KPDES permit limits as

1. an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average and 240 colonies/100 ml as a maximum weekly average;
2. a pH effluent gross limit of between 6.0 and 9.0 standard units and shall not change more than 1.0 standard unit over a period of 24 hours;
3. a chronic iron (Fe) effluent gross limit of 1.0 mg/L if aquatic life is adversely affected and of 3.5 mg/L if aquatic life has not been shown to be adversely affected, and an acute iron effluent gross limit of 4.0 mg/L;
4. a chronic cadmium (Cd) effluent gross limit of $e^{(0.7409*(\ln(\text{hardness}))-4.719)}$ µg/L and $e^{(1.0166*(\ln(\text{hardness}))-3.924)}$ µg/L as an acute limit;
5. a chronic copper (Cu) effluent gross limit of $e^{(0.8545*(\ln(\text{hardness}))-1.702)}$ µg/L and $e^{(0.9422*(\ln(\text{hardness}))-1.700)}$ µg/L as an acute limit;
6. a chronic lead (Pb) effluent gross limit of $e^{(1.273*(\ln(\text{hardness}))-4.705)}$ µg/L and $e^{(1.273*(\ln(\text{hardness}))-1.460)}$ µg/L as an acute limit;
7. a chronic nickel (Ni) effluent gross limit of $e^{(0.846*(\ln(\text{hardness}))+0.0584)}$ µg/L and $e^{(0.846*(\ln(\text{hardness}))+2.255)}$ µg/L as an acute limit;
8. a chronic and acute zinc (Zn) effluent gross limits are identical as of $e^{(0.8473*(\ln(\text{hardness}))+0.884)}$ µg/L.

The WLA for the KPDES permittees which only contain requirements to develop a Stormwater Pollution Prevention Plan (SWPPP) will be addressed through possible revision and implementation of a SWPPP. The KYG050000 (Inactive Mine Lands General Permit) permittees are in compliance if they comply with the permit. KPDES mining permittees must meet the discharge limits set in their KPDES permits.

The following changes to KPDES mining permittees who discharge to a waterbody with a pH TMDL addressed by this document are required:

1. Permittees must report alkalinity in mg/L as $CaCO_3$ and aluminum in units of mg/L whenever and wherever iron and manganese are reported. However, for aluminum this is report-only, no discharge limit is established.
2. There must be sufficient net alkalinity present to buffer metals hydrolysis whenever and wherever iron and manganese are reported. Net alkalinity is defined as the alkalinity of the discharge water minus the calculated acidity; net alkalinity must be greater than or equal to zero. The calculated acidity will be determined using Equation S.2, from Hedin *et al*. (1991), which conservatively assumes iron is in the form of Fe^{3+}:

$$\text{Calculated Acidity, mg/L as } CaCO_3 = 50 \times ((10^{(3-pH)}) + (3 \times \text{Fe mg/L}/55.8) + (2 \times \text{Mn mg/L}/54.9) + (3 \times \text{Al mg/L}/27.0))$$

Equation S.2

If the net alkalinity is below zero, then a violation has occurred.

These changes will be made to the existing mining permittees who discharge to a waterbody with a pH TMDL addressed by this document when their permits are renewed. These requirements apply to any new or expanded mining permits which discharge to a waterbody with a pH TMDL addressed by this document.

Table S.8 lists the KPDES permittees within the Pond Creek watershed, with the KPDES number, permittee name, permittee status (as of June 2016), permittee location and the pollutant (addressed in this TMDL only) limits in their permits or the requirements in the permits. The permittees, which are inactive, were active during the data collection period and contributed to the impairment; those permittees will not receive a WLA.

