Hinkson Creek in Missouri
Draft Total Maximum Daily Load (TMDL)
SUMMARY OF COMMENTS AND RESPONSES
Part I of III

Prepared by the Environmental Protection Agency (EPA), Region 7
Water, Wetlands and Pesticides Division
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INTRODUCTION

EPA public noticed a draft TMDL for Hinkson Creek (water body identification MO_1007 and MO_1008) from October 28, 2010 to December 1, 2010. EPA is establishing this TMDL to meet the obligations of the 2001 Consent Decree, *American Canoe Association, et al. v. EPA*, Consolidated Case No. 98-1195-CV-W-SOW, consolidated with 98-4282-CV-W-SOW, (Consent Decree). This document summarizes and paraphrases comments received, EPA's response to comments and changes made to the final TMDL where appropriate. Included is a list of all commentors.

RESPONSE TO COMMENTS (EPA responses in bold)

1. Comment: The EPA is required by court order to finalize this TMDL by December 31, 2010. Any extension beyond that date not approved by a federal court with jurisdiction would be a violation of that court order. This would force the Sierra Club to file an "enforcement" motion. We will oppose any attempt for such an extension because 10 years is long enough.

1. Response: On December 20, 2010, an extension of the Consent Decree deadline to allow for the establishment of TMDLs for Hinkson, Pearson and Wilson Creeks (with Jordan Creek) was granted which extended the deadline to January 31, 2011. EPA is working with Missouri to establish or approve all of these TMDLs by the January 31, 2011 deadline.

2. Comment: If any potential lawsuit requires a stay, we adamantly oppose such an attempt to stay the TMDL and its recommendations.

2. Response: EPA appreciates and has taken note of the stakeholder's comment.

3. Comment: The use of storm water is an appropriate and legal surrogate for unknown pollutants. The reduction of storm water will lead to a reduction in a variety of contaminants.

3. Response: EPA appreciates the commentor's support for the TMDL.

4. Comment: We support the reduction of storm water runoff as a surrogate for the multiple pollutants and stressors associated with urban water runoff and nonpoint source runoff. There is little doubt that Hinkson Creek rises quickly after rain events and drops quickly later. This causes many problems with aquatic habitat. We agree that storm water flow is part of the solution. A resident on Hinkson Creek has noticed the destruction of the creek bed, the immense

amount of erosion because of ever-increasing rising of the creek during rain events and large deposits of sediment in the creek bed and bends.

4. Response: EPA appreciates the commentor's support and observations about conditions at Hinkson Creek.

5. Comment: Request to monitor every summer beginning a few years after implementation of the TMDL's recommendations have begun. This is to ensure that storm water reduction leads to non-impairment. EPA needs to consider monitoring on a regular basis for changes in biological and chemical water quality.

5. Response: EPA agrees that such monitoring may be beneficial. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, the Missouri Department of Natural Resources (MDNR) will incorporate the TMDL into its current water quality management (WQM) plan for implementation and monitoring, per EPA regulations (40 Code of Federal Regulations [CFR] § 130.7(d)(2)). This comment will be shared with MDNR.

6. Comment: The proposed approach of only concentrating on water flow or hydrology only focuses on one part of the problem. If we want to increase aquatic community health then the solution needs to address chemicals, habitat and flow. Even if it is expensive, appropriate consideration of monitoring for changes in biological and chemical water quality standards (WQS) are needed to achieve the goal of improving creek quality and the habitat provided to plants and animals.

6. Response: As discussed in the TMDL documentation, a combination of toxic pollutants found in storm water runoff is contributing to the aquatic life impairment. However, there is no indication that one particular pollutant is exceeding the state's numeric water quality criteria or causing an excursion of the state's water quality criteria. There is however, a strong relationship between pollutant loads and storm water runoff as documented in Section 4 of the TMDL. This section outlines the four principle ways that storm water runoff from urban areas is linked to degradation of aquatic life in urban streams. Specifically, the section describes how Hinkson Creek's flow and biological data links storm water runoff to diminished aquatic life. Therefore, the TMDL uses the surrogate measure of storm water runoff to represent the combination of toxic pollutants that contribute to the impairment of Hinkson Creek and has the added benefit of addressing the hydrologic changes to the stream that degrade the overall health of the biological communities. The TMDL includes another target, that 100 percent of all sites surveyed receive a fully supporting rating. Achieving WQS can be accomplished through implementation of the TMDL that will guide the use of Best Management Practices (BMPs), retrofitting and green infrastructure actions to reduce the impacts of storm water runoff.

MDNR will incorporate the TMDL into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that

makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water.

7. Comment: The TMDL appears to only address high flows which would reduce major flooding events but still not improve aquatic life. The complex interactions of hydrology, climate and land use need to be understood in order to restore water quality. Base flows should not be reduced in order to protect aquatic life.

7. Response: The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows – not reducing them.

The analysis does not include lower flows (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson's aquatic life use is explained in section 4 of the TMDL. Please refer to Section 4.5.3 of the TMDL that outlines the four principle ways that storm water runoff from urban areas is linked to degradation of aquatic life in urban streams and how Hinkson Creek's data links storm water to decreased aquatic life. The commentor is directed to Appendices C, D and E for data and further analyses. Indeed, it is the site-specific biological and flow data for Hinkson Creek and the reference streams, as well as the dynamic modeling in the TMDL that allows for an understanding of the complex interactions between hydrology, climate and land use to set the loads that protect water quality which will improve aquatic life.

8. Comment: The proposal is confusing. Spending enormous amounts of money to address an unknown source of pollutants does not make sense when studies are being done to better understand the creek and impairment. See "Integrating Science Based Decision Making and TMDL Allocations in Urbanizing Watersheds," by the University of Missouri, and the October 2010 article at http://www.stormh2o.com/october/2010/sediment-laser-diffraction.aspx.

8. Response: A hallmark of the TMDL process is adaptive management or implementation. This is an iterative process to achieve water quality goals. The findings of the ongoing studies can be used to further refine the implementation of this TMDL.

Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions.

A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP. There is one overarching requirement for all TMDLs, they must meet any applicable WQS (40 CFR § 130.7(c)(1)(ii)).

The pollutant causing the impairments is listed as unknown on the 303(d) List, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." [40 CFR § 130.2(i)]. The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson Creek's warm-water aquatic life designated beneficial use also addresses chemicals and habitat. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the margin of safety (MOS) in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality, such as other potential sources of toxic pollutants suggested by the commentor (40 CFR 130.7(c)(1)).

EPA appreciates the commentor's information. Please keep in mind that data supplied needs to meet the minimum data quality level that MDNR considers appropriate for use in determining TMDL targets and modeling. Data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If the data provided by the commentor is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

9. Comment: Millions have been spent contaminating Hinkson Creek, now millions are needed to clean it up. For years, our group has opposed projects that would hasten storm water runoff and recommended solutions similar to those proposed. We recognize that retrofitting will not be easy or cheap. It took five years to pass a storm water ordinance that is slowly being chipped away and eroded. The recommendations for reducing storm water runoff are needed to repair the damage that years without storm water controls have created.

A Similar Comment: The most cost effective way to achieve the proposed flow reductions is to construct a large detention basin with culverts that can handle all but 100 and 500 year events. Since this is the most likely solution, it is important for aquatic life to retain remaining natural characteristics using biotechnical methods and not simply an engineered solution with a lot of concrete. A solution is needed that is balanced and reasoned.

Another comment: The TMDL is impossible to implement.

Another comment about the cost of implementation: The Boone County Regional Sewer District has concerns about what the TMDL may mean to the District's rates.

Another comment about implementation: Using the approach outlined in the TMDL will jeopardize our very limited financial resources, requiring us to focus on the Hinkson Creek watershed and ignore developing areas in adjacent watersheds.

9. Response: EPA appreciates the stakeholders' comments on the TMDL and applauds citizens who are actively working in their watershed to improve water quality. EPA understands that stakeholders face economic challenges. TMDLs are required to target WQS (40 CFR 130.7(c)(1)(ii)), and this is done absent cost considerations. MDNR will work with permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR §130.7(d)(2)). Finally, EPA doesn't necessarily endorse large detention basins with culverts as the most cost effective BMPs and does not endorse one BMP technology over another.

Efforts to improve water quality have already begun in each of these communities. BMPs can be integrated into redevelopment efforts from a single lot to an entire citywide plan. This approach can often cost less than traditional methods of storm water control. These BMPs reduce storm water runoff and the associated pollutants and provide flexibility in how and where storm water management is accomplished. On a city-wide scale, an interconnected network of open spaces and natural areas, such as greenways, wetlands, parks, urban forests and native plant vegetation can naturally manage storm water, reduce flooding risk and improve air and water quality. On a smaller scale, BMPs include green roofs, rain gardens, rain barrels and cisterns, vegetated swales, pocket wetlands and porous pavement. There are many choices for BMPs that filter or degrade pollutants biologically or chemically. Implementing these practices is expected to occur gradually over a period of time. A number of EPA policies, memoranda and resolutions explaining the benefits of this approach can be found at the following internet address: http://cfpub.epa.gov/npdes/greeninfrastructure/information.cfm#greenpolicy and www.epa.gov/nps/lid/.

The conversion of wasteload allocations (WLAs) to permit limits is within the purview of the MDNR National Pollutant Discharge and Elimination System (NPDES) Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

EPA understands that resources are limited and that communities are sometimes hard pressed to meet the demands of water and wastewater system improvements. EPA urges the commentor to work with MDNR's Financial Assistance Center to discuss grants, low-interest loans or other options that may be available to the city should wastewater system improvements be necessary. To reach MDNR's Financial Assistance Center, call (573) 751-1192 and ask for either Mr. Doug Garrett or Ms. Traci Newberry, or email Mr. Garrett at doug.garrett@dnr.mo.gov. You can also find them on the Web at http://www.dnr.mo.gov/env/wpp/srf/index.html.

10. Comment: The use of one USGS gaging station at Providence Road for flow data is inadequate.

10. Response: The use of the Providence Road United States Geological Survey (USGS) gage, which is located within the Hinkson Creek watershed, is appropriate because this gage provides a measure of the actual hydrologic condition for Hinkson Creek. Since this gage contains only the most recent 3-year flow data of the last 10 years and cannot provide complete flow information about Hinkson Creek, an annualized flow duration curve analysis (modeling) was used to address the impairment. Based on flow analysis, the last 3 years of flow data collected in the gage were atypical high flow condition. A 95 percent confidence interval was applied to the existing flow data, which was derived from the normalized flow data based on the reference streams.

The TMDL is being done at this time to meet the requirements of the Consent Decree and the Providence Road USGS gage represents the best data available. In addition to the data and modeling approach described in the previous paragraph, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR 130.7(c)(1)). If new data becomes available that meets the MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time.

11. Comment: Some commentors are also concerned that the precipitation data used is from the Columbia airport, which is outside the watershed.

11. Response: The Sanborn Field (UMC) weather station is the closest weather station available to describe the weather conditions for the study watershed. Using the closest available station is appropriate as annual precipitation of a long-term record is used to describe the watershed. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR 130.7(c)(1)). If new data becomes available that meets MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time.

12. Comment: While there is water quality and invertebrate sampling that was done throughout the watershed, only two sites have data for six sampling events.

12. Response: The commentor is referring to Stations 6 and 7 which are the two sites that have six sampling events. Station 7 is located just below the city of Columbia's Sanitary Landfill while Station 6 is about 5 miles downstream from Station 7. Since Station 7 does not show any noticeable biological effects from the landfill, this station is used as a representative site for depicting the upstream rural condition. Station 6 represents an urbanized reach. Detailed biological information has been provided in several MDNR studies.

All data has been used appropriately within the Hinkson Creek TMDL. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. In addition to the data used in the TMDL, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR 130.7(c)(1)). If new data becomes available that meets the MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time.

13. Comment: No invertebrate data from MDNR has been collected since 2006 when many of Columbia's ordinances and storm water rules went into effect. The TMDL does not reflect watershed improvements from implementation of control equipment, best management practices and elimination of discharges.

13. Response: The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)).

Regarding the commentor's concerns about the TMDL not reflecting watershed improvements from recent implementation measures: One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. Per EPA regulations, MDNR incorporates the TMDL into Missouri's WQM plan for implementation (40 CFR § 130.7(d)(2)).

MDNR will work with permitted facilities identified in the TMDL. Per EPA regulations, it is the state that incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). If new data becomes available that meets the MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this new data.

14. Comment: The Hinkson Creek watershed is large and includes a variety of land uses and land types. A realistic solution is to consider the sub-basins rather than the entire watershed.

14. Response: EPA appreciates the commentor's viewpoint to consider sub-basins rather than the entire watershed. However, all potential sources must be considered in the TMDL. The entire area that drains into the impaired segments of Hinkson Creek is analyzed in the TMDL and included in the loading capacity. All pollutants preventing or expected to prevent WQS attainment (and their sources) must be listed in the TMDL, per 40 CFR § 130.7(c)(1)(ii). The Hinkson Creek watershed is a small to medium sized watershed having only one USGS gage. A reference stream approach is used to link urbanization to the degraded water quality seen in Hinkson Creek.

15. Comment: Updated data is vitally important to make decisions that potentially have such far reaching effects as this TMDL. The latest data used for the evaluation is from 2004. Validated

and updated data is needed to determine the current condition of Hinkson Creek. This data could then be used to update a draft TMDL and control plan if one is still needed.

A similar comment: Environmental quality and economic growth can and should be compatible. Implementing the proposed TMDL poses significant issues with future development and current land use in the watershed. So it is very important to use the most recent available water quality data, link observed water quality problems to identified pollutants and deal with those discharges in proportion to their impact on the stream.

Another comment: The information used in the TMDL is outdated and does not consider the millions in improvements made by public and private since the 2002 sampling. A new baseline is needed to verify if the creek is currently meeting aquatic life attainability.

15. Response: EPA appreciates the commentors' concerns about new data being needed. This TMDL was based upon data that was gathered as recently as 2009. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge in the data or modeling (40 CFR 130.7(c)(1)).

MDNR will incorporate monitoring and implementation into Missouri's WQM plan (40 CFR § 130.7(d)(2)). EPA anticipates over time new data will be collected. One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities.

The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

16. Comment: The basic concept of the Clean Water Act (CWA) and TMDLs is that a single pollutant is identified creating the observed condition. This is then addressed by imposing more stringent discharge limitations than those currently permitted. The absence of an identified pollutant makes it impossible to develop a TMDL that conforms fully to the CWA. Updated data is needed in order to identify the pollutant causing the concern. Using gross storm water flow as a surrogate does not meet the requirements of the CWA nor is it in the best interest of the community.

A similar comment: Commentor is adamantly opposed to the use of a surrogate in the draft TMDL.

16. Response: The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR 130.2(i). EPA regulations also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach 40 CFR 130.7 (c)(1)(i). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) List, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

To the extent that the term "flow" refers solely to the volume and velocity of flowing water, flow may result in hydrologic and geomorphologic changes that in turn affect aquatic life. However, by itself, flow volume or velocity is not a CWA Section 502(6) "pollutant." These TMDLs are targeting storm water runoff as a surrogate for the toxic mix of multiple pollutants and stressors associated with urban storm water.

Numerous studies have recognized that there are pollutants associated with storm water from municipal separate storm sewer systems that can affect aquatic life. For a summary of impacts associated with urban storm water, please refer to, *USEPA, Preliminary Data Summary of Urban Storm water Best Management Practices* (Aug. 1999) (EPA-821-R-99-012), Chapter 4. In 1987, Congress amended the CWA to (among other things) add Section 402(p) (codified at 33 U.S.C. 1342(p)) to cover certain discharges composed entirely of storm water. Section 402(p) requires NPDES permit coverage for discharges of storm water associated with industrial activity (including construction activity) and from large and medium MS4s. In addition, excess storm water runoff may cause scour and resuspension of sediment (a pollutant) in receiving waters. From a technical perspective, it is extremely difficult to separate the effects on aquatic life caused by changes in the hydrology or geomorphology of the water from those caused by the pollutants entrained in the storm water (including resuspended sediment caused by storm water runoff).

Accordingly, EPA believes it is appropriate for storm water runoff to serve as a surrogate for the presence of these pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/geomorphologic impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

17. Comment: The commentor recommends a "blue ribbon task force" led by representatives of the city of Columbia, Boone County and the University of Missouri convene and discuss how to obtain better quality data, how to use such data to make more informed decisions and future measures that may be needed to address water quality issues which still exist.

17. Response: EPA applauds the commentor for suggesting that stakeholders get involved in their watershed. Obtaining new data and researching and implementing new measures to address water quality issues is most effectively undertaken by stakeholders who are directly impacted by the water body's impairment. EPA encourages stakeholders to work with watershed groups already focusing on Hinkson Creek. Please contact MDNR to find other groups already active in Hinkson Creek's watershed.

18. Comment: The draft TMDL approach and content are largely similar to the draft TMDL developed by MDNR's Water Protection Program. Because of this, MDNR has very few technical or editorial comments.

18. Response: Although many similarities do exist, EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other storm water runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited available flow data, EPA is using annualized flow duration analysis to specifically target high flow conditions.

19. Comment: Clarify this statement in Section 2.4, second to last paragraph, page 8, "...the TMDL is designed to ensure reference with WQS..."

19. Response: The language in the TMDL has been edited to provide clarity.

20. Comment: In Section 3.1.3, first paragraph, page 10, change 113 Land Disturbance permits to 112 to agree with the correct number in Table 4.

20. Response: Thank you for your comment. The number has been corrected.

21. Comment: A Table 16 is referenced three times in the document, but does not exist in the text. See Sections 6, 7 and 8.

21. Response: Thank you for your comment. All references to Table 16 have been removed.

22. Comment: In the Margin of Safety section only Tables 13 and 15 need to be referenced.

22. Response: Thank you for your comment. The MOS section has been corrected to only reference Tables 13 and 15.

23. Comment: Perhaps the TMDL needs to clarify that general watershed management is not technically warranted to control storm water at flows greater than three percent of Hinkson Creek's flow duration curve in the last paragraph of Section 4.6.2.

23. Response: Thank you for your comment. The suggested language has been added to the TMDL to clarify TMDL targets.

24. Comment: In Section 4.6.2, perhaps it should be noted that reductions from current levels are not needed at the 70 percent flow duration interval since it is more closely related to sustaining base flow conditions in the water body. This is supported by Table 13 where it is stated that a goal of the TMDL is to restore base flow dynamics.

24. Response: Thank you for your comment. Language has been included to clarify that low flow reductions are not the target of the TMDL.

25. Comment: In Section 10, first paragraph, make a correction that the CWA 319 grant awarded to study Hinkson Creek hydrology is discussed in Appendix E, not Appendix D. Also add a reference to Appendix E at the end of the last sentence in Section 11.

25. Response: Thank you for the comment. The corrections were made in the final TMDL per the commentor's request.

26. Comment: A review of the TMDL indicates a reduction of at least 50.1% is required in order to negate the impairment. Why did EPA reduce the amount of storm water runoff reductions needed in order to meet WQS?

26. Response: Although many similarities do exist, EPA has revised the previous Hinkson Creek public noticed by MDNR model and remodeled the watershed. In order to align with other storm water runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited available flow data, EPA is using annualized flow duration analysis to specifically target high flow conditions. The 50.1 percent reduction was included in the MDNR TMDL model and is no longer pertinent. In the current EPA remodeled Hinkson Creek TMDL, the flow water quality target ranges between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC). The target was derived from actual flow data collected from October 2008 to September 2010. The TMDL flows were determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams.

27. Comment: The TMDL seems to state that the search for a known pollutant should be avoided. All of the information that could and has been collected in the sub-watersheds needs to be included and look for a solution in each.

27. Response: Contrary to the conclusion made in Comment 27, the TMDL investigates *all known* potential sources of the impairments (please see Section 3 of the TMDL on Source Inventory). The entire drainage area to the impaired segments of Hinkson Creek is

considered in the TMDL, which includes sub-watersheds. The Hinkson Creek watershed is a small to medium sized watershed having only one USGS gage. A reference stream approach is utilized to link urbanization to the degraded water quality seen in Hinkson Creek. There is no need to divide the watershed into several sub-watersheds since the current analysis has addressed urban and rural land use conditions.

28. Comment: Why is the TMDL reducing the base flow and is there enough research data collected from other streams to show this is a real solution to improve water quality, protect aquatic life, remove nonpoint sources and enforce clean water standards.

28. Response: The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows.

The analysis does not include lower flow settings (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis can be used to revise the TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

Contrary to what the commentor indicated, the TMDL is targeting storm water runoff at the higher flows. Since the TMDL targets a reduction at the higher flows and is not reducing the base flow, research data is not needed to validate a reduction in base flow.

29. Comment: The 303(d) listing for unknown pollutants is in direct conflict with the CWA.

29. Response: The state's listing of Hinkson Creek as impaired is beyond the scope of this public notice. However, due to the number of public comments asking why Hinkson was listed as impaired for "unspecified" or "unknown" pollutants, this response offers the regulatory explanation for Hinkson Creek's 303(d) listing.

EPA regulations require states to identify all waters still requiring TMDLs where standards are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1). While the CWA specifies that TMDLs shall be developed for pollutants, Section 303(d)(1) simply requires that certain waters be listed. The regulations do not exempt waters where the specific pollutant causing or expected to cause the exceedence of the applicable WQS is not known. When either EPA's or MDNR's evaluation of data and/or information of the water body's designated use, numeric criteria, or narrative criteria for water bodies, classified and unclassified, indicate impairment of the natural biological community, the water body should be included on the state's 303(d) list. Listing for "unknown" or "unspecified" pollutants is a valid listing until such time as a specific pollutant or pollutants have been determined through additional monitoring and assessment before a TMDL is actually developed.

The pollutant causing the impairments is listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." 40 CFR § 130.2(i). The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson Creek's warm-water aquatic life designated beneficial use also addresses chemicals and habitat.

Please see, *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act,* July 29, 2005, found online at http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf.

> **If a designated use is not supported and the segment is impaired or threatened, the fact that the specific pollutant is not known does not provide a basis for excluding the segment from Category 5. These segments must be listed unless the state can demonstrate that no pollutant(s) causes or contribute to the impairment. Prior to establishing a TMDL for such segments the pollutant causing the impairment must be identified**.

30. Comment: A meeting is requested to be hosted by EPA with the city of Columbia, Boone County and University of Missouri staff to resolve issues before any TMDL is issued for Hinkson Creek.

30. Response: A meeting was held in the EPA Region 7 offices on December 20, 2010.

31. Comment: An executive summary would be helpful to determine where to spend review time.

31. Response: The Introduction and page ii of the TMDL serve as an Executive Summary.

32. Comment: Section 2.2 discusses the additional development but not the number of people served. If these people didn't live and conduct business here, they will in other, less regulated basins and still have negative impacts. Recommend looking at allowable impact per person rather than maximum impact per area. This would result in some streams not meeting beneficial uses but these would be offset by less impact to streams that are closer to pristine.

32. Response: Thank you for the comment. All waters must be protected for their beneficial uses. EPA recommends that the commentor work with MDNR through the implementation plan and with other stakeholders in the community to address development's impact on the watershed. Adjusting the beneficial use of some waters in favor of maintaining other waters is beyond the scope of this TMDL's public notice.

33. Comment: The last sentence in the last paragraph above Table 5 is incomplete.

33. Response: Thank you for the comment, the language in the TMDL has been revised.

34. Comment: What were the SCI scores for the attainment streams? If these were much better than the minimum needed for attainment, then this approach is overestimating what needs to be done to meet the minimum level of attainment.

34. Response: The SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI < 16). The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating. This target can be accomplished through actions and BMPs used to reduce storm water runoff.

35. Comment: The USGS Water Resources Investigation Report 95-4231 lists average main channel slopes for four of these five streams (see table), and my calculated main channel slope for the Middle Fork Salt River is 2.97 feet/mile. At 11.1 feet/mile Hinkson Creek, the calculated main channel slope is significantly steeper than all four attainment streams. Main channel slope is a significant factor in determining runoff characteristics and should not be ignored when comparing flow duration curves. To quantify the effect of slope, the commentor applied the Missouri Rural USGS rural peak flow regression equations to these watersheds. These equations predict that Hinkson, if it wasn't urbanized, would produce twice the peak flow rate per square mile for the two year storm than the other basins would. So, a rural Hinkson Creek would be expected to be naturally flashier than any of these four reference streams. In other words, the flow duration curve would be expected to be higher for events such as the ones in the 3 to 5 percent exceedance range because of the stream slope steepness. The target flow duration curve should include an adjustment for slope.

Stream	Size (square miles)	Main channel slope	Hydrologic region	Predicted 2 year peak flow per square mile, USGS 1995 regression equations
Hinkson	69.8	11.1	2	47.4
Big Creek	414	3.3	2	21.4
Middle Fk. Salt River	313	Measured at 2.97 using CARES data	1	18.9
North River	354	5	1	22.1
S. Fabius River	620	3.4	1	16.2
USGS Water Resources Investigation Report 95-4231, Techniques for Estimating the 2 to 500 Year Flood Discharges on Unregulated Streams.				

35. Response: Hinkson is a third order stream. Based on the most updated NHD Plus data, its slope is 4.6 ft/mile. The estimated 2-year peak flow based on the Hinkson flow data is 30 cfs/square mile, suggesting the slope is about 3 ft/mile. The flow duration curve derived from the reference streams that were selected from the same ecoregion where Hinkson Creek is located is an appropriate method used to determine the TMDL targets for Hinkson Creek. In addition, the current Hinkson Creek TMDL does not use peak flows to determine the TMDL goals. This TMDL uses the entire flow values for data analysis, and the 95 percent confidence interval to target the high flow conditions observed in the recent years.

36. Comment: In Table 15, 5th row, does "Target Percent Increase" indicate that the TMDL is seeking an increase in the peak flow for large storms and a decrease in peak flow for small storms?

36. Response: The targeted percent increase on Table 15 indicates that Hinkson Creek's flow is 28.7 percent higher than the target flow derived from the reference streams at the 3 percentile flow exceedance. In other words, a 28.7 percent flow reduction at such flow exceedance is necessary to mitigate the impairment.

37. Comment: In Table 15 the wasteload and load allocations do not provide any method for adjustment based on weather. While the earlier versions of the TMDL were confusing but were somehow tied to rainfall amounts, they had the advantage that there was an avenue by which precipitation could be accounted even though it wasn't clear how this was done.

37. Response: The WLA is calculated based on the total design flow of the permitted facilities while the LA is calculated based on the rural impervious area. The weather condition has been incorporated into flow duration analysis since it is closely related to the flow condition. The 95 percent confidence interval is specifically applied to account for the wet-weather condition that appeared in the recent three years.

38. Comment: The Boone County Commission and University of Missouri concurs with the reasons and basis included in the letter submitted by Mr. David Shorr, Lathrop and Gage LLP.

38. Response: EPA thanks the stakeholder for their comments and acknowledges that the Boone County Commission and University of Missouri concurs with Lathrop and Gage's comments by reference. EPA makes every effort to review and address all comments.

39. Comment: The Boone County Commission and permit partners have always and will continue to be willing to work along side MDNR and EPA to meet the goal of the CWA for Hinkson Creek. We are requesting a meeting with EPA and MDNR to discuss implementation before issuance of any TMDL.

39. Response: EPA thanks the commentor. A meeting was held in the EPA Region 7 office on December 20, 2010.

40. Comment: The University of Missouri objects to the issuance of the EPA's proposed Hinkson Creek TMDL.

40. Response: EPA thanks the stakeholder for their comments and has taken note of the objection.

41. Comment: Throughout the development process, the University of Missouri has suggested several alternate approaches to the MDNR, but all have been ignored without a response. EPA has not made any real effort to engage stakeholders in the short time it has taken over responsibility for the TMDL. It is our understanding that TMDLs are supposed to be developed in consultation with affected stakeholders, yet there has been little evidence that the University of Missouri's comments have been considered.

In a similar comment: The Boone County Regional Sewer District is also disappointed that EPA has never included the District in any discussions regarding this TMDL.

41. Response: While EPA cannot respond to those actions taken or not taken by MDNR, EPA has met CWA obligations for public notice of these TMDLs. First, EPA reminds the commentor that the TMDLs, as public noticed by EPA, are revised and remodeled from the TMDLs public noticed by MDNR. Many of the revisions to EPA's TMDLs were in response to issues that EPA had been made aware of during MDNR's public comment period.

Additionally, EPA has performed the required public notice for the establishment of these EPA TMDLs. EPA has made every effort to fully review and respond to those comments made during the public comment period. In addition, EPA has incorporated previous public comment and stakeholder interaction from MDNR's TMDL development for Hinkson Creek. EPA policy agrees that there should be full and meaningful public participation in the TMDL development process from those impacted by the TMDL (40 CFR § 130.7(c)(1)(ii)).[1] The public notice period offers an opportunity for meaningful review of the TMDL as EPA is establishing it. All comments received during public notice are considered and addressed in the final TMDL as is appropriate (40 CFR § 130.7(d)(2)).

Per EPA regulations, public notice should follow the state's public review process as defined in the state's Continuing Planning Process (CPP) (40 CFR § 130.7(a), 40 CFR § 130.7(c)(1)(ii) and 40 CFR § 130.7(d)(2)). Missouri's most current CPP defines a 30 day public notice period distributed to all known stakeholders impacted by the TMDL. (Missouri's most current CPP is found at http://www.dnr.mo.gov/env/wpp/cpp/cpp_toc.htm) To distribute the draft TMDL as widely as possible, EPA publishes the draft TMDL on its Website (http://www.epa.gov/region07/water/tmdl_public_notice.htm) and concurrently MDNR notified stakeholders on its Website (http://www.dnr.mo.gov/env/wpp/tmdl/wpc-tmdl-progress.htm) for 30 days. When the draft TMDL is posted on the Websites, EPA and/or MDNR sends timely notice by mail and/or email to all identified point source facilities, nonpoint source entities, watershed stakeholders, community groups, elected

[1] *Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992*, EPA, May 20, 2002

representatives, cities, townships and counties that are part of the impaired watershed or have indicated previous interest in the impaired water's TMDL to notify them of the posting.

42. Comment: The Hinkson Creek area encompasses much of our community and is a significant area for future growth in the Columbia area. We are concerned that the negative action of EPA will limit possible opportunities for our population. We agree with our local units of government to have an adequate review of all relevant evidence available for Hinkson Creek.

42. Response: The TMDL does not purport to exert control over local land use or limit development within the Hinkson Creek watershed. The TMDL instead calculates the total maximum daily load of a pollutant that Hinkson Creek can assimilate without exceeding WQS. The TMDL then allocates that total maximum daily load among a variety of sources that are contributing to the impairment of Hinkson Creek. Please refer to Section 6 of the TMDL for more information regarding the WLA. Some of these sources include municipal separate storm sewers (MS4s) and discharges from construction sites that disturb more than an acre of land. As stated below, discharges from both of these types of sources are regulated under the CWA. *See* 33 U.S.C. 1342(p).

The TMDL expresses its loading target and allocations for the suite of pollutants in terms of an appropriate surrogate measure; EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. This is squarely within EPA's authority under the CWA. In 1987, Congress amended the CWA to (among other things) add Section 402(p) (codified at 33 U.S.C. 1342(p)) to cover certain discharges composed entirely of storm water. Section 402(p) requires NPDES permit coverage for discharges of storm water associated with industrial activity (including construction activity) and from large and medium MS4s. In addition, EPA was directed to study and issue regulations that designate additional storm water discharges. EPA issued regulations on December 8, 1999 (64 FR 68722), expanding the NPDES storm water program to include discharges from smaller MS4s (including all systems within "urbanized areas" and other systems serving populations less than 100,000) and storm water discharges from construction sites that disturb one to five acres, with opportunities for area-specific exclusions.

The TMDL does not purport to regulate flow or land use, but rather uses storm water runoff as a surrogate parameter for the toxic suite of pollutants in the stream. In other words, storm water runoff is used as an alternate way of expressing the TMDL's endpoint. *See* National Research Council, *Urban Stormwater Management in the United States* (2009) ("A more straightforward way to regulate storm water contributions to water body impairment would be to use flow or a surrogate, like impervious cover, as a measure of storm water loading . . . Efforts to reduce storm water flow will automatically achieve reductions in pollutant loading. Moreover, flow is itself responsible for additional erosion and sedimentation that adversely impacts surface water quality").

The use of a surrogate indicator is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. *See Friends of the Earth v. U.S. Environmental Protection Agency,* 346 F. Supp. 2d 182, 200-01 (D.D.C. 2004), *rev'd and remanded on other grounds,* 446 F.3d 140 (D.C. Cir. 2006), *cert. denied sub nom D.C. Water & Sewer Authority v. Friends of the Earth,* 549 U.S. 1175 (2007) (TMDL that achieves pertinent WQS using a surrogate parameter is permissible. It is also consistent with EPA's regulations, which specify that "TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure.") (40 C.F.R. §130.2(i)).

EPA appreciates the stakeholders' concerns about the TMDL's potential impact on their community's development. TMDLs must target WQS (40 CFR 130.7(c)(1)(ii)), and this is done without a requirement to incorporate cost considerations. However, it is MDNR that will incorporate the TMDL into Missouri's WQM plan for monitoring and implementation (40 CFR § 130.7(d)(2)). MDNR does assist community groups and permitted facilities during implementation of the TMDL to mitigate negative economic impact, whether it is the cost of wastewater system improvements or permit limits directly. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov. To reach MDNR's Financial Assistance Center, call (573) 751-1192 and ask for either Mr. Doug Garrett or Ms. Traci Newberry, or email Mr. Garrett at doug.garrett@dnr.mo.gov. You can also find them on the Web at http://www.dnr.mo.gov/env/wpp/srf/index.html.

43. Comment: The TMDL does not provide criteria as to what would be satisfactory monitoring results.

43. Response: MDNR will incorporate the TMDL into Missouri's WQM plan for monitoring and implementation (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation (of which monitoring is a significant component). Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data comes available as a result of monitoring, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

MDNR's Implementation Plan was included as a supplement in Appendix E in an effort to help stakeholders budget their resources and discover what is already being done in the watershed. Part of MDNR's WQM Plan will include the criteria for satisfactory monitoring results.

44. Comment: The Hinkson Creek is an important urban stream in our area. Our government units have worked to increase regulations to assist the cleanliness of streams by buffering them from residential and commercial development. The identification of a problem has helped bring attention to Hinkson Creek for our citizens. Our goal is to make Columbia and Boone County

the most livable, easy to transit as we grow around a center core and maximize our land area to continue to make Columbia an even greater city.

