Decision Rationale

Total Maximum Daily Load for
Total Aluminum and Total Iron for the Little Kanwaha River Watershed

I. Introduction

This document will set forth the Environmental Protection Agency's (EPA) rationale for establishing the Total Maximum Daily Load (TMDL) for Total Iron and Total Aluminum for the Little Kanawha River and five of its tributaries (Reedy Creek, Spring Creek, Sand Fork, Oil Creek, and Saltlick Creek). The TMDL was sent out for public comment on July 15, 2000. Our rationale is based on the determination that the TMDL meets the following 8 regulatory conditions pursuant to 40 CFR §130. According to the 1997 Consent Decree EPA was responsible to fulfill West Virginia's obligations under the Consent Decree if the State was unable to do so. EPA established the TMDL for the Little Kanawha River Watershed because the State was unable to fulfill its Consent Decree commitments.

1. The TMDLs are designed to implement applicable water quality standards.
2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
3. The TMDLs consider the impacts of background pollutant contributions.
4. The TMDLs consider critical environmental conditions.
5. The TMDLs consider seasonal environmental variations.
6. The TMDLs include a margin of safety.
7. The TMDLs have been subject to public participation.
8. There is reasonable assurance that the TMDLs can be met.

II. Background

Located in central West Virginia, the Little Kanawha River watershed [1] is approximately 2,307 square miles (1.5 million square acres). The TMDL addresses 47 river miles of the Little Kanawha River from the Burnsville Dam to its confluence with the Ohio River. Reedy Creek, Spring Creek, Sand Fork, Oil Creek, and Saltlick Creek have impaired lengths of 22.63 miles, 25.27 miles, 18.66 miles, 9.81 miles, and 17.71 miles respectively.

In response to Section 303 (d) of the Clean Water Act (CWA), the West Virginia Division of Environmental Protection (WVDEP) listed 47 river miles of the Little Kanawha as being impaired by elevated levels of Total Aluminum and Total Iron on West Virginia's 1998 303 (d) list. Spring Creek,

[1] The Little Kanawha River watershed is hydrologic unit No. 05030203

Reedy Creek, Oil Creek, Saltlick Creek, and Sand Fork were all listed on the 1998 303 (d) list for violating the Total Aluminum and Total Iron standard as well. The Little Kanawha River and five of its tributaries were listed for violations of West Virginia's Total Aluminum and Total Iron standard for aquatic life and human health. Aluminum is a naturally occurring metal, and the most common metal found in the earth's crust. Although it is common in the environment, it is not found in pure form and is extracted from bauxite and cryolite ore. Aluminum has a wide range of industrial applications. The metal is not readily soluble in a neutral solution, however, it may readily dissolve in an acidic or alkaline solution. In the 1988 EPA report Ambient Water Quality Criteria for - Aluminum, several studies are documented that demonstrate the toxicity of Total Aluminum to freshwater organisms. Studies conducted in the 1970s and 1980s document the toxicity of this metal to Trout and Carp. The LC-50 (concentration at which the substance is lethal to 50% of the organisms exposed) for Carp after a 48-hour exposure and Brook Trout after a 98-hour exposure was 4,000 and 3,600 ug/L respectively. The freshwater Final Acute Value for Aluminum at a pH between 6.5 and 9.0 was calculated to be 1,496 ug/L[2]. The Aluminum standard of 750 ug/L, was derived by multiplying the acute value of the most sensitive organism by 0.5.

Section 303 (d) of the Clean Water Act and its implementing regulations require a TMDL to be developed for those waterbodies identified as impaired by the State where technology-based and other controls do not provide for the attainment of Water Quality Standards. The TMDL prepared by EPA is designed to determine the acceptable load of Total Aluminum and Total Iron which can be delivered to the Little Kanawha and the five tributaries, as demonstrated by the Storm Water Modeling Method (SWMM)[3], in order to ensure that the water quality standard is attained and maintained. These levels of Total Aluminum and Total Iron will ensure that the Aquatic Life and Human Health usage are supported. SWMM is considered an appropriate model to analyze this watershed because of its dynamic ability to represent loading to a mixed land use watershed during observed meteorological conditions.

