Missouri
Department of
Natural Resources

DRAFT INDIAN CREEK, TRIBUTARY TO INDIAN CREEK, AND COUTROIS CREEK TMDL PUBLIC COMMENTS

3rd Public Notice
March 23, 2010 – May 7, 2010

Indian Creek – WBID # 1946
Trib. to Indian Creek – WBID # 3663
Courtois Creek – WBID # 1946

Washington County, Mo.

Missouri Department of Natural Resources
Water Protection Program
PO Box 176
Jefferson City, MO 65102-0176
800-361-4827 / 573-751-1300

Kruse, Michael

From: Hoke, John
Sent: Monday, April 05, 2010 8:03 AM
To: Kruse, Michael
Subject: FW: TMDL info sheet

John Hoke
Env. Specialist IV, TMDL Unit Chief
Water Quality Monitoring & Assessment
Missouri Department of Natural Resources
Phone: (573) 526-1446 Fax: (573) 522-9920

-----Original Message-----
From: nathan fleer [mailto:nfleer@gmail.com]
Sent: Saturday, April 03, 2010 10:37 AM
To: Hoke, John
Subject: TMDL info sheet

John,

My name is Nathan Fleer, Stream Team member #2200. I live at 19804 State highway C Belgrade, Missouri 63622. My wife and I live about 5 miles from the Courtois Creek at the Brazil Road low water bridge. We have swam and fished this section of the Courtois for several years and are concerned about the situation at hand. If there is anything that we can do to help (be it taking water samples, checking aquatic life, etc.), please feel free to contact me at any time. Our home phone # is 573-438-5241, if no answer leave a message. Thank You.

Nathan Fleer

Stream Team member #2200

Kruse, Michael

From: Kruse, Michael
Sent: Monday, April 05, 2010 10:17 AM
To: 'nfleer@gmail.com'
Cc: Hoke, John
Subject: Courtois Creek - TMDL

Mr. Fleer,

Thank you for your e-mail concerning Courtois Creek, received Saturday, April 3. The Department very much appreciates the dedication and assistance of citizen volunteers such as yourself to monitor and report water quality issues on your local streams. For the Indian Creek, Tributary to Indian Creek, and Courtois Creek TMDL, we have sufficient monitoring data to establish the necessary reductions and will be monitoring during and after any implementation activities that reduce lead and zinc loading to the creeks. However, we will routinely review water quality data submitted by Volunteer Water Quality Monitors and incorporate those data into our analysis, as appropriate.

For additional information on the Indian Creek, Tributary to Indian Creek, and Courtois Creek TMDL, please visit the Department's website at the link below. The public comment period is open until May 7. If you have questions on the TMDL or need additional information or assistance, please let me know. Comments pertaining to the TMDL should be sent to the Department of Natural Resources, Water Protection Program, Water Quality Monitoring and Assessment Section, P.O. Box 176, Jefferson City, MO 65102-0176. E-mail comments may be sent to john.hoke@dnr.mo.gov. If commenting by e-mail, please provide contact information such as name, mailing address and phone number. Thank you again for your interest and involvement in protecting the quality of Missouri's waters.

http://www.dnr.mo.gov/env/wpp/tmdl/pn-indian-ck.htm

Mike Kruse
Environmental Specialist
Div. of Env. Quality/Water Protection Program
Mo. Dept. of Natural Resources, Jefferson City
Ph: (573) 522-4901 FAX: (573) 522-9920
michael.kruse@dnr.mo.gov

April 15, 2010

Mr. John Hoke
Missouri Department of Natural Resource
Water Protection Program
P.O. Box 176
Jefferson City, MO 65102-0176

CERTIFIED MAIL: 7005-1160-0003-1667-1682

RE: Indian Creek (and Tributary) and Courtois Creek

Dear Mr. Hoke:

Per our conversation of Monday, April 12, 2010, we believe that the map included in the Total Maximum Daily Load Information Sheet pertaining to Indian Creek and Tributary and Courtois Creek, mistakenly identifies impaired waters on our property at 10432 Well Rd., Steelville, MO.

Our property lies one and 2/10th miles upstream of the source of pollution draining out of the Doe Run tailings ponds on Indian Creek Tributary.

Please be sure that this map is changed to correctly identify the impaired waters that begin 3/10th mile upstream from Indian Creek.

Thank you for your assistance in this. Please contact us with any questions.

Sincerely,

Richard Keith
Doris Keith

Richard and Doris Keith
10432 Wells Road
Steelville, MO 65565

1-573-244-3359

STATE OF MISSOURI
Jeremiah W. (Jay) Nixon, Governor • Mark N. Templeton, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

May 21, 2010

Richard and Doris Keith
10432 Wells Road
Steelville, MO 65565

RE: Response to Comments on the Indian Creek, Tributary to Indian Creek, and Courtois Creek Draft Total Maximum Daily Load

Dear Mr. and Mrs. Keith:

The Missouri Department of Natural Resources (Department) appreciates the comments you provided on the draft Indian Creek, Tributary to Indian Creek, and Courtois Creek Total Maximum Daily Load (TMDL). In your letter, you note an error in our document in which the impaired portion of Tributary to Indian Creek was depicted as extending over 1.2 miles upstream onto your property and upstream of the mine discharge causing the impairment. The topographic map included in the TMDL has been edited to correctly show the impaired portion of Tributary to Indian Creek as extending only 0.3 miles from the confluence with Indian Creek as listed in Missouri's U.S. Environmental Protection Agency's-approved 2008 303(d) list of impaired waters. This change will be included in the final TMDL document to be submitted to the U.S. Environmental Protection Agency.