44. Response: EPA applauds citizens and community leaders who are actively working in their watershed to improve water quality. More is accomplished when stakeholder groups combine resources to improve their watershed.

45. Comment: Table 3: Site Specific Permits in the Hinkson Creek Watershed needs to be corrected. The following systems no longer exist: MO 0050989 El Chaparral Subdivision Lagoon, MO 0096539 Concorde Estates Subdivision WWTP, MO 0096954 Sunrise Estates WWTP and MO 0117781 OTSCON WWTP. There are also active efforts to eliminate ten more facilities listed in this table by the end of 2013.

45. Response: EPA thanks the commentor for the information. The TMDL has been corrected by removing the expired permits. However, any permits that are still in effect are still included in the TMDL.

46. Comment: The Hinkson Creek, Pearson Creek and Wilson Creek (with Jordon Creek) TMDLs have similarities: urban and rural land uses, aquatic life impairments due to "unknown pollutants," a TMDL approach using stream flow as a surrogate for water quality pollutants, using reference streams to set flow-based targets, and wasteload allocations targeted at municipal separate storm sewer systems. Yet, EPA used different approaches for the Hinkson Creek TMDL as compared to Wilson/ Jordan Creek and Pearson Creek TMDLs.

46. Response: Available information for the Pearson, Wilson, Hinkson and reference watersheds were used to calculate target loads and the anticipated full range of stream flows. Differences between these watersheds have led to different water quality targets.

First, available data for each stream is different. Pearson and Wilson Creeks (with Jordon Creek) have several stream flow gages operated by USGS that have measured and recorded water levels over time; ten years of historical information was available to calculate the full range of anticipated flows. Alternatively, the Hinkson Creek watershed gage provided three years of data during years of high rainfall, so a range of anticipated flows was estimated from selected reference streams in the area.

Second, each stream was compared to reference streams in the same ecological area that had similar soils, physiography, minimal urban area and healthy aquatic communities. Pearson and Wilson Creeks (with Jordon Creek) were compared to four reference stream watersheds in the Ozark Highlands ecoregion while Hinkson Creek was compared to four reference stream watersheds in the Central Irregular Plains ecoregion. In order to compare these watersheds, the same calculations were done for each stream. Each flow measurement was divided by the watershed size to determine a flow per square mile value to account for the effect of different watershed sizes. The reference stream flows were then averaged within each group to produce two average reference stream flow patterns. The flow patterns for Pearson, Wilson and Hinkson Creek were then compared to the matching average reference stream flow pattern.

Water quality targets for each watershed are based on anticipated high flows in the averaged reference stream where the stream is just contained within the banks and has maximum velocity, i.e., bankfull discharge. Additional information regarding these calculations can be found in the respective TMDL.

47. Comment: A TMDL approach that uses flow as a surrogate for water quality is flawed. Wilson, Jordan and Pearson Creeks have documented pollutant sources where water quality data exceeds Missouri's numeric water quality criteria.

47. Response: In response to the comment that there is "documented pollutant sources where water quality data exceeds Missouri's numeric water quality criteria," EPA is not aware that this data exists indicating a numeric criterion has been exceeded, as described in the comment. Studies have shown that low levels of many pollutants can negatively affect aquatic communities. These pollutants include chloride, sediment, hydrocarbons, pesticides, nutrients, pathogens, metals, volatile compounds, PCBs and other compounds. Please provide MDNR any new data not represented in the TMDL. The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

To the extent that the term "flow" refers solely to the volume and velocity of flowing water, flow may affect hydrologic and geomorphologic changes that in turn affect aquatic life. However, by itself, flow volume or velocity is not a CWA Section 502(6) "pollutant." These TMDLs are targeting storm water runoff as a surrogate for the toxic mix of multiple pollutants and stressors associated with urban storm water. Numerous studies have recognized that there are pollutants associated with storm water from municipal separate storm sewer systems that can affect aquatic life. For a summary of impacts associated with urban storm water, please refer to, *USEPA, Preliminary Data Summary of Urban Storm water Best Management Practices* (Aug. 1999) (EPA-821-R-99-012), Chapter 4. In 1987, Congress amended the CWA to (among other things) add Section 402(p) (codified at 33 U.S.C. 1342(p)) to cover certain discharges composed entirely of storm water. Section 402(p) requires NPDES permit coverage for discharges of storm water associated with industrial activity (including construction activity) and from large and medium MS4s. In addition, excess storm water runoff may cause scour and resuspension of sediment (a pollutant) in receiving waters. From a technical perspective, it is extremely difficult to separate the effects on aquatic life caused by changes in the hydrology or geomorphology of the water from those caused by the pollutants entrained in the storm water (including resuspended sediment caused by storm water runoff). Accordingly, EPA believes it is appropriate in a TMDL analysis for storm water runoff to serve as a surrogate for the presence of these pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/ geomorphologic

impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

48. Comment: Setting allocations based upon "high" flow conditions, i.e., 5 to 10 percent flow exceedance, is more appropriate than using the full range of the flow duration curve as used in the Wilson/ Jordan Creek and Pearson Creek TMDLs. The Hinkson Creek TMDL targets this upper portion of the flow duration curve as did Appendices D and E in the Wilson/ Jordan Creek and Pearson Creek TMDLs. Further, EPA states that mitigation of high flows should be sufficient to meet TMDL targets during more frequent, i.e., lower flow, stream conditions. In addition, comparisons of lower flow categories to Wilson Creek (with Jordon Creek) are not appropriate due to losing conditions. They recommend that allocations referenced within the TMDL be revised to include only the 5th and 10th percentile flows, should EPA continue to use the flow duration curve approach.

48. Response: The Wilson Creek (with Jordon Creek) TMDL has been modified to include only targets for the 5th and 10th percentiles of flow exceedances. The Pearson Creek TMDL has been modified to include targets for the 5, 10, 30 and 50th percentiles of flow exceedances. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. Differences between these watersheds have led to different water quality targets and available data for each stream is different. Pearson and Wilson/Jordan Creeks have several stream flow gages operated by USGS that have measured and recorded water levels over time; ten years of historical information was available to calculate the full range of anticipated flows. Alternatively, the Hinkson Creek watershed gage only provided three years of data during years of high rainfall. Because of the limited flow data available in the Hinkson Creek watershed, a range of anticipated flows was estimated from selected reference streams in the area. EPA used annualized flow duration analysis to specifically target high flow conditions in the Hinkson Creek TMDL.

49. Comment: The TMDLs should account for hydrologic variation between reference streams to develop targets if EPA uses the flow duration approach. For example in the Wilson/Jordan Creek and Pearson Creek TMDL, the average of the 5th percentile normalized flow exceedances for Bryant, North and Bull Creeks were used to set the TMDL target of about 3 cfs. This infers that the hydrologic characteristics of Bull Creek, a biologic reference stream whose 5th percentile normalized flow exceedance was about 4 cfs/square mile, do not meet the TMDL targets. EPA used a statistical approach to develop TMDL flow targets for Hinkson Creek based upon the upper 95th percent confidence limit of reference stream flow duration curves. While it appears this was done due to differences in hydrologic conditions within the historic data, this approach does not account for the variation inherent in different catchments such as land use, watershed morphology, etc. Accounting for the variation between flow duration curves could dramatically influence TMDL targets. For example, the differences for Wilson and Pearson Creek TMDLs when compared to Bull Creek at the 5th percentile normalized flow exceedance are about 15 percent and 5 percent, respectively. This dissimilarity between the ecoregional reference streams and TMDL study streams invalidated the flow duration curve approach for setting TMDL targets. However, if this approach is followed, EPA is requested to account for

hydrologic variation between reference and TMDL streams in deriving the most appropriate TMDL targets.

49. Response: The Hinkson, Pearson and Wilson Creeks (with Jordon Creek) TMDLs have addressed hydrologic variations using reference streams selected from either an ecoregion or an ecological drainage unit. To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to 1) minimize the hydrologic flow variations occurring in each reference stream and 2) generalize a typical reference stream condition applicable to the target watersheds. Looking at individual reference stream hydrological conditions as indicated by the commentor is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major wastewater treatment facilities. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach specifically targets the existing high flow condition that may transport a large amount of pollutants and cause a negative affect on the biological condition of the stream.

50. Comment: Request that ALL potential pollutant sources be considered, studied in more depth and included in the implementation plan.

50. Response: All potential sources contributing to the impairment are considered in the Hinkson Creek TMDL. Please refer to Section 3 of the TMDL that details a source inventory for point and nonpoint sources. MDNR will incorporate the TMDL into Missouri's WQM plan for monitoring and implementation (40 CFR § 130.7(d)(2)).

51. Comment: If EPA uses the flow duration curve to set TMDL targets, then the commentor requests that this be done consistently between Wilson/ Jordan, Pearson and Hinkson Creek TMDLs.

51. Response: Please refer to responses 46, 47, 48 and 49 above for information about the data and modeling differentiations between the TMDLs.

52. Unintended consequences of such widespread implementation will likely be pushing development into other sensitive watersheds and increased sprawl.

52. Response: Thank you for the comment. All waters must be protected for their beneficial uses. EPA recommends that the commentor work with MDNR through the implementation plan and with other stakeholders in the community to address the development's impact on the watershed. Adjusting the beneficial use of some waters in favor of maintaining other waters is beyond the scope of this TMDL's public notice.

LIST OF COMMENTORS

1. Ken Midkiff, Missouri Clean Water Campaign, Missouri
   Diane Oerly, Show-Me Clean Streams, Columbia, Missouri

Darren Ridenhour, THF Grindstone Development, L.L.C., St. Louis, Missouri
John Hoke, Missouri Department of Natural Resources, Jefferson City, Missouri
Hank Ottinger, Sierra Club Osage Group, Columbia/Jefferson City, Missouri
Priscilla Stotts, Tebbetts, Missouri
Bob McDavid, city of Columbia, Columbia, Missouri
John Holmes, Allstate Consultants, LLC, Columbia, Missouri
Karen Miller, Boone County Commission, Columbia, Missouri
Jacquelyn Jones, University of Missouri-Columbia, Columbia, Missouri
Todd Wagner, city of Springfield, Springfield, Missouri

END SUMMARY OF COMMENTS AND RESPONSES

Hinkson Creek in Missouri
Draft Total Maximum Daily Load (TMDL)
SUMMARY OF COMMENTS AND RESPONSES
Part II of III

Prepared by the Environmental Protection Agency (EPA), Region 7
Water, Wetlands and Pesticides Division
January 2011

INTRODUCTION

EPA public noticed a draft TMDL for Hinkson Creek (water body identification MO_1007 and MO_1008) from October 28, 2010 to December 1, 2010. EPA is establishing this TMDL to meet the obligations of the 2001 Consent Decree, *American Canoe Association, et al. v. EPA*, Consolidated Case No. 98-1195-CV-W-SOW, consolidated with 98-4282-CV-W-SOW, (Consent Decree or CD). This document summarizes and paraphrases comments received, EPA's response to comments and changes made to the final TMDL where appropriate. Included is a list of all commentors.

RESPONSE TO COMMENTS (EPA responses in bold)

1. Comment: Comment letter provided Exhibits A – E in Appendices A and J documenting actions by local private and public organizations to enhance the Hinkson Creek watershed. The comment letter also included in Appendix N the city of Columbia ordinances, Chapter 12A, Land Preservation and Appendix O Boone County Storm water Ordinance and Boone County Zoning Regulations, Chapter 26, Stream Buffer Regulations.

1. Response: EPA acknowledges receipt of the attachments to your letter. Your letter and all attachments are addressed in these responses. The activities detailed in the letter are included as Appendix D to the TMDL.

2. Comment: We believe sufficient data exists to demonstrate that Hinkson Creek adequately supports aquatic populations and meets threshold requirements.

2. Response: EPA thanks the stakeholder for their feedback. The state's listing of Hinkson Creek as impaired is beyond the scope of this public notice. However, EPA does not believe that data in its possession currently exist to demonstrate that Hinkson supports its warm-water aquatic life use. EPA encourages stakeholders to submit data to the Missouri Department of Natural Resources (MDNR) or conduct monitoring to demonstrate that Hinkson Creek is meeting water quality standards (WQS). Please keep in mind that data supplied needs to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling (and new monitoring needs an MDNR approved quality assurance project plan). Data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 Code of State Regulations [CSR] 20-7.031 and 10 CSR 20-7.050). If the data is found to meet MDNR's minimum level for data inclusion or as new data becomes

available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL.

3. Comment: We believe there is no such thing as an "unknown" pollutant and that the law requires both the MDNR and the EPA to designate pollutants so our community can properly address, with the most aggressive effort and least cost, the greatest prospects of success.

3. Response: EPA thanks the commentor for the interest in their watershed. Regarding the commentor's concerns about the "unknown source of pollutants:" The pollutant causing the impairments is listed as unknown on the Clean Water Act (CWA) 303(d) list; however, the TMDL uses the surrogate measure of storm water runoff to represent the combination of toxic pollutants that contribute to the impairment of Hinkson Creek and has the added benefit of addressing the hydrologic changes to the stream that degrade the overall health of the biological communities. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." (40 Code of Federal Regulations (CFR) § 130.2(i)).

EPA regulations require states to identify all waters still requiring TMDLs where standards are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1). While the CWA specifies that TMDLs shall be developed for pollutants, Section 303(d)(1) simply requires that certain waters be listed. The regulations do not exempt waters where the specific pollutant causing or expected to cause the exceedance of the applicable WQS is not known. Where either EPA's or MDNR's evaluation of data and/or information of the water body's designated use, numeric criteria, or narrative criteria for water bodies, classified and unclassified, indicate impairment of the natural biological community, then the water body should be included on the state's 303(d) list.

Regarding cost and prospects of success: TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)). MDNR will incorporate the TMDL into its current Water Quality Management (WQM) plan for implementation (40 CFR § 130.7(d)(2)).

4. Comment: MDNR does not have the legal authority to make this recommendation.

4. Response: The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR 130.2(i). EPA regulations also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR 130.7 (c)(1)(i)). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple

pollutants. In the case of Hinkson Creek, the pollutant causing the impairments may be listed as unknown on the 303(d) List; however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

To the extent that the term "flow" refers solely to the volume and velocity of flowing water, flow may result in hydrologic and geomorphologic changes that in turn affect aquatic life. However, by itself, flow volume or velocity is not a CWA Section 502(6) "pollutant." These TMDLs are targeting storm water runoff as a surrogate for the toxic mix of multiple pollutants and stressors associated with urban storm water.

Numerous studies have recognized that there are pollutants associated with storm water from municipal separate storm sewer systems that can affect aquatic life. For a summary of impacts associated with urban storm water, please refer to, *USEPA, Preliminary Data Summary of Urban Storm water Best Management Practices* (Aug. 1999) (EPA-821-R-99-012), Chapter 4. In 1987, Congress amended the CWA to (among other things) add Section 402(p) (codified at 33 U.S.C. 1342(p)) to cover certain discharges composed entirely of storm water. Section 402(p) requires NPDES permit coverage for discharges of storm water associated with industrial activity (including construction activity) and from large and medium MS4s. In addition, excess storm water runoff may cause scour and resuspension of sediment (a pollutant) in receiving waters. From a technical perspective, it is extremely difficult to separate the effects on aquatic life caused by changes in the hydrology or geomorphology of the water from those caused by the pollutants entrained in the storm water (including resuspended sediment caused by storm water runoff).

Accordingly, EPA believes it is appropriate for storm water runoff to serve as a surrogate for the presence of these pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/geomorphologic impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

5. Comment: The implementation of the TMDL will fall to the City of Columbia, Boone County, and the University of Missouri through their municipal separate storm sewer system (MS4) permit.

5. Response: MDNR will work with all stakeholders to determine implementation options with the best prospects of success. EPA regulations require the state to incorporate the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). **Please note that the TMDL not only identifies the Boone County, City of Columbia, and University of Missouri-Columbia, the joint MS4 permittees as a potential source of the impairment, but**

also identifies an additional number of point source permit holders located within the wasteload allocation (WLA) area and several nonpoint sources assigned to the LA.

6. Comment: The TMDL is a mandatory requirement for the MS4.

6. Response: MDNR will work with permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)).

7. Comment: Boone County does not support the conclusions in the TMDL. A different approach is warranted to define the water quality impairment and set the TMDL.

7. Response: This comment is vague. However in an effort to be responsive EPA refers the commentor to the Response to Comment numbers 16 and 29 from the SUMMARY OF COMMENTS AND RESPONSES Part I of III.

8. Comment: More monitoring data is needed to correctly assess the health of the invertebrate community, divide the watershed into subwatersheds and use the Center for Watershed Protection (CWP) approach to segment and treat different runoff volumes.

8. Response: National studies, including the CWP and the Water Environment Research Foundation (WERF) studies, as cited in the TMDL, have documented the connection between increased impervious area in urban areas to increases in storm water runoff, which contributes numerous pollutants and results in changes in hydrology with increased magnitude, duration and frequency of storm water. These resulting changes are known to negatively affect water quality and aquatic life.

As stated in the TMDL, the CWP study reviewed hundreds of research studies. The combined review and synthesis of information in these studies led CWP to conclude that impervious cover as low as 10 percent can be related to aquatic life impairments and worsens as more areas within the watershed are developed.

Reducing the frequency and magnitude of high flows will encourage infiltration so that the stream hydrology more closely matches pre-development hydrology as measured in the reference stream watersheds. In turn this will reduce the amount of pollutants carried by storm water into Hinkson Creek. Based upon the analysis by national and local studies, it is reasonable that addressing these negative impacts will result in better habitat and protection of aquatic life and natural biological aquatic communities.

The TMDL investigates *all known* potential sources of the impairments. Please see Section 3 of the TMDL on Source Inventory. The entire drainage area to the impaired segments of Hinkson Creek is considered in the TMDL which includes sub-watersheds. The Hinkson Creek watershed is a small to medium sized watershed having only one United States Geological Survey (USGS) gage. A reference stream approach is utilized to link urbanization to the degraded water quality seen in Hinkson Creek. There is no need to

divide the watershed into several sub-watersheds since the current analysis has addressed urban and rural land use conditions.

EPA encourages the collection of additional data. In fact, one of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available, MDNR may consider submitting a revised or modified TMDL for this water at any time.

9. Comment: Potential Consequences of Implementing -- This TMDL includes detention basins, starving the stream, increasing the level of pollutants, movement towards sensitive areas, loss of funding, cost to implement this TMDL and loss of public trust.

9. Response: EPA doesn't necessarily endorse any specific best management practice (BMP) technology as the most cost effective and does not endorse one BMP technology over another. Neither the TMDL nor the implementation plan, requires a specific BMP technology. One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

Permanently removing natural background volume from the watershed/stream is not the intention of the TMDL and is not recommended. Retaining water at its source is not meant to remove all volume, but rather is another means of holding back runoff from impervious surfaces during storm events. The intention is for excess storm water to be addressed, so there would be no increase in concentration of contaminants such as the commentor suggests.

It is the goal of the TMDL that the community will embrace storm water runoff reduction as a necessity for enhancement of its natural resources (attract people to Columbia and increase quality of life) and to be proactive in controlling the runoff, in addition to any MS4 requirements. Local businesses and developers may step forward to make these changes and improvements to the watershed. Stakeholders may want to look to the standards of construction across the country relating to storm water runoff.

EPA understands that stakeholders face economic challenges. TMDLs are required to target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done absent cost considerations. MDNR will work with permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)).

10. Comment: Please provide more detail on the Missouri Stream Condition Index (MSCI or SCI) scores, and data quality objectives. How are the scores determined?

10. Response: A stream with stream condition index (SCI) scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI< 16). The TMDL includes an additional target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC).

The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, the MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)).

For information regarding MDNR's criteria for assigning SCI scores, please refer to http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

11. Comment: What is considered fully supporting (in the SCI scores)?

11. Response: A stream with SCI scores equal to 16 (or greater) is considered fully supportive according to MDNR criteria. See Response to Comment number 10 above regarding information as to how the SCI scores are calculated.

12. Comment: Do the scores in reference streams ever drop to below fully supporting?

12. Response: An individual score for a reference stream may drop below 16, but SCI scores are based on a composite score– based on MDNR's criteria for assigning SCI scores, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

There is a database of reference streams with associated SCI scores and new biological data are compared to those scores. MDNR's reference stream biocriteria is at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

13. Comment: What percentage of time does the stream have to remain fully supporting in order to achieve its designated use?

13. Response: EPA has established in the Hinkson Creek TMDL a target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). See Response to Comment 16 above for additional information on Missouri's SCI scores.

14. Comment: How many temporal and spatial samples are needed?

14. Response: There is no set number. Assessment is conducted based on the number of samples available.

15. Comment: How does MDNR determine the baseline?

15. Response: There is a database of reference streams with associated SCI scores and new biological data are compared to those scores. MDNR's reference stream biocriteria is at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

16. Comment: The end goals of this TMDL need to be clarified. At what point does the department consider the invertebrate population to be fully supporting? (75 percent of the sites for 2 sampling seasons?) Please clarify this in the TMDL.

16. Response: The TMDL's goal is Hinkson Creek meeting all its designated beneficial uses. The TMDL includes a target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16).

17. Comment: Use of precipitation and flow data to develop flow duration curves. Figures 5, 6, 8 and use flow and precipitation data from 2008 and 2009. Although a t-test was performed, it is highly unlikely that the flow regimes are comparable. Please define flow regimes, and the methodology used. Both 2008 and 2009 were unusually high precipitation years (54 and 56 inches in part of the watershed, as opposed to 38 inches in a normal water year). The antecedent soil moisture conditions and frequency of rainfall would likely affect interception rates for summer runoff values and flooding. How were these situations taken into consideration in these figures? What significance did previous rainfall events have on flow? The rainfall events surrounding the 5 highest flows (1-5 days before the high flow event) contain extreme rainfall amounts (up to 7 inches) preceding these "normalized" flows?

17. Response: Figure 5 provides a FDC comparison between the entire Hinkson Creek flow record (22 years) and the flow data recorded in the last three years. This figure clearly reveals that the flows in the last three years were higher than the normal flow. As a result, EPA uses an annualized FDC analysis based on the selected reference streams and then targets its 95 percentile confidence interval in order to develop the high flow TMDL goals for Hinkson Creek. Based on the results of flow duration analysis and the consideration of channel forming flow conditions (i.e., bankfull discharge), the TMDL targets were set ranging between the upper 3-5 percentiles of flow exceedances to reduce excess pollutant loading that can adversely affect the biological conditions in Hinkson Creek.

18. Comment: What flow regimes are being compared? In some sections of the document, we are looking at 1967, and 2007. In other areas we are looking at 1974 – 82, and 1986 - 1991 and 2007 - 09. In other areas all of the data 1974 - 1991 is lumped together and compared to 2007 - 09. We argue that precipitation for 2007 – 09 were outliers and should not be used to set flow

reductions. Additionally, none of the flow analysis periods used for the Hinkson correspond to the same time period in the "reference" streams, and only Big Creek overlaps.

18. Response: The commentor is referring to sections of the TMDL where the dominant rainfall season and its corresponding flow condition in Hinkson Creek are described. This information was not used for TMDL analysis. The actual TMDL was determined based on the entire flow conditions from the reference streams from 1961 to 2010 (water years). The load reduction was then calculated based on the entire flow conditions measured at Hinkson Creek from 2008-2010 (water years). The information that the commentor cites is just providing a picture of the flow conditions and suggests that flow may be altered in the recent decade in response to a rapid urbanization in the watershed in the recent years. The flow conditions recorded in 2008-2010 reflects the high flow situation that a conventional flow duration analysis cannot handle as the commentor has suggested. To address these unique flow conditions, EPA uses the 95 percentile confidence interval of the flow conditions from the reference streams to determine appropriate TMDL goals.

19. Comment: The flow/volume reduction requirements are still not clear. Is this a 1-year event, the runoff from a 1-year event? The high flow event. Are we trying to reduce the cfs? If so, to what level? Can MDNR put this into terminology that the engineers, developers, local MS4 and regulators can all understand?

19. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. EPA has revised and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. The comment is not pertinent to the EPA public noticed TMDL.

The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows. Additionally, another target for Hinkson Creek, is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16). This additional target can be accomplished through actions and BMPs used to reduce storm water runoff. How the targets are met through implementation will be determined by MDNR when it incorporates the TMDL into its WQM plan for implementation and monitoring.

20. Comment: In Section 2.5, the TMDL states that storm water runoff is nonpoint source pollution. That is partially true. However with the modification of the CWA in 1989 to include storm water in the national pollutant discharge elimination system (NPDES) permit, and development of Phase I and Phase II, storm water became a point source. Please clarify for the reader that although, storm water has a diffuse component, it is now classified and treated as a point source, under management of the MS4.

20. Response: Please note that this TMDL, as public noticed, is not identical to the

previously public noticed MDNR version. EPA has revised and remodeled the watershed. The comment is not pertinent to the current TMDL. Please refer to Sections 3.1.3 and 6, where the current TMDL discusses regulated storm water as a point source.

21. Comment: Several statements are unsupported in the Draft TMDL. Please provide references or more information for the following:

Section 2.4 defining the problem. MDNR has received citizen reports regarding all five of the water quality problems mentioned above (for Hinkson Creek). Please provide dates and documentation.

Section 2.6. "Specifically, this TMDL is aimed at restoring the stream's natural peak and base flow dynamics. Creating more natural stream flows will restore habitat and reduce the release of toxic pollutants into Hinkson Creek." How do the authors know which flows are needed for aquatic life? Flow does not control the release of toxic pollutants; it is only the transport mechanism. Please substantiate this second sentence. This TMDL only sets a reduction of the Q0.3 flow (I think). It does not require an increase in base flow. Please define the historic flow we are trying to achieve with this TMDL, and provide a hydrograph of historic flows.

21. Response: Section 2.4: These citizen reports were made prior to the 1998 Missouri 303(d) List and MDNR states that there is no longer "a record of the supporting documentation for older 303(d) lists which were disposed of after two years."

Response Section 2.6: To the extent that the term "flow" refers solely to the volume and velocity of flowing water, flow may affect hydrologic and geomorphologic changes that in turn affect aquatic life. However, by itself, flow volume or velocity is not a CWA Section 502(6) "pollutant." These TMDLs are targeting storm water runoff as a surrogate for the toxic mix of multiple pollutants and stressors associated with urban storm water. Numerous studies have recognized that there are pollutants associated with storm water runoff from MS4s that can affect aquatic life. For a summary of impacts associated with urban storm water, please refer to *EPA, Preliminary Data Summary of Urban Storm water Best Management Practices* (Aug. 1999) (EPA-821-R-99-012), Chapter 4. In 1987, Congress amended the CWA to (among other things) add Section 402(p) (codified at 33 U.S.C. 1342(p)) to cover certain discharges composed entirely of storm water. Section 402(p) requires NPDES permit coverage for discharges of storm water associated with industrial activity (including construction activity) and from large and medium MS4s. In addition, excess storm water runoff may cause scour and resuspension of sediment (a pollutant) in receiving waters. From a technical perspective, it is extremely difficult to separate the effects on aquatic life caused by changes in the hydrology or geomorphology of the water from those caused by the pollutants entrained in the storm water. Accordingly, EPA believes it is appropriate for storm water runoff to serve as a surrogate for the presence of these pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/geomorphologic impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

22. Comment: Which facility is referred to in the last sentence of section 3.1.2?

22. Response: The Columbia Sanitary Landfill.

23. Comment: Section 4.5 Water Quality Targets: Please substantiate the statement "reducing storm water runoff volume to Hinkson Creek will address the vast majority of issues associated with the impairment and restore the aquatic life designated use …"

23. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. This statement is now included in Section 4.5.1 of the current TMDL. In the report for *Urban Storm water Management in the United States,* the National Research Council suggests: "A more straightforward way to regulate storm water contributions to water body impairment would be to use flow or a surrogate, like impervious cover, as a measure of storm water loading . . . Efforts to reduce storm water flow will automatically achieve reductions in pollutant loading. Moreover, flow is itself responsible for additional erosion and sedimentation that adversely impacts surface water quality."

24. Comment: Section 5. Load Capacity. Provide documentation to correlate volume, pollution and fully supporting aquatic life.

24. Response: The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows. An additional target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16). This additional target can be accomplished through actions and BMPs used to reduce storm water runoff.

25. Comment: Section 7. Load Allocation – references table 13, but I think 14 is the correct table. However the information is not included in that table either, (allocation for different precipitation intensities). Also, is there more to that paragraph? It just seems to stop.

25. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. EPA has revised and remodeled the watershed. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. The table to which the commentor refers is different in the EPA TMDL and the associated text and tables have been revised.

26. Comment: Same section. Please detail how the Load allocation goals will be met through the implementation of the Hinkson Creek Watershed Management Plan? That plan mainly addresses urban nonpoint storm water, while more than half the watershed is fringe, or agriculture. How will the nonpoint source load allocation be addressed for that portion of the watershed?

26. Response: The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water

recharge. Groundwater recharge results in increasing base flows. Additionally, another target for Hinkson Creek, is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16). This additional target can be accomplished through actions and BMPs used to reduce storm water runoff. How the targets are met through implementation will be determined by MDNR when it incorporates the TMDL into its WQM plan for implementation and monitoring.

The way rural nonpoint sources are usually addressed is to form a watershed group and get local citizens to come up with ideas and plans. A reasonable approach may be to see how much reduction is achieved through the urban nonpoint source reductions and then tackle the rural issues if more reduction is needed.

27. Comment: Section 11. Implementation – The statement that the MS4 permittees have agreed to reassess the Hinkson Creek bio-community is incorrect. This monitoring was offered by the Central Missouri Development Council, not the MS4s.

27. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. Section 11 is no longer the implementation section. Appendix E includes a supplemental implementation plan. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, the MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)).

28. Comment: There are at least three items in this TMDL that damage the credibility of the document, and may need to be evaluated to determine if they actually contribute to goals of the TMDL.

The first is Tables 6 and 7. The statement in Section 3.1.5 is that "Based on data collected during the Hinkson Creek water quality studies, Table 6 and 7 were constructed to list stressors and conditions found in Hinkson Creek main stem and selected storm water outfalls." If that is the case, then provide the data and examples to support those stressors and conditions. The table states that pollutants such as caffeine discarded by drinks in parking lots are a major pollutant in storm water. Does MDNR have data to back that up? Is it more likely that this pollutant is mainly found in Combined Sewer Overflows, or septic waste?

There are several items in Table 7 that have an asterisk, but there is not a note or reference, which may lead the reader to believe that these tables were not constructed by MDNR, but may come from another source, if that is the case, remove the previously mentioned statement, and cite the source.

28. Response: As stated in the TMDL Section 4.5.2, is based on data collected during the Hinkson Creek water quality studies, Tables 6 and 7 were constructed to list stressors and conditions found in the Hinkson Creek main stem and selected storm water outfalls. Additionally, Tables 6 and 7 include likely and/or possible sources of pollutants for each

stressor and condition. Also stated in the TMDL, to view the Executive Summaries from these or other studies in their entirety, go to www.dnr.mo.gov/env/esp/esp-wqm.htm.

As stated in the TMDL the asterisk denotes some specific examples, which were found in the studies.

29. Comment: Finally, section 11.1 Green Infrastructure. Who is the target audience for this TMDL?

29. Response: Hinkson Creek stakeholders: The audience is everyone who lives in the Hinkson Creek watershed or is affected by it.

30. Comment: Is it the intent of this document to educate the reader on all of the ways to address storm water, or just the MDNR preferred way?

30. Response: The TMDL is Hinkson Creek specific and neither attempts to educate the reader about all the ways to address storm water nor advocate a "MDNR preferred way," but simply is a TMDL with load allocations designed to facilitate Hinkson Creek meeting its beneficial uses. The implementation section is MDNR's recommendation describing the type of implementation that is sustainable and would benefit from a green infrastructure in the Hinkson Creek watershed.

31. Comment: The inclusion of this section [implementation] slants the document and should be removed.

31. Response: EPA retained MDNR's implementation section as an appendix to the EPA established TMDLfor informational purposes.

32. Comment: Define terms used in this document such as flow, volume, discharge, flow regime, stage, etc.

32. Response: Thank you for the suggestion. All terms are defined in the TMDL.

33. Comment: Grammar and technical writing.

33. Response: See Comments and Responses 42-46 below. (Grammar and technical writing comments have been addressed in the TMDL either through editing or because when EPA revised the TMDL the issue was corrected.)

34. Comment: Section 3.1.3 Third paragraph, first sentence. Subject/verb agreement – two permits were issued.

34. Response: Added comma for clarification: "…Department of Transportation, which was issued….."

35. Comment: Section 4.4, is the use of bullets and numbers needed?

35. Response: No, only letters as listed in Missouri's WQS.

36. Comment: Load allocation. Is there additional information on the last sentence? Or is that the end? There should be a period somewhere.

36. Response: Period added.

37. Comment: Check your tables and figures. There are several places within the document where the table and figure referenced is not the correct item.

37. Response: Tables and citations are corrected.

38. Comment: 3rd paragraph, page 1 – It is our belief that the stream is improving. Farming practices of the early 20th century removed most of the forest in the watershed which caused damage to the stream that it is still recovering from today. Many of the harmful effects said to stem from urban development today also came from farming practices then, including low baseflow as forests and prairies were replaced with pastures and row crops. The baseflow that is noted in the study to have been present in the late 1960s certainly contained a high percentage of effluent from water treatment operations effluent. Most of this effluent baseflow resulted from the delivery of piped, potable water to households in the watershed as opposed to rain water falling on the watershed. This effluent was known to be of poor quality which is why the city of Columbia has tried so hard to remove those facilities over the years. Since the middle of the last century, the city of Columbia has eliminated approximately 10 million gallons per day of poor quality treated effluent from Hinkson Creek. (This estimate is based upon the actual or design flows for 54 wastewater treatment plants that were eliminated.)

38. Response: TMDLs must target current WQS and designated beneficial uses for the water body (40 CFR § 130.7(c)(1)(ii)). Table A of Missouri's WQS (10 CSR 20-7.031), entitled "Criteria for Designated Uses" identifies the criteria associated with the "Protection of Aquatic Life" use designation. The TMDL offers historical biological community health information through the analysis of data in the document and in the background section and appendices; however, the focus of the TMDL is how the water body can attain its' current designated uses. EPA commends stakeholders in the watershed who have already taken steps to improve Hinkson Creek, but no data has been provided that would indicate Hinkson Creek is currently meeting its designated beneficial uses or that the water quality and biological health of Hinkson Creek has improved considerably since the 1960s. Please provide MDNR any new data not represented in the TMDL. Please keep in mind that data supplied needs to meet the minimum data quality level that MDNR considers appropriate for use in determining TMDL targets and modeling. Data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If the data provided by the commentor is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data. It's EPA hope that this TMDL will assist stakeholders and community groups in their effort to improve their watershed.