The TMDL for the Little Kanawha River watershed was established for Total Aluminum and Total Iron. Acid mine drainage is often considered the primary source of instream Aluminum and Iron. As mentioned earlier, the solubility of Aluminum will increase with changes to the waters pH. The lower pH typically seen in waters effected by acid mine drainage makes the Aluminum more soluble. However, there is a limited amount of mining activities or abandoned mines within this watershed and most of these activities are isolated to specific subwatersheds, such as the Sand Fork. Therefore, it was determined that there must be another source of metals (Total Aluminum and Total Iron). There were no industrial or commercial centers identified within the watershed.

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[2]USEPA. 1998. *Ambient Water Quality Criteria for - Aluminum 1988*. EPA 440/5-86-008. U.S. Environmental Protection Agency, Office of Water.

[3]Huber, W.C., Dickinson, R.E., Barnwell, T.O. 1992. The USEPA SWMM4 Stormwater Management Model: Version 4 Users Manual. EPA/600/3-88/001a. U.S. Environmental Protection Agency, Environmental Research Laboratory, Athens, Georgia.

Forested lands and agriculture make up 77% and 16% of the land usage within the watershed, respectively. The remainder of the watershed is compromised of water, urban built-up land, and transportation land (streets and roads). The traditional sources of metals were thus ruled out, because they were not detected in sufficient numbers. During the literature review process, sediment was identified as another possible source of Aluminum and Iron contamination. Further research documented that the bedrock in the Little Kanawha River and watershed is rich in metals and oxidizing sulfides that can cause elevated concentrations of Aluminum. In addition, correlation coefficients indicate that iron is associated with Aluminum as a result of precipitated iron oxyhydroxides in the streambed.[4]

Five monitoring stations were located within the watershed. Water quality data from these stations was evaluated to determine if there was a link between the elevated metals and Total Suspended Solids (TSS). The Total Aluminum and Total Iron concentrations correlated with the concentrations of TSS. As the TSS increased, so did the levels of Aluminum and Iron. High flow events are often associated with elevated levels of TSS. The rainfall and runoff that cause these high flow events also have the power to washoff sediments from the land segments and feed this sediment load to the stream. Sediment on the stream bed is also resuspended during these turbulent flows. This can be illustrated in Spring Creek where the concentration of Total Aluminum and Total Iron increased by four folds for flow events ranking in the highest 10% of observed sediment concentrations. Regression analysis indicated that a good linear relationship exists for between Total Aluminum and Total Iron and sediment concentrations[5]. It was determined that this relationship did not hold true for Dissolved Aluminum and Dissolved Iron.

A relation was drawn between the maintenance and attainment of the Total Aluminum and Total Iron standard and the concentration of TSS. Therefore, one could insure that the Little Kanawha River Watershed would attain standards if limitations and controls were placed on the amount of sediment reaching the river.

III. Discussion of Regulatory Conditions

EPA finds that sufficient information has been provided to meet all of the 8 basic regulatory requirements for establishing a metals TMDL on the Little Kanawha River watershed.

1) The TMDL is designed to meet the applicable water quality standards.

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[4]Watts, K.C., Hinkle, M.E., and Griffits, W.R. 1994. *Isopleth Maps of Titanium, Aluminum, and Associated Elements in Stream Sediments of West Virginia.* U.S. Department of the Interior, U.S. Geologic Survey.

[5]USEPA. 2000. *Metals TMDL for Little Kanawha River Watershed, West Virginia*. U.S. Environmental Protection Agency, Region III.

Modeling and data interpretation by EPA and its contractor has indicated that excessive levels of Total Aluminum and Total Iron can be linked to the amount of suspended solids in the watershed. The West Virginia water quality criterion for Total Aluminum is 0.75 mg/L. The Aluminum standard was derived by multiplying the acute value of the most sensitive organism by 0.5. As mentioned earlier, the acute value of the most sensitive organism was 1,496 ug/L, therefore the Final Acute Value is 0.75 mg/L (750 ug/L). This standard is for Total Aluminum (dissolved and suspended) for the protection of Aquatic Life. This standard is not to be exceeded on average more than once every three years. The standard is applied to all B1 (warm water fisheries), B2 (trout waters), and B4 (wetlands) waters.