Thank you again for your comments. If you should have questions or would like to discuss this TMDL further, please contact me at (573) 526-1446 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

John Hoke, TMDL Unit Chief
Water Quality Monitoring and Assessment Section

JH:mkl

LimnoTech
Water | Environment | Scientists | Engineers

MEMORANDUM

DATE: May 7, 2010

FROM: Hans Holmberg
Kathy Sweet

TO: John Hoke, Missouri Department of Natural Resources

CC: Robert Brundage, Newman, Comley & Ruth, P.
John Carter, The Doe Run Company
Aaron Miller, The Doe Run Company
Jim Fricke, RMC

SUBJECT: Review of Revised Draft TMDLs for Courtois Creek, Indian Creek, and Tributary to Indian Creek

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In cooperation with Newman Comley & Ruth, The Doe Run Company, and RMC, we have completed our review of the draft Total Maximum Daily Loads (TMDLs) for Indian Creek, Tributary to Indian Creek, and Courtois Creek, as issued by the Missouri Department of Natural Resources (MDNR) on March 23, 2010. This memorandum presents our comments and recommendations for the draft TMDLs.

Comment #1. Page 1, 3rd paragraph: The draft TMDL states "*This document provides TMDLs for dissolved lead and zinc, because these are the pollutants for which there is available data. Additionally, it is believed lead is the primary pollutant resulting in metal toxicity for which the metals impairment was based. It is believed reducing lead concentrations to or below water quality standards will also result in eliminating the effects of metals toxicity to the streams' aquatic life.*" This paragraph previously states that the 303(d) listing for Tributary to Indian Creek, and the previous 303(d) listings for Indian Creek and Courtois Creek are based on dissolved lead and zinc in water. As such, the reason the TMDLs are developed for lead and zinc is because these are the pollutants resulting in the 303(d) listing in the streams and not because "*these are the pollutants for which there is available data.*" The sentence should be revised as follows: "This document provides TMDLs for dissolved lead and zinc because these are the pollutants for which available data suggested an impairment of the designated beneficial uses."

Comment #2. Page 3, 2nd paragraph: The draft TMDL states "*It is common to find lead and zinc contamination in soil, groundwater and surface water surrounding lead and zinc mines, mills, smelter sites and transportation corridors.*" This is a subjective statement that is not supported by data and should be removed from the TMDL. Furthermore, smelter sites and transportation corridors have no influence on the streams addressed by this TMDL.

Comment #3. Page 3, 2nd paragraph: The draft TMDL states "*Contamination from mining and milling sites comes from tailings impoundments, processing areas, and from underground mine workings that may penetrate shallow aquifers.*" We are not aware of any potential contamination that may result from underground mine workings that may penetrate

shallow aquifers. This sentence should be revised as follows: "Sources of lead and zinc from mining and milling sites may include tailings impoundments, processing areas, and dewatering of underground mine workings."

Comment #4. Page 3, 2nd paragraph: The last two sentences of this paragraph refer to smelter sites and have no relevance to this TMDL. Therefore, these sentences should be removed from the TMDL.

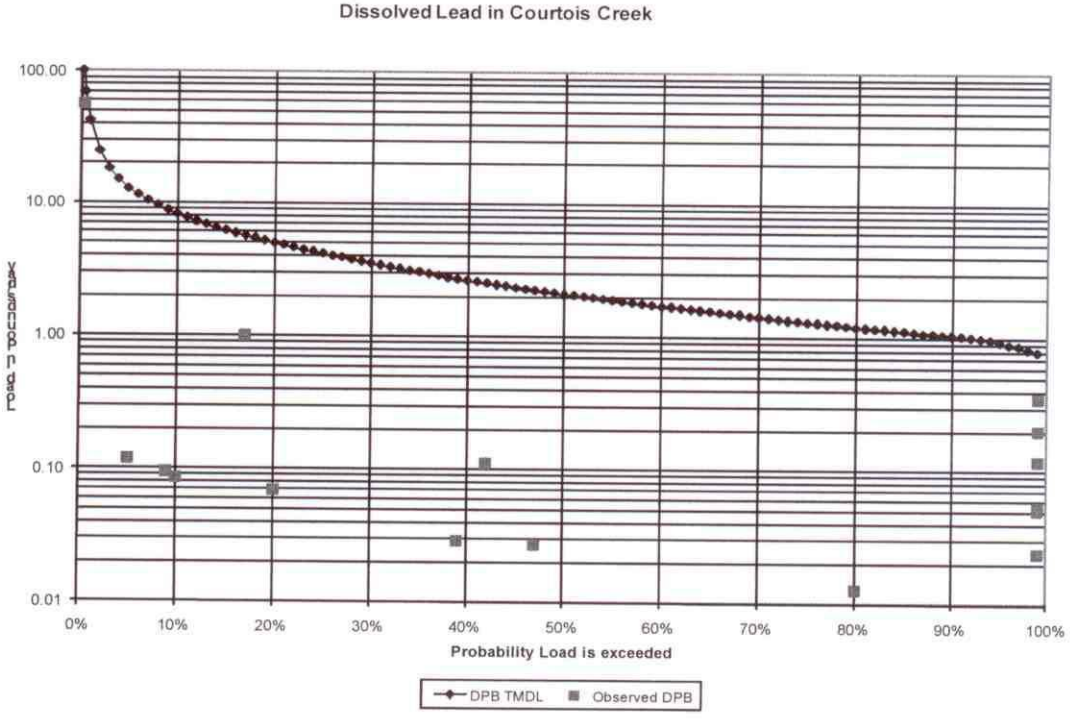
Comment #5. Page 5, 5th paragraph: The draft TMDL states: "*The Doe Run-Viburnum Operations facility has five permitted outfalls and includes mine dewatering ponds that may overflow during large storm events.*" There are a series of basins that provide settling of mine water prior to discharge through outfall 004. These basins do not typically overflow even during large storm events. There are also tailings impoundments that discharge through outfalls 002, 005, and 006. These are discussed further in Comments 6 and 7 below. The sentence in the draft TMDL should be revised as follows: "The Doe Run-Viburnum Operations facility has five permitted outfalls that discharge mine water, precipitation, and runoff from the facility and tailings impoundments, as well as treated domestic sewage and stormwater runoff from the City of Viburnum."