39. Comment: 3rd paragraph, page 2 – We are heartened to see something of a phased approach in the implementation, but it appears to us that only the WLA part of the TMDL has the force of law. This being the case, the implementation could potentially be thrown out by a permitting authority (whether EPA or MDNR), or by a lawsuit brought against the city, the MS4 or MDNR. Therefore, a phased approach needs to be in the regulatory portion of the TMDL. To expend a great deal of time, effort and money to reach a goal that is so poorly supported by scientific study seems to us unwise, not to say irresponsible.

39. Response: **EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. Per EPA regulations the state will incorporate the TMDL into its current WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). Additionally, if new data or information reveals that the TMDL requires revision, at any time MDNR may submit and EPA may approve a revised or modified TMDL.**

In a phased TMDL, EPA uses the best information available at the time to establish the TMDL at levels necessary to implement applicable WQS and to make the allocations to the pollution sources. However, the phased TMDL approach recognizes that additional data and information may be necessary to further validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the WQS. Using a phased TMDL approach does not include targeting LCs, WLAs or LA less than WQS. There is one overarching requirement for all TMDLs, they must meet all applicable WQS (40 CFR § 130.7(c)(1)(ii)). A TMDL must be written and modeled to meet WQS. The phased TMDL process begins with monitoring and adaptive implementation using any new data and information to reduce uncertainty and adjust implementation activities. Upon collection, the data and information would then be assessed and would form the basis for any appropriate future revision to the TMDLs, including any necessary adjustments to the load reductions or the allocation of the allowable load or both. As MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

40. Comment: Section 2.6 Last clause in the last sentence of the second paragraph: there is no assurance that attainment of WQSs will follow from this TMDL because the studies that are said to support it are inconclusive. The regulations do not seem to support the use of a surrogate for an unidentified pollutant. They support the use of a surrogate for a pollutant that has been identified but is difficult to measure or regulate, and for which a clear relationship between the surrogate and the pollutant(s) can be established. The regulations do support the use of a phased approach to TMDLs. The ability to use a phased approach appears to have been included in Federal regulations for just this situation; an inconclusive study coupled with the need to begin addressing the situation as soon as possible.

40. Response: Regarding the commentor's concern about whether the TMDL's implementation will achieve WQS: A hallmark of the TMDL process is adaptive management or implementation. This is an iterative process to achieve water quality goals.

Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions. A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP. There is one overarching requirement for all TMDLs, they must meet any applicable WQS (40 CFR § 130.7(c)(1)(ii)).

Regarding the commentor's concerns about regulations not seeming to support the use of a surrogate for an unidentified pollutant: The pollutant causing the impairments is listed as unknown on the 303(d) list, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure."(40 CFR § 130.2(i)). The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson Creek's warm-water aquatic life designated beneficial use also addresses chemicals and habitat. The TMDL is being done at this time to meet the requirements of the consent decree and it uses the best data available. Additionally, the margin of safety (MOS) in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality, such as other potential sources of toxic pollutants suggested by the commentor (40 CFR § 130.7(c)(1)).

EPA appreciates the commentor's information. Please keep in mind that data supplied needs to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. Data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If the data suggested (but not provided) by the commentor is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

41. Comment: Section 5, in this section runoff volume is said to be the surrogate, but later in the document the target given is flow. The two are related, but there are situations in which flow can be reduced although volume stays the same. This is the case with traditional dry detention, for instance. This inconsistency should be rectified. With respect to what this section says about volume, volume is not the only concern, timing is important too. We can envision a situation in which we do an excellent job of volume control and leave stream life starved for water during critical times of its life cycle.

41. Response: The TMDL specifically targets reducing storm water runoff (not volume) at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows. See the Response to Comment number 43 above.

42. Comment: Section 5.2, the commentor does not like the way the TMDL handles base flow.

42. Response: This comment is vague, however in an attempt to respond, EPA assumes that the commentor, like many other commentors, believes that the TMDL is calling for a reduction to base flow. The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows.

The analysis does not include lower flow settings (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

The surrogate relationship between urban storm water runoff and the toxic mix of pollutants impairing Hinkson's aquatic life use is explained in Section 4 of the TMDL. Specifically, please refer to Section 4.5.3 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and how Hinkson Creek's data links storm water to decreased aquatic life.

43. Comment: Section 5.3, first paragraph: here the target is said to be runoff reduction whereas later in this section it is said to be flow.

43. Response: The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows. Another target for the Hinkson Creek TMDL is for 100 percent of all sites surveyed to receive a fully supporting biological rating. This target can be accomplished through actions and BMPs used to reduce storm water runoff volume. EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

44. Comment: Section 5.3, second paragraph: why was the flow value of 0.3 percent chosen? In the Potash Brook TMDL, it was chosen because studies of the stream showed that was the flow that tended to move the sediment which was impairing the use. This was a clear link between the impaired use, the pollutant, and the TMDL. No such link is presented here.

44. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

45. Comment: Section 7, this section is speaking of runoff volume as the load allocation whereas Section 5 largely speaks of flow as the target.

45. Response: EPA has revised the previous Hinkson Creek TMDL that was public noticed by MDNR, and EPA has remodeled the watershed. In order to align with other TMDLs that target storm water runoff from impervious surfaces, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

46. Comment: The reference in Table 13 is incorrect.

46. Response: EPA has revised the previous Hinkson Creek TMDL that was public noticed by MDNR, and EPA has remodeled the watershed. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

47. Comment: Section 11. Sixth paragraph (inset): the one year average annual storm is not the Water Quality Storm. The Water Quality Storm for the Columbia area is 1.3 inches, which approximately represents the depth of 90 percent of all 24-hour rain events and thus a little more than 90% of the rainfall volume. The MS4 intended to say that focusing on the water quality storm for volume reduction could result in the modest volume reductions proposed for the one-year average annual stream flow at the official stream gauge. A basis of comparison still needs to be established for the one-year average annual flow measured at the stream gauge near Providence Road if this approach is used.

47. Response: EPA has revised the previous Hinkson Creek TMDL that was public noticed by MDNR, and EPA has remodeled the watershed. In order to align with other TMDLs that target storm water runoff from impervious surfaces, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

48. Comment: Section 11.3.1 The second sentence makes it seem as if grassy and/or vegetative swales are the only low impact development practice.

48. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

49. Comment: The failure of the Department to identify a pollutant causing the occasional impairment, which in reviewing the history of the TMDL program, is key to the process.

49. Response: Although this question was asked of MDNR and the listing of Hinkson Creek as impaired is beyond the scope of this public notice, EPA would like to take an opportunity to clarify for the commentor, due to the number of public comments asking why Hinkson was listed as impaired for "unspecified" or "unknown" pollutants. This response offers the regulatory explanation for Hinkson Creek's 303(d) listing.

EPA regulations require states to identify all waters still requiring TMDLs where standards are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1). While the CWA specifies that TMDLs shall be developed for pollutants, Section 303(d)(1) simply requires that certain waters be listed. The regulations do not exempt waters where the specific pollutant causing or expected to cause the exceedance of the applicable WQS is not known. Where either EPA's or MDNR's evaluation of data and/or information of the water body's designated use, numeric criteria, or narrative criteria for water bodies, classified and unclassified, indicate impairment of the natural biological community, the water body should be included on the state's 303(d) list. As such, listing for "unknown" or "unspecified" pollutants is a valid listing until such time as a specific pollutant or pollutants have been determined through additional monitoring and assessment before a TMDL is actually developed.

The pollutant causing the impairments is listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." (40 CFR § 130.2(i)). The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson Creek's warm-water aquatic life designated beneficial use also addresses chemicals and habitat.

Please see, Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the CWA, July 29, 2005 found online at http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf.

If a designated use is not supported and the segment is impaired or threatened, the fact that the specific pollutant is not known does not provide a basis for excluding the segment from Category 5. These segments must be listed unless the state can demonstrate that no pollutant(s) causes or contribute to the impairment. Prior to establishing a TMDL for such segments the pollutant causing the impairment must be identified. For the Hinkson Creek TMDLs, EPA has identified toxic conditions caused by multiple pollutants, carried by storm water runoff.

50. Comment: The methodology used to reach the conclusions contains many unsupportable assumptions and compares and simplifies data that is fundamentally different - particularly troubling considering the magnitude of the solution presented.

50. Response: The methodology in the TMDL adheres to EPA regulations and guidelines. The CWA supports the Hinkson TMDL because EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson's warm-water aquatic life designated beneficial use also addresses chemicals and habitat.

51. Comment: The failure of the Department to consider the potential permit implications of the draft Waste Load Allocation (WLA) in spite of repeated communication of this concern by the affected permit holders.

51. Response: EPA is not aware and therefore cannot provide feedback about communication between MDNR and Missouri permittees. However, please note that the conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

52. Comment: The lack of clarity in the document as to the Department's expectations of the affected parties, including the inappropriate use of flow and volume interchangeably, and the disconnect between the reported impairment and the point where the TMDL process ends.

52. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. EPA's TMDL clearly targets storm water runoff and also targets 100 percent of all sites surveyed must receive a fully supporting biological rating of 16 (or greater). The language in EPA's TMDL has been clarified in reference to flow and volume. Finally, there is no disconnect in the TMDL. Hinkson Creek must meet its beneficial uses as designated by Missouri. Although MDNR may revise or submit another TMDL for Hinkson Creek at a later date, Hinkson Creek must meet its current beneficial uses. See the Response to Comment number 49 above.

53. Comment: The failure of the Department to craft the TMDL as a phased approach as clearly applicable in these specific circumstances based on EPA documents provided to the Department by the University of Missouri-Columbia.

53. Response: EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. In a phased TMDL, EPA uses the best information available to establish the TMDL at levels necessary to implement applicable WQS and to make the allocations to the pollution sources. However, the phased TMDL

approach recognizes that additional data and information may be necessary to further validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the WQS. Using a phased TMDL approach does not include targeting LCs, WLAs or LA less than WQS. There is one overarching requirement for all TMDLs, they must meet all applicable WQS (40 CFR § 130.7(c)(1)(ii)). A TMDL must be written and modeled to meet WQS. MDNR will incorporate the TMDL in into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). The phased TMDL process begins with monitoring and adaptive implementation using any new data and information to reduce uncertainty and adjust implementation activities. Upon collection, the data and information would then be assessed and would form the basis for any appropriate future revision to the TMDLs, including any necessary adjustments to the load reductions or the allocation of the allowable load or both. MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

The conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions. A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP.

54. Comment: The failure of the department to coordinate companion programs working toward the same goal in the Water Pollution Control Branch instead of allowing each program to craft isolated solutions to the same problem.

54. Response: EPA commends the stakeholders efforts to improve the watershed. The stakeholders are urged to work together with MDNR as the TMDL is implemented. EPA is not familiar with communication between MDNR and stakeholders and cannot speak directly to the concern raised by the comment.

55. Comment: The stated driving force of the Department being the lawsuit against EPA that consequently compelled the Department to craft a document by December 31, 2009 instead of being driven to find a sound, workable solution for the People of Missouri.

55. Response: EPA recognizes that Hinkson Creek has been listed as impaired since 1998 and stakeholders of the watershed have been working to improve its water quality for many years. EPA is establishing the TMDL at this time to meet the deadlines of a Consent Decree whose plaintiffs are Hinkson Creek stakeholders. This push to develop a TMDL means that the unknown pollutant has been defined in a TMDL and an implementation plan has been written for the stakeholders. This TMDL is the first step in a process that

will greatly benefit all of Hinkson Creek's stakeholders. A hallmark of the TMDL process is adaptive management or implementation. This is an iterative process to achieve water quality goals and it is a phased process by its very nature.

Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions. A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP.

56. Comment: 3.A. Hydrologic Analysis and Interpretation Periods of record for comparative analyses appear to be inconsistent.

56. Response: The FDCs developed for this TMDL are useful for describing the hydrologic condition of Hinkson Creek and its watershed over a long period of time. The FDCs incorporate the full spectrum of stream flow conditions from very low to very high and any flow variability due to seasonal variations.

Because the FDC represents flow under all possible stream conditions, it has the advantage of avoiding the constraints associated with using a single-flow critical condition approach. Because the TMDL is applicable under all flow conditions, it is also applicable for all seasons. Climatic variation is therefore implicitly taken into account within the TMDL calculations. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)).

One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

57. Comment: 3.A.4. TMDL requirements are unclear.

57. Response: The TMDL targets are based on a reduction in storm water runoff at high flows. EPA uses storm water runoff as a surrogate to target a group of toxic pollutants transported from rural and in particular urban areas during runoff events. EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The 50.1 percent reduction was from the previous MDNR TMDL model and is no longer pertinent to the current TMDL. In the current EPA remodeled Hinkson

Creek TMDL, the water quality target ranges between the upper 3 and 5 percentiles of flow exceedances of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. There are many watershed management practices able to retain these pollutants. For example, National Research Council in 2009 published a report entitled *Urban Stormwater Management in the United States* (referenced in the TMDL page 18, 46 and 69). This report provides detailed information about the impacts of urbanization, associated management approaches and some innovative permitting strategies.

MDNR will incorporate the TMDL into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

58. Comment: 3.A.5. Volume reductions may cause increases of instream concentrations.

58. Response: The main goal of this TMDL is to restore and/or improve the biological condition impaired by a toxic mix of pollutants from both urban and rural areas during high flow events. The flow patterns that support biological community are defined by the reference streams selected from the EDU where Hinkson Creek is located. MDNR's biological studies have indicated that stream biota have been affected by a number of pollutants. Reducing storm water runoff can actually reduce these pollutants transported during runoff events. A FDC analysis does consider a full spectrum of flow conditions, including shallow groundwater, that may influence the fate and transport of the pollutants. In order to create favorable biological conditions, both urban and rural settings have been incorporated to estimate flow targets to control the pollutants using the imperviousness of land use.

59. Comment: 3.A.6. Reductions in runoff may not proportionally reduce unidentified pollutant loading.

59. Response: This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. It is expected that runoff from agricultural areas can transport excess sediments and agrochemicals and affect stream biota. Therefore, controlling runoff from the agricultural areas, which is one of the goals of this TMDL, can

definitely improve stream biological conditions. As for urban areas, reducing storm water can decrease a risk of numerous urban chemicals being delivered into stream channels.

60. Comment: 3.C.2. The return interval targeted by the TMDL does not establish a linkage with the beneficial use.

60. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). EPA regulations also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR § 130.7 (c)(1)(i)). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

61. Comment: 3.C.4. The biological community in Hinkson Creek may not be currently impaired.

61. Response: The listing of this water as impaired is beyond the scope of this TMDL public notice. However, the SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI< 16). The TMDL includes an additional target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously

improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC.

62. Comment (paraphrased): The commentor sees this TMDL as a precedent setting endeavor and using storm water runoff volume reduction as a relatively new approach. The commentor believes TMDLs should be limited to pollutant loading.

62. Response: EPA regulations require states to identify all waters still requiring TMDLs where standards are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1). While the CWA specifies that TMDLs shall be developed for pollutants, Section 303(d)(1) simply requires that certain waters be listed. The regulations do not exempt waters where the specific pollutant causing or expected to cause the exceedance of the applicable WQS is not known. Where either EPA's or MDNR's evaluation of data and/or information of the water body's designated use, numeric criteria, or narrative criteria for water bodies, classified and unclassified, indicate impairment of the natural biological community, then the water body should be included on the state's 303(d) list. As such, listing for "unknown" or "unspecified" pollutants is a valid listing until such time as a specific pollutant or pollutants have been determined through additional monitoring and assessment before a TMDL is actually developed.

The pollutant causing the impairments is listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." (40 CFR § 130.2(i)). The TMDL uses the surrogate measure of storm water runoff to represent the combination of toxic pollutants that contribute to the impairment of Hinkson Creek and has the added benefit of addressing the hydrologic changes to the creek that degrade the overall health of the biological communities.

While this is the first TMDL where EPA Region 7 and Missouri have targeted storm water runoff, more than 20 TMDLs using this approach have been developed in other states including Connecticut, Maine, Vermont and North Carolina. Hundreds of research studies have documented the connection between increased impervious area in urban areas and increases in storm water runoff. Storm water runoff has been shown to carry multiple pollutants that result in toxic water conditions and the runoff can result in physical changes to the stream channel. These changes negatively affect water quality and aquatic life. Locally collected data and studies support these national findings by showing a very low diversity of fish and aquatic invertebrates and the anticipated changes in storm water runoff patterns. EPA's regulations state that TMDLs can be expressed in several ways, including toxicity, which is a characteristic of one or more pollutants, or *other appropriate measure* (emphasis added; 40 CFR § 130.2(i)).

The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level

necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). EPA regulations also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR § 130.7 (c)(1)(i)). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

63. Comment: The proposed TMDL states, "A reduction in storm water runoff can be accomplished by storm water retention and enhanced infiltration and evapotranspiration." Implied is that the TMDL only addresses post-construction runoff impacts because these fate and transport process are not typically applied to construction storm water runoff controls.

63. Response: EPA thanks the commentor for the opportunity to clarify that these conclusions are not part of this TMDL. Neither the TMDL nor the implementation plan, requires specific BMP technology.

64. Comment: Page 11, section 2.6, the stated intent of the TMDL is to restore the stream's natural peak and base flow dynamics, and that the TMDL will restore habitat and reduce the release of toxic pollutants into Hinkson Creek. The relationship between urbanized areas and impervious area, and stream health is well established; however, the reasons and mechanisms related to water quality are not entirely understood. Accordingly, we have concerns that the statements in this section may not be accurate. For example, some stressors and pollutants listed in tables 6 and 7 represent materials used or disposed into the environment regardless of rainfall volume reduction, and will eventually enter waters of the state. One such example includes chloride, which is an environmental pollutant in runoff as well as in groundwater (via, infiltration). Chloride is better addressed by other source reduction BMPs unrelated to reducing runoff volume. Granted, volume reducing solutions may provide a detention effect that reduces the concentrated of chloride that discharges into the stream. However, employing volume reduction BMPs may be not be the most effective or least costly way to addressing pollutants like chloride. Additionally, post-construction volume reduction does not address all nonpoint source pollution issues, including control of erosion and sediment from land disturbance sites, which also significantly contribute to sedimentation and stream impairment. The TMDL discusses the impacts of sediment and sedimentation related to urbanization and runoff; however, sediment as a pollutant from construction sites was not evaluated, and this is concerning. With

so many unknowns related to whether post-construction runoff alone is the problem, it seems a tremendous burden has been placed on the MS4s to reduce runoff from already developed areas without knowing with certainty the problem.

64. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

The TMDL specifically targets reducing storm water runoff at the higher flows. By slowing and retaining storm water, infiltration aids ground water recharge which will ultimately assist in increasing base flows. Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. It is expected that runoff from agricultural areas can transport excess sediments and agrochemicals, and affect stream biota. Therefore, controlling runoff from the agricultural areas, which is one of the goals of this TMDL, can definitely improve stream biological conditions. As for urban areas, reducing storm water can decrease a risk of numerous urban chemicals being delivered into stream channels. For example, reducing storm water runoff would mean that less chloride, applied as winter road salt, would be transported to the streams. While, based on a number of MDNR's biological studies, chloride was not identified as the exclusive pollutant; overall, Hinkson Creek has had higher chloride levels than the reference streams. Samples for chlorides collected in Hinkson Creek exceeded Missouri's chronic chloride WQS of 230 milligrams per liter (mg/L) on December 13, 2005, when the measured concentration was 333 mg/L (Site 1007/4.3). As such, while this pollutant may contribute to aquatic life impairment in Hinkson Creek, there are insufficient occurrences of exceedance to identify this as the pollutant causing the impairment. Additionally, while measurements taken during winter from tributaries and drainages to Hinkson Creek exhibited elevated concentrations of chloride, analyses of other pollutants were not taken from these sites. Samples were also not taken from these sites outside the winter season when deicer would not be used. The high concentrations of chloride in this storm water runoff serve to reinforce the rationale of controlling storm water runoff and the loading of a myriad of pollutants typically found in high concentrations in urban runoff across all seasons. Based on all the available information provided by MDNR, EPA believes that using storm water runoff as a surrogate is an appropriate approach to abate unknown pollutants. This approach has

been included by EPA and many states in the development of their TMDLs to address unknown pollutants, and strongly supported by EPA.

Although sediment was not studied with respect to the impairment in Hinkson Creek, EPA encourages the state and other stakeholders to consider sediment in future study efforts. Missouri has the authority to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). This comment will be shared with MDNR. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). If new data becomes available that meets the MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time.

65. Comment: Page 23, Figure 5 and 6 show considerable variation in flow. Developing a resultant TMDL with legal implications for specific flow reductions to the tenth of a percent based on this data appears statistically unsupportable given the apparent variability of data.

65. Response: A comparison of 1967 and 2007 is to provide general information about flow change in relation to rapid urbanization in the recent years. This information was not used in deriving the TMDL targets. The TMDL targets are based on the reference streams over a 50-year flow record while the TMDL reduction goals are estimated based on the 2008-2010 flow data measured in Hinkson Creek.

Figure 5 provides a comparison between the entire flow record and the data from the last three years. As indicated, the averaged flows measured in the last three years were much higher than the averaged flow for the entire flow record. Hinkson Creek has been impaired for biology since the late 1990s. However, there is no flow data that covers the late 1990s to the present. Because of a lack of flow data, EPA used the 2008-2010 data to develop the TMDL targets for the high flow using an annualized FDC analysis. Figure 6 provides flow information in regard to stream stage (or height). From the two regressions presented in the figure, a bankfull discharge is determined. This bankfull discharge occurs at approximately 1 percent of flow exceedance. If a flow is greater than the bankfull discharge, then the stream would flood. Typical watershed managements are not aiming for flood control. As a result, these practices normally used in a watershed cannot control this type of storm water. Therefore, EPA believes that the TMDL targets primarily range at the upper 3-5 percentiles of flow exceedances of the high flow conditions to ensure there is a good stream biota protection during typical high flow conditions (see Figure 9 and Table 15).

As indicated above, the high flow conditions are targeted at the present time because of the limited flow data in the recent decade. As flow data continues to be measured at the Hinkson gage in the future, MDNR can then use a longer flow data to develop average management targets using the traditional FDC analysis and revise this TMDL.

66. Comment: Page 26, Figure 8 seems to indicate that the FDC for Hinkson Creek is in the range of the reference streams. As the TMDL document references, streams impaired by modifying the flow regime of urban runoff exhibit long periods of smaller base flows, with short periods of larger peak flows. However, the FDC suggests that Hinkson Creek's baseflow is typical of the reference streams. Thus, while Figure 4 indicates that baseflow has decreased, it doesn't appear that baseflow levels are unacceptable. This again seems to indicate that hydrologic changes resulting from post-construction urban runoff are not the only cause of the impairment.

66. Response: This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of water body identification (WBID) 1007 to determine the TMDL flow allocation.

The underlying assumption in the approach is that urban, more developed areas typically convey more storm water due to less infiltration while rural, less developed or agricultural areas generate less runoff because of fewer impervious surface areas. Therefore, the TMDL allocation process for the Hinkson Creek TMDL is simplified through the use of a land use-based allocation approach to distribute the overall percent reduction targets for the watershed.

The TMDL does not target base flow. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. The TMDL includes another target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows.

The analysis does not include lower flow settings (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

67. Comment: Page 27, the basis for selecting volume reduction goals (Figure 9 and Table 12) at the Q 0.3 percent flow occurrence is unclear, and MDNR should explain why Q 0.3 percent will return the stream to attainment. (Methods for assessing and developing ecological stream flows are available.) The TMDL states, "This (Q 0.3 percent) value approximates the one year return flow, based on the rank of the flow rate above which the probability of occurrence is -11365." It isn't clear what MDNR intends by this statement: specifically, does Q 0.3 percent correlate to the l-year 24-hour storm? If MDNR intends to apply the TMDL to BMP design using a 1-year 24-hour design storm (P=2.5inches), then this is concerning.

67. Response: EPA revised and remodeled the Hinkson Creek TMDL previously public noticed by MDNR. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In the current EPA remodeled Hinkson Creek TMDL, the flow water quality target ranges between the upper 3 and 5 percentiles of flow exceedances of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL targets were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams.

68. Comment: As the TMDL indicates on Page 33, precipitation events less than 1.5 inches are responsible for about 75 percent of runoff pollutant discharges and are key events when addressing mass pollutant discharges into urban streams. If a 1-year 24-hour design storm (P=2.5inches) rainfall is used to size BMPs, then roughly half of the BMP volume will have minimal impact on pollutant loads carried by storm water runoff. On the other hand, this would double BMP size (and construction costs). For many typical urban redevelopment sites, this will increase the development costs by $40,000- $100,000/acre.

68. Response: The commentor's first two sentences no longer apply. EPA revised and remodeled the Hinkson Creek TMDL previously public noticed by MDNR. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions.

In terms of the commentor's questions about implementation: TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to incorporate cost considerations. MDNR will incorporate the TMDL into Missouri's WQM plan for monitoring and implementation (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation (of which monitoring is a significant component). Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities.

69. Comment: Because application of volume reduction BMPs is best applied at the micro

scale (not regional scale), the use of distributing infiltrating BMPs of this size (P=2.5 inches) in an urban setting will be a limiting factor due to space constraints. The use of larger, more economical regional infiltration BMP approaches is not desirable (maintainable or effective) in our experience.

69. Response: EPA appreciates the commentor's viewpoint to consider smaller areas rather than the entire watershed. However, all potential sources must be considered in the TMDL and as such the entire area that drains into the impaired segments of Hinkson Creek is analyzed in the TMDL and included in the loading capacity (LC). All pollutants preventing or expected to prevent WQS attainment (and their sources) must be listed in the TMDL, per 40 CFR § 130.7(c)(1)(ii). The Hinkson Creek watershed is a small-to medium-sized watershed having only one USGS gage. A reference stream approach is used to link urbanization to the degraded water quality seen in Hinkson Creek. Refer to Appendices D and E for activities already occurring with the Hinkson Creek watershed. MDNR will incorporate the TMDL into Missouri's WQM plan for monitoring and implementation (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation (of which monitoring is a significant component). Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

70. Comment: Redevelopment of sites and the accompanying controls that are put in place to limit storm water load are an important component to long-term improvement of water quality in urban areas. If the rate of control implementation is slowed because of lack of redevelopment projects, then attainment may not be observed for a very long time (and/or the MS4 forced to spend valuable public dollars to subsidize redevelopment).

70. Response: TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)). However, EPA understands that stakeholders face economic challenges. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

EPA urges the commentor to work with MDNR's Financial Assistance Center to discuss grant, low-interest loans or other options that may be available to the city should wastewater system improvements be necessary. To reach MDNR's Financial Assistance Center, call (573) 751-1192 and ask for either Mr. Doug Garrett or Ms. Traci Newberry, or email Mr. Garrett at doug.garrett@dnr.mo.gov. You can also find them on the Web at

http://www.dnr.mo.gov/env/wpp/srf/index.html.

71. Comment: Because of the tremendous burden designing for Q 0.3 percent (and the 1-year 24 hour storm) could place on the MS4 and development community, it is critically important that MDNR have a vision for how the TMDL will be implemented through BMP design. The commentor supports a reasonable, balanced, scientifically defensible, iterative approach to setting goal and implementing actions to achieve results (emphasis added). As proposed, this TMDL implementation could lead to several unintended consequences, including technical and cost impracticability that ultimately drives development further from the urban core (generating other environmental and pollution problems). Additionally, a reality of this rule is that permittees must either raise revenues or cut services in other areas to cover the costs of carrying out these storm water rules (as part of their small MS4 permit).

71. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment (Q 0.3 percent...) made previously for the MDNR TMDL model is no longer pertinent to the current TMDL. With that said: MDNR will incorporate the TMDL into Missouri's WQM plan for monitoring and implementation (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation (of which monitoring is a significant component). Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

MDNR's Implementation Plan was included as a supplement in Appendix E in an effort to help stakeholders budget their resources and provide current information as to measures already underway in the watershed. Part of MDNR's Implementation Plan will include the criteria for satisfactory monitoring results.

72. Comment: This 303(d) listing and TMDL is concerning as it would appear to apply to many areas across the state that have over 10 percent impervious areas, shopping center parking lots, and other situations common with urbanized areas. It is not appropriate to evaluate and declare all urban streams as impaired based on impervious area alone, nor feasible to assess or even address all such streams statewide through the TMDL process.

72. Response: EPA appreciates this stakeholder's comment. This TMDL targets only Hinkson Creek and the specifics to Hinkson Creek's water quality impairment. In the Hinkson Creek TMDL, EPA is not making any broad judgments about other Missouri waters and whether they are impaired. The listing of Missouri urban streams as impaired based on impervious area is beyond the scope of this TMDL public notice and EPA is not "addressing all such streams statewide through the TMDL process."

73. Comment: Another concern the commentor has about the TMDL process as it relates to the broader perspective of storm water quality strategies. If watersheds with over 10 percent impervious area begin to degrade stream water quality, then waiting until the stream is included in the 303(d) list and then retrofitting controls provides a disincentive to development through the better site design practices like large conservation efforts that provide enhanced storm water management performance. Possibly a more appropriate approach for MDNR is to lower the applicability threshold to the MS4 permit, to ensure new development in high growth areas will be protective of the water environment. Efforts to expand regulation to currently unregulated sources of pollution, like agriculture, should also be considered. In summary, prevention is a more prudent approach than the difficult, costly efforts to restore a watershed through retrofitting. This approach would also level the playing field with regard to eliminating circumstances that promote sprawl.

73. Response: EPA appreciates the comment. EPA recognizes that preventative and protective measures are far more desirable that retrofitting. This is how the development community can make a huge difference in water quality throughout the state by taking proactive steps to improve and maintain water quality before a water is listed as impaired. With this said, the listing of waters as impaired is beyond the scope of this TMDL public notice.

74. Comment: As I interpret this and the previous version of the TMDL, the requirement for a reduction in volume of runoff has switched from being based on a single large design storm to an annual runoff volume reduction. I applaud this switch as it will result in both a cost savings and a better solution for our streams. It would be clearer if instead of saying the surrogate is "storm water runoff volume," the TMDL said "annual storm water runoff volume."

74. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

75. Comment: Page 4 – This page talks about how much more development has occurred, but it doesn't discuss how many more people are served by the new development. If the people who will be served by the added development don't live and conduct business in the Hinkson Creek basin, they will do so elsewhere and have negative impacts on other basins where there is relatively little regulation. Wouldn't it make more sense to look at allowable impact per person than maximum impact per area? This would result in some streams that don't meet their beneficial uses, but these would be offset by less impact to other streams that are closer to pristine.

75. Response: All water bodies are required to meet all Missouri WQS, numeric and narrative, including maintaining designated beneficial uses. All water bodies assessed as not meeting WQS will be listed as impaired on Missouri's 303(d) lists. A TMDL must be written and modeled to meet WQS. MDNR will incorporate the TMDL in into Missouri's

WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). EPA uses the best information available to establish the TMDL at levels necessary to implement applicable WQS and to make the allocations to the pollution sources. However, the phased TMDL approach recognizes that additional data and information may be necessary to further validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the WQS. Using a phased TMDL approach does not include targeting LCs, WLAs or load allocations (LAs) less than WQS. There is one overarching requirement for all TMDLs; they must meet all applicable WQS (40 CFR § 130.7(c)(1)(ii)). The phased TMDL process begins with monitoring and adaptive implementation using any new data and information to reduce uncertainty and adjust implementation activities. Upon collection, the data and information would then be assessed and would form the basis for any appropriate future revision to the TMDLs, including any necessary adjustments to the load reductions or the allocation of the allowable load or both. MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

76. Comment: Page 6, section 2.4 first paragraph – Why is the problem no longer listed as "unspecified pollution due to urban nonpoint runoff"? How was the unspecified pollution originally detected? Were there earlier biological assessments and if so, why aren't they discussed in this TMDL and compared to the more recent ones?

76. Response: Thank you for pointing out this sentence. We will update it to agree with the 2008 Missouri 303(d) Listing for unknown pollutants from urban runoff. Either way, the original listing was not based on any specific data or assessments. Rather it was listed based on citizen reports relating to all of the five points noted in the first paragraph in Section 2.4. Once listed, a water body cannot be removed, unless done in accordance with 40 CFR § 130.10(d)(7)(iv).

77. Comment: Page 9, fourth bullet – How many water samples were collected in total?

77. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. However, with regard to the Phase II study, it appears as if these statements refer to one sample each collected at sites 6 and 7 in the spring of 2005.

78. Comment: Sites 7 and 6 only: Hinkson Creek Metric Values and Scores, Spring 2005, Using Ozark/Moreau/Loutre Biocriteria Reference Database

Station #	TR	EPT Taxa	BI	SDI	SCI	Support
#7 Value	70	14	5.93	2.99		
#7 Score	3	5	5	5	18	Full
#6 Value	76	13	5.94	2.84		
#6 Score	5	3	5	5	18	Full

78. Response: The commentor is referring to Stations 6 and 7 which are the two sites that have six sampling events. Station 7 is located just below the city of Columbia's Sanitary Landfill while Station 6 is about 5 miles downstream from Station 7. Since Station 7 does not show any noticeable biological effects from the landfill, this station is used as a representative site for depicting the upstream rural condition. Station 6 represents an urbanized reach. Detailed biological information has been provided in several MDNR studies.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. Reducing storm water can decrease a risk of numerous urban chemicals being delivered into stream channels. The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR 130.2(i). EPA regulations also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach 40 CFR 130.7 (c)(1)(i). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) List, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

In addition to the data used in the TMDL, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)).

79. Comment: Page 11, section 2.6, third paragraph, third sentence – Should this say that the surrogate is annual volume of flow instead of peak flow following storm events?

79. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA

uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

80. Comment: Page 19, section 4.4 – The title says "Specific Criteria" but the section seems to talk about general criteria. Is this a typo?

80. Response: To address this comment the heading has been changed to "criteria."

81. Comment: Page 20, Section 4.5, third paragraph – If only 93 percent of the reference stream samples are supporting, why you are requiring 100 percent for Hinkson. Maybe 100 percent isn't possible.