The Total Iron standard is applied to B1, B2, and B4 waters as a Chronic (four-day average concentration not to be exceeded more than once every three years on average) value. The Total Iron standard is applied to the use designation A as well. The designation is applied to public water supplies, whose criteria must not be exceeded to protect human health from the toxic effects through drinking water and fish consumption[6]. The Human Health standard for Total Iron is not to exceed 1.5 mg/L.

The West Virginia Environmental Quality Board has proposed to change the aluminum water quality criteria from a total standard to a dissolved standard. This modification has not yet been finalized, and EPA has expressed some concern that the Board has not presented sufficient information to indicate that dissolved aluminum will be protective of aquatic life in the State. According to the Federal regulation at 40 CFR 131.21 (c)(2), even if the modification is finalized, it is not considered effective for Clean Water Act purposes (that includes the development of TMDLs) until EPA approves. Similar to the aluminum standard, the proposed change to the iron criteria has not been finalized or approved by EPA and therefore is not viewed as effective.

The SWMM model was used to evaluate the instream concentrations of TSS, Total Aluminum, and Total Iron. The Little Kanawha River watershed was broken up into several hydrologically connected watersheds for the model. The modelers' goals were to develop a model for the Little Kanawha River that would represent the dominant characteristics of the watershed, represent the point and nonpoint source loadings to the Little Kanawha watershed during various flows and storm events, and estimate instream pollutant concentrations and loading under different hydrologic conditions.

The Little Kanawha River has 19 major tributaries, these subwatersheds were further broken down into 85 subwatersheds to provide more detail in the pollutant loading to each of the Little Kanawha's tributaries. There were 26 land uses defined in the watershed, these 26 were then categorized into 11 land use types. Therefore, every land use in the watershed was grouped into one of these 11 categories. The eleven land uses are forest 1, forest 2, forest 3, agriculture 1, agriculture 2, urban, road 1, road 2, barren, wetland, and water.

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[6]USEPA. 2000. *Metals TMDL for Little Kanwaha River Watershed, West Virginia*. U.S. Environmental Protection Agency, Region III.

Rainfall and meteorological conditions drive hydrologic modeling by providing a transport mechanism for nonpoint sources of pollutants and providing flow to the stream via surface runoff, interflow, and groundwater. Temperature and weather patterns also determine the type of precipitation (snow or rain), snowmelt and subsequent runoff, and evapotransportation. Six hourly participation monitoring stations were evaluated for potential use in this TMDL. It was determined that the Liverpool (WV5323) and Gassaway (WV3361) stations were representative of the meteorological conditions in the Little Kanawha River watershed. The Liverpool station which is located in the southwestern border of the watershed was selected for use in this model. The mean monthly rainfall at the Liverpool station ranged from 2.41 inches to 4.32 inches for the 1948 through 1998 time period. From 1988 to 1997, the mean annual rainfall at the Liverpool station was 44.21 inches, with a maximum annual rainfall of 52 inches and a minimum of 35 inches.

SWMM runoff block simulated the runoff and buildup of pollutants in each of the subwatersheds. As mentioned earlier, the Little Kanawha River Watershed was divided into several (85) subwatersheds. By dividing the watershed into several smaller basins, the simulations of runoff, water quality, and pollutant loading became more manageable. Several factors were evaluated in determining the boundaries of the subwatersheds, such as: local geology and drainage patterns, 303 (d) listed segments, primary conveyance streams, land based loadings, and location of instream monitoring stations. For example, the Reedy Creek tributary to the Little Kanawha River was modeled as nine subwatersheds.