Comment #6. Page 5, 5th paragraph: The draft TMDL states: "*Both of these tailings impoundments are likely significant contributors of lead and zinc loading to the impaired water bodies due to runoff-producing storm events.*" It should be noted that outfalls 005 and 006 on the new tailings impoundment rarely ever discharge. Outfall 006 has not discharged since April 2006 and Outfall 005 has not discharged since at least December 2005. These outfalls only have the potential to discharge during extreme stormwater events. However, the draft TMDL makes no allocation for these potential discharges in the wasteload allocation (WLA) for the high flow interval. The TMDL should include in the WLA an allowance for increased loadings at higher flow intervals. The sentence in the draft TMDL should be revised as follows: "The new tailings impoundment discharges through outfalls 005 and 006 only under extreme storm event conditions. The old tailings impoundment discharges through outfall 002 on a more frequent basis as a result of discharges from the City of Viburnum wastewater treatment plant and runoff from the surrounding watershed, including the City of Viburnum."

Comment #7. Page 5, paragraph 6: The draft TMDL states: "*In addition to the tailings impoundments, haul roads and other disturbed areas within the mining area may contribute metal loading to the impaired water bodies as a result of such storm events. These sources may involve runoff from areas with lead and zinc contaminated soils along roads and in residential yards. Soil contamination of lead and zinc occurs in these areas as a result of mine concentrate or tailings being moved either unintentionally through vehicle debris or intentionally for use as fill material. As a result, these sources may also contribute lead and zinc to surface waters as a result of runoff producing storm events.*" It should be noted that a significant drainage area, including the majority of the City of Viburnum (see Figure 2 in the draft TMDL) and the City of Viburnum wastewater treatment plant, discharge through the old tailings impoundment and eventually through Outfall 002 into Indian Creek. Therefore, Outfall 002 is susceptible to increased loadings as a result of point source and non-point sources discharges from outside the Doe Run facility. The draft TMDL makes no recognition of this in the WLA and allows no increase in the WLA

under high flow conditions. The TMDL should include in the WLA recognition of the potential contribution of sources of metals loading outside the Doe Run facility. Additionally, the WLA should include an allowance for increased loadings at higher flow intervals.

Comment #8. Page 7, 3rd paragraph: The draft TMDL speculates that "*historic and legacy lead and zinc*" in the sediments can be suspended during high-flow storm events causing a water quality concern and concludes "*It is therefore reasonable and necessary to have load allocations for lead and zinc at higher flows to account for nonpoint source instream loading of these pollutants.*" However, the TMDL presents no supporting data to indicate resuspension of bottom sediments contributes to the elevated dissolved lead and zinc values in the water column that are the basis for the 303(d) listing. Therefore, this paragraph should be deleted. In fact, if the existing loads are properly calculated and not artificially inflated, as described in subsequent comments, the available data will likely show few exceedances of water quality criteria at high flows. For example, plotting the Courtois Creek dissolved lead loadings, as calculated from Courtois Creek dissolved lead samples and Courtois Creek estimated flows, without adding artificially inflated loads from Indian Creek and Tributary to Indian Creek, does not show elevated dissolved lead in Courtois Creek, as shown in the figure below.