81. Response: The TMDL uses the surrogate measure of storm water runoff to represent the combination of toxic pollutants that contribute to the impairment of Hinkson Creek and has the added benefit of addressing the hydrologic changes to the stream that degrade the overall health of the biological communities.

EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR § 130.7 (c)(1) (i)). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS.

The CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL.

The SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI< 16). The TMDL includes an additional target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC.

82. Comment: Page 21 section 5.1 – Why does the TMDL show flow duration curves from only two four month periods of time? Given all the variables that go into determining the volume of runoff that occurs from a given depth of rainfall, it doesn't seem that 4 months of data

would be statistically significant. What were the rainfall distributions during the storms? What were the antecedent moisture conditions? Appendix C doesn't list the rainfall events during the April-July 1967 time period so I can't look at the relative durations of the storms in the two periods or how much rain occurred in the month prior. However, the average duration of the storms listed in Appendix C for April-July 2007 is 53.3 hours whereas the average duration of all storms listed in Appendix C is 99.7 hours. So, it seems possible that the storms were more intense in the 2007 time period.

82. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

A comparison of 1967 and 2007 is to provide general information about flow change in relation to rapid urbanization in the recent years. This information was not used in deriving the TMDL targets. The TMDL targets are based on the reference streams over a 50 year flow record while the TMDL reduction goals are estimated based on the 2008-2010 flow data measured in Hinkson Creek.

83. Comment: USGS Water Resources Investigation Report 95-4231 lists average main channel slopes for 4 of these 5 streams (see table below). Hinkson Creek is significantly steeper than at least 3 of the four attainment streams. Likewise, when USGS rural peak flow regression equations are applied to these watersheds they predict that Hinkson, if it wasn't urbanized, would produce twice the peak flow rate per square mile for the 2 year storm that the other basins would. My point is that a rural Hinkson Creek would be expected to be naturally flashier than any of these three reference streams. I suspect that if someone were to calculate the Main Channel Slope for the Middle Fork of the Salt River and apply the USGS regression equations they would find that it is not predicted to be as naturally flashy as Hinkson either.

83. Response: Hinkson is a third order stream. Based on the most updated NHD Plus data, its slope is 4.6 feet per mile (ft/mile). The estimated 2-year peak flow based on the Hinkson flow data is 30 cubic feet per second (cfs) per square mile (cfs/square mile), suggesting the slope is about 3 ft/mile. The flow duration curve derived from the reference streams that were selected from the same ecoregion where Hinkson Creek is located is an appropriate method used to determine the TMDL targets for the Hinkson Creek. In addition, the current Hinkson Creek TMDL does not use peak flows to determine the TMDL goals. This TMDL uses the entire flow values for data analysis, and the 95 percent confidence interval to target the high flow conditions observed in the recent years.

84. Comment: Page 27, Table 12. The percent reduction in flow that would be required to match the Middle Fork Salt River is only 31.9 percent. So a 50.5 percent reduction is likely to be at least 19.6 percent more reduction than is needed to fully support. We are not sure that the Middle Fork Salt River represents the threshold of impairment. For all we know, it could possibly handle more runoff and still fully support the use. But the other rivers are likely to

exceed the threshold since they have significantly less volume of runoff. So, by using the median of these rivers we would be clearly exceeding what is needed to match another stream that is supporting.

84. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

85. Comment: Page 30, Table 15 – Should this table be clarified by adding a heading to the last column stating that the percentages are of the total runoff from the entire basin? These percentages could be incorrectly interpreted as being a 24 percent reduction of the water from the individual land use. It would probably be clearer if you added another column listing what percentage of the current runoff from each land use category must be reduced (about 50.5 percent from each).

85. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

86. Comment: Page 30, third paragraph under "6.", first sentence – Is the listed table number correct?

86. Response: EPA thanks the stakeholder for their comment. Language in the TMDL has been revised from the MDNR public noticed TMDL which has resulted in the issue being addressed. The reference to the table number has been corrected.

87. Comment: Page 30, first sentence under "7." – there appears to be an error with regards to which table is being referenced, however, none of the tables provide "precipitation intensities." Should this be precipitation depths?

87. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. EPA has revised and remodeled the watershed. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. The table to which the commentor refers is different in the EPA TMDL and the associated text and tables have been revised.

88. Comment: Page 30, section "7." – It is hard to imagine how the Hinkson Creek Watershed Management Plan is going to significantly reduce the runoff from predominantly agricultural areas when agricultural areas are exempt from the CWA. Even if all the water from

"open areas" was captured, it wouldn't make much of a dent in the volume of runoff from agricultural areas.

88. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID 1007 to determine the TMDL flow allocation.

The underlying assumption in the approach is that urban, more developed areas typically convey more storm water due to less infiltration while rural, less developed or agricultural areas generate less runoff because of fewer impervious surface areas. With appropriate classification of land use within the watershed, developed/urbanized areas can be included in the WLA portion of the TMDL and lesser developed areas can be included in the LA portion. This approach is reasonable as urban areas tend to be dominated by point source conveyances of storm water, while rural areas are predominantly drained by surface flows. Therefore, the TMDL allocation process for the Hinkson Creek TMDL is simplified through the use of a land use based allocation approach to distribute the overall percent reduction targets for the watershed. In urban areas, reducing storm water can decrease the risk of numerous urban chemicals being delivered into stream channels.

EPA did include MDNR's implementation plan as Appendix E to the TMDL as an information tool for stakeholders. The Hinkson Creek Watershed Management Plan is only addressing urban nonpoint source. TMDLs are required to consider and address nonpoint source runoff. Typically, this is done through the organization of watershed groups to help plan and implement improvement strategies. The TMDL is not intended to require that all runoff be captured, only that it be slowed down or, otherwise, held back temporarily or restrained to enable it to infiltrate and/or runoff more slowly. This will enable the water to be filtered/cleaned to varying extents and will also reduce the strength of runoff, in itself a destructive force.

89. Comment: Page 30, last sentence – This appears to require that new developments can't produce any additional runoff. If that is the intent, it needs to be clear for what storms this applies. The way this is worded it seems as if the community can do some calculations that will prevent added runoff. It will really be the developers who will have to physically prevent added runoff.

89. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. EPA has revised and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

90. Comment: Page 31, Section 8. Do we really need to provide a 20 percent MOS?

90. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. The MOS is implicit based on conservative assumptions applied while modeling. The TMDL flow values were determined as the percentage difference between the Hinkson Creek flow rate and the 95 percent confidence limit of flow values for the reference streams to target the high flow conditions between 2008 and 2010. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

91. Comment: Page 33, Third paragraph –The water quality storm is 1.3 inches and represents the depth of rainfall for which 90 percent of storms are smaller. I think the TMDL should include a definition of the "one-year average annual storm"? It doesn't sound like the sort of thing that would be equivalent to the water quality storm. The 24-hour 1-year return period storm in this area is 3 inches. The 1-hour 1-year return period storm in this area is about 1.2 inches. The water quality storm doesn't have a duration or rainfall distribution associated with it. Different durations and distributions of 1.3 inch storms will produce different volumes of runoff. So, it is not clear how we will measure the runoff from the water quality storm at the USGS gage. I can imagine how we might measure the runoff of some particular 1.3 inch storm with a given duration and distribution if we can get it to happen but what would we compare it to see if we've achieved the reduction? The equation presented on page 22 might be used, but it has an R-squared value of only 0.37 so I don't think it is appropriate.

91. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

92. Comment: What happens after the five year period? How do the 1 percent and 4 percent reductions mentioned in this paragraph relate to the 50.5 percent reduction discussed earlier?

92. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

93. Comment: USE OF THE 0.3 PERCENT HIGH FLOW VALUE TO SET TARGET REDUCTIONS. The major technical concern with the draft Hinkson Creek TMDL is use of the 0.3 percent high flow value (HFV) to compare Hinkson to four attainment streams/rivers. This comparison is the cornerstone in setting the target reduction of flow by 50.5 percent, a flow reduction that seems excessive relative to the level of impairment measured in Hinkson Creek. More importantly, use of the 0.3 percent HFV renders the attempted comparison of stream systems moot, as it fails to evaluate the relation between stream flow and watershed characteristics.

93. Response: Please note that EPA EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In this EPA TMDL, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously, for the MDNR TMDL model is no longer pertinent to the current TMDL.

94. Comment: The flow duration curves (Figure 8 in the TMDL), when taken as a whole, represent discharge over the range of conditions and allow for comparisons of how discharge is influenced by watershed characteristics. The ends of the curves reflecting extreme discharge values relating to unusually intense storm events (left side of curve) or extended dry periods (right side of curve). Comparisons made at the ends of the curves are greatly influenced by out of the ordinary meteorological events, and thus do a poor job of reflecting the differences in discharge that actually relate to watershed characteristics. The 0.3 percent HFV may relate to channel forming events, but that is a separate issue from nonpoint pollution. Because the TMDL is using discharge as a surrogate for nonpoint source pollution (Table 7 of TMDL), habitat loss and sedimentation (factors influenced by any runoff event), the comparison of flow duration curves should not be strictly tied to the 0.3 percent HFV.

94. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

95. Comment: Table 1 contains information concerning the four highest discharge values from Hinkson Creek during the period represented in Figures 8 and 9 of the TMDL. If the whole of the stated period of March 2007 to October 2009 (Table 10 in TMDL) were included in the analysis, the Hinkson data shown in Figure 8 represent discharge values from 975 days. The vertical line in Figure 9 of the TMDL that represents the 0.3 percent HFV would therefore be placed along the curve at a point between the second and third highest normalized discharge values.

95. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model is no longer pertinent to the current TMDL.

96. Comment: As shown in Table 1, the precipitation events that relate to the most extreme discharge values in Hinkson Creek are well above what would be considered normal. There is no doubt that the impervious surfaces within Columbia had an influence on how much runoff reached Hinkson Creek during these events, but the influence of urbanization is obscured by the extremity of the precipitation events.

96. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow

exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

EPA believes that the revised methodology described in the TMDL is technically defensible. In the report for *Urban Storm water Management in the United States,* the National Research Council suggests: "A more straightforward way to regulate storm water contributions to water body impairment would be to use flow or a surrogate, like impervious cover, as a measure of storm water loading . . . Efforts to reduce storm water flow will automatically achieve reductions in pollutant loading. Moreover, flow is itself responsible for additional erosion and sedimentation that adversely impacts surface water quality" (NRC, 2009). This storm water-surrogate coupling with a reference stream approach has been widely used by many states to develop TMDLs. On November 12, 2010, EPA headquarters released a revised memo indicating that using a surrogate pollutant parameter such as storm water or impervious cover was an appropriate method to establish water quality standards through reducing the toxicity caused by a number of pollutants transported during runoff events.
http://www.epa.gov/npdes/pubs/establishingtmdlwla_revision.pdf

The revised TMDL specifically targets reducing storm water runoff at the higher flows. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. By slowing and retaining storm water, infiltration aids ground water recharge which will ultimately assist in increasing base flows.

National studies (CWP and WERF, as cited in the TMDL) have documented the connection between increased impervious area in urban areas to increases in storm water runoff which contribute numerous pollutants and changes in hydrology with increased magnitude, duration and frequency of storm water. These resulting changes are known to negatively affect water quality and aquatic life.

As stated in the TMDL, the CWP study reviewed hundreds of research studies. The combined review and synthesis of information in these studies led CWP to conclude that impervious cover as low as 10 percent can be related to aquatic life impairments and worsens as more areas within the watershed are developed.

Reducing the frequency and magnitude of high flows will encourage infiltration so that the stream hydrology more closely matches pre-development hydrology as measured in the reference stream watersheds. In turn this will reduce the amount of pollutants carried by storm water into Hinkson Creek. Based upon the analysis by national and local studies, it is reasonable that addressing these negative impacts will result in better habitat and protection of aquatic life and natural biological aquatic communities.

The relationship between storm water runoff and the toxic mix of pollutants impairing Hinkson's warm-water aquatic life designated use also addresses other chemical pollutants and habitat degradation. Specifically, please refer to Section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and specifically how Hinkson Creek's data links storm water to decreased aquatic life.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions.

Based on the MDNR's biological studies, urban areas have been identified as the potential source contributing pollutants to Hinkson Creek and these pollutants have impaired the stream's biological community. However, the concentrations of all the pollutants are below the state's WQS. To address the synergic biological effect of these pollutants, EPA uses storm water runoff as a surrogate to target all the potential pollutants transported during runoff events so that the favorable biological condition can be restored or created. The TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. To create the baseline of biological conditions, several reference streams were selected and normalized to reduce hydrologic variations caused by many environmental factors such as soils and watershed size. TMDL targets were determined using the limited flow data and then allocated to both rural and urban areas based on their associated surface imperviousness.

The use of a surrogate parameter is permissible under the CWA Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure, " per 40 CFR § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR 130.7 (c)(1)(i)). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

97. Comment: The highest discharge values for the four attainment streams/rivers are shown in Table 2. Again, the very highest of discharges were related to above normal precipitation events or extended periods of rain. The exceptions would be the high discharge values for the North River on March 31, 1998 and January 22, 1999. Both of these peak discharges occurred with only 1.2 inches of rainfall. It is possible that the ground was frozen during both of these events, which would greatly reduce, if not eliminate, infiltration into the soil.

97. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

98. Comment: Use of the 0.3 percent HFV does not truly compare the systems in a way that provides any measure of how the watersheds influence discharge. Instead, the comparison in the TMDL is, in essence, a comparison of individual rain events (i.e., how did discharge in Hinkson Creek after 7inches of rain in a week's time compare to discharge in Big Creek after 9.65 inches of rain in a four day period). Unless MDNR feels that the failure of Hinkson Creek to meet WQSs is related only to the most extreme of flows (which would suggest that nonpoint source pollution is not an issue 99.7 percent of the time) this comparison is seriously flawed and does not achieve what it sets out to do.

98. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

99. Comment: Figure 8 in the TMDL represents around 4260 daily discharge values from

the five streams. Collectively, the data provide a "big picture" comparison that could be useful in setting target reductions in Hinkson Creek. Choice of the 0.3 percent HFV as the only point of comparison effectively ignores 99.7 percent of the data in Figure 8. To make a useful comparison using the flow duration curves would require, at a minimum, for the comparison to be made at a point on the curve that represents discharge relating to more typical precipitation events. It may be worth considering comparisons at multiple points along the curves to better encompass the relationship between discharge and watershed characteristics.

99. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL.

100. Comment: The four attainment streams/rivers are all bigger than Hinkson Creek (based on average discharge) and have substantially larger watersheds (4.5 to 8.9 times larger). Smaller streams tend to be flashy compared to larger systems, with water levels coming up and going back down faster than observed in larger rivers. This difference in response can be observed when comparing Table 1 and 2 (above). Hinkson Creek and the North River are the only two streams that had peak discharge values that related to individual precipitation events. The other three rivers had multiple high discharge values on consecutive days, indicating that the peak flows were spread out over time after a substantial precipitation event. The differences in stream and watershed size among these systems needs to be considered when comparisons of flow duration curves are made.

100. Response: EPA appreciates the thought put into the commentor's questions; however, looking at individual reference stream hydrological conditions as indicated by the commentor is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major wastewater treatment facilities (WWTFs). The Hinkson Creek TMDL addressed hydrologic variations using reference streams selected from either an ecoregion or an ecological drainage unit (EDU). To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to 1) minimize the hydrologic flow variations occurring in each reference stream and 2) generalize a typical reference stream condition applicable to the target watersheds. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach specifically targets the existing high flow condition that may

transport a large amount of pollutants and cause a negative effect on the biological condition of the stream.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID 1007 to determine the TMDL flow allocation.

EPA believes that the methodology described in Section 4.6.2 of the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA. The development of targets follows MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf Reference streams from the same EDU were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation.

The reference streams were selected based the availability of biological sites that can best describe the conditions of the Hinkson Creek watershed. The selected watersheds have some degree of urban development and have also similar land use and soil conditions since they were chosen from the same ecoregion or EDU where Hinkson Creek is located. These streams were then normalized because of variations of watershed size to obtain a representative hydrologic condition. The Hinkson Creek TMDL uses annualized flow duration to target the limited local flow conditions and also uses bankfull discharge to exclude extreme flow conditions that are beyond the protection goals defined by the conventional watershed management practices. EPA believes that focusing on the upper 3-5 percentiles of flow exceedances for the high flow conditions will curfew a large amount of pollutants transported in the storm water runoff and create a better biological condition for Hinkson Creek.

101. Comments: Out of the 34 SCI scores recorded for Hinkson Creek (Table 3 in TMDL), 20 resulted in values that indicate the creek is fully supporting aquatic life (score of 16-20), with the remainder registering scores indicative of partially supporting aquatic life (10-14). Even if the two most up-stream sites are excluded from the analysis, 50 percent of the SCI scores are still at or above a value of 16. An average of the 26 scores from these sites results in a value of 14.8

(15.3 when up-stream scores are included). It would seem that Hinkson Creek is not meeting criteria, but is missing it by a fairly small margin. Does MDNR truly feel that the suggested reduction of discharge by 50.5 percent is a fitting fix to what would seem to be a minor problem?

101. Response: Please note that EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL. The 50.1 percent reduction was only included in the previously public noticed MDNR TMDL model and is no longer pertinent to the TMDL public noticed by EPA. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. However, the commentor should keep in mind that it's MDNR that will implement the TMDL when it's incorporated into Missouri's WQM Plan (40 CFR § 130.7(d)(2) and through the iterative process of monitoring and implementation the WQS for Hinkson Creek will be achieved.

Regarding the commentor's observation that some of the SCI scores are above 16: A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI< 16). The TMDL includes an additional target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)).

102. Comment: Figure 4 in the TMDL compares flow duration curves from four month periods in 1967 and 2007. According to the USGS website containing data from the Hinkson Creek gauging station, there are a total of 23 years in which discharge data is available for the April-July period (and 19 years in which the full year of data are available). Given the abundance of information, why does the TMDL only compare data from two four month periods?

102. Response: Flow response to precipitation in Hinkson Creek has increased markedly over time. The commentor is directed to Section 4.5 of the TMDL which discusses and presents data from 1967 to 2010. Specifically, please refer to Table 9: *Comparison of Precipitation and Flow for April 1 – July 31*. Data were based on the Sanborn Field

(University of Missouri – Columbia [UMC]) Weather Station and United States Geological Survey (USGS) gage. A comparison of flow response to precipitation between 1967 and 2007 shows that, despite a smaller amount of rainfall in the latter year, average daily flow was more than 80 percent higher. Another example is in Table 10 of the TMDL, we see that peak flow increased from 7.56 cubic feet per second per square mile (cfs/sq mile) in 1967 to 73.78 cfs/sq mile in 2010. In addition to higher flows in the stream from storm water, increased impermeable surface area within the watershed results in reduced base flows. This is illustrated in the FDCs for these same two time periods in Figure 4 of the TMDL. The right half of the graph gives an indication that base flow in 2007 is consistently lower than in 1967 and the left half indicates the opposite effect for higher flows.

103. Comment: Figure 6 in the TMDL seems to indicate that discharge has only increased minimally during the fall, winter and spring seasons, and substantially during the summer season when data from the 1970s, 1980s and 2000s were compared. Given that urbanization and its impacts on watershed runoff are year-round phenomena, what is the explanation for the differences among seasons? Does this graph suggest that the city only really needs to focus on runoff during the summer because changes in discharge have been nominal during the other seasons?

103. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. EPA has revised and remodeled the watershed. Figure 6 is a graphical approach to determine the bankfull discharge using all available field flow measurements. The revised TMDL considers all of the flow data and has determined the targets that can reduce pollutants being transported in storm water runoff that occurs in all seasons.

104. Comment: In section 5.3 of the TMDL it is stated that the attainment streams are in watersheds that are within an order of magnitude of the size of the Hinkson Creek watershed. Given that these streams/rivers have watersheds that are between 4.5 and 8.9 times larger than the Hinkson Creek watershed, are there any assumptions that MDNR is making about how these systems compare? If so, what are they? Were there any streams that are more similar to the Hinkson in size that have both discharge and invertebrate data?

104. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL.

EPA appreciates the thought put into the commentor's questions; however, looking at individual reference stream hydrological conditions as indicated by the commentor is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major WWTFs. The Hinkson Creek TMDL addressed hydrologic variations using reference streams selected from either

an ecoregion or an EDU. To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to 1) minimize the hydrologic flow variations occurring in each reference stream and 2) generalize a typical reference stream condition applicable to the target watersheds. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach specifically targets the existing high flow condition that may transport a large amount of pollutants and cause a negative effect on the biological condition of the stream.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID 1007 to determine the TMDL flow allocation.

The development of storm water runoff targets using reference streams located within the same EDU follows MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf Reference streams from the same EDU were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation. To estimate the reference conditions of Hinkson Creek, the synthetic (or representative) flow from the reference streams was derived from the average values of all the individual log transformed flow values (or median of the individual reference streams). Prior to the synthetic flow being derived from the average, all of the flows are normalized based on their respective watershed sizes.

The reference streams were selected based the availability of biological sites that can best describe the conditions of the Hinkson Creek watershed. The selected watersheds have some degree of urban development and have also similar land use and soil conditions since they were chosen from the same ecoregion or EDU where Hinkson Creek is located. These streams were then normalized because of variations of watershed size to obtain a representative hydrologic condition. Potash Brook TMDL uses a similar approach to select the appropriate attainment streams (e.g., La Platte River). However, Hinkson Creek TMDL uses a different analytical approach to derive the TMDL target. The Hinkson

Creek TMDL uses annualized flow duration to target the limited local flow conditions and also uses bankfull discharge to exclude extreme flow conditions that are beyond the protection goals defined by the conventional watershed management practices. EPA believes that focusing on the upper 3-5 percentiles of flow exceedances for the high flow conditions will curfew a large amount of pollutants transported in the storm water runoff and create a better biological condition for Hinkson Creek.

105. Comment: What were the SCI scores for the attainment streams?

105. Response: The SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI< 16). The TMDL includes an additional target that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC.

106. Comment: In section 5.5 of the TMDL it is stated that forest and wetland land use is not expected to generate significant runoff. Given that these land covers account for 29.4 percent of the watershed (Table 13 in TMDL), and the measure of success for the TMDL is a reduction in stream discharge, shouldn't the runoff from these land uses be taken into account? I realize that the reduction in runoff will be made on the other land cover types, but discounting the contribution of 29 percent of the watershed to the creek's flow seems inappropriate. This would seem especially true given that the target reduction was based on discharges that occurred in conjunction with extreme rain events. For example, a total of 5.32 inches of rain fell within a 24 hour period on October 8, 2009. Does the MDNR truly feel that there was no runoff from this precipitation event from the forested areas in the watershed?

106. Response: EPA thanks the commentor for their interest in Hinkson Creek. Forest and wetland areas, though considered, were not identified to have significant impact on the impairment. Furthermore, rainfall of 5.32 inches would be generating an over-bankfull storm water condition that cannot be controlled by a typical watershed management practice. Thus, this revised TMDL targets the upper 3-5 percentiles of flow exceedances for the high flow conditions. The commentor is referred to the TMDL document for more detailed information.

107. Comment: If the city is capable of meeting the goal of a 50 percent reduction in discharge during extreme rain events (5 inches in a 24-hour period; 7 inches within a week) it will take a substantial amount of capacity in terms of rain barrels, rain gardens, detention ponds, etc. If these infrastructures are in place to catch this large amount of runoff from making it to the stream, what is going to happen when a normal rains occurs? If we have the capacity to hold the runoff from 2-3 inches of rain, will the water from a half inch rain ever make it to the stream?

107. Response: Please note that this TMDL, as public noticed, is not identical to the previously public noticed MDNR version. EPA has revised and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The 50.1 percent reduction was only included in the previously public noticed MDNR TMDL model and is no longer pertinent to the TMDL public noticed by EPA. In this TMDL public noticed by EPA, the flow water quality target ranges between the upper 3-5 percentiles of flow exceedances for the high flow conditions of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. However, the commentor should keep in mind that it's MDNR that will implement the TMDL when it's incorporated into Missouri's WQM Plan (40 CFR §130.7(d)(2)) and through the iterative process of monitoring and implementation the WQS for Hinkson Creek will be achieved.

108. Comment: In section 5.1 of the TMDL it is noted that the average daily flow during April-July 2007 was 80 percent higher than the average flow April-July 1967. Were daily flow values normally distributed during the four month periods in each of these two years? Would geometric mean values be a better descriptive statistic than arithmetic means in this situation? What was the difference in geometric mean daily flow values for these two periods?

108. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. The comment, made previously for the MDNR TMDL model, is no longer pertinent to the current TMDL. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. More specifically, the entire water-year flow data between 2008 and 2010 was analyzed to derive the TMDL targets.

109. Comment: Flow data in Figure 8 were normalized for watershed size and yearly precipitation. Could MDNR expand on how these data transformations were conducted?

109. Response: To better answer the commentor's question, we start with the understanding that Figure 8 summarizes a comparison of the synthetic flow and the four selected streams during the hydrologic period from 1961-2010. To generate representative flows for the four selected streams, synthetic flow was calculated by averaging the log transformation of the daily streamflow values. In Table 12 the commentor can find the annual precipitation data associated with each of these individual streams, which describes the general hydrologic conditions of the four reference streams found in Figure 8.

110. Comment: 3.C.12 Excessive chloride levels should be evaluated as a primary stressor and

major contributor to the potential aquatic life impairment. MDNR did not consider chloride as a significant potential stressor during TMDL development. *We strongly recommend that MDNR conduct additional studies to evaluate potential impacts from excessive chloride levels and consider this constituent as a primary stressor within the Hinkson Creek TMDL.*

110. Response: EPA encourages the state and other stakeholders to consider chloride in future study efforts. Missouri has the authority to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, the MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). Reducing storm water runoff would mean that less chloride, as applied as winter road salt, would be transported to the streams. While, based on a number of MDNR's biological studies, chloride was not identified as the exclusive pollutant; overall, Hinkson Creek has had higher chloride levels than the reference streams. Samples for chlorides collected in Hinkson Creek exceeded Missouri's chronic chloride WQS of 230 mg/L on December 13, 2005, when the measured concentration was 333 mg/L (Site 1007/4.3). As such, while this pollutant may contribute to aquatic life impairment in Hinkson Creek, there are insufficient occurrences of exceedance to identify this as the pollutant causing the impairment. Additionally, while measurements taken during winter from tributaries and drainages to Hinkson Creek exhibited elevated concentrations of chloride, analyses of other pollutants were not taken from these sites. Samples were also not taken from these sites outside the winter season when deicer would not be used. The high concentrations of chloride in this storm water runoff serve to reinforce the rationale of controlling storm water runoff and the loading of a myriad of pollutants typically found in high concentrations in urban runoff across all seasons.

EPA encourages the collection of additional data, in fact one of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available, MDNR may consider submitting a revised or modified TMDL for this water at any time.

LIST OF COMMENTORS

Ken Midkiff, Missouri Clean Water Campaign, Missouri
Diane Oerly, Show-Me Clean Streams, Columbia, Missouri
Darren Ridenhour, THF Grindstone Development, L.L.C., St. Louis, Missouri
John Hoke, Missouri Department of Natural Resources, Jefferson City, Missouri
Hank Ottinger, Sierra Club Osage Group, Columbia/Jefferson City, Missouri
Priscilla Stotts, Tebbetts, Missouri
Bob McDavid, city of Columbia, Columbia, Missouri
John Holmes, Allstate Consultants, LLC, Columbia, Missouri
Karen Miller, Boone County Commission, Columbia, Missouri
Jacquelyn Jones, University of Missouri-Columbia, Columbia, Missouri
Todd Wagner, city of Springfield, Springfield, Missouri

END SUMMARY OF COMMENTS AND RESPONSES, PART II

Hinkson Creek in Missouri
Draft Total Maximum Daily Load (TMDL)
SUMMARY OF COMMENTS AND RESPONSES
Part III of III

Prepared by the Environmental Protection Agency (EPA), Region 7
Water, Wetlands and Pesticides Division
January 2011

INTRODUCTION

EPA public noticed a draft TMDL for Hinkson Creek (water body identification MO_1007 and MO_1008) from October 28, 2010 to December 1, 2010. EPA is establishing this TMDL to meet the obligations of the 2001 Consent Decree, *American Canoe Association, et al. v. EPA*, Consolidated Case No. 98-1195-CV-W-SOW, consolidated with 98-4282-CV-W-SOW (Consent Decree). This document summarizes and paraphrases comments received, EPA's response to comments and changes made to the final TMDL where appropriate. Included is a list of all commentors.

RESPONSE TO COMMENTS (EPA responses in bold)

1. Comment: Municipal separate storm sewer system (MS4) permittee has concerns regarding implementation of reductions found in the Hinkson Creek TMDL.

1. Response: EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. Per EPA regulations, the state will incorporate the TMDL into its current Water Quality Management (WQM) plan for implementation (40 Code of Federal Regulations [CFR] § 130.7(d)(2)). Additionally, if new data or information reveals that the TMDL requires revision, the Missouri Department of Natural Resources (MDNR) may submit and EPA may approve a revised or modified TMDL.

The conversion of wasteload allocations (WLA) to permit limits is done by MDNR's national pollutant discharge elimination system (NPDES) Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

2. Comment: The draft TMDL does not establish causality between runoff and beneficial use attainment in either Hinkson Creek or attainment streams. Information presented in the TMDL does not provide any assurance that benthic macroinvertebrate metrics will respond to changes in storm water runoff.

2. Response: This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow

conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized flow duration curve (FDC) was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. In urban areas, reducing storm water can decrease a risk of numerous urban chemicals being delivered into stream channels. The relationship between storm water and the toxic mix of pollutants impairing Hinkson's warm-water aquatic life designated use also addresses chemical pollutants and habitat degradation. Specifically, please refer to Section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and specifically how Hinkson Creek's data links storm water to decreased aquatic life. Accordingly, EPA believes it is appropriate for storm water runoff to serve as a surrogate for the presence of these pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/geomorphologic impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

3. Comment: The TMDL does not demonstrate that runoff volume has increased or that baseflow has decreased in the Hinkson Creek watershed over time.

3. Response: Flow response to precipitation in Hinkson Creek has increased markedly over time. The commentor is directed to Section 4.5 of the TMDL which discusses and presents data from 1967 to 2010. Specifically, please refer to Table 9: *Comparison of Precipitation and Flow for April 1 – July 31*. Data were based on the Sanborn Field (University of Missouri – Columbia [UMC]) Weather Station and United States Geological Survey (USGS) gage. A comparison of flow response to precipitation between 1967 and 2007 shows that, despite a smaller amount of rainfall in the latter year, average daily flow was more than 80 percent higher. Another example is in Table 10 of the TMDL, we see that peak flow increased from 7.56 cubic feet per second per square mile (cfs/sq mile) in 1967 to 73.78 cfs/sq mile in 2010. In addition to higher flows in the stream from storm water, increased impermeable surface area within the watershed results in reduced base flows. This is illustrated in the FDCs for these same two time periods in Figure 4 of the TMDL. The right half of the graph gives an indication that base flow in 2007 is consistently lower than in 1967 and the left half indicates the opposite effect for higher flows.

4. Comment: It is not clear what methodology grounded in peer reviewed literature, or agency guidance, supports the process used to select 'attainment' streams set forth in the TMDL.

4. Response: The commentor is asking about the reference approach used in the TMDL. The use of a surrogate parameter is permissible under the Clean Water Act (CWA) Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate

measure," per 40 CFR § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR § 130.7(c)(1)(i)). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable water quality standards (WQS). TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

In the report for Urban Storm water Management in the United States, the National Research Council suggests: "A more straightforward way to regulate storm water contributions to water body impairment would be to use flow or a surrogate, like impervious cover, as a measure of storm water loading . . . Efforts to reduce storm water flow will automatically achieve reductions in pollutant loading. Moreover, flow is itself responsible for additional erosion and sedimentation that adversely impacts surface water quality" (NRC, 2009). This storm water-surrogate coupling with a reference stream approach has been widely used by many states to develop TMDLs. On November 12, 2010, EPA believes it is an appropriate approach and many states have broadly used this approach for their TMDLs.

The development of storm water runoff targets using reference streams located within the same Ecological Drainage Unit (EDU) follows MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf Reference streams from the same EDU were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation.

5. Comment: Land use data and flow analysis cited in the TMDL are inconclusive. While impervious area has likely increased in the Hinkson catchment to some degree, Geographic Information System (GIS) coverage used in the TMDL are not well suited for demonstrating urban land use changes at the scale of interest.

A similar comment about land use in the TMDL: Land use comparison from 1993 and 2005 are used to support the claim of increased flow; however, FDCs presented in Figure 4 are compared for 1967 and 2007. Because the time periods of comparative analysis differ, potential changes to the FDCs are not clearly the result of unquantified changes in urbanization. Is it possible that

changes in farming practices or climatic patterns have influenced hydrograph and duration characteristics?

5. Response: EPA thanks the commentors for their feedback. EPA believes that the methodology for land use data and analysis described in the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA. EPA guidance allows for use of a land use analysis based on the extent of imperviousness to determine the amount of the loading capacity (LC) that will be allocated to point versus nonpoint sources, *Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs*, EPA Office of Water, Memorandum from Robert H. Wayland, III, Director of OWOW to Water Division Directors, November 22, 2002, found online at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/final-wwtmdl.pdf.

The underlying assumption in the approach is that urban, more developed areas typically convey more storm water due to less infiltration, while rural, less developed or agricultural areas generate less runoff because of fewer impervious surface areas. With appropriate classification of land use within the watershed, developed/urbanized areas can be included in the WLA portion of the TMDL and lesser developed areas can be included in the Load Allocation (LA) portion. This approach is reasonable as urban areas tend to be dominated by point source conveyances of storm water, while rural areas are predominantly drained by surface flows. Therefore, the TMDL allocation process for the Hinkson Creek TMDL is simplified through the use of a land use based allocation approach to distribute the overall percent reduction targets for the watershed. Please refer to Sections 2 and 5 and Appendix C of the TMDL for detailed information on land use data and analysis in the TMDL. An amalgam of Landsat Thematic mapper data collected just prior to development of the final land use data layer shows that the percentage of urban land use in the Hinkson Creek watershed increased approximately 160 percent between 1991 and 2005, with the majority of urban growth occurring as retail and residential development. To substantiate the Landsat Thematic mapper data, correlating data showing increases in housing units was retrieved from the Housing Market Analysis on the city's website. The TMDL used GIS coverage that reflected urban land use changes at the scale indicated by the amalgam Landsat Thematic mapper data.