The 26 designated land uses identified in the GAP 2000 Land Use Coverage data, were reclassified into 11 land uses. These designated land use categories were classified by an estimation of their sediment, Total Aluminum, and Total Iron yields and loading behavior. The objective of this reclassification was to simplify the modeling process. For a description of the GAP and SWMM designated landuses please refer to Table 5-2 of the Metals TMDL for Little Kanawha River Watershed, West Virginia, USEPA, 2000. The percent impervious area was estimated for each land use category prior to the SWMM simulation. Imperviousness directly affects the runoff and infiltration capacity of the land segments. Generally, segments with a higher percentage of impervious land have lower infiltration rates and higher runoff values, as rainfall is unable to percolate through the land surface. The percent impervious for a subwatershed can be determined by multiplying the percent impervious for each land use by its acreage. This process is repeated for each landuse within the watershed and summed.

The water quality modeling was simulated for the meteorological conditions at the Liverpool station from 1988-1997 using the 11 categories identified from the GAP 2000 land use conditions. The model was developed for the Total Iron, Total Aluminum, and TSS. The processes of buildup and washoff were analyzed to determine pollutant loading to a stream. Buildup is the accumulation of the pollutant upon the land surface during dry weather conditions. Washoff is the process of transporting the pollutant to the stream during wet weather (rainfall) events.

Erosion from pervious land segments is a source of Aluminum and Iron to the Little Kanawha River Watershed. Erosion from the different land sources is a function of soil type, rainfall characteristics (intensity, etc.), slopes of the land surface, and land use. The runoff block of the SWMM model estimates the erosion and sediment loading to the stream. A sediment loading for each of the land uses was determined using literature values and public input.

2) The TMDL includes a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

A three staged approach has been developed for achieving water quality standards on the Little Kanawha River Watershed. The first stage of the TMDL focuses on reducing the frequency of violations so that the standards are being met 75% of the time. Stage 1 targets smaller to medium sized storm events and sediment control practices in specific portions of the watershed. Stage 2 of this plan, which can be run concurrently to Stage 1, consists of compiling additional water quality information on the watershed to monitor the water quality conditions and the efficiency of the management practices installed on the watershed. Stage 3 of this TMDL will use the information generated in Stage 2 to evaluate water quality in the watershed and work toward insuring that the standards are fully (for all storm events) achieved. Stage 3 will look at which of the State's management practices work best in the reduction of metals loading.

There are several advantages to the three-stage program. By phasing reductions in loading, the TMDL limits the severity of the load reductions being sought. It also allows the State to monitor water quality in the watershed to insure that the model's assumptions are correct and determine if the standards will be achieved with smaller load reductions. Strategies for the attainment of the standard can be changed based on information gathered during stages 1 and 2. Lastly, the TMDL may be amended and reevaluated based on new information and/or an adoption of new State standards.

The TMDLs for the Little Kanawha Watershed were developed on a subwatershed basis. There are 19 tributaries to the Little Kanawha River, one of the tributaries was further divided into 3 subwatersheds. Allocation plans were therefore established for 21 subwatersheds. These 21 allocation plans represent the allocation plan needed for the total watershed. These plans are meant to be protective of the main stem of the Little Kanawha River and its tributaries.

Three allocation scenarios were originally proposed by EPA, a fourth scenario was developed after the public comment period. The fourth scenario was developed in response to the comments and recommendations of local stakeholders. Scenario #4 was chosen for the Little Kanawha River TMDL. Scenario #1, called for an identical load reduction from all watersheds except watersheds 50 and 55, these watersheds would need greater load reductions.

Scenario #2, used a three-tier reduction approach. A loading magnitude was determined for each watershed, those watersheds with the highest loadings per unit area were assigned with the highest load reductions. The watersheds with the lowest loadings per unit area were assigned with the lowest load reductions.

Scenario #3, was similar to Scenario #1, all watersheds were assigned with an identical load reduction with the exception of watershed #65. The Hughes reservoir is being developed in this watershed and will impact the sediment and metals load to points downstream. Therefore, Scenario #3 called for a higher load reduction in watershed #65.

Scenario #4 is a combination of Scenarios 2 and 3. Scenario #4, used a three-tier reduction approach identical to the approach used in Scenario #2. A loading magnitude was determined for each watershed, those watersheds with the highest loadings per unit area were assigned with the highest load reductions. The watersheds with the lowest loadings per unit area were assigned with the lowest load reductions. Similar to Scenario #3, this Scenario also addressed the impact of the Hughes Dam being developed on watershed #65. The reduction in this watershed was based on a calculation of sediment and trap efficiency specific to the reservoir.