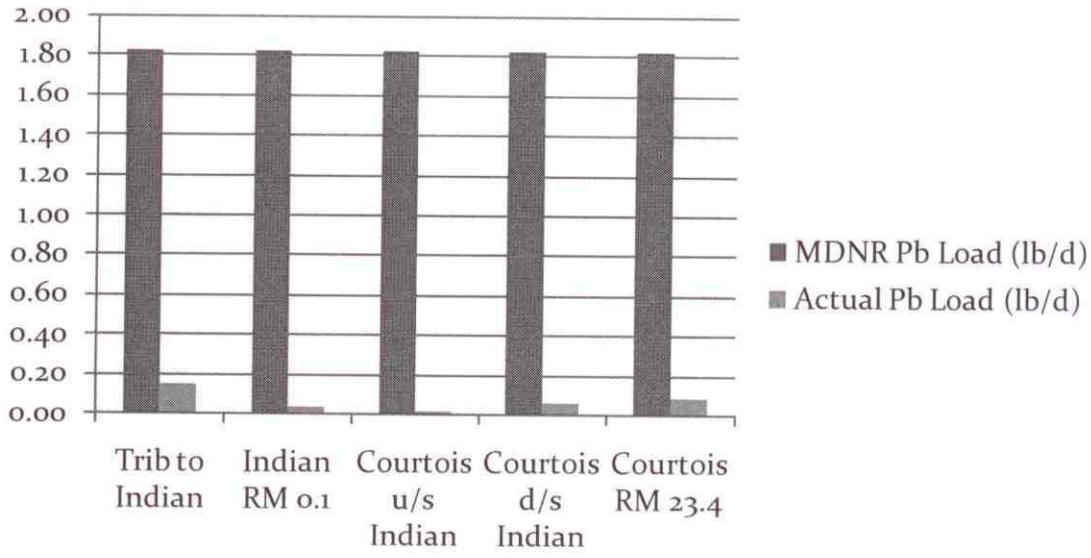


Comment #9. The draft TMDL Report now includes the development of TMDLs for lead and zinc in the Tributary to Indian Creek where Outfall 004 discharges. As such, the development of numeric water quality targets in Section 4.5.1 should include the calculation of criteria for Tributary to Indian Creek based on representative hardness. Because Outfall 004 is the primary source of water in the Tributary to Indian Creek, hardness data from Outfall 004 should be used. DNR was previously provided with hardness data for Outfall 004. 43

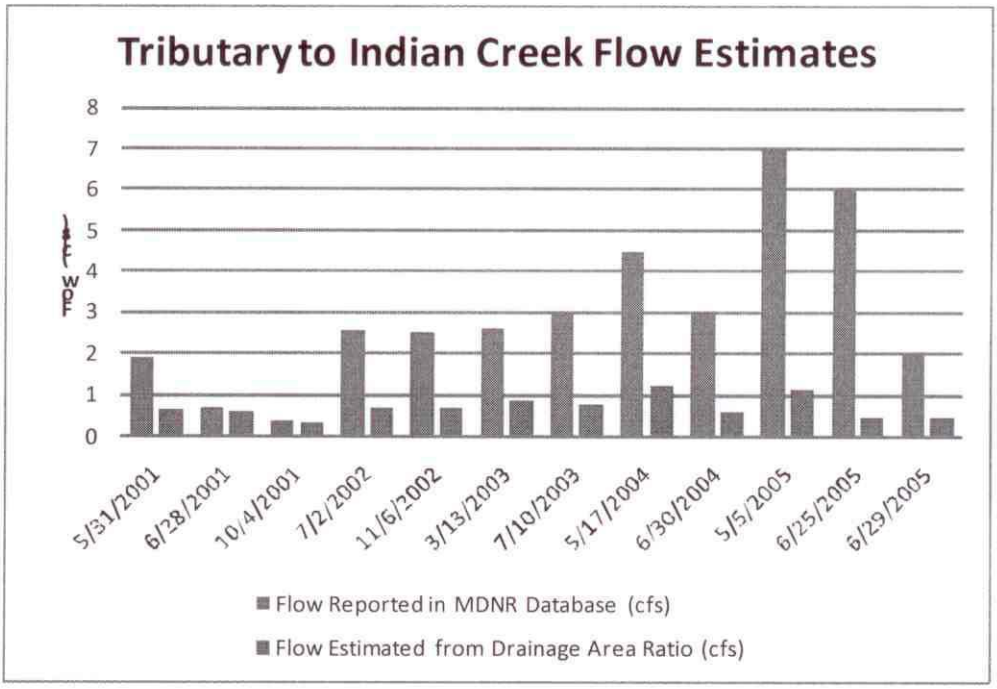
samples between January 1, 2006 and July 8, 2009 indicated a 25th percentile hardness value of 275 mg/L.

Comment #10. Page 10, 2nd paragraph: The draft TMDL Report indicates that only uncensored data were used to graph observed pollutant loads against target pollutant loads at corresponding probability flows. This approach effectively ignores a substantial portion of the data, and presents a biased picture, since it does not show many load values that would fall below the TMDL curve.