Table S.8 KPDES Permittees within the Pond Creek Watershed

KPDES#	Permit Name	Active	Design Flow	Latitude	Longitude	Pollutant Limits/Requirement in the Permit
KY0020010	Greenville STP	Yes	1.31	37.219167	-87.169444	bacteria, pH, Cd, Cu, Pb, Zn
KY0066575	Drakesboro STP	Yes	0.165	37.217222	-87.040833	bacteria, pH, Cd, Cu, Pb, Zn
KY0108537	Shaunaco LLC (889-0145)	Yes	0	37.228611	-87.218889	pH, Cd, Cu, Fe, Pb, Ni, Zn
KY0109606	Greenville Bulk Plant	Yes	0	37.212500	-87.184700	pH
KY0111996	Oxford Mining Co Kentucky LLC (889-0153)	Yes	0	37.265000	-87.094056	pH, Fe
KYG045755	Oxford Mining Co Ky LLC (889-0156)	Yes	0	37.179722	-87.113889	pH, Fe
KYG046498	Oxford Mining Co Kentucky LLC (889-0153)	Yes	0	37.265000	-87.094056	pH, Fe
KYG640029	Central City Water & Sewer	Yes	0.0005	37.173800	-87.073000	pH, Fe
KYG640108	Greenville Utilities Commission	Yes	0.027	37.113900	-87.103200	pH, Fe
KYGW40011	Thoroughfare Mining LLC (889-5018)	Yes	0	37.294720	-87.053060	bacteria, pH, Fe
KYGW40062	Armstrong Coal Co Inc (Consolidated)	Yes	0	37.294990	-87.052770	pH, Fe
KYP000064	Powderly, City of	Yes	0	37.235833	-87.163889	discharge to Greenville WWTP
KYR003239	Central Pallet Mills	Yes	0	37.237167	-87.121083	pH and to develop a SWPPP
KYR004015	Carl Mitchell & Son Implement - Paradise Rd	Yes	0	37.238014	-87.120822	pH and to develop a SWPPP

Total Maximum Daily Load (TMDL) Synopsis

KPDES#	Permit Name	Active	Design Flow	Latitude	Longitude	Pollutant Limits/Requirement in the Permit
KYR004021	Harsco Minerals	Yes	0	37.230667	-87.038861	pH and to develop a SWPPP
KYR10J469	Muhlenberg County Airport	Yes	0	37.222067	-87.164333	to develop a SWPPP
KYR10K083	Owensboro Health Greenville Clinic	Yes	0	37.196391	-87.187716	to develop a SWPPP
KYR10K315	Western Kentucky Lateral	Yes	0	37.209464	-87.209069	to develop a SWPPP
KYR10K433	Owensboro Health Muhlenberg Healthplex	Yes	0	37.238889	-87.150189	to develop a SWPPP
KY0023329	Bremen Consolidated School	No	0.008	37.214000	-87.132800	bacteria
KY0099538	Texas Gas Transmission LLC - West Greenville	No	0	37.211111	-87.206944	pH
KY0106046	C & R Coal Co Inc (889-0151)	No	0	37.208333	-87.090000	pH, Fe
KY0107701	Armstrong Coal Co Inc (889-5014)	No	0	37.298889	-87.059167	pH, Cd, Cu, Fe, Pb, Ni, Zn
KYG043169	Black Hills Coal Inc (889-7010)	No	0	37.211111	-87.228611	pH, Fe
KYG043563	Beech Creek Energy Inc (889-0062)	No	0	37.196944	-87.051389	pH, Fe
KYG043825	Muhlenberg Coals Inc (889-0066)	No	0	37.250278	-87.068889	pH, Fe
KYG044318	Armstrong Coal Co Inc (889-0138)	No	0	37.294167	-87.043333	pH, Fe
KYG044386	Beech Creek Energy Inc (889-0062)	No	0	37.196944	-87.051389	pH, Fe
KYG044486	G & G Energies Inc (889-0074)	No	0	37.170457	-87.194335	pH, Fe
KYG044573	Friendship Energy Inc (889-0079)	No	0	37.217528	-87.175069	pH, Fe
KYG044789	Beech Creek Energy Inc (889-0084)	No	0	37.170833	-87.056111	pH, Fe