Farming practices and climatic changes may be an influence however, all potential sources have been considered in the TMDL and as such the entire area that drains into the impaired segments of Hinkson Creek is analyzed in the TMDL and included in the LC. FDCs have been demonstrated to be the best surrogate for defining hydrologic targets because they represent all flow conditions, across all seasons. The FDCs developed for this TMDL are useful for describing the hydrologic condition of Hinkson Creek and its watershed over a long period of time. The curves incorporate the full spectrum of stream flow conditions from very low to very high and any flow variability due to seasonal variations.

Because the FDC represents flow under all possible stream conditions, it has the advantage of avoiding the constraints associated with using a single-flow critical condition approach.

Because the TMDL is applicable under all flow conditions, it is also applicable for all seasons. Climatic variation is therefore implicitly taken into account within the TMDL calculations. Additionally the margin of safety (MOS) in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)).

One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

6. Comment: Little tangible evidence is offered in the TMDL that supports changes in runoff volume are responsible in whole, or in part, for periodic depressions in benthic macro invertebrate scores. We believe that additional stressor-response data and a more refined hydrologic analysis approach are necessary to assure that compliance with TMDL targets will yield consistent attainment of Hinkson Creek aquatic life uses.

6. Response: National studies, including the Center for Watershed Protection (CWP) and the Water Environment Research Foundation (WERF) studies, as cited in the TMDL, have documented the connection between increased impervious area in urban areas to increases in storm water runoff, which contributes numerous pollutants and results in changes in hydrology with increased magnitude, duration and frequency of storm water. These resulting changes are known to negatively affect water quality and aquatic life.

As stated in the TMDL, the CWP study reviewed hundreds of research studies. The combined review and synthesis of information in these studies led CWP to conclude that impervious cover as low as 10 percent can be related to aquatic life impairments and worsens as more areas within the watershed are developed.

Reducing the frequency and magnitude of high flows will encourage infiltration so that the stream hydrology more closely matches pre-development hydrology as measured in the reference stream watersheds. In turn this will reduce the amount of pollutants carried by storm water into Hinkson Creek. Based upon the analysis by national and local studies, it is reasonable that addressing these negative impacts will result in better habitat and protection of aquatic life and natural biological aquatic communities.

EPA encourages the collection of additional data, in fact one of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

7. Comment: Attainment of biocriteria at frequencies prescribed by Missouri's 303(d) listing methodology and biocriteria documents serve as the primary TMDL target as l) bioassessment scores served as the rationale for listing Hinkson Creek as impaired and 2) site specific causal relationships between runoff and ecological health have not been established in the TMDL.

7. Response: Thank you for the comment. All waters must be protected for their current beneficial uses and water quality criteria (including biocriteria). Adjusting the beneficial uses and water body criteria is beyond the scope of this TMDL's public notice. EPA encourages the commentor to work with MDNR during their next 303(d) impaired water listing process.

In regard to the commentor's first comment about bioassessment scores: The stream condition index (SCI) scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI < 16). The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating. This target can be accomplished through actions and BMPs used to reduce storm water runoff.

In regard to the commentor's second concern about relationships with runoff and ecological health: The relationship between storm water and the toxic mix of pollutants impairing Hinkson Creek's warm-water aquatic life designated use also addresses chemical pollutants and habitat degradation. Specifically, please refer to Section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and specifically how Hinkson Creek's data links storm water to decreased aquatic life.

8. Comment: Table 9, precipitation and flow statistics for 1967 and 2007 are compared for the April 1 - July 31 period. Why are only 4 out of 12 months of available data being used to describe precipitation and runoff? If fall biological surveys are used to assess use attainment in Hinkson Creek, it would seem appropriate that flow data collected in the late summer/fall season also be incorporated into hydrologic analyses and comparisons. How do we know that antecedent precipitation regimes did not influence the results of a 4-month comparison?

A similar question about using only April to July data for analysis: The selection of only four months (April 1 to July 31) for only two individual years (1967 and 2007, Figure 4) is not adequate for identifying differences in precipitation-runoff responses. Presumed differences in the flow-duration curves could be attributed to differences in precipitation characteristics alone.

8. Response: Table 9 is describing the dominant rainfall season and its corresponding flow condition in Hinkson Creek. This information was not used for TMDL analysis. The

TMDL was determined based on the entire flow conditions from the reference streams. The load reduction was then calculated based on the entire flow conditions measured at Hinkson Creek from 2008-2010.

9. Comment: Why shouldn't the full available and comparable period of record (April 1 - December 31) be presented to capture seasonal patterns in rainfall and runoff. Precipitation and streamflow data often do not follow a normal statistical distribution, we question the use of the arithmetic means to describe central tendencies. If the period of record is expanded to all available and comparable months for 1967 and 2007 (March 11 - December 31, n=296), we note that the median, geometric mean, and cumulative Period of Record (POR) streamflow values for 1967 (median=5.75 cfs) are greater than values for 2007 (median= 3.05 cfs). Side-by-side boxplots of the two data sets indicate both years have very skewed daily average flows, *which suggests that the arithmetic mean is a biased estimator* and the median is a more appropriate metric of the central tendency of data. More importantly, the medians are not statistically different from each other based on the non-parametric Mann-Whitney test (p=0.95). The lack of statistical difference between the median daily average flow for 1967 and 2007 indicates that *the data do not support the claim that the flow regime in the creek has been significantly changed.* It is not clear why a truncated period of record was selected.

9. Response: Table 9 is describing the dominant rainfall season and its corresponding flow condition in Hinkson Creek. This information was not used for TMDL analysis. The TMDL was determined based on the entire flow conditions from the reference streams. The load reduction was then calculated based on the entire flow conditions measured at Hinkson Creek from 2008-2010. Table 9 is just providing a snapshot of the flow condition between two years and suggesting that flow may be altered in the recent decade in response to a rapid urbanization in the watershed in the recent years.

10. Comment: We note that higher baseflows in 1967 (referenced in relation to Figure 4, Page 27) could be attributed to wastewater treatment facilities (WWTFs) that historically discharged to Hinkson Creek. Approximately fifty-three (53) WWTFs that discharged historically within the Hinkson Creek basin have been eliminated. *It is not clear that presumed reductions in baseflow can be wholly attributed to unquantified infiltration reductions in the catchment.*

10. Response: The original TMDL as public noticed by MDNR was modified using reference streams' hydrologic condition to define the favorable or suitable living condition for the biological communities in Hinkson Creek. An annualized FDC was then used to determine the reduction needed to meet the favorable biological condition. The comment about baseflow and WWTFs is not pertinent to this updated TMDL.

11. Comment: The commentor suggests that Figure 9 shows that Hinkson Creek has a relatively high normalized base or low-flow compared to the average synthetic FDC derived from reference streams; therefore, they suggest that MDNR conduct a baseflow separation and trend analysis on the entire period of record at the Hinkson gage to determine if baseflows from discharging groundwater have significantly decreased over time and whether any changes are due to other causes.

11. Response: EPA appreciates the commentor's suggestion and MDNR will receive a copy of all comments on EPA's Hinkson Creek TMDL for potential follow-up. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). If new data becomes available from the commentor's suggested baseflow separation and trend analysis that data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)).

12. Comment: Reductions in runoff may not proportionally reduce unidentified pollutant loading. Application of a catchment-wide surrogate for a pollutant is likely to yield unintended consequences. Reducing runoff volume (transport medium) on a basin-wide basis infers that beneficial uses as measured by macroinvertebrate scores respond in a continuous, linear and negative manner to pollutant load. However, toxicological responses are frequently concentration-driven, often threshold in nature (not continuous), and may be non-linear (sigmoid). If periodically lower biological metrics are the result of discrete activities that have been remediated or abated, such as chloride wash-off from road salt storage facilities, how will basin-wide runoff reductions improve ecological health? Furthermore, if impacts were related to chloride or other 'urban' contaminants, how will reducing runoff from agricultural land benefit biological scores?

12. Response: This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. It is expected that runoff from agricultural areas can transport excess sediments and agrochemicals, and affect stream biota. Therefore, controlling runoff from the agricultural areas, which is one of the goals of this TMDL, can definitely improve stream biological conditions. As for urban areas, reducing storm water can decrease the risk of numerous urban chemicals being delivered into stream channels. For example, reducing storm water runoff would mean that less chloride, as applied as winter road salt, would be transported to the streams. While, based on a number of MDNR's biological studies, chloride was not identified as the exclusive pollutant; overall,

Hinkson Creek has had higher chloride levels than the reference streams. Samples for chlorides collected in Hinkson Creek exceeded Missouri's chronic chloride WQS of 230 milligrams per liter (mg/L) on December 13, 2005, when the measured concentration was 333 mg/L (Site 1007/4.3). As such, while this pollutant may contribute to aquatic life impairment in Hinkson Creek, there are insufficient occurrences of exceedance to identify this as the pollutant causing the impairment. Additionally, while measurements taken during winter from tributaries and drainages to Hinkson Creek exhibited elevated concentrations of chloride, analyses of other pollutants were not taken from these sites. Samples were also not taken from these sites outside the winter season when deicer would not be used. The high concentrations of chloride in this storm water runoff serve to reinforce the rationale of controlling storm water runoff and the loading of a myriad of pollutants typically found in high concentrations in urban runoff across all seasons. Based on all the available information, EPA believes that using storm water runoff as a surrogate is an appropriate approach to abate unknown pollutants. EPA believes it is an appropriate approach and many states have broadly used this approach for their TMDLs.

Efforts to improve water quality have already begun in each of these communities. Best management practices (BMPs) can be integrated into redevelopment efforts from a single lot to an entire city-wide plan. This can often cost less than traditional methods of storm water control. These BMPs reduce storm water runoff and the associated pollutants and provide flexibility in how and where storm water management is accomplished. On a city-wide scale, an interconnected network of open spaces and natural areas, such as greenways, wetlands, parks, urban forests and native plant vegetation, naturally manage storm water, reduce flooding risk and improve air and water quality. On a smaller scale, BMPs include green roofs, rain gardens, rain barrels and cisterns, vegetated swales, pocket wetlands and porous pavements. Nearly every BMP filters or biologically or chemically degrades pollutants resulting in their reduction in storm water runoff. Implementing these practices is expected to occur gradually over a period of time. A number of EPA policies, memoranda and resolutions explaining the benefits of this approach can be found at the following internet address: http://cfpub.epa.gov/npdes/greeninfrastructure/information.cfm#greenpolicy and www.epa.gov/nps/lid/.

13. Comment: A commentor notes that MDNR survey reports suggest that evaluating the effects of sediment should be considered in subsequent investigations. Where contaminated sediment may represent a significant exposure pathway, the role of sediment budgeting techniques may be useful during TMDL re-analysis. The commentor bases their suggestion on the following premise, "Although not documented, contaminated sediments could be a critical exposure pathway for macroinvertebrate communities in Hinkson Creek. Absorbed pollutants are subject to sediment transport and delivery phenomena that can operate at timescales much slower than the Hinkson Creek study period (2001 - 2006). It is possible, but uncertain, that biological scores may have been affected by contaminated sediment generated several years ago that is now being released from storage and delivered to the Hinkson Creek channel."

13. Response: Although sediment was not studied with respect to the impairment in Hinkson Creek, EPA encourages the state and other stakeholders to consider sediment in

future study efforts. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). This comment will be shared with MDNR. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). If new data becomes available, that data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

14. Comment: The runoff reduction approach does not adequately consider fate and transport of pollutants that may contaminate groundwater in urban areas. For example, if the unidentified pollutant(s) are discharged from groundwater sources during baseflow conditions, then reducing runoff volumes could potentially increase overall in-stream concentrations. In addition, increasing infiltration in areas where soils are contaminated, or where known upgradient plumes occur, could in fact cause an increase in pollutant(s) reaching Hinkson Creek. Reducing storm water runoff to achieve historical streamflow patterns from the 1960s is an incomplete approach and does not consider the water balance as a whole. To achieve streamflow characteristics from the 1960s, we may actually have to infiltrate volumes of water that exceed historic rates due to potential reductions in evapotranspiration. *The TMDL should consider propagated effects on the urban water balance if a runoff reduction approach continues to be pursued.*

14. Response: The main goal of this remodeled TMDL is to restore and/or improve the biological condition impaired by a toxic mix of pollutants from both urban and rural areas during high flow events. The flow patterns that support biological community are defined by the reference streams selected from the EDU where Hinkson Creek is located. MDNR's biological studies have indicated that stream biota have been affected by a number of pollutants. Reducing storm water runoff can actually reduce these pollutants transported during runoff events. A FDC analysis does consider all spectrum of flow conditions, including shallow groundwater, that may influence the fate and transport of the pollutants. In order to create favorable biological conditions, both urban and rural settings have been incorporated to estimate flow targets to control the pollutants using the imperviousness of land use.

15. Comment: Based on the commentor's analysis of the 1993 and 2005 Missouri Resource Assessment Program (MoRAP) datasets, there is no strictly "urban" land use category as presented in the draft TMDL. Additionally, the land use categories differ between the 1993 and 2005 MoRAP data and are therefore not directly comparable. It appears that EPA may have used different versions of the Hinkson Creek watershed boundary GIS shapefile to calculate acreage values in the draft TMDL. Despite dataset differences, EPA appears to have grouped the

following land use categories into a single "urban" category: 1993 MoRAP land use categories urban impervious and urban vegetated and 2005 MoRAP land use categories impervious, high intensity urban and low intensity urban. *By grouping* 1993 *and 2005 data in this manner, the draft TMDL infers that all urban land uses contribute equally to storm water runoff.* However, not all urban uses are equal and their impacts to storm water runoff differ substantially. Also, increases to "urban" area referenced in the TMDL are due to the definition of "low intensity urban" land uses. The 2005 MoRAP metadata defines "low intensity urban" as "vegetated urban environments with a low density of buildings." It is highly unlikely that "low intensity urban" land uses contribute to storm water runoff with the same magnitude as "impervious" land uses.

15. Response: Two MoRAP datasets (1993 and 2005) were compared, using a generalized/simplified land use categorizing method. Originally, there were 16 land use types in each dataset. In order to compare these datasets, these 16 land use types were regrouped into 5 categories (see Tables 1 and 2). For example, 1993 urban contains impervious and urban vegetated while 2005 urban area includes impervious and high and low intensity urban. Based on the new regrouped datasets, total urban area increases from 4,527 acres in 1993 to 11,890 acres in 2005, which is about a 160 percent increase. The TMDL load calculation is based on the 2005 land use data. To estimate the total percent of imperviousness, the impervious (100 percent impervious cover), high intensity urban (45 percent) and low intensity urban areas (30 percent) are calculated separately for their imperviousness and then summed together. EPA believes that land use comparisons using a simplified method are a proper way to estimate land use changes over time. EPA has taken into account all the differences of land use types to derive the appropriate TMDL targets by using the most recent land use dataset.

16. Comment: The commentor says that the TMDL's assertion that percent "urban" land cover increased approximately 160% from 1993 to 2005 is not supported by the underlying MoRAP datasets.

The 2005 land use category "low intensity urban" has no "urban" land use counterpart in the 1993 dataset. We note that comparison of the 2005 MoRAP dataset with aerial imagery indicates that "low intensity urban" is primarily residential land. Based on our aerial imagery analysis, we also note that residential land is generally *excluded* from any "urban" land use category in the 1993 MoRAP dataset.

The commentor performed a GIS spatial analysis of the MoRAP datasets and found that the 2005 "low intensity urban" land use was identified by any one of 10 different categories in 1993. Of the 7,843 acres categorized as "low intensity urban" in 2005, non-"urban" land uses, as identified by the 1993 dataset, accounted for 6,450 acres (i.e., 82.2%). However, this does not indicate an actual increase in "urban" land use as suggested in the draft TMDL. Neighborhoods established well before 1993 are generally categorized as "cool-season grassland" or "deciduous forest" in the 1993 dataset. Again, as noted above, few if any residential neighborhoods are identified under any "urban" category in the 1993 dataset. Therefore, it may not be appropriate to draw any conclusions regarding urban area increases attributed to the 2005 "low intensity urban" land use category.

A more appropriate comparison between the 1993 and 2005 MoRAP datasets might be between the following categories: "Urban impervious" (1993 dataset) and "impervious" (2005 dataset), and "Urban vegetated" (1993 dataset) and "high intensity urban" (2005 dataset). However, this would suggest a decrease of approximately 1,061 acres in impervious urban area from 1993 to 2005. Comparing "urban vegetated" to "high intensity urban" suggests a nominal increase of only 541 acres from 1993 to 2005. Our spatial analysis presented also suggests that 1,279 acres of "urban impervious" land was converted to "low intensity urban" from 1993 to 2005. Given the cited differences between 1993 and 2005 datasets, it is unlikely that definitive time-trend conclusions regarding urban land use in Hinkson Creek may be determined from MoRAP datasets.

Another comment about the MoRAP data: Inconsistencies between the MoRAP datasets suggests inaccuracies and lack of comparability. We note that Tables 1 and 2 in the draft TMDL suggest that open water acreage within the Hinkson Creek TMDL increased from 422 to 1,439 acres from 1993 to 2005. Closer inspection of the data and associated metadata suggests this does not represent an actual increase in open water acreage, but rather improved techniques for classifying waters between 1993 and 2005. Although the datasets suggest an increase of approximately 240% in open waters, in actuality there was likely no change. *This illustrates that land use data digitized under different methodologies are not comparable.*

16. Response: Two MoRAP datasets (1993 and 2005) were compared, using a generalized/simplified land use categorizing method. Originally, there were 16 land use types in each dataset. In order to compare these datasets, these 16 land use types were regrouped into 5 categories (see Tables 1 and 2). For example, 1993 urban contains impervious and urban vegetated while 2005 urban area includes impervious and high and low intensity urban. Based on the new regrouped datasets, total urban area increases from 4,527 acres in 1993 to 11,890 acres in 2005, which is about a 160 percent increase. The TMDL load calculation is based on the 2005 land use data. To estimate the total percent of imperviousness, the impervious, high intensity urban and low intensity urban areas are calculated separately for their imperviousness and then summed together. EPA believes that land use comparisons using a simplified method are a proper way to estimate land use changes over time. EPA has taken into account all the differences of land use types to derive the appropriate TMDL targets by using the most recent land use dataset.

17. Comment: Commentor notes that EPA did not consider 1976 land use GIS data as part of the TMDL. This land use data suggests there were approximately 6,978 urban acres within the Hinkson Creek watershed in 1976, whereas the draft TMDL suggests there were approximately 4,527 urban acres in 1993. There was likely no such decrease in urban land use, but further underscores the questionable validity of available land use datasets in establishing meaningful time-trends.

17. Response: The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Any new data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-

7.031 and 10 CSR 20-7.050). If the data suggested (but not provided) by the commentor or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

The TMDL load calculation is based on the 2005 land use data. EPA believes that land use comparisons using a simplified method are a proper way to estimate land use changes over time. EPA has taken into account all the differences of land use types to derive the appropriate TMDL targets by using the most recent land use dataset. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)).

18. Comment: The commentor says that historical biological community health is not documented in the TMDL. Throughout this TMDL document, an assumption has been made that the biological community was attaining the beneficial use prior to increased urbanization and that restoring hydrology to historical levels will restore biological health. There is really not much evidence that this was the case in the 1960-1990 period. The biological health of Hinkson Creek has not been adequately documented for this time period and anecdotal evidence suggests that the water quality and biological health of Hinkson Creek was poor and has improved considerably since the 1960s. MDNR and EPA should investigate their own records for water quality and biological data collected during this time period. The commentor notes that approximately 53 WWTFs historically discharged within the Hinkson Creek watershed and that agricultural practices may have changed in the past 50 years.

18. Response: Table A of Missouri's WQS (10 CSR 20-7.031), entitled "Criteria for Designated Uses" identifies the current criteria associated with the "Protection of Aquatic Life" use designation. TMDLs must target current WQS and designated beneficial uses for the water body (40 CFR § 130.7(c)). The TMDL offers historical biological community health information through the analysis of data in the document and in the background section and appendices; however, the focus of the TMDL is how the water body can attain its current designated uses.

19. Comment: The return interval targeted by the TMDL does not establish a linkage with the beneficial use. Although the use of a surrogate measure (reference stream flow duration targets/storm water runoff volume) for "pollutants" has merit in specific and targeted situations where multiple stressors exist, we believe that a TMDL must ultimately be linked to the protection of a beneficial use. For example, in the Potash Brook TMDL (VTDEC 2006) performed by the Vermont Department of Environmental Conservation, such a link was established. A stream geomorphic data assessment of Potash Brook performed in 2005 documented "less than stable" instream sediment conditions that provide the link to the impaired biotic community. The Potash Brook TMDL has been cited by EPA as an example of a TMDL that has successfully used storm flow as a surrogate for multiple impairments. *We note that a link between Missouri attainment stream return intervals and biological endpoints has not been established.*

In the TMDL, EPA appears to have assumed that higher biological scores in the four "flow attainment" streams are due solely to the differences in flow regimes. While the literature and EPA guidance support the reference approach when evaluating regional stream differences, EPA has not provided sufficient data to quantify the assumed cause-effect relationship between storm flow and biological health in any of the study streams. No information is presented in the TMDL to suggest that the higher biological scores were directly linked to storm water runoff or impervious area. At a minimum, a statistically significant ($p<0.05$) correlation relating biological scores and impervious area is needed to justify future studies capable of detecting and quantifying causation.

19. Response: EPA acknowledges that the TMDL must target current WQS (40 CFR § 130.7(c). In this instance, the TMDL targets the impaired warm-water aquatic life designated beneficial use by establishing a surrogate relationship between storm water runoff and the toxic mix of pollutants causing the impairment. In addition to having a beneficial use target, the TMDL establishes a link between reference streams and biological endpoints.

Please note that although many similarities do exist, EPA has revised the previous Hinkson Creek TMDL public noticed by MDNRand remodeled the watershed. In order to align with other storm water runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of the limited available flow data, EPA is using annualized flow duration analysis to specifically target high flow conditions. The 50.1 percent reduction (return intervals) was only included in the previously public noticed MDNR TMDL model and is no longer pertinent to the TMDL public noticed by EPA. In this TMDL public noticed by EPA, the flow water quality target should be between the upper 3 and 5 percentiles of flow exceedance of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. For further explanation as to how the TMDL's target links to biological endpoints, please see response 2 above.

20. Comment: Although MDNR's series of stream evaluations did include elements of EPA's Stressor Identification Guidance, it appears as if MDNR's approach did not support the structured assessment methods recommended by EPA and the technical literature. As a result of MDNR's approach, some important data (e.g., biological samples in Hinkson Creek and flow attainment streams) were collected inconsistently or, as EPA itself admits, not collected at all. For example, on page 8 of the draft document, EPA states the following: "Sediment has been established as the primary source of impairment in numerous TMDLs throughout the country. However, since sediment was not studied with respect to the impairment in Hinkson Creek, sediment cannot act as the basis for a surrogate TMDL as it has elsewhere." EPA should consider re-evaluating stressors in Hinkson Creek and attainment streams according to a structured watershed monitoring plan which adheres to stressor identification guidance and the technical literature. Adams (2003) offers several criteria useful in establishing causation between stressors and observed effects.

20. Response: EPA states the following: "Sediment has been established as the primary source of impairment in numerous TMDLs throughout the country. However, since sediment was not studied with respect to the impairment in Hinkson Creek, sediment cannot act as the basis for a surrogate TMDL as it has elsewhere." Consequently, EPA addresses pollutants related to urbanization and its associated effect on stream biology. Because none of pollutants exceed a particular numeric WQS and in order to address the synergic effect of these chemicals, EPA uses storm water runoff reductions as a surrogate to target a reduction in all potential pollutants. EPA believes it is an appropriate approach and many states have broadly used this approach for their TMDLs.

Although sediment was not studied with respect to the impairment in Hinkson Creek, EPA encourages the state and other stakeholders to consider sediment in future study efforts. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). EPA agrees that such monitoring may be beneficial. The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

21. Comment: Biomonitoring endpoints should serve as the primary TMDL target. The TMDL document suggests that significant flow reductions are required at the three and five percent flow exceedance values (Table 15 of draft TMDL) to protect a fully supporting biological community. If a linkage between storm water runoff and the biological community does exist, it has not been demonstrated. Therefore, we question whether these significant flow reductions would be necessary to achieve the beneficial uses. *This further suggests that achieving a fully supporting biological community should be the primary water quality target rather than a reduction of storm water input, since aquatic life impairment is the driver for placement of Hinkson Creek on the impaired waters list.* On Page 8 of the draft TMDL it says, "Federal regulation also states that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach (40 CFR § 130.7 (c) (1))." It is unclear to us why biomonitoring is not the primary water quality target instead of a technically unsupported flow reduction.

21. Response: The TMDL targets Hinkson Creek's warm-water aquatic life designated beneficial use. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). Hinkson is not different from other TMDLs because frequently TMDLs are complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the

watershed. The increase in impervious surfaces is the result of development in the watershed.

The main goal of this TMDL is to restore and/or improve the biological condition impaired by unknown pollutants from both urban and rural areas during high flow events. The flow patterns that support biological community are defined by the reference streams selected from the EDU where Hinkson Creek is located. MDNR's biological studies have indicated that stream biota have been affected by a number of pollutants. Reducing storm water runoff can actually reduce these pollutants transported during runoff events. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI < 16). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. For additional information please refer to Response to Comments number 29 in the SUMMARY of COMMENTS and RESPONSES (I of III).

22. Comment: The biological community in Hinkson Creek may not be currently impaired. With the exception of the spring of 2002 assessment, macro invertebrate samples collected by MDNR have shown the urban portion of Hinkson Creek to be fully *supporting or very nearly so each time the biological community has been evaluated*. The last comprehensive investigation of the macroinvertebrate community was conducted by MDNR in the fall of 2001 and spring of 2002. To our knowledge the last macroinvertebrate sampling of any kind was performed by MDNR in the spring of 2006. We believe that a more methodical investigation into the biological community is warranted to better understand the biological health of Hinkson Creek.

22. Response: The main goal of this TMDL is to restore and/or improve the biological condition impaired by unknown pollutants from both urban and rural areas during high flow events. The flow patterns that support biological community are defined by the reference streams selected from the EDU where Hinkson Creek is located. MDNR's biological studies have indicated that stream biota have been affected by a number of pollutants. Reducing storm water runoff can actually reduce these pollutants transported during runoff events. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supportive for biological communities (SCI < 16). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC.

The listing of this water as impaired is beyond the scope of this TMDL public notice. EPA is establishing this TMDL at this time to meet the requirements of the Consent Decree and

based the TMDL on the best data available. The commentor's suggestion (commentor did not provide the data) will be shared with MDNR and with EPA's Missouri WQS Coordinator for consideration during the next Missouri 303(d) list review. If any data provided by commentors is found to meet MDNR's minimum quality assurance level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

23. Comment: Several significant differences exist between the Hinkson Creek TMDL and the Potash Brook template.

The Potash Brook TMDL has been cited as an example of a TMDL that has successfully used storm flow as a surrogate for multiple impairments. As such, this approach is being used as a template for the Hinkson Creek TMDL. However, there are several major differences between the two watersheds that must be recognized. Potash Brook is a 7.1 square mile watershed compared to Hinkson Creek which is approximately 90 square miles. Potash Brook has a heavily impaired aquatic community as opposed to Hinkson Creek, which regularly is found to be between fully supporting and partially supporting. Are there lessons to be learned in the Potash Brook TMDL? Have the runoff reduction targets been achieved, and if so, has the biological community been restored as a result?

23. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNRand remodeled the watershed. In order to align with other storm water surrogate TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total storm water runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment, is in reference to the MDNR TMDL model, and is no longer pertinent to the current TMDL.

24. Comment: The attainment stream selection process cited in the TMDL is questionable. The second paragraph of Section 4.6 in the TMDL ('Setting the Water Quality Targets') states, The instream water quality target for the TMDL is the high flow category of the FDC developed from the biological reference streams. This approach is similar to that used in the Potash Brook TMDL. The Potash Brook TMDL states that the use of "attainment" streams as opposed to "reference" streams is used "because reference tends to imply that the ultimate goal of the impaired steam approaches pristine. Instead, the attainment watershed(s), while meeting or exceeding the Vermont WQS criteria for aquatic life, should contain some level of development in order to better approximate the true ecological potential of the impaired stream." This use of "attainment streams" gave recognition to the fact that highly developed watersheds would not be expected to attain reference conditions.

A fairly rigorous approach was used for the selection of attainment streams by the Vermont Department of Environmental Conservation using an analysis that were evaluated for similar size, slope, soils, climatic patterns, channel type and land use/cover and were all in relatively close geographical proximity to Potash Brook. In addition, they all contained some level of development in order to approximate what the true ecological potential might be.

Unfortunately, the streams selected for the Hinkson Creek TMDL are not physiographically similar to Hinkson Creek. To be physiographically similar, the "attainment" streams selected for the Hinkson Creek TMDL should be of similar size and should have similar levels of urbanization. The selected attainment streams are 3-7 times larger (313 - 620 square miles) than the Hinkson Creek watershed area of 90 square miles and all contain very low levels of urbanization. The "attainment" streams selected for the Hinkson Creek comparison were primarily based on the availability of macroinvertebrate data and the presence of a USGS gauging station in order to supply flow information.

It is our opinion that the selection process of attainment streams for this TMDL is inadequate and not sound. Two of the four "attainment" streams are actually "reference" streams for their particular EDUs, a comparison that we believe is not appropriate. On page 14 of the Potash Brook TMDL the authors state, "However, haphazard matching of attainment streams, and thus flow targets, to Potash Brook could lead to targets with a high degree of uncertainty as to whether standards would be met." This is certainly the case with the attainment streams selected for the Hinkson Creek comparison.

It is our opinion that either other urban streams that are attaining their beneficial uses, or other similar streams within the Ozark/Moreau/Loutre EDU be used for comparisons to Hinkson Creek.

24. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNRand remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL.

Although EPA's TMDL uses reference streams as opposed to attainment streams, EPA believes that the methodology described in the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA. The development of targets follows MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at
http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

Reference streams from the same EDU were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation.

25. Comment: Rescoring historic biomonitoring data is not appropriate. Rescoring of historic data based on more recent sampling of reference streams (TMDL Table 8 italics) is not appropriate in our opinion. It makes it extremely difficult, if not impossible, to make impairment decisions that could change based on data that will be collected in the future. Study streams

should be evaluated based upon the scoring criteria that are in effect at the time of sampling. For example, Missouri SCI scores determined in the fall of 2001 should be assessed based on the reference stream criteria that were available and in effect in 2001. Continually reassessing Missouri SCI scores whenever new data are collected is unprecedented and will clearly make impairment determinations difficult in the future.

We strongly recommend that any given stream be scored based on the reference stream scoring criteria that is available at the time of sampling, and as scoring criteria for reference streams changes as a result of the collection of additional data, then only new data collected on study streams be appropriately compared to the new scoring criteria.

Following are the Missouri SCI scores that we believe to be correct and consistent with previous reported results:

- Fall 2001: Site 2 should be 18. Site 1 should be 16.
- Spring 2002: Site 8 should be 18
- Fall 2005: Site 6 should be 18. Site 5.5 should be 14.
- Spring 2006: Site 2 should be 14.

25. Response: The SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI < 16). The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating. This target can be accomplished through actions and BMPs used to reduce storm water runoff.

The SCI scores used in the Hinkson Creek TMDL were provided by MDNR and based on Missouri guidelines. Hinkson Creek has been on Missouri's 303(d) lists since 1998. During each new listing cycle (2002, 2004, 2006 and 2008) all readily available data must be assessed to determine what streams need to be listed in category 5 (impaired waters 303(d) list). During assessment all data must be evaluated according to the current assessment methodology as public noticed by MDNR.

EPA believes that the methodology described in the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA. The development of SCI scores following MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, is found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

The listing of Hinkson Creek as impaired is beyond the scope of this public notice. However, due to the number of public comments asking why Hinkson was listed as

impaired for "unspecified" or "unknown" pollutants, this response offers the regulatory explanation for Hinkson Creek's 303(d) listing. EPA is establishing this TMDL at this time to meet the requirements of the Consent Decree and based the TMDL on the best data available. The commentor's suggestion (commentor did not provide the data) will be shared with MDNR and with EPA's Missouri WQS Coordinator for consideration during the next Missouri 303(d) list review. If any data provided by commentors is found to meet MDNR's minimum quality assurance level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

26. Comment: Based on our interpretation of the biomonitoring results when the correct (see above) MSCI scores are applied, the upstream sites (sites 7 and 8) score as fully supporting 78 percent (7 of 9) of the time. The lower Hinkson sites (sites 1-6) scored as fully supporting 52 percent (13 of 25) of the time. It should be noted, however, that following the spring 2002 sampling event the MSCI scores within the urbanized portion of Hinkson Creek have been fully supporting nearly 70 percent of the time. This is *quite comparable* to MDNR's TMDL web page which indicates that reference streams in this EDU score as fully supporting approximately *75-80 percent* of the time.

26. Response: EPA appreciates the commentor's concerns. Information as to how SCI scores are applied is discussed in Response 25 above. Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses.

The listing of this water as impaired is beyond the scope of this TMDL public notice. EPA is establishing this TMDL at this time to meet the requirements of the Consent Decree and based the TMDL on the best data available. The commentor's suggestion (commentor did not provide the data) will be shared with MDNR and with EPA's Missouri WQS Coordinator for consideration during the next Missouri 303(d) list review. If any data provided by commentors is found to meet MDNR's minimum quality assurance level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

27. Comment: Additionally, it is not clear why EPA is targeting a higher biocriteria attainment frequency (100%, page 36) than what is typically achieved in reference streams. *A 100% attainment frequency for Hinkson Creek is unrealistic and not supported by MDNR biocriteria guidance.*

27. Response: EPA appreciates the commentor's concerns. Information as to how SCI scores are applied is discussed in Response to Comments number 25 above. The biological impairment needs to be continuously improved to meet the aquatic life designated uses. Please note that the TMDL primary targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. Also, please note that TMDLs must target current WQS (40 CFR § 130.7(c)(1)(ii)).

28. Comment: We recommend that a comprehensive bioassessment of Hinkson Creek similar to that conducted in 2001-2002 be performed to better assess the current status of the aquatic community because the spring 2002 biomonitoring dataset may be an anomaly.