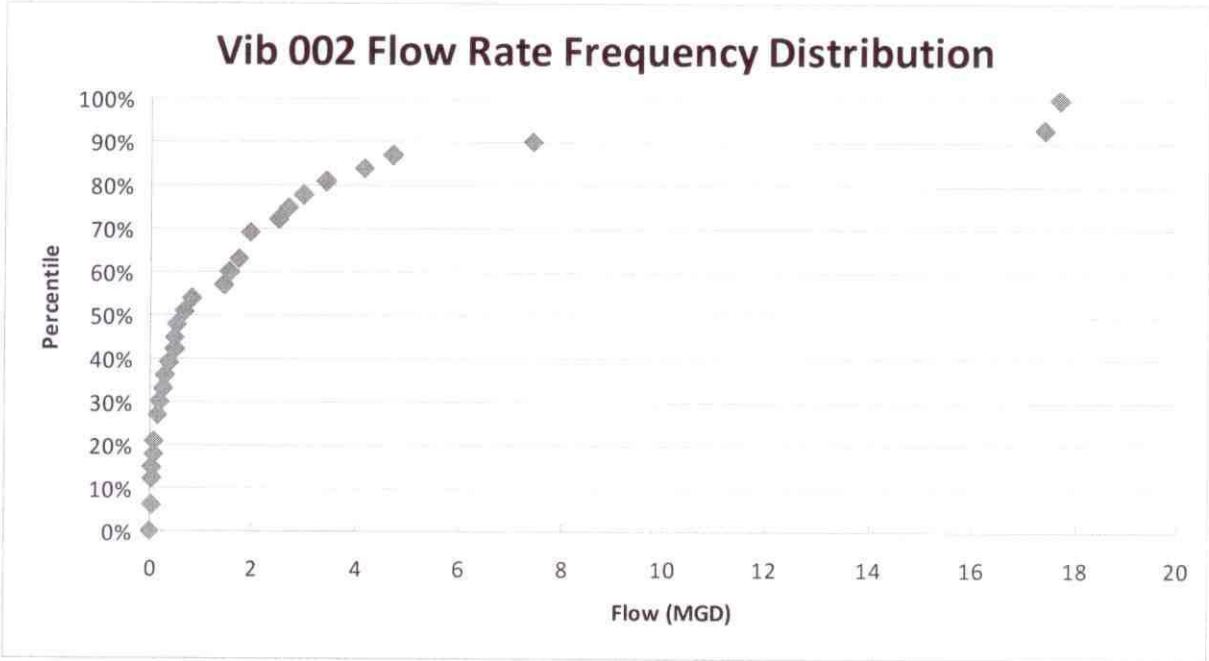
Comment #11. Page 10, 2nd paragraph: The draft TMDL Report further indicates that "*Where sampling sites were upstream of the watershed outlet, the average daily flows at those sites were adjusted to the watershed area of the outlet.*" This approach significantly overestimates the observed loads. It is appropriate to use, for example, Tributary to Indian Creek dissolved metal concentrations in conjunction with appropriately-estimated Tributary flows to estimate loads from Tributary to Indian Creek. It is not, however, appropriate to use that same Tributary to Indian Creek dissolved metal concentration in conjunction with flows at the mouth of Indian Creek or Courtois Creek to estimate loads in Indian and Courtois Creeks. This approach is equivalent to pouring one pound of salt into a gallon of water, then mixing the gallon of saltwater with a gallon of freshwater and stating that the resulting two-gallon mixture contained two pounds of salt. The figure below provides an example of MDNR's over-estimation of dissolved lead loads, using data for September 18, 2001. Samples were collected on that date in Tributary to Indian Creek, Indian Creek, and three locations in Courtois Creek. Results for Indian Creek and Courtois Creek were all non-detect, so MDNR elected not to use the data for these locations, and instead applied only concentration from Tributary to Indian Creek, along with estimated flow at the mouth of Courtois Creek, to estimate the dissolved lead load in Courtois Creek (shown as the blue bars in the figure; actual loads based on measured concentrations and flows are shown in green). This "normalizing" of the loads makes it appear that loadings are much higher than the TMDL curve, when in many cases, they are not.

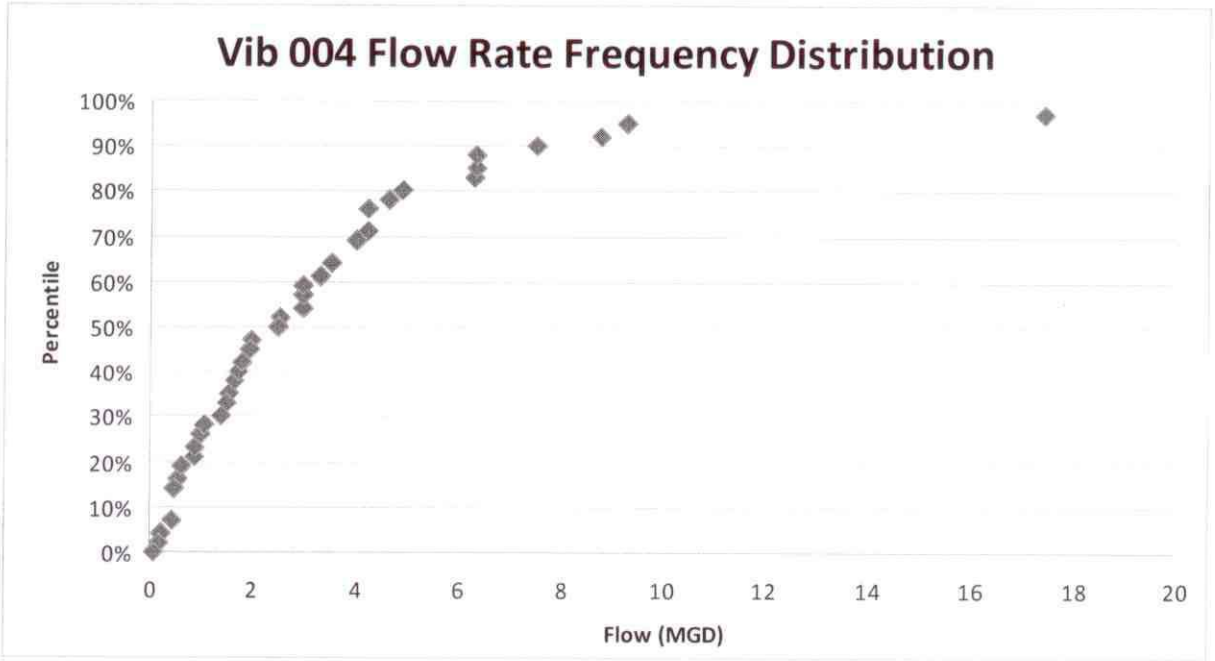


Comment #12. Page 10, 2nd paragraph: Estimating flow probability for Tributary to Indian Creek and Indian Creek based on flows at USGS gage 07013000-Meramec River near Steelville, MO and a watershed area adjustment is not appropriate. The Indian Creek drainage area is 21.5 square miles, just 2.75% of the drainage area at the Meramec River gage (781 square miles). The Tributary to Indian Creek drainage area is 2.4 square miles, just 0.3% of the drainage area at the USGS gage on the Meramec. (Note that we have been unable to confirm MDNR's flow estimates for Tributary to Indian Creek using the drainage area method and the drainage areas presented in the Draft TMDL Report .)
The drainage area ratio method should not be applied to such significant differences in areas, especially when the smaller watersheds have significant point source contributions. In the absence of sufficient flow data for these streams, the Load Duration Curve approach is not applicable. An indication of the deficiency of this approach is illustrated by a comparison of MDNR's data, as presented in Appendix C of the Draft TMDL Report, with estimated Tributary to Indian Creek flows, as determined based on the Meramec River gage. As shown in the figure below, the drainage area ratio does not adequately describe the flows in Tributary to Indian Creek as measured by MDNR.