Total Maximum Daily Load (TMDL) Synopsis

KPDES#	Permit Name	Active	Design Flow	Latitude	Longitude	Pollutant Limits/Requirement in the Permit
KYG044998	Beech Creek Energy Inc (889-0093)	No	0	37.186944	-87.070556	pH, Fe
KYG045704	Schoate Mining Co LLC (889-0155)	No	0	37.245000	-87.108333	pH, Fe
KYG046025	C & R Coal Co Inc (889-0126)	No	0	37.178333	-87.092778	pH, Fe
KYG046026	C & R Coal Co Inc (889-0122)	No	0	37.175833	-87.086944	pH, Fe
KYG046617	Armstrong Coal Co Inc (889-9005)	No	0	37.290278	-87.060278	pH, Fe
KYG046775	Armstrong Coal Co Inc (889-5014)	No	0	37.295000	-87.053600	pH, Fe
KYR000524	Central Pallet Mill Inc	No	0	37.220000	-87.118333	pH and to develop a SWPPP
KYR000918	Harsco Minerals	No	0	37.230667	-87.038861	pH and to develop a SWPPP
KYR001665	Carl Mitchell & Son Implement	No	0	37.239428	-87.121152	pH and to develop a SWPPP
KYR001693	Meuth Construction Supply	No	0	37.243362	-87.085699	pH and to develop a SWPPP
KYR00A008	Reed Minerals	No	0	37.230667	-87.038861	pH and to develop a SWPPP
KYR00A009	Reed Minerals	No	0	37.230667	-87.038861	pH and to develop a SWPPP
KYR10E810	Muhlenberg Co High School Phas 3	No	0	37.216500	-87.189224	to develop a SWPPP
KYR10E960	Muhlenberg County Emergency SE	No	0	37.235680	-87.151550	to develop a SWPPP
KYR10F821	Muhlenberg Co High School	No	0	37.218839	-87.189686	to develop a SWPPP
KYR10G145	Greenville WWTP	No	0	37.220472	-87.169111	to develop a SWPPP
KYR10G154	Knight Construction & Excavating Inc	No	0	37.212776	-87.196388	to develop a SWPPP
KYR10G285	Pogue Chrysler	No	0	37.229353	-87.157828	to develop a SWPPP
KYR10G428	I-69 - Hopkins Co	No	0	37.181100	-87.176900	to develop a SWPPP
KYR10G429	I-69 - Hopkins Co	No	0	37.181100	-87.176900	to develop a SWPPP

Total Maximum Daily Load (TMDL) Synopsis

KPDES#	Permit Name	Active	Design Flow	Latitude	Longitude	Pollutant Limits/Requirement in the Permit
KYR10G456	I-69 - Hopkins Co	No	0	37.181100	-87.176900	to develop a SWPPP
KYR10G458	I-69 - Hopkins Co	No	0	37.181100	-87.176900	to develop a SWPPP
KYR10G631	US 62 - Muhlenberg Co	No	0	37.198889	-87.178333	to develop a SWPPP
KYR10G632	US 62 - Muhlenberg Co	No	0	37.198889	-87.178333	to develop a SWPPP
KYR10H138	Muhlenberg Co High School	No	0	37.218839	-87.189686	to develop a SWPPP
KYR10H705	Muhlenberg County Park Phase I	No	0	37.226610	-87.187427	to develop a SWPPP
KYR10I149	Pogue Electric Service Inc.	No	0	37.224749	-87.172138	to develop a SWPPP
KYG044105	Cleaton Coal Co (889-5014)	No	0	37.298889	-87.059167	pH, Fe
KYG050000*	N/A	N/A	N/A	N/A	N/A	N/A

* KYG050000 is the Inactive Mine Lands General Permit, see Section 1 of the KPDES Permit KYG050000 for more information regarding the permit coverage eligibility and exclusions. As long as the permittees make good faith effort to comply with the permit, they are considered to be compliant with the TMDL.
N/A: Not Applicable