Waste Load Allocations

The TMDL for the Little Kanawha River Watershed identified several point sources. Point sources were identified through EPA's Permit Compliance System (PCS). Thirty-four Permitted facilities were identified by PCS. Roughly, fifty percent of these permits were for sewage treatment plants. There were only three facilities with Iron limits. There were no permits with Aluminum limits. Loading from these facilities was determined through flow and concentration values documented in the facilities Discharge Monitoring Record (DMR). Facilities without limits for Iron or Aluminum were not seen as contributing these pollutants to the watershed. No waste load allocations were established in this TMDL. Gross allocations were determined for the tributaries which receive the effluent from the facilities permitted for Iron or Aluminum. These streams were also listed as impaired due to acid mine drainage (AMD). The WLAs for these facilities will be addressed in the AMD TMDLs.

Load Allocations

According to federal regulations at 40 CFR 130.2 (g), load allocations are best estimates of the loading, which may range form reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible natural and nonpoint source loads should be distinguished.

As mentioned earlier loads were determined for each land use based on literature values. These loads were placed in the model which was calibrated to observed data. Loads were determined for agricultural land, urban built-up land, roadways, forestry activities, undisturbed, forested land, barren lands, construction sites, mining operations, and oil and gas operations.

Table 1 Selected Stage 1 Allocation - Scenario 4 [a]

	% Reduction	TSS	Al	Fe
Subwatershed		**ton/yr**		
153	22.0%	1345	65	48
540[b]	46.5%	1392	110	121
555[b]	37.7%	2396	189	210
3	30.0%	918	42	40
8	30.0%	464	22	16
5	30.0%	2110	100	59
10	14.0%	1725	80	70
15	22.0%	1856	90	66
20	22.0%	3352	156	135
25	30.0%	1508	68	61
30	30.0%	856	30	49
35	30.0%	3101	145	118
40	30.0%	798	28	44
45	30.0%	4281	143	238
50[c]	45.1%	1518	120	748
55[c]	35.9%	2760	218	1126
60	22.0%	602	45	51
65[d]	13.0%	9598	679	783
70	5.0%	764	61	68
75	5.0%	1026	85	92
80	5.0%	806	64	71
85	5.0%	1727	119	139
90	5.0%	1696	105	128
95	13.0%	455	23	32

[a] Limiting pollutant is aluminum. TSS and associated iron reductions are based on meeting aluminum target
[b] Load reduction based on meeting tributary target
[c] Load reduction includes reduction for listed tributary
[d] Presumes construction of Hughes Reservoir

Table 2 Stage 3 Final Load Reduction Targets for the Little Kanawha Metals TMDLs

Segment	***Aluminum***	**Existing Loads**	**Stage 3**	**Percent Reduction from 25% exceedence to 0%**
	Segment Name	**tons/yr**	**tons/yr**	
555	Reedy Creek	303.00	24.00	54.6%
540	Spring Crek	206.00	17.00	45.6%
153	Sand Fork Creek	83.00	14.00	60.9%

8	Oil Creek	32.00	5.00	53.6%
3	Salt Lick Creek	59.00	8.00	56.7%
60	Little Kanawha River	1,760.00	238.00	64.5%
95	Little Kanawha River	3,153.00	384.67	67.8%
	Iron			
	Segment Name			
555	Reedy Creek	336.00	60.00	44.7%
540	Spring Crek	227.00	41.00	35.3%
153	Sand Fork Creek	62.00	35.00	21.3%
8	Oil Creek	23.00	14.00	8.7%
3	Salt Lick Creek	57.00	22.00	31.6%
60	Little Kanawha River	1,833.00	629.00	43.7%
95	Little Kanawha River	3,464.00	918.00	52.5%

3) The TMDL considers the impacts of background pollution.

A constant discharge representing base flow was incorporated at the inlet points in the modeled stream network to represent contributions from groundwater seepage[7]. A sediment loading was established for undisturbed forest land conditions, which would be considered a background loading, as well.

4) The TMDL considers critical environmental conditions.