A further indication of the deficiency in this approach is illustrated in Figures 6 and 7 in the draft TMDL. These figures would suggest that the majority of the data collected in Tributary to Indian Creek fall into flow exceedance percentiles of 10% or less, or very high flows. Also, the low-flow intervals (Percent Load Exceeded 80-100%) in Tables 9 through 12 of the draft TMDL do not include sufficient flow to account for typical flows through outfalls 002 and 004, as indicated in the flow rate frequency distribution plots below.





As an alternative to the Load Duration Curve approach, we recommend a straightforward approach to the TMDL, setting the TMDL equal to the stream flow times the water quality criterion times the appropriate conversion factor.

Comment #13. Page 15, Section 6.1 and Page 17, Section 7: The draft TMDL states: "*The wasteload allocation for these TMDLs is set to the lesser of applicable water quality-based or technology based effluent limits or the TMDL loading at the 80-100 percent flow exceedance for dissolved zinc and dissolved lead in the Indian Creek, Tributary to Indian Creek, and Courtois Creek watersheds. This flow*

exceedance was chosen as it is most representative of critical low flow discharge conditions and is anticipated to be protective at all flow conditions." The WLA in the TMDL should be set consistent with the development of a WLA used in calculating a water quality-based effluent limitation (WQBEL). There is no reason for a WLA in a TMDL to be more stringent than a WLA for purposes of developing a WQBEL considering a sufficient Margin of Safety is implicitly included in the calculation of the water quality criterion using the 25th percentile hardness.

Comment #14. Page 15, Section 6.3: The draft TMDL states: *"The difference between the load capacity and wasteload allocation at each flow interval will be allocated as the load allocation since the margin of safety is implicit."* Allocating all additional load capacity at higher flow intervals to the load allocation is arbitrary and capricious. This approach provides no recognition that the point sources may be significantly impacted by precipitation and runoff, not only from Doe Run facilities, but including runoff from the City of Viburnum. The TMDL must include recognition of the increased loadings driven by precipitation events within the WLA.

STATE OF MISSOURI
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DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

May 21, 2010

Mr. Hans Holmberg
LimnoTech
2217 Vine Street, Suite 201
Hudson, WI 54016

RE: Response to Comments on the Indian Creek, Tributary to Indian Creek, and Courtois Creek Draft Total Maximum Daily Load

Dear Mr. Holmberg:

The Missouri Department of Natural Resources (Department) appreciates the comments provided by LimnoTech on behalf of the Doe Run Company on the draft Indian Creek, Tributary to Indian Creek, and Courtois Creek Total Maximum Daily Load (TMDL). This letter responds to comments received from the Doe Run Company following the public comment period for this TMDL that ended on May 7, 2010. Please find herein the Department's response to each comment and the location of the revision (if applicable) within the final document as it will be submitted to the U.S. Environmental Protection Agency (EPA).

Comment 1 – *Regarding page 1, 3rd paragraph. "This paragraph previously states that the 303(d) listing for Tributary to Indian Creek, and the previous 303(d) listings for Indian Creek and Courtois Creek are based on dissolved lead and zinc in water. As such, the reason the TMDLs are developed for lead and zinc is because these are the pollutants resulting in the 303(d) listing in the streams and not because 'these are the pollutants for which there is available data.' The sentence should be revised as follows: 'This document provides TMDLs for dissolved lead and zinc because these are the pollutants for which available data suggested an impairment of the designated beneficial uses."*

This paragraph was included to provide an explanation of listing changes from the 2004/2006 303(d) list of impaired waters to the current EPA-approved 2008 303(d) list. For the 2008 303(d) list, zinc was removed as a pollutant causing impairment for Indian Creek and Courtois Creek, but was retained for Tributary to Indian Creek. Lead remains a listed pollutant for all three streams, and is believed to be the primary cause of toxicity to aquatic organisms in the impaired segments. LimnoTech is correct in stating that it is because of these pollutants being listed on the 303(d) list as causes of impairment that TMDLs are being developed. For this reason, the language in this paragraph has been revised.

Comment 2 – *"Page 3, 2nd paragraph: The draft TMDL states 'It is common to find lead and zinc contamination in soil, groundwater and surface water surrounding lead and zinc mines, mills, smelter sites and transportation corridors.' This is a subjective statement that is not supported by data and should be removed from the TMDL. Furthermore, smelter sites and transportation corridors have no influence on the streams addressed by this TMDL."*

The paragraph described provides general information regarding lead mining in Missouri and is included to provide a preface to the situation occurring at the Viburnum mining area that has resulted in the impairment of Indian Creek, Tributary to Indian Creek, and Courtois Creek. Because this paragraph describes lead mining in Missouri in a general sense, mining practices and potential sources of contamination other than those which may be present at the Viburnum facility are described. The Department believes this information is appropriate for inclusion in the background section of this TMDL to help describe the nature of metal impairments resulting from mining activities, to aid in the understanding of local conditions, and to increase awareness of potential sources of contamination for TMDL implementation or pollution abatement.