28. Response: EPA appreciates the commentor's suggestion and MDNR will receive a copy of all comments on EPA's Hinkson Creek TMDL. EPA has included language to this TMDL to better articulate the recognized need for phased and adaptive management of the TMDL. In fact, within that same section, included on page ix, EPA anticipates that such a study as the commentor suggests will be conducted. However, the TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). EPA agrees that such monitoring may be beneficial. Any data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

29. Comment: Little data are presented to support the assumption that reducing storm water flows will increase baseflows, improve dissolved oxygen (DO) and ultimately enhance the biological health of Hinkson Creek.

Several times throughout the draft TMDL document (e.g., pages 8, 18, 30), EPA suggests that peak storm flow reductions will result in increased base flows and higher DO concentrations during baseflow periods. On page 8, EPA states the following: "MDNR water quality studies did reveal, however, that a large percentage of the problems noted above, including increased sediment and low DO at low flows, can be attributed to urban runoff conditions which result in excessive storm water runoff and lower than normal baseflow conditions." Neither EPA nor MDNR has offered data to support the claim that "lower than normal" baseflows are directly caused by peak storm flows or urban runoff conditions. In fact Schuler (1994, page 2), a paper which is cited in the draft TMDL, states that actual data have demonstrated that this is rarely the case. Furthermore, the assumption that low DO concentrations indirectly result from urban runoff conditions is unsubstantiated.

As EPA is aware, recently collected continuous data demonstrated that prolonged periods of low [dissolved oxygen] DO (below 5 mg/L) occur in several Missouri reference stream reaches during baseflow conditions. As reference stream reaches represent the "best available representatives of ecoregion waters in a natural condition with respect to habitat, water quality, biological integrity and diversity, watershed land use and riparian conditions" (10 CSR 20-7.031 (1) (U)), *it is unclear why EPA or MDNR believes that baseflow DO concentrations in Hinkson*

Creek can improve to acceptable levels when it has been demonstrated that baseflow DO conditions in reference streams cannot.

29. Response: The TMDL does not target baseflow or DO concentrations. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. The TMDL includes another target, that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). The TMDL instead indicates that by meeting the storm water runoff reductions and thereby decreasing the toxic mix of pollutants being discharged into the stream, and meeting the biocriteria target, base flow and DO concentrations may be improved. The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows.

The analysis does not include lower flow settings (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

Contrary to what the commentor indicated the TMDL is targeting storm water runoff at the higher flows.

30. Comment: Physical habitat limitation should be explored as a causal variable. Habitat quality limits the biological potential for streams and rivers. Reduced habitat quality within urban stream reaches is well documented in literature. According to MDNR standard operating procedures (SOPs), habitat quality is measured during bioassessments. Furthermore, SOPs stipulate that habitat quality scores for study streams (e.g., Hinkson Creek) must be within a specified percentage of reference stream habitat scores, otherwise application of biocriteria to study streams is unjustified (i.e. habitat limited). Habitat limitation appears to offer a plausible explanation of periodically lowered macro invertebrate scores in Hinkson Creek. *However available habitat data do not appear to be evaluated to any substantive degree in the TMDL.* Restoration strategies leading to improved habitat quality may differ from the volume reduction approach recommended in the TMDL.

30. Response: Although habitat was not studied with respect to the impairment in Hinkson Creek, EPA encourages the state and other stakeholders to consider habitat in future study efforts. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)). This comment will be shared with MDNR. This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. SCI scores consisting of biotic index, taxa richness, Shannon diversity index and EPT index, were incorporated into the TMDL development. The TMDL targets are based on a reduction in storm water

runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. Additionally, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). Any data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

31. Comment: TMDL implementation feasibility is uncertain. It is difficult to assess the feasibility and cost implications associated with meeting the TMDL. To attain TMDL flow targets, storm water volumes will have to be reduced significantly. Currently, the Boone County Storm water Ordinance requires that the runoff from 10% of the 1.3-inch water quality volume be permanently reduced. However, the Ordinance allows for a waiver of this requirement if there is a risk for groundwater contamination or site constraints make infiltration infeasible. The *TMDL does not provide any consideration for site constraints that may inhibit volume reductions.*

For many parts of the watershed and during many times of year the retention of large runoff volumes may not be feasible due to: high groundwater table, permeability of soils, limited pervious space availability, limited areas for evapotranspiration in dense developed areas, desirability of dense development versus sprawl, potential for water balance issues and un-natural baseflow impacts and lack of non-potable demand for harvested storm water,

For areas that are conducive to achieving volume losses, other site constraints may impact the practicability of implementing infiltration facilities due to the presence of existing infrastructure and location of available space relative to the tributary drainage area. For agricultural areas, infiltration facilities may be more attractable than bioretention facilities. However, the feasibility of achieving volume reductions in the agricultural areas is even more uncertain than it is for urban areas. Agricultural lands generally have very low imperviousness such that runoff and shallow subsurface interflow typically only occurs when the soils become saturated. During these conditions infiltration rates would be expected to be reduced and infiltration basins would need to be sized to retain storm water for longer periods of time in order to reduce volumes.

31. Response: EPA and the Hinkson Creek TMDL do not mandate any expenditure of funds. EPA and the Hinkson Creek TMDL do not recommend implementation of any particular water quality controls or BMPs. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility. However, MDNR will work with permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). EPA understands that there are economic and feasibility challenges facing stakeholders.

In a phased TMDL, EPA uses the best information available to establish the TMDL at levels necessary to implement applicable WQS and to make the allocations to the pollution sources. However, the phased TMDL approach recognizes that additional data and information may be necessary to further validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the WQS. Using a phased TMDL approach does not include targeting LCs, WLAs or LA less than WQS. There is one overarching requirement for all TMDLs, they must meet all applicable WQS (40 CFR § 130.7(c)(1)(ii)).

The conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

EPA understands that resources are limited and that communities are sometimes hard pressed to meet the demands of water and wastewater system improvements. EPA urges the commentor to work with MDNR's Financial Assistance Center to discuss grant, low-interest loans or other options that may be available to the city should wastewater system improvements be necessary. To reach MDNR's Financial Assistance Center, call (573) 751-1192 and ask for either Mr. Doug Garrett or Ms. Traci Newberry, or email Mr. Garrett at doug.garrett@dnr.mo.gov. You can also find them on the Web at http://www.dnr.mo.gov/env/wpp/srf/index.html.

32. Comment: The Permit Holders object to the issuance of the TMDL for Hinkson Creek. The 303(d) listing of the Hinkson Creek is not supported by evidence and the TMDL unlawfully attempts to mandate a reduction in flow contrary to EPA's authority under the CWA.

32. Response: The listing of Hinkson Creek as impaired is beyond the scope of this public notice. However, due to the number of public comments asking why Hinkson was listed as impaired for "unspecified" or "unknown" pollutants, this response offers the regulatory explanation for Hinkson Creek's 303(d) listing.

EPA regulations require states to identify all waters still requiring TMDLs where standards are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1). While the CWA specifies that TMDLs shall be developed for pollutants, Section 303(d)(1) simply requires that certain waters be listed. The regulations do not exempt waters where the specific pollutant causing or expected to cause the exceedance of the applicable WQS is not known. Where either EPA's or MDNR's evaluation of data and/or information of the water body's designated use, numeric criteria, or narrative criteria for water bodies, classified and unclassified, indicate impairment of the natural biological community, then the water body should be included on the State's 303(d) list. As such, listing for "unknown" or "unspecified" pollutants is a valid listing until such time as a specific pollutant or pollutants have been determined through additional monitoring and assessment before a TMDL is actually developed.

In the case of Hinkson Creek, the pollutant causing the impairments is listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." 40 CFR § 130.2(i). The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson Creek's warm-water aquatic life designated beneficial use also addresses chemicals and habitat. TMDLs are often complicated by multiple pollutants. Using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

To the extent that the term "flow" refers solely to the volume and velocity of flowing water, flow may affect hydrologic and geomorphologic changes that in turn affect aquatic life. However, by itself, flow volume or velocity is not a CWA Section 502(6) "pollutant." The Hinkson Creek TMDL does not target a reduction in flow; the TMDL targets a reduction in storm water runoff. Accordingly, EPA believes it is appropriate in a TMDL analysis for storm water runoff to serve as a surrogate for the presence of these mix of pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/geomorphologic impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

33. Comment: The Permit Holders agree with the goal, objective and necessary outcome desired of this TMDL - conditions such to remove Hinkson Creek from the 303(d) impaired waters listing.

33. Response: While EPA thanks the commentors for their support, the listing of Hinkson Creek as impaired is beyond the scope of this TMDL public notice. Please refer to Response to Comment number 25.

34. Comment: The Permit Holders do not agree with this TMDL's means and methods to achieve the outcome, and believe the strategy as proposed may result in the opposite effect.

34. Response: EPA thanks the commentors for their input. Please read the responses throughout this document for information about how other commentors questions about the modeling and implementation of this TMDL were answered. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility. However, MDNR will work with permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). EPA understands that there are economic and feasibility challenges facing stakeholders. The conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr.

Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

35. Comment: This draft TMDL ignores all representative available evidence supporting the delisting of Hinkson Creek.

35. Response: Please refer to response number 33.

36. Comment: Judging by the hasty timing this TMDL has been placed on public notice, it is clear that the EPA is issuing this TMDL only to meet a deadline in the 2001 Consent Decree in the face of all evidence to the contrary.

36. Response: EPA appreciates the stakeholder's comment, but the TMDL is consistent with the CWA requirements and meets regulations and guidelines. The TMDL is scientifically defensible. It is true EPA must meet the requirements of the Consent Decree, Hinkson Creek has been the subject of TMDL development by MDNR for many years and EPA disagrees that the TMDL was prepared "hastily." The data in the TMDL is representative of instream conditions and meets the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). Although EPA cannot establish implementation plans, EPA included the implementation plan that MDNR previously public noticed as an information resource for stakeholders. Hinkson Creek is an important asset to stakeholders many of whom are already working to improve the watershed. EPA believes this TMDL will be a benefit to the watershed and work in concert with current efforts. MDNR will incorporate the TMDL into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)).

37. Comment: EPA failed to conduct any fact finding to validate its TMDL findings as no stakeholders have been contacted regarding this document. It is disturbing that EPA openly admits that it is "establishing the TMDL to meet the milestones of the 2001Consent Decree." Issuing a flawed TMDL only to meet a consent decree timeline is not a scientifically supported basis by which to issue this TMDL and wholly ignores the Congressional intent for public participation as a major element of the TMDL process.

37. Response: EPA does not agree that this is a flawed TMDL. See previous responses above for the entire scientifically supported basis.

Although the TMDL is being established at this time to meet a Consent Decree deadline, EPA nevertheless believes the TMDL to be consistent with the CWA, EPA regulations, guidance and is scientifically defensible. EPA also incorporated previous public comment and stakeholder interaction from MDNR's TMDL development for Hinkson Creek. EPA policy agrees that there should be full and meaningful public participation in the TMDL development process from those impacted by the TMDL (40 CFR § 130.7(c)(1)(ii)).[1] The public notice period offers an opportunity for meaningful review for the TMDL as EPA is

[1] *Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992*, EPA, May 20, 2002

establishing it. All comments received during public notice are considered and addressed in the final TMDL as is appropriate (40 CFR § 130.7(d)(2)).

Per EPA regulations, public notice should follow the state's public review process as defined in the state's Continuing Planning Process (CPP) (40 CFR § 130.7(a), 40 CFR § 130.7(c)(1)(ii) and 40 CFR § 130.7(d)(2)). Missouri's most current CPP defines a 30 day public notice period distributed to all known stakeholders impacted by the TMDL. (Missouri's most current CPP is found at http://www.dnr.mo.gov/env/wpp/cpp/cpp_toc.htm) To distribute the draft TMDL as widely as possible, EPA publishes the draft TMDL on its Website (http://www.epa.gov/region07/water/tmdl_public_notice.htm) and concurrently MDNR notified stakeholders on its Website (http://www.dnr.mo.gov/env/wpp/tmdl/wpc-tmdl-progress.htm) for 30 days. When the draft TMDL is posted on the Websites, EPA and/or MDNR sends timely notice by mail and/or email to all identified point source facilities, nonpoint source entities, watershed stakeholders, community groups, elected representatives, cities, townships and counties that are part of the impaired watershed or have indicated previous interest in the impaired water's TMDL to notify them of the posting.

MDNR will work with permitted facilities identified in the TMDL as per EPA regulations, *…the state incorporates the TMDL into its current WQM plan for implementation* (40 CFR § 130.7(d)(2)). In addition, MDNR provided the implementation plan which EPA included in Appendix E as an informational tool for watershed stakeholders.

38. Comment: The Permit Holders demand that EPA withhold this TMDL and conduct an adequate review of all relevant evidence available for the Hinkson Creek and engage the principal stakeholders who will be subject to any TMDL, the County of Boone, the city of Columbia and the UMC.

38. Response: EPA provided public notice as described in Response 37 above. Additionally, a meeting was held in the EPA Region 7 offices on December 20, 2010, to further understand stakeholder comments.

39. Comment: All prior comments submitted to the MDNR by the Permit Holders and several interested stakeholders are hereby incorporated into this correspondence and have been included as appendices to this letter. The Geosyntec Consultants Report dated November 30, 2010, is also hereby incorporated into this correspondence.

39. Response: EPA acknowledges the commentors wishes and hereby incorporates all referenced appendices and the Geosyntec Consultants Report into the comment public record. The Geosyntec Consultants Report comments are addressed within this SUMMARY of COMMENTS and RESPONSES (III of III).

40. Comment: The CWA Prohibits the Listing of the Hinkson Creek Where No *Pollutant* Has Been Identified. The identification of a pollutant is expressly required under the Clean Water

Act before a TMDL can be developed. Section 303(d) only requires the development of TMDLs:

> …for those *pollutants* which the Administrator identifies under Section 1314(a)(2) of this title as suitable for calculation. Such load shall be established at a level necessary to implement the applicable WQS with seasonal variations and a MOS which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

In addition, federal regulation requires States to identify the specific "pollutant(s) causing or expected to cause violations of applicable WQS on their 303(d) lists. This requirement has not been fulfilled.

At the outset, the TMDL states that, "No pollutant, or suite of pollutants, appears to be the main cause of the impairment in Hinkson Creek." It further states that the TMDL that "no one contaminant was discerned to be the primary pollutant of concern. This conclusion is consistent with that reached by the MDNR in its prior draft TMDL and confirms that this TMDL is being established without an identified pollutant in violation of Section 303(d) of the Clean Water Act.

The assertion that the stressors and pollutants listed in Tables 6 and 7 are "collectively causing the impairment" is not supported by evidence in the record and does not meet EPA's requirement to identify a pollutant before a TMDL can be established. Many items listed in Tables 6 and 7 were attributable to direct sources that have been eliminated in the watershed, further undermining this conclusion. Without the correlation between a specific pollutant of concern and the observed impairment, the requirement to identify a pollutant before the establishment of a TMDL has not been met.

The EPA appears to rely upon its 1998 listing guidance as the basis to develop this TMDL without an identified pollutant. This reliance not only contradicts the clear statutory and regulatory mandate, but is flawed since the 1998 guidance does not address the development of TMDLs and only addresses a state's decision to *list* a water body on a 303(d) list when a pollutant has not been identified. This guidance in no way changes the CWA mandate that EPA must identify a pollutant before a TMDL can be developed.

40. Response: As stated in the TMDL Section 4.5.2, is based on data collected during the Hinkson Creek water quality studies, Tables 6 and 7 were constructed to list stressors and conditions found in the Hinkson Creek main stem and selected storm water outfalls. Additionally, Tables 6 and 7 include likely and/or possible sources of pollutants for each stressor and condition. Also stated in the TMDL, to view the Executive Summaries from these studies, or the studies, in their entirety, go to www.dnr.mo.gov/env/esp/esp-wqm.htm.

In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings

to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation. EPA's regulations state that TMDLs can be expressed in several ways, including in terms of toxicity, which is a characteristic of one or more pollutants, or by some "other appropriate measure." (40 CFR § 130.2(i)).

Please see, *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act,* July 29, 2005 found online at http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf.

> **If a designated use is not supported and the segment is impaired or threatened, the fact that the specific pollutant is not known does not provide a basis for excluding the segment from Category 5. These segments must be listed unless the state can demonstrate that no pollutant(s) causes or contribute to the impairment. Prior to establishing a TMDL for such segments the pollutant causing the impairment must be identified**.

41. Comment: The agency's failure to exercise its non-discretionary duty under the CWA is enforceable by citizen suit. The Administrator has the non-discretionary task of identifying pollutants in setting the goals and objectives of a TMDL as discussed in the commentor's previous comment (comment 40). Because the specific pollutants designated for Hinkson Creek are, by admission of the agency, "unknown," the agency has failed to fulfill this non-discretionary duty. Webster's Dictionary defines "unknown" as: not known; (a) not disclosed or identified; (b) not determine or verified. The statements are not consistent because "unknown" cannot be a "pollutant" as required by the CWA. The English language does not allow this fact to occur. The failure of the agency to fulfill its non-discretionary duty to specifically identify pollutants under Sections 303 and 304 of the CWA must be addressed. Failure to address this non-discretionary duty is subject to enforcement by a citizens' suit pursuant to the CWA.

41. Response: EPA believes the TMDL to be consistent with the CWA, EPA regulations, guidance and is scientifically defensible. For more information about the unknown pollutant for Hinkson Creek, please refer to Response 40 above.

42. Comment: Flow is not a pollutant under the CWA. Nothing in federal regulation authorizes the use of flow as a pollutant. Federal regulations are clear that EPA can only reduce pollution in a TMDL by identifying WLAs for point sources and load allocations (LA) for nonpoint sources. A "WLA" is defined as, "The portion of a TMDL's pollutant load allocated to a point source of a *pollutant* for which an NPDES permit is required. Not only is there no known pollutant to base a WLA upon, but nothing in the definitions of WLA or "pollutant" authorizes the EPA to regulate water flow, volume or quantity through a TMDL. Further, there is no evidence in the record that flow was adequately studied to justify the treatment of flow as a pollutant in the TMDL. The EPA includes flow data (when comparing to reference streams) for the last three years -- all abnormally wet years -- speculating that fluctuations in aquatic life are related to flow. The agency's supposition provides no legal basis to require a mandatory reduction in flow and is contrary to EPA's authority under the CWA and implementing regulations.

42. Response: For more information about the unknown pollutant for Hinkson Creek, please refer to Responses 5, 29, 32 and 40 above.

The CWA supports the Hinkson TMDL because EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure" per 40 CFR § 130.2(i). Hinkson is not different from other TMDLs because frequently TMDLs are complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairment may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed.

43. Comment: EPA's conclusion that Hinkson Creek has an impaired biological community is flawed. According to the studies upon which this TMDL is based, Hinkson Creek supports a biological community required for the designated use. Many places sampled achieved a score of sixteen, which MDNR recognizes as fully supporting aquatic life. With the exception of MDNR's non-representative spring of 2002 assessment, macroinvertebrate samples collected by MDNR have shown the urban portion of Hinkson Creek to *be fully supporting or very nearly so each time the biological community has been evaluated.* Even comparing to the study done for Potash Brook in Vermont - the TMDL cited as precedent for the Hinkson Creek TMDL -- Hinkson Creek could be considered a high quality urban reference stream to which other streams in Missouri cities should be compared for attainment of aquatic life. This data hardly supports the agency's conclusion that this stream is impaired. The last comprehensive investigation of the macroinvertebrate community was conducted by MDNR in the fall of 2001 and spring of 2002, over eight years ago. The data derived from this assessment is not representative of current conditions in the Hinkson Creek since it does not reflect improvements in the watershed from the MS4 Permit Holders' implementation of control equipment, BMPs and elimination of discharges in the Hinkson watershed.

43. Response: The listing of this water as impaired is beyond the scope of this TMDL public notice. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supportive for biological communities (SCI < 16). In regard to the biological communities, the commentor is directed to responses 7, 12, 21, 22, 25 and 29 above for more information.

44. Comment: Throughout this TMDL document, an erroneous assumption has been made that the biological community was attaining the beneficial use prior to increased urbanization and that restoring hydrology to historical levels will restore biological health. This assumption is baseless in that the biological health of Hinkson Creek has not been adequately documented for the reference time period and anecdotal evidence suggests that the water quality and biological health of Hinkson Creek was poor and has actually improved considerably since the 1960's. For instance, nearly 54 on-site or small WWTFs have been eliminated and replaced with regional WWTFs to improve water quality in the Hinkson watershed. Agricultural practices have also

improved in the past 50 years. There is insufficient evidence that the biological community was attaining beneficial uses in the 1960- 1990 period and EPA's conclusions are improperly based on this assumption.

44. Response: TMDLs must target current WQS and designated beneficial uses for the water body without any regard to previous attainment (40 CFR § 130.7(c)(1)(ii)). Table A of Missouri's WQS (10 CSR 20-7.031), entitled "Criteria for Designated Uses," identifies the criteria associated with the "Protection of Aquatic Life" use designation. The TMDL offers historical biological community health information through the analysis of data in the document and in the background section and appendices; however, the focus of the TMDL is how the water body can attain its current designated uses. EPA commends stakeholders in the watershed who have already taken steps to improve Hinkson Creek, but no data has been provided that would indicate Hinkson Creek is currently meeting its designated beneficial uses or that the water quality and biological health of Hinkson Creek has improved considerably since the 1960s. Please provide MDNR any new data not represented in the TMDL. The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data. In regard to the biological communities, the commentor is directed to Response 43 above for more information.

45. Comment: EPA's conclusions in the TMDL are unsupported by the record and EPA's conclusions ignore evidence that water quality has improved in Hinkson Creek. The TMDL relies on incomplete data and ignores the fact that the Hinkson Creek has continually improved. Farming practices of the early 20th century removed most of the forest in the watershed which caused damage to the stream. Many of the harmful effect said to stem from urban development today also came from farming practices in the early 20th century, including low baseflow as forests and prairies were replaced with pastures and row crops. The baseflow noted in the study to have been present in the late 1960's certainly contained a high percentage of effluent from water treatment plant effluent. Most of this effluent baseflow resulted from the delivery of piped, potable water to households in the watershed as opposed to rain water falling on the watershed. This effluent was known to be of poor quality. This is why the city of Columbia has removed those facilities from the watershed over the years. Since the middle of the last century, the city of Columbia has eliminated approximately 10 million gallons per day of poor quality treated effluent from Hinkson Creek. (This estimate is based upon the actual or design flows for 54 wastewater treatment plants (WWTPs) that were eliminated.)

45. Response: EPA commends stakeholders in the watershed who have already taken steps to improve Hinkson Creek and urges them to continue working toward Hinkson Creek meeting its designated uses. The Hinkson Creek TMDL was written with the best available data, based on that data, the TMDL is written to meet WQS (40 CFR § 130.7(c)(1)(ii)). There is no scientific basis to conclude that Hinkson Creek has better water quality than it

did historically. On the contrary, Hinkson Creek still is not meeting its designated beneficial use and is currently listed as impaired. EPA was not provided any new data or biological assessments during the public notice of the Hinkson Creek TMDL. TMDLs must target current WQS and designated beneficial uses for that water body (40 CFR § 130.7(c)(1)(ii)). Table A of Missouri's WQS (10 CSR 20-7.031), entitled "Criteria for Designated Uses," identifies the criteria associated with the "Protection of Aquatic Life" use designation. The TMDL offers historical biological community health information through the analysis of data in the document and in the background section and appendices; however, the focus of the TMDL is how the water body can attain its' current designated uses. Please provide MDNR any new data not represented in the TMDL. The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

46. Comment: While the removal of sewage treatment plant effluent from smaller treatment plants has improved the quality of water in the Hinkson, the TMDL reflects no analysis that the continued removal of "baseflow" or too much control of volume and flow will not be damaging to the aquatic community in the watershed.

46. Response: EPA thanks the commentor for their concern about Hinkson Creek. There is no scientific basis to conclude that Hinkson Creek has better water quality than it did historically. On the contrary, Hinkson Creek still is not meeting its current designated beneficial use and is currently listed as impaired. EPA was not provided any new data or biological assessments during the public notice of the Hinkson Creek TMDL to indicate otherwise.

Flow response to precipitation in Hinkson Creek has increased markedly over time. The commentor is directed to Section 4.5 of the TMDL which discusses and presents data from 1967 to 2010. Specifically, please refer to Table 9: *Comparison of Precipitation and Flow for April 1 – July 31.* Data were based on the Sanborn Field (University of Missouri – Columbia [UMC]) Weather Station and United States Geological Survey (USGS) gage. A comparison of flow response to precipitation between 1967 and 2007 shows that, despite a smaller amount of rainfall in the latter year, average daily flow was more than 80 percent higher. Another example is in Table 10 of the TMDL, we see that peak flow increased from 7.56 cfs/sq mile in 1967 to 73.78 cfs/sq mile in 2010. In addition to higher flows in the stream from storm water, increased impermeable surface area within the watershed results in reduced base flows. This is illustrated in the FDCs for these same two time periods in Figure 4 of the TMDL. The right half of the graph gives an indication that base flow in 2007 is consistently lower than in 1967 and the left half indicates the opposite effect for higher flows.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID1007 to determine the TMDL flow allocation.

The underlying assumption in the approach is that urban, more developed areas typically convey more storm water due to less infiltration while rural, less developed or agricultural areas generate less runoff because of fewer impervious surface areas. With appropriate classification of land use within the watershed, developed/urbanized areas can be included in the WLA portion of the TMDL, and lesser developed areas can be included in the LA portion. This approach is reasonable as urban areas tend to be dominated by point source conveyances of storm water, while rural areas are predominantly drained by surface flows. Therefore, the TMDL allocation process for the Hinkson Creek TMDL is simplified through the use of a land use based allocation approach to distribute the overall percent reduction targets for the watershed.

The TMDL does not target baseflow. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the FDC. The TMDL includes another target, that 100 percent of all sites surveyed receive a fully supporting rating (SCI ≥ 16). The TMDL indicates that by meeting the storm water runoff reductions and thereby decreasing the toxic mix of pollutants being discharged into the stream, and meeting the TMDL's biocriteria target, base flow concentrations may be improved. The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows – not reducing them.

The analysis does not include lower flows (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

A hallmark of the TMDL process is adaptive management or implementation. This is an iterative process to achieve water quality goals. Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an

impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions. A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP. There is one overarching requirement for all TMDLs, they must meet any applicable WQS (40 CFR § 130.7(c)(1)(ii)).

47. Comment: The TMDL further ignores the reality that mandating the expenditure of all available public funds in an attempt to reach an impossible target will diminish the permit holders' capability to implement numerous other water quality controls that will improve the watershed.

47. Response: EPA and the Hinkson Creek TMDL do not recommend implementation of any particular water quality controls or BMPs. It is MDNR that will work with permitted facilities identified in the TMDL. Per EPA regulations the state incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)).

The Hinkson Creek TMDL was written with the best available data. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility. However, MDNR will work with the permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). EPA understands that there are economic and feasibility challenges facing stakeholders. The conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

EPA understands that resources are limited and that communities are sometimes hard pressed to meet the demands of water and wastewater system improvements. EPA urges the commentor to work with MDNR's Financial Assistance Center to discuss grant, low-interest loans or other options that may be available to the city should wastewater system improvements be necessary. To reach MDNR's Financial Assistance Center, call (573) 751-1192 and ask for either Mr. Doug Garrett or Ms. Traci Newberry, or email Mr. Garrett at doug.garrett@dnr.mo.gov. You can also find them on the Web at http://www.dnr.mo.gov/env/wpp/srf/index.html.

48. Comment: EPA's conclusions in the TMDL are unsupported by the record. EPA has no evidence that a reduction in flow will improve water quality in the Hinkson Creek. Because there is no data to support that a reduction in flow or volume will improve WQS, a mandatory reduction in flow is inappropriate and against the weight of the evidence in the record.

This TMDL is based on the unsupported conclusion that the aquatic invertebrate community has been negatively impacted by the increase in urbanization (imperviousness) which has increased either the amount of water in the creek; or the amount of water at the extreme event (0.03%). The purpose of the TMDL is to determine the pollutant loading a water body can assimilate

without exceeding the WQS for that pollutant. This draft TMDL uses flow (or volume) as a surrogate for any pollutant that may be found in storm water runoff.

Without understanding the sources of pollutants and delivery pathways from certain land uses, basin-wide reductions could actually increase instream pollutant concentrations due to less dilution. Lumping of all urban land uses for the land use-based TMDL allocations may cause further increases in concentrations.

Commercial and industrial areas will have fewer opportunities for reducing runoff volumes than residential areas and infiltration may even be prohibited for some types of industries. If residential areas reduce runoff volumes more than commercial and industrial areas, then in-stream concentrations could increase.

48. Response: EPA appreciates the commentor's interest in Hinkson Creek. The TMDL specifically targets reducing storm water runoff at the higher flows. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows.

National studies (CWP and WERF, as cited in the TMDL) have documented the connection between increased impervious area in urban areas to increases in storm water runoff which contribute numerous pollutants and changes in hydrology with increased magnitude, duration and frequency of storm water. These resulting changes are known to negatively affect water quality and aquatic life.

As stated in the TMDL, the CWP study reviewed hundreds of research studies. The combined review and synthesis of information in these studies led CWP to conclude that impervious cover as low as 10 percent can be related to aquatic life impairments and worsens as more areas within the watershed are developed.

Reducing the frequency and magnitude of high flows will encourage infiltration so that the stream hydrology more closely matches pre-development hydrology as measured in the reference stream watersheds. In turn this will reduce the amount of pollutants carried by storm water into Hinkson Creek. Based upon the analysis by national and local studies, it is reasonable that addressing these negative impacts will result in better habitat and protection of aquatic life and natural biological aquatic communities.

The relationship between storm water runoff and the toxic mix of pollutants impairing Hinkson's warm-water aquatic life designated use also addresses other chemical pollutants and habitat degradation. Specifically, please refer to Section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and specifically how Hinkson Creek's data links storm water to decreased aquatic life.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions.

Based on the MDNR's biological studies, urban areas have been identified as the potential source contributing pollutants to Hinkson Creek and these pollutants have impaired the stream's biological community. However, the concentrations of all the pollutants are below the state's WQS. To address the synergic biological effect of these pollutants, EPA uses storm water runoff as a surrogate to target all the potential pollutants transported during runoff events so that the favorable biological condition can be restored or created. The TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. To create the baseline of biological conditions, several reference streams were selected and normalized to reduce hydrologic variations caused by many environmental factors such as soils and watershed size. TMDL targets were determined using the limited flow data and then allocated to both rural and urban areas based on their associated surface imperviousness.

Based on all the available information provided by MDNR, EPA believes that using storm water runoff as a surrogate is an appropriate approach to abate unknown pollutants and can specifically target various pollutants transported from different land use types. EPA believes it is an appropriate approach and many states have broadly used this approach for their TMDLs. EPA appreciates the stakeholders' comments on the TMDL and understands that the commentor is concerned about possible environmental outcomes that may result from various implementation plans. MDNR will work with permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. If new data reveal critical developments in Hinkson Creek, the TMDL's adaptive management process will be able to respond. Please see Response 5 above for a more definitive response on land use issues.

49. Comment: Understanding pollutant generation, transport, and delivery processes are necessary in developing effective control and restoration measures.

49. Response: In order to develop effective controls and restoration measures, the generation, transport and delivery of a pollutant should be understood. Based on the MDNR's biological studies, urban area is identified as the potential source contributing pollutants to Hinkson Creek and impairing its biological community via runoff events. Because the concentrations of potential chemicals are below the state's WQS and the biological impairment is considered due to their synergic effect, EPA uses storm water runoff as a surrogate to target all the potential pollutants transported during runoff events so that the favorable biological condition can be restored or created. To create the baseline

of biological conditions, several reference streams were selected and normalized to reduce hydrologic variations caused by many environmental factors such as soils and watershed size. TMDL targets were determined using the limited flow data and then allocated to both rural and urban areas based on their associated surface imperviousness.

The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. § 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). EPA regulations also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach 40 CFR § 130.7 (c)(1)(i). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) List, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation.

The TMDL specifically targets reducing storm water runoff at the higher flows. Slowing and retaining storm water promotes infiltration, which aids ground water recharge. Groundwater recharge results in increasing base flows. The analysis does not include lower flow settings (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

A hallmark of the TMDL process is adaptive management or implementation. This is an iterative process to achieve water quality goals. Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions. A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP. There is one overarching requirement for all TMDLs, they must meet any applicable WQS (40 CFR § 130.7(c)(1)(ii)).

The surrogate relationship between storm water and the toxic mix of pollutants impairing Hinkson's aquatic life use is explained in Section 4 of the TMDL. Specifically, please refer to Section 4.5.3 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and how Hinkson Creek's data links storm water to decreased aquatic life. The commentor is directed to Appendices C, D and E for data and further analyses. Indeed, it is the dynamic ability of the modeling in the TMDL that allows an understanding of the complex interactions between hydrology, climate and land use to set the loads that protect water quality which will improve aquatic life.

50. Comment: It is still unclear from the language in the Draft TMDL, if a reduction in flow (or volume) is the target.

A reduction in volume is impossible. If a volume reduction is required, then the community has to remove that amount of water from the watershed. Once the required volume is captured, what can be done with it? The TMDL states reduction by either infiltration or evapotranspiration are allowable methods. Ninety percent of the soils in this watershed have slow to very slow permeability. That is less than a half an inch per hour, under ponded conditions. Evapotranspiration rates are difficult to calculate. Using the PAN Method evapotranspiration rates, we could expect about 1/2 inch per day. At that rate, it would take weeks to evaporate and infiltrate the water from a 0.5 inch storm. That is just one event. The average rainfall for Boone County is 38 inches per year. For the last two years, this area received over 50 inches of precipitation. Even through detention and slow release, the same volume or amount of water is f1owing through the channel just spread out over a longer time period. A volume reduction of that magnitude is scientifically impossible.

50. Response: EPA uses storm water runoff at high flows as a surrogate to target a group of toxic pollutants transported from rural and in particular urban areas during runoff events. EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. The comment refers to the MDNR TMDL model and is not pertinent to the current TMDL. The 50.1 percent reduction was from the previous MDNR TMDL model and is no longer pertinent to the current TMDL. In the EPA Hinkson Creek TMDL, the water quality target range between the upper 3 and 5 percentiles of flow exceedances of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. There are many watershed management practices able to retain these pollutants. For example, National Research Council in 2009 published a report entitled *Urban Stormwater Management in the United States* (referenced in the TMDL pages 18, 46 and 69). This report provides detailed information about the impacts of urbanization, associated management approaches and some innovative permitting strategies.