EPA regulations at 40 CFR 130.7 (c)(1) require TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of the Little Kanawha River Watershed is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[8]. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

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[7]USEPA. 2000. *Metals TMDLs for Little Kanawha River Watershed, West Virginia.* U.S. Environmental Protection Agency, Region III.

[8]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

Monitoring data shows that the most severe violations in the water quality standard primarily occur during the time period from July to November. By modeling to insure that water quality standards are attained and maintained for this time period it is believed that the standards will be attained through all periods.

5) The TMDLs consider seasonal environmental variations.

Seasonal variations involve changes in stream flow as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flow normally occurs during the colder period of winter and in early spring from snow melt and spring rain, while seasonally low flow typically occurs during the warmer summer and early fall drought periods. Consistent with our discussion regarding critical conditions, the SWMM model and TMDL analysis will effectively consider seasonal environmental variations. The TMDL was developed to attain standards during the time period from July through November, over which the most severe violations took place. It is believed that episodic thunderstorms caused the large violations observed during this period.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. Margins of Safety (MOS) may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the wasteload allocation, load allocation, or TMDL.

EPA has used an implicit margin of safety in establishing the TMDL for the Little Kanawha River Watershed. The MOS has been incorporated implicitly by using a dynamic model to simulate daily loading over a wide range of conditions and modeling more conservatively then standards (the standards would allow a violation once every three years the TMDL has been modeled for no exceedances over the ten year modeling period).

7) The TMDLs have been subject to public participation.

From the beginning of the TMDL process in the Little Kanawha, there has been significant public participation and stakeholder involvement. When the Little Kanawha River was announced in November 1999 as a potential stream for TMDL development in 2000, the DEP received a significant number of public comments.

After the Little Kanawha River was formally selected for TMDL development in early 2000, the DEP opted to have an informational meeting in the watershed to answer questions of stakeholders and provide a timeline for the process through Sept. 30. The meeting, held in March, was attended by over 100 people. Participants included concerned farmers, Farm Bureau members, local residents, representatives from the oil and gas industry, foresters, and state agencies.

A number of comments up to that point suggested that DEP and EPA look at additional data in the development of the TMDL for the Little Kanawha. Based on those comments, the agencies provided for additional public involvement through a stakeholder group comprised of agencies and groups involved in nonpoint source management. Participants included the DEP and several of its program offices, West Virginia Soil Conservation Agency, Division of Highways, Division of Forestry, Department of Agriculture and the Division of Natural Resources. The group was encouraged to provide additional land use and water quality data to EPA contractors, who would be incorporating all data into the TMDL model. An independent stakeholder group made up of industry and agriculture representatives active in the Little Kanawha watershed was also formed and worked to provide additional information to the DEP and EPA for the TMDL development.

Based on the data collected by DEP, data provided via public comment and informational meetings, and data shared between state nonpoint source management agencies and industry groups, the TMDL was written and the model was executed.

The public had additional venues for comment and data submission, including the 45-day comment period provided by the EPA after the draft TMDL was released in August 2000.

8) There is a reasonable assurance that the TMDL can be met.

EPA requires that there be a reasonable assurance that the TMDL can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

EPA anticipates the DEP’s Office of Water Resources will use the report to reenergize the activities of various agencies with appropriate authorities to address the water quality impacts. For example in Stage 1, reductions targets of 5 to 46.5% are proposed in select streams. Partner agencies will be asked to review those watersheds for the presence of their respective land uses and determine if additional maintenance by the industries and/or land users is needed. Eroding farmland may be addressed through landowners accessing cost-share funding from the Conservation Partnership. Maintenance of existing unpaved county roads falling under jurisdiction of the Division of Highways will be encouraged. Oil and gas and logging road maintenance and reclamation can, in many cases, be required of industries which built them.

It is anticipated that focusing increased attention on the implementation of existing nonpoint source program mechanisms, as well as enforcement of existing statutory and regulatory authorities, will result in sediment reductions to the various streams. Stage 2 indicates that follow-up monitoring will be conducted to ascertain the effectiveness of that process and to enable modifications if necessary to ultimately achieve standards.