To better indicate the general nature of the described paragraph, this information is now included under Section 2.3 Defining the Problem as Section 2.3.1 Lead and Zinc Mining Activities in Missouri. Additionally, language has been added to clarify that the described modes of contamination are general in nature for mining practices throughout Missouri. Furthermore, specific data showing the frequency of occurrence of water body contamination due to metals mining in Missouri has also been included. To further reduce confusion, information specifically pertaining to the Viburnum mine site has been changed from Section 2.4 to Section 2.3.2 Lead and Zinc Mining Activities in the Impaired Watershed.

Comment 3 – *"Page 3, 2nd paragraph: The draft TMDL states 'Contamination from mining and milling sites comes from tailings impoundments, processing areas, and from underground mine workings that may penetrate shallow aquifers.' We are not aware of any potential contamination that may result from underground mine workings that may penetrate shallow aquifers. This sentence should be revised as follows: 'Sources of lead and zinc from mining and milling sites may include tailings impoundments, processing areas, and dewatering of underground mine workings.'*

As stated in response to Comment 2, the paragraph described provides general information regarding lead mining in Missouri and was not intended to describe the specific conditions at the Viburnum mine site. As also stated previously, this paragraph is now included in the TMDL document under Section 2.3.1 Lead and Zinc Mining Activities in Missouri. To reduce confusion, information specifically pertaining to the Viburnum mine site has been changed from Section 2.4 to Section 2.3.2 Lead and Zinc Mining Activities in the Impaired Watershed.

Comment 4 – *"Page 3, 2nd paragraph: The last two sentences of this paragraph refer to smelter sites and have no relevance to this TMDL. Therefore, these sentences should be removed from the TMDL."*

As stated in response to Comment 2, the paragraph described provides general information regarding lead mining in Missouri and was not intended to describe the specific conditions at the Viburnum mine site. As also stated previously, this paragraph is now included in the TMDL document under Section 2.3.1 Lead and Zinc Mining Activities in Missouri. To reduce confusion, information specifically pertaining to the Viburnum mine site has been changed from Section 2.4 to Section 2.3.2 Lead and Zinc Mining Activities in the Impaired Watershed. For these reasons, the two sentences referenced in Comment 4 have been retained.

Comment 5 – *"Page 5, 5th paragraph: The draft TMDL states: 'The Doe Run-Viburnum Operations facility has five permitted outfalls and includes mine dewatering ponds that may overflow during large storm events.' There are a series of basins that provide settling of mine water prior to discharge through outfall 004. These basins do not typically overflow even during large storm events. There are also tailings impoundments that discharge through outfalls 002, 005, and 006. These are discussed further in comments 6 and 7 below. The sentence in the draft TMDL should be revised as follows: 'the Doe Run-Viburnum Operations facility has five permitted outfalls that discharge mine water, precipitation, and runoff from the facility and tailings impoundments, as well as treated domestic sewage and stormwater runoff from the City of Viburnum."*

The sentence quoted from the TMDL was revised to note that the five permitted outfalls discharge precipitation and runoff in addition to mine water. Section 2.1 of the TMDL document acknowledges that 1.3 percent of the impaired watershed is urban. An additional sentence was added to note the potential for effluent from the City of Viburnum's wastewater lagoon to reach outfall 002.

Comment 6 – *"Page 5, 5th Paragraph: The draft TMDL states: 'Both of these tailings impoundments are likely significant contributors of lead and zinc loading to the impaired water bodies due to runoff-producing storm events.' It should be noted that outfalls 005 and 006 on the new tailings impoundment rarely ever discharge. Outfall 006 has not discharged since April 2006 and Outfall 005 has not discharged since at least December 2005. These outfalls only have the potential to discharge during extreme stormwater events. However, the draft TMDL makes no allocation for these potential discharges in the wasteload allocation (WLA) for the high flow interval. The TMDL should include in the WLA an allowance for increased loadings at higher flow intervals. The sentence in the draft TMDL should be revised as follows: 'The new tailings impoundment discharges through outfalls 005 and 006 only under extreme storm event conditions. The old tailings impoundment discharges through outfall 002 on a more frequent basis as a result of discharges from the City of Viburnum's wastewater treatment plant and runoff from the surrounding watershed, including the City of Viburnum."*

The wasteload allocations found in this TMDL are expected to be protective of all flow conditions, including critical low flow. The Department does not believe higher wasteload allocations at higher stream flows would be adequately protective of water quality. Numeric criteria for acute and chronic protection of aquatic life are developed based on assumptions of a frequency, magnitude, and duration of exposure to toxics. Fixed effluent limits for the mass and concentration of a toxic discharge, based on monthly average and daily maximum, are set based on statistics considering treatment

variability and the exposure assumptions mentioned above. A flow-variable permit limit can undermine the exposure assumptions used in the water quality standards to permit limit process (i.e. the statistics and methods found in EPA's "Technical Support Document for Water Quality-based Toxics Control" (EPA/505/2-90-001)). Because flow-variable permit limits would not be based on the assumption that the numeric criteria should not be reached or exceeded more than once every three years on average, any violation of the permit limit becomes a de facto violation of numeric water quality standards, without regard to frequency of occurrence. The flow-variable approach would therefore not be protective of water quality.

Regarding the sentence quoted from the TMDL, the sentence was revised to indicate the potential for discharge during large runoff-producing storm events. As stated in response to Comment 5, an additional sentence was added to the document to note the potential for effluent from the City of Viburnum's wastewater lagoon to reach outfall 002.