MDNR will incorporate the TMDL into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

51. Comment: The Hinkson Creek TMDL contradicts EPA's own guidance by not allowing phased WLA approach. EPA guidance supports the use of a phased approach for TMDLs when (1) significant data uncertainty is present; or (2) when using a surrogate to interpret a narrative standard; or (3) when uncertainty about the effectiveness of implementation activities exists. These are clearly the situation demonstrated with the Hinkson Creek. EPA guidance states:

> *"Phased TMDLs*
> We recommend the use of the term "phased TMDLs" be limited to TMDLs that for scheduling reasons need to be established despite significant data uncertainty and where the State expects that the LC and allocation scheme will be revised in the near future as additional information is collected. In other words, phased TMDLs would be reserved for the second scenario described in the 1991 Guidance.
>
> The phased TMDL approach would be used in situations where limited existing data are used to develop a TMDL and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. Such significant uncertainty may arise, for example, because the State is using a surrogate to interpret a narrative standard, or because there is little information regarding the LC of a complex system such as an estuary and it is difficult to predict how the a water body will react to the planned load reductions ...
>
> *TMDLs with Adaptive Implementation and Trading Provisions*
>
> Adaptive implementation is an iterative implementation process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. The National Research Council report suggests that adaptive implementation include "immediate actions, an array of possible long-term actions, success monitoring, and experimentation for model refinement." By using the adaptive implementation approach, one can utilize the new information available from monitoring following initial TMDL implementation efforts to appropriately target the next suite of implementation activities.
>
> Phased TMDLs are an example of the adaptive implementation approach because each new phase utilizes new information to reevaluate the original TMDL. ... Implementation of TMDLs can take many years and when uncertainty about the effectiveness of implementation activities exists, TMDLs would benefit from containing elements that

would facilitate adaptive implementation such as, for example, provisions for a flexible LA/WLA scheme....

... EPA believes that in appropriate cases it should be feasible for States to develop TMDLs that facilitate implementation of practicable controls while additional data collection and analysis are conducted to guide implementation actions. Follow-up monitoring is integral to the adaptive implementation approach. Monitoring addresses uncertainty in the efficacy of implementation actions and can provide assurance that implementation measures are succeeding in attaining WQS, as well as inform the ongoing TMDL implementation strategy...

51. Response: EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. In a phased TMDL, EPA uses the best information available to establish the TMDL at levels necessary to implement applicable WQS and to make the allocations to the pollution sources. However, the phased TMDL approach recognizes that additional data and information may be necessary to further validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the WQS. Using a phased TMDL approach does not include targeting LCs, WLAs or LA less than WQS. There is one overarching requirement for all TMDLs, they must meet all applicable WQS (40 CFR § 130.7(c)(1)(ii)). A TMDL must be written and modeled to meet WQS. MDNR will incorporate the TMDL into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). The phased TMDL process begins with monitoring and adaptive implementation, an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. Upon collection, the data and information would then be assessed and would form the basis for any appropriate future revision to the TMDLs, including any necessary adjustments to the load reductions or the allocation of the allowable load or both. Additionally, EPA recognizes that implementation of TMDLs will be iterative, as it uses any new data or information to reduce uncertainty and adjust the implementation activities accordingly. As new data becomes available as a result of monitoring, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

Development of a TMDL requires data collection and evaluation of implemented BMPs, or techniques to prevent pollution, to determine which and how pollutant sources can be controlled or eliminated to restore an impaired water body. This work can be adaptive; data gathered during the implementation process can be used to determine future actions. A TMDL can be revised or modified at any point; a decision to do so often depends on interim results, findings of ongoing studies or field data and the effectiveness of an implemented BMP.

The conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

52. Comment: The Hinkson Creek TMDL lends itself squarely to the use of a phased approach due to the limited data upon which it is based and the scientific uncertainty of the impacts a flow reduction of this magnitude will have in the watershed. In fact, MDNR supported the use of a phased approach in its October 21, 2009 correspondence and attachment. It is unclear why this applicable EPA recommended approach was dismissed while considerable effort was made to fit the existing limited data to an inapplicable, unworkable approach, namely the use of reference streams. It is clear that the phased approach is the most workable solution, which would allow the Permit Holders to continue improvements in the watershed. Ignoring this approach is arbitrary, capricious, and unsupported by any evidence in the record.

52. Response: Please see the Response to Comment number 51 above.

53. Comment: EPA should incorporate the current ordinances and work with the local storm water management planning to address Hinkson Creek. Hinkson Creek is a unique urban stream in Missouri. Throughout the city, the riparian corridor is mainly intact. This is due to Columbia's Flood Plain Ordinances. These protections have recently been increased to include the entire stream network with the new City/County Stream Buffer Regulations. The riparian corridors protect and stabilize stream banks, reduce stream temperatures, as well as add important nutrients and habitat for aquatic organisms. Although there are some sections of Hinkson that have been channelized, most of the stream system retains some sinuosity. These features may explain why the agencies' studies find the aquatic invertebrates in Hinkson are partially to fully supporting over time. The permit holders have continuously engaged stakeholders to develop storm water planning approaches in the community. Through this process, the permit holders have enacted comprehensive ordinances to address water quality and flow reductions throughout the watershed. For instance, the storm water ordinances for the city and the county require that the water volume (1.3 inches) be treated through a filtration BMP. This storm is frequently called the first flush, as it contains the majority of contaminants. The Draft TMDL does not reflect these ordinances and will potentially conflict with measures.

53. Response: EPA recognizes the work that's already been done in the watershed and applauds the stakeholders for their efforts to improve water quality in Hinkson Creek. The current improvements in the watershed and existing regulations will function in concert with the TMDL per MDNR's implementation. MDNR will incorporate the TMDL into Missouri's WQM plan for implementation and monitoring (40 CFR § 130.7(d)(2)). One of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

54. Comment: This TMDL Will Have Adverse Consequences in the Community: Detention Basins-- to be the most effective, storm water detention basins would have to be constructed low in the watershed. This would remove the riparian corridor and established hardwood forest. MDNR just developed nutrient criteria for reservoirs. During that process it was determined that

impounded water needed a retention time of 6 months or more to achieve pollutant reduction. Most storm water detention basins drain in 48 hours or less. If the residents of Boone chose regional detention, it would be difficult to design a regional basin large enough to hold 6 months of flow. Therefore, this TMDL could create additional water quality impairments in those detention basins. Slow release of the storm water, and fluctuating stream flow may increase the amount of time that the channel is full, destabilizing banks and cause more erosion.

54. Response: The TMDL does not require detention basins nor does the implementation plan proposed by MDNR. Neither EPA nor the TMDL requires implementation of specific BMPs. MDNR will work with stakeholders on the implementation of the TMDL. Regarding potential problems that could develop during implementation: Per EPA regulations, Missouri incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities including adjusting BMPs. If new data reveal critical developments in Hinkson Creek, the TMDL's adaptive management process will be able to respond.

55. Comment: As stated during the meeting on April 20, 2010, engineers will design facilities to capture the runoff from a specific storm event. Runoff from storms under that threshold is also detained. Therefore, the potential exists to remove so much water that the stream and invertebrates are actually starved of water during drought times.

55. Response: EPA was not present at the April 20, 2010 public meeting, which was part of the public notice of MDNRs original Hinkson Creek TMDL. EPA has since revised the previous Hinkson Creek public noticed MDNR model and remodeled the watershed. The comment refers to the MDNR TMDL model and is not pertinent to the current EPA TMDL.

MDNR will work with stakeholders on the implementation of the TMDL. Regarding potential problems that could develop during implementation: Per EPA regulations, Missouri incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. If new data reveal critical developments in Hinkson Creek, the TMDL's adaptive management process will be able to respond.

56. Comment: This TMDL suggests that the community should capture the relatively clean water from rooftops and lawns. This would mean that a larger percentage of the water that reaches the creek is from high polluting sources such as parking lots and streets. This could in fact increase the concentration of contaminants that enters the stream.

56. Response: Neither EPA nor the TMDL requires implementation of specific BMPs. MDNR will work with stakeholders on the implementation of the TMDL. Per EPA

regulations, Missouri incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. If new data reveal critical developments in Hinkson Creek, the TMDL's adaptive management process will be able to respond.

57. Comment: The TMDL and its methodology will result in the unintended consequence of increased sprawl by limiting the ability to develop in the Hinkson Creek watershed. The proposal calls for a substantial reduction in volume, flow or quantity. To achieve such a reduction, significant structures at significant costs will be required. Structures will be required to be constructed in the existing footprint of the City and County to meet the reduction objective. This will come at considerable public and private expense. New development will seek to maximize cost benefit ratios. New projects will seek other watersheds with fewer restrictions. All of which are outside the core of the central Columbia area. This will result in an expansion of infrastructure and increase the footprint of the current City further into the County, placing adjacent watersheds under stress. While Boone County storm water ordinances will provide some protection, the outward expansion of the urbanized area will be the unintended consequence of the Hinkson Creek TMDL.

57. Response: EPA thanks the commentor for sharing their concerns. The TMDL is not designed to limit development in Hinkson Creek's watershed, but rather provide pollutant LCs that protects Hinkson Creek's designated uses. Regarding potential problems that could develop during implementation: Per EPA regulations, Missouri incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. Please also note that, all water bodies are required to meet all Missouri WQS (numeric and narrative) including maintaining designated beneficial uses. All water bodies assessed as not meeting WQS will be listed as impaired on Missouri's 303(d) lists.

58. Comment: Loss of funding -- Unlike WWTPs that receive billions of dollars in financial aid, grants and loans, there is very little federal or state money available for storm water programs. Municipalities must either fund activities out of general revenue, utility fees or taxes. Nonpoint source funding is only available if the activity is not covered in either the permit, or the Storm Water Management Plan (SWMP). Retrofits are currently not a requirement of the permit, or spelled out in the SWMP. By placing the volume reduction requirements in the WLA section of the TMDL, they become part of the MS4 permit. Therefore, any activities that would reduce the volume or move us toward that goal are unable to be funded through nonpoint source funding (319).

58. Response: EPA has revised the previous Hinkson Creek TMDL public noticed by MDNRand remodeled the watershed. In order to align with other runoff TMDLs, EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis

to specifically target high flow conditions. The comment on volume reduction requirements refers to the MDNR TMDL model and is not pertinent to the current TMDL. EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. The Hinkson Creek TMDL was written with the best available data. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility. However, MDNR will work with the permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). EPA understands that there are economic and feasibility challenges facing stakeholders. The conversion of WLAs to permit limits is within the purview of the MDNR's NPDES Permits and Engineering Section. Should you have questions regarding the determination of permit effluent limits, please contact Mr. Refaat Mefrakis, Chief, NPDES Permits and Engineering Section, at (573) 526-2928 or via email at refaat.mefrakis@dnr.mo.gov.

EPA understands that resources are limited and that communities are sometimes hard pressed to meet the demands of water and wastewater system improvements. EPA urges the commentor to work with MDNR's Financial Assistance Center to discuss grant, low-interest loans or other options that may be available to the city should wastewater system improvements be necessary. To reach MDNR's Financial Assistance Center, call (573) 751-1192 and ask for either Mr. Doug Garrett or Ms. Traci Newberry, or email Mr. Garrett at doug.garrett@dnr.mo.gov. You can also find them on the Web at http://www.dnr.mo.gov/env/wpp/srf/index.html.

59. Comment: Cost estimates range up to $300,000,000 dollars to implement the TMDL in Hinkson Creek. The Vermont Potash Brook TMDL is similarly situated. The Hinkson Creek watershed is 13 times larger. In January 2010, the Vermont Department of Environmental Conservation found the cost to implement that TMDL would be $25 million for the 7 square mile watershed. They have chosen not to implement the Potash Brook TMDL until funding is available.

59. Response: Please refer to response to comments number 58 above.

60. Comment: Currently the Hinkson Creek Restoration Project and the clean sweep events help to tie the community to the watershed. The magnitude of the requirements in this TMDL, the inadequately proven science and the cost could unite the community against doing anything to help the creek. The TMDL should be withdrawn and reassessed using current representative data, consistent with EPA guidance, to avoid future adverse impacts on community watersheds.

60. Response: EPA thanks the stakeholder for their comment. The Hinkson Creek TMDL is consistent with the CWA and current EPA regulations, guidance and is scientifically defensible. Please refer to Response to Comments number 58 above for concerns about costs of implementation.

61. Comment: Throughout the TMDL, flow is used interchangeably with volume, but these are two distinctly different hydrologic metrics that have very different control strategies. Flow rate reductions may be achieved using detention storage with controlled release to shave peaks, while volume reductions require increased infiltration, evapotranspiration, and/or harvest and use. Because the target reductions are based on a comparison of FDCs at the 1-year return period, one may surmise that flow rate reductions are required such that the 1-year peak flow in Hinkson Creek must match the target 1-year peak flow of the attainment streams. The applicability of these reductions for any other flow return period is not supportable because the differences between Hinkson Creek and the attainment streams vary with the frequency of occurrence.

If the intent is to require volume reductions, then flow-duration analyses are inappropriate. *Instead, a comparison of average annual runoff volumes or a comparison of design storm runoff volumes should have been conducted.* The agency should clarify the proposed metric for this TMDL and at what temporal scale it applies. If FDCs are determined to be the parameter of interest, then flow-duration matching should be the TMDL goal versus volume reduction, with specified parts of the flow-duration curve based upon geomorphic analyses supporting the beneficial use.

Further, the data first used claim some impairment of Hinkson Creek, aquatic invertebrate community testing, is only mentioned as a secondary goal of the TMDL; reduction of the recorded flow from the single USGS gauge is cited as the primary target. But in spite of the agency's attempts to use a surrogate of flow in this TMDL, restoring the aquatic invertebrate community should be the primary target. The document should be specific as to what percentage of sampling sites for what period of time will be considered supporting. It appears the TMDL is targeting 100% attainment, even while the reference streams do not achieve this goal. This target is arbitrary and capricious.

61. Response: EPA thanks the commentor for sharing their concerns. The TMDL's language has been adjusted for clarity concerning flow and volume. The TMDL now clarifies that EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff, and that because of the limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. Storm water runoff has been shown to carry multiple pollutants that result in toxic water conditions and the runoff can result in physical changes to the stream channel. These changes negatively affect water quality and aquatic life. The TMDL further clarifies that the suite of pollutants carried by storm water runoff are the suspected cause of impairment.

TMDLs always must be written to meet WQS (40 CFR § 130.7(c)(1)(ii)). Hinkson Creek's TMDL targets meeting the warm water aquatic life designated use. The development of storm water runoff targets using reference streams located within the same EDU follows MDNR's selection criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf Reference streams from the same EDU were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The

result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation. Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating (SCI ≥ 16).

EPA uses percent imperviousness to estimate the contribution of urban storm water to the total runoff. Because of limited flow data available, EPA uses annualized flow duration analysis to specifically target high flow conditions. In the EPA Hinkson Creek TMDL, the flow water quality target ranges between the upper 3 and 5 percentiles of flow exceedances of the FDC derived from flow data collected from October 2008 to September 2010. The TMDL flows were therefore determined as the difference between the present flows seen in Hinkson Creek during 2008-2010 and the 95 percent upper confidence limit of the synthetic flows for the reference streams. Comments' concerning 1-year peak flow refers to the MDNR TMDL model and is not pertinent to the current EPA TMDL.

62. Comment: The EPA failed to undertake any fact-finding to support its TMDL. The agency has adopted regulations for making TMDL determinations that do not contain adequate fact-finding process. As a result, the determinations regarding the Hinkson Creek are not supported by substantial evidence and are entitled to *de novo* review.

62. Response: The Hinkson Creek TMDL is consistent with the CWA and current EPA regulations and guidance. Furthermore, the TMDL is scientifically defensible and supported by substantial evidence.

Hinkson Creek has been the subject of TMDL development by MDNR for many years. The TMDL is being done at this time to meet the requirements of the Consent Decree and it uses the best data available. The data in the TMDL is representative of instream conditions and meets the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). All pollutants preventing or expected to prevent WQS attainment (and their sources) must be listed in the TMDL, per 40 CFR § 130.7(c)(1)(ii).

63. Comment: The TMDL fails to address downstream impacts of the endangered pallid sturgeon at the confluence of Perche Creek and the Missouri River. The TMDL fails to address downstream impacts upon the pallid sturgeon at the Missouri River. The biological opinion provided by the U.S. Fish and Wildlife Service (FWS) for the operation of the Missouri River establishes an increased need for sediment in the River. Specifically, the biological opinion indicates a need for increased sediment to support pallid sturgeon reproduction. Known populations of pallid sturgeon exist downstream at the mouth of Perche Creek. Perche Creek receives the sediment contributions of Hinkson Creek. Removal of sediment contribution from the Hinkson Creek watershed at the mouth of Perche Creek will be detrimental to the pallid sturgeon.

The TMDL implies that contributions of sediment into Hinkson Creek should be removed. Yet, the very same "habitat improvements" are being created by the U.S. Army Corps of Engineers with the blessing of EPA and the FWS in the Missouri River to enhance populations of pallid

sturgeon in the reaches of the Missouri River impacted by Hinkson Creek. There is no evidence of consultation. There is no evidence of any shared information between any federal agencies other than the EPA.

When comparing the biological index numbers on Hinkson Creek and the fact that they are near performing, the removal of sedimentation the Perche Creek watershed may be detrimental and result in a taking of potential pallid sturgeon yearlings. The failure to properly protect and address the impact on the pallid sturgeon by this specific TMDL results in a potential violation of the Endangered Species Act which may be supported by members of the public through their right to sue for the failure of any agency involving a federal action from properly addressing its impact. The TMDL as proffered may impact the pallid sturgeon with no attempt to address the consequences.

63. Response: EPA consults with the FWS on every TMDL. Contact was made with the FWS on November 1, 2010. The species listed for Boone County includes the Gray bat, Indiana bat, pallid sturgeon and Topeka shiner.

64. Comment: The TMDL inhibits the legal rights of downstream riparian landowners with regard to both their legal ownership interests in their land and their legal rights regarding volume, flow or quantity on private property.

The confiscation and/or modification of the riparian landowners' property and water-related rights represent independent takings by administrative actions. As landowners in the watershed, the permit holders object to the manner and action of this TMDL and place the agency on notice that their actions result in a regulatory taking of both riparian property and rights to water and encourage a change in direction.

The agency does not have the legal authority to implement the surrogate approach presented in the TMDL as it impacts the rights of riparian landowners and is not authorized by law. No regulation has been developed to implement such authority, if such should exist.

64. Response: EPA thanks the stakeholders for their comments. The TMDL does not call for confiscating or modifying landowner's property and water rights by administrative action. TMDLs are written to meet WQS (40 CFR § 130.7(c)(1)(ii)). Per EPA regulations the state incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)).

65. Comment: The Hinkson Creek TMDL is a federal action of sufficient and unique impact to require a basin specific National Environmental Policy Act (NEPA) analysis versus acceptance of a programmatic authorization. By admission of the MDNR at public meetings, the Hinkson Creek TMDL and its surrogate of volume, flow or quantity is unique. By admission of the MDNR to implement this TMDL to control volume, flow or quantity will require structural alternatives of consequences not normally required in a TMDL. By MDNR's and EPA's admission, they rely upon an example from a small watershed in Vermont in developing the surrogate strategy. MDNR nor EPA can determine whether concentrations of "unknown" pollutants will increase or decrease as a result of this strategy. MDNR nor EPA can confirm that

improvements required as a result of this strategy may not limit base flow and thereby create stress upon biological indicators. The unique and special character of the solution provided in this TMDL mandates a specific evaluation under NEPA for this federal action. There is no denial that this TMDL will be incorporated into the EPA's overall TMDL action strategy for the State of Missouri. There is no denial that this is a federal action. By virtue of the unique character, unknown consequences on the overall environment, and impact on the human environment, a site specific NEPA analysis is necessary. For the reasons so stated, the permit holders request the agency to reconsider the methodologies, designations and implementation of this TMDL to place it in comport with the law and support the efforts of these communities to improve water quality.

65. Response: EPA and the Hinkson Creek TMDL do not mandate any expenditure of funds. EPA and the Hinkson Creek TMDL do not recommend implementation of any particular water quality controls or BMPs. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility.

While these are the first TMDLs where EPA Region 7 and Missouri have targeted storm water runoff, more than 20 TMDLs using this approach have been developed in other states including Connecticut, Maine, Vermont and North Carolina. Hundreds of research studies have documented the connection between increased impervious area in urban areas and increases in storm water runoff. Storm water runoff has been shown to carry multiple pollutants that result in toxic water conditions and the runoff can result in physical changes to the stream channel. These physical changes negatively affect water quality and aquatic life. Locally collected data and studies support these national findings by showing a very low diversity of fish and aquatic invertebrates and the anticipated changes in storm water runoff patterns. EPA's regulations state that TMDLs can be expressed in several ways, including toxicity, which is a characteristic of one or more pollutants, or *by some other appropriate measure* (emphasis added; 40 CFR § 130.2(i)). Based upon the analysis by national and local studies, EPA believes it is reasonable that addressing storm water runoff will result in better habitat and protection for aquatic communities.

The use of a surrogate parameter is permissible under CWA Section 303(d)(1)(C) (33 U.S.C. § 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach 40 CFR § 130.7(c)(1)(i). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable WQS. EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed.

EPA is sensitive to the needs of permit holders in the watershed and encourages them to work closely with MDNR as the TMDL is implemented. The Hinkson Creek TMDL is being established in accordance with Section 303(d) of the CWA and the methodological approach in Hinkson Creek is neither new nor unusual. Please refer to section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and specifically how Hinkson Creek's data links storm water to decreased aquatic life. MDNR's implementation plans which are included as informational only, do not contain actions or strategies that are characteristically unique to TMDLs.

EPA does not concur that the establishment of this TMDL is subject to the requirements of the National Environmental Policy Act of 1969 (NEPA), as this action, consistent with Section 511 of the CWA, is not considered to be a "major Federal action significantly affecting the quality of the human environment" within the meaning set forth in NEPA.

66. Comments: In section 2.1 of the TMDL, the impaired section described here does not match that shown in the drawing on page 2.

66. Response: Section 2.1 Geography describes the general information about the location of Hinkson Creek watershed while Figures 1 and 2 show the land use condition for 1993 and 2005, respectively.

67. Comment: In section 2.2 of the TMDL, it states "Land use within the Hinkson Creek watershed has changed substantially within the past decade." That would seem to imply the past 10 years, 2000--2010. However the data reviewed is from 1993 and 2000-2005. Areas that have been urban for some time in Flat Branch and County House Branch are shown as Grassland or Forest in the 1993 graphic. Those watersheds were essentially built out by 1993 and very little development has occurred in them since. Much of the development noted on page 2 in the second paragraph (inset) was in Bear Creek. Therefore this overstates the case.

67. Response: Based on the satellite imagery taken in the periods of 1991 and 1993, it does show that there was limited urban development in both Flat and County House Branch subwatersheds. Two land use datasets were used in the Hinkson Creek TMDL; 1993 and 2005. The latter imagery was taken for the period 2000-2004. These two land use datasets were compared for the decades between 1990s and 2000s. Therefore, the use of the decade in the document is appropriate.

68. Comment: The assertion in the first paragraph of section 2.3 is that soils become more permeable in the lower third of the watershed is not supported by the following paragraphs. In the later paragraphs it is noted that most of the land in the lower third, though well-drained has slow infiltration. More accurately, the soils become a little more permeable as one moves from the ridge of the watershed to the floodplain. And, in fact, the more permeable floodplains remain remarkably untouched and open through Columbia. Most soils in the watershed provide less than the recommended 1/2" per hour for infiltration which is the minimum generally recommended for infiltration type practices. This will limit the effectiveness of vegetated infiltration practices like rain gardens, especially their effectiveness to increase baseflow.

68. Response: Soil information in Section 2.3 was solely based on Soil Survey of Boone County. This document can be obtained online at http://soildatamart.nrcs.usda.gov/Manuscripts/MO019/0/boone_MO.pdf. EPA and the Hinkson Creek TMDL do not recommend implementation of any particular water quality controls or BMPs. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility.

Please provide MDNR any new data not represented in the TMDL. The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

69. Comment: Regarding section 2.4 of the TMDL, the first sentence in this section is incorrect. Hinkson was originally listed as unspecified pollutant from urban nonpoint lagoon runoff on the 1998 Missouri 303(d) list. This would imply bacteria from septic waste was the pollutant. Therefore, how do the citizen reports relating to hydrology (flooding, reduced base flows, erosion) contribute to the original listing? The TMDL states "MDNR water quality studies did reveal, however, that a large percentage of the problems, including increased sediment and low dissolved oxygen at low flows can be attributed to urban runoff conditions ... " Could low dissolved oxygen at low flows also be due to lagoon runoff? Why was that option not explored?

69. Response: EPA thanks the commentor for their suggestions; however, the first sentence in Section 2.4 of the TMDL is correct – this is why the suggested option was not explored more than any other potential source. Please note, Hinkson Creek segment 1008 is currently on the EPA approved 2008 Missouri 303(d) List for a bacteria impairment that isn't part of EPA's consent decree requirements. Because the bacteria listing isn't a consent decree requirement, EPA did not include the 2008 bacteria impairment in the EPA established Hinkson Creek TMDL as a surrogate for the unknown listing. Furthermore, MDNR may develop a TMDL for the bacteria listing at their discretion.

70. Comment: In section 2.4, the TMDL document states "Specifically, this TMDL is aimed at restoring the stream's natural peak and base flow dynamics. Creating more natural stream flows will restore habitat and reduce the release of toxic pollutants into Hinkson Creek." There is no peer-reviewed literature to corroborate that statement. The preliminary results from the EPA wetland grant study of PL-566 structures in Northern Missouri seems to contradict that statement. Impounded streams with highly disrupted "natural flows" and reduced habitat contained higher quantities and diversity of aquatic life (invertebrates) than the "natural" stream comparisons. If the purpose of a TMDL is to determine the pollutant loading a water body can assimilate without exceeding the WQS for that pollutant, and EPA/DNR has not defined a pollutant, then how can the WQS be exceeded?

70. Response: Water quality monitoring has not revealed exceedances of a specific numeric water quality criterion. However, all Missouri streams are protected by the general criteria contained in Missouri's WQS at 10 CSR 20-7.031(3). These criteria are also called narrative criteria, since they do not contain specific numeric limits. The particular general criteria that are not attained in Hinkson Creek include:

- **(A)Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses.**
- **(C) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses.**
- **(D) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life.**
- **(G) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community.**

As discussed in the TMDL documentation, a combination of toxic pollutants found in storm water runoff is contributing to the aquatic life impairment. However, there is no indication that one pollutant is causing or contributing to an exceedance of any pollutant specific water quality criterion. There is however, a strong relationship between pollutant loads and storm water runoff as documented in Section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams, and specifically how Hinkson Creek's flow and biological data links storm water runoff to decreased aquatic life. Therefore, the TMDL uses the surrogate measure of storm water runoff to represent the combination of toxic pollutants that contribute to the impairment of Hinkson Creek and has the added benefit of addressing the hydrologic changes to the stream that degrade the overall health of the biological communities. The TMDL includes another target, that 100 percent of all sites surveyed receive a fully supporting rating.

71. Comment: In section 3.2.2, in the second paragraph, fourth sentence, the math appears to be incorrect.

71. Response: EPA thanks the commentor for their input. The math in Section 3.2.2 is correct. (1650 multiplied by .39% equals 6.435. The number of failing septic tanks is rounded up to *potentially* 7 in the TMDL.)

72. Comment: In section 3.2.3, given the discrepancies noted in Section 2.2, the information in this section is suspect. Riparian areas in the Hinkson Creek watershed are remarkably well preserved. Approximately 63% of the riparian corridor is forest, woodland or grassland. The city and the county have recently enacted stream buffer regulations that protect 100 feet of the riparian corridor on both sides of the main stem of Hinkson Creek. Additionally, the MKT trail system encourages restoration and protection of hardwood forests along the creek, while the city's floodplain regulation prevents development in these areas.

72. Response: EPA thanks the stakeholder for taking the time to comment on the Hinkson Creek TMDL. EPA applauds the city and county for actions already taken to improve Hinkson Creek. The TMDL will enable MDNR and the local governments to work in concert to continue improvements to the watershed.

Please note that although improvements have already been implemented in the watershed, Hinkson Creek is not meeting its designated uses and a TMDL will help the water body toward the goal of meeting WQS. EPA regulations require states to identify all waters still requiring TMDLs where WQS are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1).

73. Comment: Section 4.2 is not consistent with Section 2.2.

73. Response: Sections 2.2 and 4.2 of the EPA TMDL document are correct: Both segments of Hinkson Creek (WBID 1007 and 1008) are listed as impaired for the Protection of Warm Water Aquatic Life designated use. Section 2.2 describes the land use analysis. EPA believes the commentor was addressing MDNR's public noticed version of the Hinkson TMDL.

74. Comment: In section 4.5.1 of the TMDL, EPA regulations do not support the use of a surrogate for an unidentified pollutant. It is even questionable whether EPA can use a surrogate for a pollutant that has been identified and is difficult to measure or regulate, and for which a clear relationship between the surrogate and the pollutant(s) can be established. No such relationship has been established here.

74. Response: The use of a surrogate parameter is permissible under the CWA Section 303(d)(1)(C) (33 U.S.C. § 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach 40 CFR § 130.7(c)(1)(i). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable water quality standards (WQS). TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation. Please see Response number 8 in Part I of Summary of Comments and Responses, for more detail about the surrogate relationship in the TMDL.

75. Comment: In section 4.5.1 of the TMDL, the regulations clearly do support the use of a phased approach to TMDLs. The ability to use a phased approach appears to have been included in Federal Regulations for just this situation; an inconclusive study coupled with the need to begin addressing the situation as soon as possible. It appears that this is the first time that storm water flow has been used for an unidentified pollutant. In the past, (in the Potash Brook, VT TMDL, for example) a pollutant has been identified and then storm water has been used as a surrogate for that pollutant. The studies noted are broad-brush planning level studies that are very useful for determining what to study, but they are inappropriate for watershed-specific work such as this.

The groundwork has been laid to identify a pollutant or pollutants causing damage to Hinkson Creek. Further work is essential to develop a well-supported, targeted TMDL that would not pose as much of a risk to the creek as this draft TMDL does. A phased TMDL, something truly supported by previous work in the watershed, is what is needed to address water quality in the Hinkson Creek and will avoid unintended harmful consequences.

75. Response: EPA appreciates input from the commentor. EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. In a phased TMDL, EPA uses the best information available establish the TMDL at levels necessary to implement applicable water quality standards and to make the allocations to the pollution sources. However, the phased TMDL approach recognizes that additional data and information may be necessary to further validate the assumptions of the TMDL and to provide greater certainty that the TMDL will achieve the WQS. There is one overarching requirement for all TMDLs, they must meet all applicable WQS (40 CFR § 130.7(c)(1)(ii)). Missouri incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). Please see the Response to Comment number 51 above.

The use of a surrogate parameter is permissible under the Clean Water Act (CWA) Section 303(d)(1)(C) (33 U.S.C. 1313(d)(1)(C)), which requires that the TMDL load "shall be established at a level necessary to implement the applicable water quality standard," but does not dictate the specific methodology for calculating or expressing the TMDL. EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure, " per 40 CFR § 130.2(i). They also state that TMDLs may be established using a biomonitoring approach as an alternative to the pollutant-by-pollutant approach 40 CFR § 130.7(c)(1)(i). This flexibility in the expression of TMDLs support reliance on a surrogate where, as in this case, there is a reasonable rationale and the TMDL is designed to ensure attainment of applicable water quality standards (WQS). TMDLs are often complicated by multiple pollutants. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of

development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation. Please see Response number 8 in Part I of Summary of Comments and Responses, for more detail about the surrogate relationship in the TMDL.

Regarding "unintended harmful consequences" that could develop during implementation: The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. If new data reveal critical developments in Hinkson Creek, the TMDL's adaptive management process will be able to respond.

76. Comment: Section 4.5.1 The TMDL states, "Based on data collected during the Hinkson Creek water quality studies, Tables 6 and 7 were constructed to list stressors and conditions found in the Hinkson Creek main stem and selected storm water outfalls." These tables would carry more credibility if the water quality results (median values) from the Hinkson Creek studies were displayed on the tables. For example, what was the amount of caffeine found in the stream? What was the mean summer temperature in stagnant pools? What was the dissolved oxygen level? The data on Chloride is helpful, but actual numbers are not supplied. Additionally, would the winter 2008 and spring 2009 readings be classified as acute or chronic?

76. Response: The commentor is referring to Stations 6 and 7 which are the two sites that have six sampling events. Station 7 is located just below the city of Columbia's Sanitary Landfill while Station 6 is about 5 miles downstream from Station 7. Since Station 7 does not show any noticeable biological effects from the landfill, this station is used as a representative site for depicting the upstream rural condition. Station 6 represents an urbanized reach. Detailed biological information has been provided in several MDNR studies.

Samples for chlorides collected in Hinkson Creek exceeded Missouri's chronic chloride WQS of 230 mg/L on December 13, 2005, when the measured concentration was 333 mg/L (Site 1007/4.3). As such, while this pollutant may contribute to aquatic life impairment in Hinkson Creek, there are insufficient occurrences of exceedance to identify this as the pollutant causing the impairment. Additionally, while measurements taken during winter from tributaries and drainages to Hinkson Creek exhibited elevated concentrations of chloride, analyses of other pollutants were not taken from these sites. Samples were also not taken from these sites outside the winter season when deicer would not be used. The high concentrations of chloride in this storm water runoff serve to reinforce the rationale of controlling storm water runoff and the loading of a myriad of pollutants typically found in high concentrations in urban runoff across all seasons. If chloride, as applied as winter salt, were the pollutant, then reducing storm water would mean that less chloride would be transported to the streams. However, based on a number of MDNR's biological studies, chloride was not identified as a major pollutant.

The amount of caffeine, the temperature and the dissolved oxygen levels of the stagnant pools are not part of the calculation for this TMDLs LC and therefore are not listed within the TMDL. All data for Hinkson Creek is available on MDNRs website (http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm) or found within the MDNR studies referenced within the TMDL (http://www.dnr.mo.gov/env/esp/wqm/biologicalassessments.htm).

77. Comment: Sections 4.5.2.1 -4.5.2.3. The sample size of the biological assessments is small. Some of the poor scores were explained by things that were immediately addressed such as salt laden runoff from a road maintenance facility and poorly stored insecticides. The limited number of assessments done reveal a stream that is at or near attainment making the costs of the TMDL out of proportion compared to the issues being addressed. Table 8, Stream Condition Index Scores for Hinkson Creek, raises more questions than answers. Which reference streams are fully supporting? What percent of the time?

77. Response: EPA appreciates the thought put into the commentor's questions. The SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI < 16). The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating. This target can be accomplished through actions and BMPs used to reduce storm water runoff.

The Hinkson Creek TMDL was written with the best available data. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility. However, MDNR will work with the permitted facilities identified in the TMDL and community groups by incorporating the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). EPA understands that there are economic and feasibility challenges facing stakeholders.

78. Comment: In sections 4.5.2.1 – 4.5.2.3, are any reference streams predominantly (60% or greater) urban? Which ones? Is it appropriate to expect an urbanized stream to have the same SCI as a forested stream? Are any Missouri steams both fully supporting aquatic life and an urban stream? The TMDL should provide supporting documentation to address these type questions.

78. Response: EPA appreciates the thought put into the commentor's questions; however, looking at individual reference stream hydrological conditions as indicated by the commentor is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major WWTFs. The Hinkson Creek TMDL addressed hydrologic variations using reference

streams selected from either an ecoregion or an EDU. To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to 1) minimize the hydrologic flow variations occurring in each reference stream and 2) generalize a typical reference stream condition applicable to the target watersheds. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach specifically targets the existing high flow condition that may transport a large amount of pollutants and cause a negative effect on the biological condition of the stream.

MDNR's biocriteria describes protocols for their reference streams and the reference streams are actually in Missouri's regulations. Please read MDNR's biocriteria for reference streams which is found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf

The reference streams were selected based the availability of biological sites that can best describe the conditions of the Hinkson Creek watershed. The selected watersheds have some degree of urban development and have similar land use and soil conditions since they were chosen from the same ecoregion or EDU where Hinkson Creek is located. These streams were then normalized because of variations of watershed size to obtain a representative hydrologic condition. The TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. The Hinkson Creek TMDL uses annualized flow duration to target the limited local flow conditions and also uses bankfull discharge to exclude extreme flow conditions that are beyond the protection goals defined by the conventional watershed management practices. An annualized FDC was applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. EPA believes that focusing on the upper 3-5 percentiles of flow exceedances for the high flow conditions will curfew a large amount of pollutants transported in the storm water runoff and create a better biological condition for Hinkson Creek. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed.

The SCI scores for the biological reference streams are 16 and above. A stream with SCI scores equal to 16 (or greater) is considered fully supportive by MDNR to indicate full support of the aquatic life designated use. Though some biological sites within Hinkson Creek show some improvement, many of the urbanized reaches remain scored as only partially supporting biological communities (SCI < 16). The biological impairment needs to be continuously improved to meet the aquatic life designated uses. The TMDL targets are based on a reduction in storm water runoff at high flows ranging between the upper 3 and 5 percentiles of flow exceedances of the Flow Duration Curve (FDC). Another target for Hinkson Creek is for 100 percent of all sites surveyed to receive a fully supporting biological rating. This target can be accomplished through actions and BMPs used to reduce storm water runoff.

79. Comment: Referring to section 4.5.2.2, most of the runoff from the area noted runs through water quality BMPs, and the road salt storage facility is no longer there.

79. Response: EPA appreciates the commentor's feedback and observations about conditions at Hinkson Creek. The commentor's information will be shared with MDNR.

80. Comment: In the first paragraph of section 4.5.3, item 2: Baseflow from effluent from small WWTPs and septic systems has gone down. (The effluent from the ones for which records were readily available is estimated to be 15 cfs. A significant portion of that would have reached the stream as base flow.) Baseflow from land has gone up over the last 40 years as farming practices kept improving and former strip mine lands become more stable and vegetated.

80. Response: EPA appreciates the commentor's feedback and observations about conditions at Hinkson Creek. The commentor's information will be shared with MDNR.

81. Comment: In section 4.5.3, first paragraph, item 4: Channels are seldom enclosed in Columbia and the riparian corridors of Hinkson and its tributaries are remarkably well preserved. The County regulations prevent the use of concrete lined channels.

81. Response: EPA appreciates the commentor's feedback and observations about conditions at Hinkson Creek. The commentor's information will be shared with MDNR.

82. Comment: In section 4.5.3, paragraph 5, the comparison given does not show anything except that there was more flow during four months in 2007 than the same four months in 1967. There are many reasons why this could be true. A much longer study time is needed to show a relationship.

82. Response: The comparison shows Hinkson's increased flow, Section 4.5.3 is supporting Section 2.4 where the water quality problems facing Hinkson Creek are defined. Section 2 provides regulatory support and scientific background. When the impairment cannot be tied to an exceedance of a single specific numeric criterion, or when a specific numeric criterion target is not discernable, using a surrogate parameter may be the most appropriate approach to developing a TMDL and restoring the waterbody. (40 CFR § 130.2(i) and 40 CFR § 130.7(c)(1)). In these cases, alternate numeric environmental indicators or conditions may be used in lieu of pollutant allocations. In the case of Hinkson Creek, the surrogate chosen to measure the needed reduction in stressors and toxic pollutants is the high storm water events, based on the 2008-2010 flow data. Section 4.5.3 analyzes Hinkson Creek's flow records from 1967 to 2010, along with the reference stream data (1961-2010), to establish the FDCs that provide the best surrogate for defining the hydrologic targets that will lead to the TMDLs load allocations.

MDNR will incorporate the TMDL into Missouri's WQM plan (40 CFR § 130.7(d)(2)). Over time new data will be generated and this TMDL's adaptive management approach will allow for the consideration of all new data that meets MDNR quality control requirements and any corresponding alteration to the TMDL needed as a result. Adaptive implementation is an iterative process that makes progress toward achieving water quality

goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data.

83. Comment: In section 4.5.3, paragraph 6: Another reason that base flow has decreased since the 1960s is that numerous small WWTFs have been removed by diverting this often-polluted flow to the city's WWTP. The ultimate origin of this baseflow was well water from much lower in the watershed and/or the Missouri river floodplain, not infiltration of rainwater.

83. Response: EPA appreciates the commentor's feedback and observations about conditions at Hinkson Creek. The TMDL is being done at this time to meet the requirements of the Consent Decree and uses the best data available. In addition to the data and modeling approach, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). The commentor's information will be shared with MDNR. Any data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

84. Comment: In section 4.5.3, paragraph 6, the FDCs for April to July 1967 and 2007 are inadequate. FDCs can be a useful tool in generalizing hydrologic condition. However, the curve should contain 10 to 30 years of daily average f1ow data. The use of a 4 month window to compare two years is not applicable, and does not illustrate a trend. The authors are drawing conclusions from two snapshots in time. The 1967 low flows may be due to sewage discharges, while the 2007 flows were during the 2nd of a two year drought, which may have depleted base flows. Without additional data and information, any number of conclusions could be drawn about these flow characteristics.

A similar question about flow: How are the data in figure 5 and 6 normalized for higher than average annual precipitation that occurred during the past three years?

Another comment about flow and precipitation: Hinkson was placed on the impaired list in 1998, but here it is stated that "The impairment occurs in the last decade." Further, rainfall and flow data from very wet years after the study was complete are used as proof that storm water flows have impaired the stream. This line of reasoning makes the conclusion suspect.

84. Response: A comparison of 1967 and 2007 is to provide general information about flow change in relation to rapid urbanization in the recent years. This information was not used in deriving the TMDL targets. The TMDL targets are based on the reference streams over a 50 year flow record while the TMDL reduction goals are estimated based on the 2008-2010 flow data measured in Hinkson Creek.

Figure 5 provides a comparison between the entire flow record and the data from the last three years. As indicated, the averaged flows measured in the last three years were much higher than the averaged flow for the entire flow record. Hinkson Creek has been impaired for biology since the late 1990s. However, there is no flow data that covers the late 1990s to the present. Because of a lack of flow data, EPA used the 2008-2010 data to develop the TMDL targets for the high flow using an annualized FDC analysis. Figure 6 provides flow information in regard to stream stage (or height). From the two regressions presented in the figure, a bankfull discharge is determined. This bankfull discharge occurs at approximately 1 percent of flow exceedance. If a flow is greater than the bankfull discharge, then stream would flood. Typical watershed managements are not aiming for flood control. As a result, these practices normally used in a watershed cannot control this type of storm water. Therefore, EPA believes that the TMDL targets should be placed at the upper 3-5 percentiles of flow exceedances of the high flow conditions to ensure there is a good stream biota protection during typical high flow conditions (see Figure 9 and Table 15).

As indicated above, the high flow conditions are targeted at the present time because of the limited flow data in the recent decade. As flow data continues to be measured at the Hinkson gage in the future, MDNR can then use a longer flow data to develop average management targets using the traditional FDC analysis and revise this TMDL.

85. Comment: The reference for table 9 on page 27 should actually be for table 10.

85. Response: EPA thanks the commentor for their feedback and the TMDL has been corrected to reference the correct table.

86. Comment: On table 10, yearly precipitation should also be included for comparison reasons. The precipitation for October 2009 through September 2010 was almost 65 inches. What was the precipitation for the 1967 -- 1991 years? Also where was the precipitation data collected?

A similar comment: Table 10. How did the Peak, Average and Median rainfall events compare for this period?

86. Response: EPA thanks the stakeholder for their comments. In regard to including precipitation data on Table 10: The precipitation and flow data are compared in the text of the TMDL and precipitation is presented in Table 9. The commentor may also pull the data from the referenced sources which are given in the TMDL, but repeated here for the commentor's convenience.

References for Tables 10 and 9: Table 10 shows the flow record for Hinkson Creek: The USGS gaging station on Hinkson Creek at Providence Road in Columbia (USGS-06910230, drainage area 69.8 mi^2) was chosen for the TMDL analyses due to its location on the impaired segment and extensive period of record (i.e., 1966-1981, 1987-1991 and 2007-2010). Table 9 can be used to compare precipitation data which was based on the Sanborn Field Weather Station and USGS Gage (06910230).

In regard to any data the commentor may have for October 2009 through September 2010 or other years, EPA appreciates the commentor's feedback and urges the commentor to share that data with MDNR. The TMDL is being done at this time to meet the requirements of the Consent Decree and uses the best data available. In addition to the data and modeling approach, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). The commentor's information will be shared with MDNR. Any data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

87. Comment: Section 4.5.3 Paragraph 7: When trying to establish a relationship between f1ows in 1967 and 2007 the flows need to be compared to rainfall and antecedent moisture in order to truly compare the flows. There are other reasons besides the conclusion that EPA has drawn to explain the difference in flows.

87. Response: Flow response to precipitation in Hinkson Creek has increased markedly over time. The commentor is directed to Section 4.5 of the TMDL which discusses and presents data from 1967 to 2010. Data were based on the Sanborn Field (UMC) Weather Station and USGS gage. A comparison of flow response to precipitation between 1967 and 2007 shows that, despite a smaller amount of rainfall in the latter year, average daily flow was more than 80 percent higher. Another example is in Table 10 of the TMDL, we see that peak flow increased from 7.56 cfs/sq mile in 1967 to 73.78 cfs/sq mile in 2010.

The underlying assumption in the approach is that urban, more developed areas typically convey more storm water due to less infiltration while rural, less developed or agricultural areas generate less runoff because of fewer impervious surface areas. This approach is reasonable as urban areas tend to be dominated by point source conveyances of storm water, while rural areas are predominantly drained by surface flows. Therefore, the TMDL allocation process for the Hinkson Creek TMDL is simplified through the use of a land use based allocation approach to distribute the overall percent reduction targets for the watershed.

In addition to the data and modeling approach, the MOS in the TMDL accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality or in the modeling (40 CFR § 130.7(c)(1)). Any information or other reasons the commentor has to explain the difference in flows should be shared with MDNR. Any data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or

future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

88. Comment: Section 4.6 of the TMDL states that "An ecoregion is a collection of watersheds that share a common zoogeographical history, physiographic and climatic characteristics and therefore likely to have a distinct set of freshwater assemblages and habitats. In addition, since the ecoregion has similar climatic characteristics, precipitation over time should be similar for the reference and impaired streams." Generally speaking, Hinkson and the comparison streams should have the same aquatic invertebrates and precipitation. But how can one compare flow conditions for watersheds with different land uses, sizes, aspects, slopes, as well as dissimilar bed and bank materials?

88. Response: EPA thanks the stakeholder for the comment. The selection of reference streams closely followed MDNR's criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf The Hinkson Creek TMDL has addressed hydrologic variations using reference streams selected from either an ecoregion or an EDU. Hinkson Creek was compared to four reference stream watersheds in the Central Irregular Plains ecoregion. In order to compare these watersheds, the same calculations were done for each stream. To generate representative flows for the four selected streams, synthetic flow was calculated by averaging the log transformation of the daily streamflow values. Each flow measurement was divided by the watershed size to determine a flow per square mile value to account for the effect of different watershed sizes. The reference stream flows were then averaged within each group to produce two average reference stream flow patterns. The flow patterns for Hinkson Creek were then compared to the matching average reference stream flow pattern.

To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to 1) minimize the hydrologic flow variations occurring in each reference stream and 2) generalize a typical reference stream condition applicable to the target watersheds. Looking at individual reference stream hydrological conditions is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major WWTFs. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach is specifically applied to target the existing high flow condition that may transport large amounts of pollutants and cause a negative effect on the biological condition of the stream.

EPA believes that the reference stream methodology and analysis described in the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA.

89. Comment: In reference to the last sentence of Section 4.6.1: Even when using reference streams from the same ecoregion, there are still differences, and the importance of those differences get magnified when small samples of data are used. This region is noted for its volatile climate and large differences can be noted within a few miles. For instance, the year-to-date rainfall (as of *11/19/1*0) total at Sanborn Field gauge is 50.7 inches whereas the value at Bradfem Farm (about 5 miles southeast of Sanborn) is 42.6 inches. A long rainfall and streamflow record is needed to attenuate the differences.

89. Response: EPA thanks the commentor for their observation. This is the exact reason we used the reference streams to determine the favorable streams conditions. All these streams have a long record of flow data. By normalizing and averaging these stream flow patterns, hydrologic variations seen in each reference stream can be minimized. See the Response to Comment number 88 above.

90. Comment: Section 4.6.1 The TMDL states "controlling the highest flows will limit pollutant loads from urban runoff therefore decreasing potentially toxic water quality conditions and increasing baseflow through increased infiltration of storm water runoff." Previous research from EPA has determined that the first flush rain events move the majority of pollutants into the stream. The water quality storm for Missouri is approximately 1.3 inches, and considerably lower than the highest flows that EPA is requiring the community to control. Is EPA reversing previous claims to assert only the high flows are to blame?

90. Response: A runoff event may occur at any point in the FDC. As such a 1.3 inch rainfall event does not correspond to any particular point in the TMDL FDC. A runoff event of that magnitude may result in a different flow at each different cumulative frequency. This is not a reversal of any previous claims made by EPA.

91. Comment: In Section 4.6.1 of the TMDL the comparison of Hinkson Creek to a synthetic flow record by calculating discharge per square mile was not normalized for slope, precipitation, or antecedent soil moisture conditions. Therefore the comparison is invalid.

91. Response: EPA appreciates the thought put into the commentor's questions; however, looking at individual reference stream hydrological conditions as indicated by the commentor is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major WWTFs. The Hinkson Creek TMDL addressed hydrologic variations using reference streams selected from either an ecoregion or an EDU. To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to
1) minimize the hydrologic flow variations occurring in each reference stream and
2) generalize a typical reference stream condition applicable to the target watersheds. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach specifically targets the existing high flow condition that may transport a large amount of pollutants and cause a negative effect on the biological condition of the stream.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID1007 to determine the TMDL flow allocation.

The reference streams were selected based the availability of biological sites that can best describe the conditions of the Hinkson Creek watershed. The selected reference stream watersheds have some degree of urban development. The synthetic flow was generated based on the reference streams selected and has similar soil, weather and land form conditions since they were chosen from the same ecoregion or EDU where Hinkson Creek is located. In order to minimize the hydrologic variation due to these conditions, the flow of these streams was normalized in respect to their watershed size to obtain a representative hydrologic condition. Hinkson Creek was compared to reference streams in the same ecological area that had similar soils, physiography, minimal urban area and healthy aquatic communities. Hinkson Creek was compared to four reference stream watersheds in the Central Irregular Plains ecoregion. In order to compare these watersheds, the same calculations were done for each stream. Each flow measurement was divided by the watershed size to determine a flow per square mile value to account for the effect of different watershed sizes. The reference stream flows were then averaged within each group to produce two average reference stream flow patterns. The flow patterns for Hinkson Creek were then compared to the matching average reference stream flow pattern.

The Hinkson Creek TMDL uses annualized flow duration to target the limited local flow conditions and also uses bankfull discharge to exclude extreme flow conditions that are beyond the protection goals defined by the conventional watershed management practices. EPA believes that focusing on the upper 3-5 percentiles of flow exceedances for the high flow conditions will curfew a large amount of pollutants transported in the storm water runoff and create a better biological condition for Hinkson Creek.

92. Comment: How do the authors know which flows are needed for aquatic life? Flow does not control the release of toxic pollutants; it is only the transport mechanism. Please substantiate the reasoning behind setting a reduction of the flow, without an increase in base flow. Please define the historic flow we are trying to achieve with this TMDL, and provide a hydrograph of historic flows.

92. Response: Thank you for the comment. To the extent that the term "flow" refers solely to the volume and velocity of flowing water, flow may affect hydrologic and

geomorphologic changes that in turn affect aquatic life. However, by itself, flow volume or velocity is not a CWA Section 502(6) "pollutant." These TMDLs are targeting storm water runoff as a surrogate for the toxic mix of multiple pollutants and stressors associated with urban storm water. Nevertheless, numerous studies have recognized that there are pollutants associated with storm water from MS4s that can affect aquatic life. For a summary of impacts associated with urban storm water, please refer to, *USEPA, Preliminary Data Summary of Urban Storm water Best Management Practices* (Aug. 1999) (EPA-821-R-99-012), Chapter 4. In 1987, Congress amended the CWA to (among other things) add Section 402(p) (codified at 33 U.S.C. 1342(p)) to cover certain discharges composed entirely of storm water. Section 402(p) requires NPDES permit coverage for discharges of storm water associated with industrial activity (including construction activity) and from large and medium MS4s. In addition, excess storm water runoff may cause scour and resuspension of sediment (a pollutant) in receiving waters. From a technical perspective, it is extremely difficult to separate the effects on aquatic life caused by changes in the hydrology or geomorphology of the water from those caused by the pollutants entrained in the storm water (including resuspended sediment caused by storm water runoff). Accordingly, EPA believes it is appropriate in a TMDL analysis for storm water runoff to serve as a surrogate for the presence of these pollutants. By expressing the TMDL in terms of storm water runoff or reductions, the TMDL will simultaneously address both the hydrologic/geomorphologic impacts of storm water runoff as well as the impacts caused by the pollutants in the storm water.

This TMDL uses storm water runoff as a surrogate to mitigate the synergic effect of unknown pollutants on the stream's biologic communities. Though a toxicological effect is often driven by concentrations, its effect often occurs during typical flow conditions. The revised TMDL uses reference streams' hydrologic condition to define the favorable or suitable living condition for biological communities in Hinkson Creek. An annualized FDC was then applied to determine the reduction needed to meet the favorable biological condition while the imperviousness of land use was used to partition the reduction to both urban and rural areas. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID 1007 to determine the TMDL flow allocation.

In regard to the commentor's question about base flow: The analysis does not include lower flow settings (moist, mid-range, dry and low flow conditions). This is because the reduction goals and TMDL loads derived from the high flow analysis may not be applicable to the other flow conditions. As more flow data is collected in the future, a long-term analysis should be used to develop a long-term TMDL and management goals to effectively control the pollutants transported from the watershed during typical storm water runoff.

Finally addressing the commentor's concerns about historic flow: TMDLs must meet current WQS (40 CFR § 130.7(c)(1)(ii)). A TMDL targets the restoration of the beneficial use of the water. The CWA supports the Hinkson TMDL because EPA regulations state

that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i).

93. Comment: Section 4.6.2, how does the use of a reference stream that is 3-7 times greater than Hinkson Creek provide an adequate comparison? The smaller the watershed and the further up the headwaters, the more the stream is subject to flash increase events. As an example, compare Hinkson creek to the Missouri river at the Jefferson City Bridge. A runoff event that causes a 2 foot increase in stage would be orders of magnitude different for these two watersheds. A larger watershed has the ability to attenuate and therefore dampen the effects downstream, where a smaller watershed would not.

93. Response: EPA appreciates the commentor's concerns. The selection of reference streams closely followed MDNR's criteria for reference streams, per MDNR's Biological Criteria for Wadeable/Perennial Streams of Missouri, found online at http://www.dnr.mo.gov/env/esp/docs/BiologicalCriteriaforWadeableStreamsofMissouri.pdf Reference streams from the same EDU were chosen to insure reference locations were similar to the impaired stream by virtue of what defines a collection of watersheds in one EDU: common zoogeographical history, physiography and climatic characteristics. The result of these shared characteristics is that watersheds in one EDU share similar distributions of animals, freshwater assemblages, habitats, weather and precipitation. The Hinkson Creek TMDL has addressed hydrologic variations using reference streams selected from either an ecoregion or an EDU. Hinkson Creek was compared to four reference stream watersheds in the Central Irregular Plains ecoregion. In order to compare these watersheds, the same calculations were done for each stream. Each flow measurement was divided by the watershed size to determine a flow per square mile value to account for the effect of different watershed sizes. The reference stream flows were then averaged within each group to produce two average reference stream flow patterns. The flow patterns for Hinkson Creek were then compared to the matching average reference stream flow pattern.

To determine TMDL targets, the flow values from the selected reference streams were averaged or normalized to 1) minimize the hydrologic flow variations occurring in each reference stream and 2) generalize a typical reference stream condition applicable to the target watersheds. Looking at individual reference stream hydrological conditions as indicated by the commentor is not an appropriate approach to determine the targets since they are also subject to many other factors such as watershed size, losing stream conditions and major WWTFs. The upper 95 percent confidence interval used for Hinkson Creek is considered an appropriate method because there is limited flow data collected from its gage during the last decade. In addition, this upper 95 percent confidence interval approach specifically targets the existing high flow condition that may transport a large amount of pollutants and cause a negative effect on the biological condition of the stream.

Please refer to Appendix C which discusses reference watersheds in greater depth and provides reference to additional scientific literature. Furthermore, Appendix C discusses

the choice of the reference streams according to MDNR's criteria and applicable WQS (40 CFR § 131).

94. Comment: In Section 4.6.2 the difference in aspect of the reference streams should also be noted. Most Missouri storms track from SW to NE, running the full [length of the] Hinkson watershed. All of the reference streams are orientated from NW to SE, and therefore may not get the full impact of many storm systems.

94. Response: Please see Response to Comment number 91 above.

95. Comment: In Section 4.6.2, the proximity to the Missouri River and the micro-climate of Columbia could affect local weather patterns, providing more intense rain storms, hotter temperatures and humidity differences.

95. Response: EPA appreciates the commentor's suggestion. The TMDL is being written at this time to meet the obligations of the Consent Decree and uses the best data available. Over time new data will be generated and this TMDL's adaptive management approach will allow for the consideration of all new data that meets MDNR quality control requirements and any corresponding alteration to the TMDL needed as a result. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. Please keep in mind that data supplied needs to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

96. Comment: "The LC is the greatest volume of storm water runoff Hinkson Creek can receive and still maintain a fully supporting warm water aquatic life designated use," from Section 5 of the TMDL. The TMDL uses volume and flow interchangeably. Is the target a reduction in the peak flow, or a reduction in the storm water volume?

Please provide peer-reviewed data to support the claim that volume controls aquatic life in Hinkson or any other stream system.

96. Response: EPA appreciates the commentor feedback on the TMDL. Language in the TMDL has been modified for clarity where appropriate.

The reference section of the TMDL lists peer reviewed documents used to support the modeling approach used in the Hinkson Creek TMDL. Please refer to Section 4 of the TMDL that outlines the four principle ways that storm water runoff from urban areas are linked to degradation of aquatic life in urban streams and specifically how Hinkson Creek's data links storm water to decreased aquatic life.

97. Comment: The TMDL states "Hinkson Creek does not currently meet aquatic life beneficial uses." However, the last data recorded in the TMDL was for spring of 2006 -- a drought year. Hinkson has not been sampled in 9 sampling seasons (from Fall 2006 to Fall 2010). Therefore there is no way of knowing if the creek is currently meeting aquatic life uses.

97. Response: EPA regulations require states to identify all waters still requiring TMDLs where standards are not met or are not expected to be met through the application of controls described in 40 CFR § 130.7(b)(1). Hinkson Creek is currently listed as impaired. The TMDL is required under Section 303(d) of the CWA and Title 40 of the CFR Part 130, which requires states to develop TMDLs for waters not meeting designated beneficial uses. If new data becomes available, that data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data.

98. Comment: Since non-attainment of biological criteria is why the stream is on the 303(d) list, this should be the primary target and it should be made explicit that, when the biological criteria are in attainment, the efforts to meet the flow targets can cease.

98. Response: In the case of Hinkson Creek, the pollutant causing the impaired warm water aquatic life beneficial use is listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. The CWA supports the Hinkson TMDL because EPA regulations state that TMDLs can be expressed in several ways, including in terms of toxicity which is a characteristic of one or more pollutants, or by some "other appropriate measure," per 40 CFR § 130.2(i). Hinkson is not different from other TMDLs because frequently TMDLs are complicated by multiple pollutants. Please see Response number 8 above, for more detail about the surrogate relationship in the TMDL. The commentor suggests the "efforts to meet the flow targets can cease" when Hinkson Creek meets its beneficial use. Missouri's WQS protects and maintains the existing level of water quality where it is better than applicable water quality criteria. This is part of the EPA "three-tiered" approach to antidegradation, which can be found at 10 CSR 20-7.031(2). Under federal and state regulations, Hinkson Creek will need to continue to meet WQS. See also the Response to Comment number 70 above.

The TMDL includes another target for Hinkson Creek, it is 100 percent of all sites surveyed receive a fully supporting biological rating (SCI ≥ 16). This target can be accomplished through actions and BMPs used to reduce storm water runoff. The biological impairment needs to be continuously improved to meet the aquatic life designated uses.

99. Comment: There is a danger that meeting those targets can cause unintended damage to the stream.

99. Response: EPA thanks the commentor for their concern about Hinkson Creek. Per EPA regulations, Missouri incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). The TMDL will be implemented through adaptive management which is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. If new data reveal critical developments in Hinkson Creek, the TMDL's adaptive management process will be able to respond.

100. Comment: Table 15 is confusing and unclear. What flow reduction is required for 3% and 5% flow exceedance? How does that translate to storm event or flood event?

100. Response: The targeted percent increase on Table 15 indicates that Hinkson Creek's flow is 28.7 percent higher than the target flow derived from the reference streams at the 3 percent flow exceedance. In other words, a 28.7 percent flow reduction at such flow exceedance is required to mitigate the impairment.

101. Comment: If the objective of this TMDL is to improve the aquatic community, then sediment, habitat and flow regime should be examined as well.

101. Response: EPA appreciates the commentor's concerns. Indeed, Hinkson is not different from other TMDLs, because frequently TMDLs are complicated by multiple pollutants impacting aquatic communities. In the case of Hinkson Creek the pollutant causing the impairments may be listed as unknown on the 303(d) list, however, data indicates that toxicity from multiple pollutants carried by storm water is the cause of the impairment. The amount of storm water running into Hinkson Creek has increased significantly due to an increase in impervious surfaces in the watershed. The increase in impervious surfaces is the result of development in the watershed. Therefore, using a surrogate that represents the toxic pollutant loadings to the stream, as well as the hydrologic conditions that are also found to be contributing to the impairment is appropriate and addresses both chemicals and habitat degradation. EPA encourages the collection of additional data, in fact one of the hallmarks of the TMDL process is adaptive management or implementation. Adaptive implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. As new data becomes available as a result of monitoring or further studies, MDNR may, at any time, consider submitting a revised or modified TMDL for this water based on this or other data. Please see the Response to Comment number 8 above, for more detail about the surrogate relationship in the TMDL.

102. Comment: The impaired section of the stream does not start at the city limits. Why is EPA pursuing a jurisdictional approach when a watershed and/or subwatershed approach is needed?

102. Response: EPA thanks the stakeholder for their comment. EPA agrees that all potential sources must be considered in the TMDL and the entire area that drains into the impaired segments of Hinkson Creek is analyzed in the TMDL and included in the LC. All pollutants preventing or expected to prevent WQS attainment (and their sources) must be listed in the TMDL, per 40 CFR § 130.7(c)(1)(ii). The Hinkson Creek watershed is a small to medium sized watershed having only one USGS gage. A reference stream approach is used to link urbanization to the degraded water quality seen in Hinkson Creek. The normalized flows (unit flow), derived from the selected reference streams and Hinkson Creek, are used to calculate the management targets for the Hinkson Creek watershed. More specifically, storm water was calculated using the percent of imperviousness based on the entire watershed that covers the whole area upstream from the terminus of WBID 1007, instead of the area just above the Hinkson Creek Gage (06910230), to determine the TMDL flow allocation.

103. Comment: EPA and MDNR have conspicuously ignored the public participation of the three MS4 permittees the County of Boone, the City of Columbia and the UMC in spite of the fact that they will be required to implement this TMDL.

103. Response: EPA agrees that there should be full and meaningful public participation in the TMDL development process from those impacted by the TMDL (40 CFR § 130.7(c)(1)(ii)).[2] The public notice period offers the opportunity for meaningful review. All comments received during public notice are considered and addressed in the final TMDL as is appropriate. The Hinkson Creek TMDL was public noticed for 30 days. Additionally to ensure EPAs understanding of those comments, EPA met with stakeholders in the EPA Region 7 offices on December 20, 2010. Please refer back to Response to Comment number 41 of the SUMMARY OF COMMENTS AND RESPONSES (I of III).

Please note that EPA cannot address Hinkson Creek's TMDL development process under MDNR's direction because MDNR did not submit the draft Hinkson Creek TMDL for EPA approval. EPA has revised the previous Hinkson Creek TMDL public noticed by MDNR and remodeled the watershed.

104. Comment: The proposed TMDL is not supported by comprehensive, representative data and studies conducted on the creek.

104. Response: Please refer to Sections 4.5, 5.2 and the appendices of the TMDL for full explanations of how data and studies support the TMDL.

105. Comment: The effort required by the proposed TMDL is far out of proportion to the findings of the studies to date. Judging from what is known and surveyed by the Permit Holders in the watershed in the early-to-mid twentieth century; the stream has improved and continues to improve. The Permit Holders' current strategies are working, are cost effective and have been developed with extensive public participation. The TMDL as proposed will undermine those efforts and has the potential to waste millions in public expenditures. The Permit Holders'

[2] *Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992*, EPA, May 20, 2002

current strategy and effort provide for further improvement with a directed focus on those actions that the Hinkson Creek actually needs rather than an expensive, unfocused approach which is impossible to implement and unsupported by the existing evidence.

105. Response: EPA thanks the commentor for their concern. The Hinkson Creek TMDL was written with the best available data. TMDLs must target WQS (40 CFR § 130.7(c)(1)(ii)), and this is done without a requirement to address economics or feasibility.

EPA applauds stakeholder efforts to improve the watershed and encourages the stakeholders to continue. Additionally, MDNR will work with watershed stakeholders. Per EPA regulations the state incorporates the TMDL into its current WQM plan for implementation (40 CFR § 130.7(d)(2)). Rather than undermine current success in the watershed, the TMDL implementation will complement current efforts through Adaptive Management. Adaptive management or implementation is an iterative process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities.

Please provide MDNR any new data not represented in the TMDL. The data will need to meet the minimum level that MDNR considers for use in determining TMDL targets and modeling. The data needs to be representative of instream conditions and meet the Quality Assurance/Quality Control levels of Missouri's Listing Methodology document (10 CSR 20-7.031 and 10 CSR 20-7.050). If data provided by any of the commentors or future monitoring is found to meet MDNR's minimum level for data inclusion, MDNR may consider submitting a revised or modified TMDL for this water at any time based on this or other data. Previous responses have outlined how the TMDL is supported by scientific evidence, the CWA and EPA regulations and guidance.

106. Comment: Federal guidelines support the use of a phased approach to TMDLs in situations such as this. We propose that a phased approach be used and additional data collected to provide for a continued strategic investment in Hinkson Creek's future and the current TMDL proposal be abandoned.

106. Response: EPA is sensitive to stakeholder concerns about implementation, and has identified the Hinkson Creek TMDL to be both phased and adaptive in order to restore water quality conditions in the watershed. The state of Missouri has the authority and responsibility to monitor and assess state waters to ensure protection of the designated beneficial uses. As such, MDNR will incorporate the TMDL into its current WQM plan for implementation and monitoring, per EPA regulations (40 CFR § 130.7(d)(2)).

EPA will share the commentor's suggestion with MDNR to collect additional data for a continued strategic investment. MDNR may submit another TMDL based on new data that meets MDNR's minimum requirements for data inclusion.

LIST OF COMMENTORS

Ken Midkiff, Missouri Clean Water Campaign, Missouri

Diane Oerly, Show-Me Clean Streams, Columbia, Missouri
Darren Ridenhour, THF Grindstone Development, L.L.C., St. Louis, Missouri
John Hoke, Missouri Department of Natural Resources, Jefferson City, Missouri
Hank Ottinger, Sierra Club Osage Group, Columbia/Jefferson City, Missouri
Priscilla Stotts, Tebbetts, Missouri
Bob McDavid, city of Columbia, Columbia, Missouri
John Holmes, Allstate Consultants, LLC, Columbia, Missouri
Karen Miller, Boone County Commission, Columbia, Missouri
Jacquelyn Jones, University of Missouri-Columbia, Columbia, Missouri
Todd Wagner, city of Springfield, Springfield, Missouri

END PART III SUMMARY OF COMMENTS AND RESPONSES