Comment 7 – *Regarding page 5, paragraph 6. "It should be noted that a significant drainage area, including the majority of the City of Viburnum (see Figure 2 in the draft TMDL) and the City of Viburnum wastewater treatment plant, discharge through the old tailings impoundment and eventually through Outfall 002 into Indian Creek. Therefore, Outfall 002 is susceptible to increased loadings as a result of point source and non-point sources discharges from outside the Doe Run facility. The draft TMDL makes no recognition of this in the WLA and allows no increase in the WLA under high flow conditions. The TMDL should include in the WLA recognition of the potential contribution of sources of metals loading outside the Doe Run facility. Additionally, the WLA should include an allowance for increased loadings at higher flow intervals."*

Please see the Department's response to Comment 6 regarding increased loadings at higher flow intervals and Comment 5 regarding recognition of additional flows from outfall 002.

Regarding sources of metals loading in the TMDL, Section 3. Source Inventory and Assessment characterizes known, suspected and potential sources of pollutant loading to the impaired water body. Pollutant sources identified within the watershed are categorized and quantified to the extent that information is available. The 4-digit federal standard industrial classification (SIC) for the Doe Run Viburnum Operations facility is 1031 – Lead and Zinc Ores, which is defined by the United States Department of Labor's Occupational Safety and Health Administration as being, "establishments, primarily engaged in mining, milling, or otherwise preparing lead ores, zinc ores, or lead-zinc ores." Existing lead and zinc effluent data indicate this Doe Run facility has reasonable potential to cause or contribute to the dissolved lead and zinc impairments. The Doe Run facility is the only point source within the impaired watersheds that has a reasonable potential to cause or contribute to the impairments. Other facilities within these watersheds have general permits (non-metallic mining), are municipal facilities, or stormwater permits. In addition, Superfund documentation of contaminated haul roads supports the assessment that the Doe Run Viburnum site is a contributor to the impairment of Indian Creek, Tributary to Indian Creek, and Courtois Creek. When compared to the Doe Run Company's mine land area, any nonpoint sources of lead and zinc loading outside the Doe Run facilityare expected to be minor.

Comment 8 – *"Page 7, 3rd paragraph: The draft TMDL speculates that 'historic and legacy lead and zinc' in the sediments can be suspended during high-flow storm events causing a water quality concern and concludes 'It is therefore reasonable and necessary to have load allocations for lead and zinc at higher flows to account for nonpoint source instream loading of these pollutants.' However, the TMDL presents no supporting data to indicate resuspension of bottom sediments contributes to the elevated dissolved lead and zinc values in the water column that are the basis for the 303(d) listing. Therefore, this paragraph should be deleted. In fact, if the existing loads are properly calculated and not artificially inflated, as described in subsequent comments, the available data will likely show few exceedances of water quality criteria at high flows. For example, plotting the Courtois Creek dissolved lead loadings, as calculated from Courtois Creek dissolved lead samples and Courtois Creek estimated flows, without adding artificially inflated loads from Indian Creek and Tributary to Indian Creek, does not show elevated dissolved lead in Courtois Creek...."*

As noted in the Department's response to Comment 7, Section 3. Source Inventory and Assessment characterizes not only known sources of the pollutants of concern, but also suspected and potential sources of pollutant loading to the impaired water body. Pollutant sources identified within the watershed are categorized and quantified to the extent that information is available. As conservative pollutants, lead and zinc do not degrade and therefore, the potential exists for these metals to be re-suspended into the water column and carried downstream via natural fluvial processes. Significant metals suspension and re-deposition can occur during and immediately following high-flow storm events. This process allows previously unavailable lead and zinc to enter the water column and become a water quality concern. An additional document citation has been added to this paragraph to better support the potential for this mode of metals transport. For these reasons, the inclusion of this paragraph in the TMDL document is appropriate.

Comment 9 – *"The draft TMDL Report now includes the development of TMDLs for lead and zinc in the Tributary to Indian Creek where Outfall 004 discharges. As such, the development of numeric water quality targets in Section 4.5.1 should include the calculation of criteria for Tributary to Indian Creek based on representative hardness. Because Outfall 004 is the primary source of water in the Tributary to Indian Creek, hardness data from Outfall 004 should be used. DNR was previously provided with hardness data for Outfall 004. 43 samples between January 1, 2006 and July 8, 2009 indicated a 25th percentile hardness value of 275 mg/L."*

The Department appreciates the opportunity to review the hardness data provided by Doe Run; however, the Department does not believe Discharge Monitoring Report data are appropriately representative of a well-mixed situation in the receiving stream. Hardness, like other instream parameters such as pH and temperature, do not undergo simple dilution downstream of the outfall (i.e. plumes can occur) and the environment may act to buffer changes instream. Additionally, state regulation requires that instream hardness be calculated from "a representative number of samples from the water body in question or from a similar water body at the appropriate stream flow conditions" [10 CSR 20-7.031(1)(Y)]. Hardness data supplied by Doe Run for Courtois Creek and Indian Creek was found to be representative of instream conditions and to be meeting the Quality Assurance/Quality Control levels of the state's 303(d) Listing Methodology

Document, which is the minimum level the Department would consider for use of data for determining TMDL targets and modeling. As a result, these data in conjunction with Department data were used for TMDL development for Courtois Creek and Indian Creek, and Indian Creek data were used to estimate water quality conditions in Tributary to Indian Creek.

Comment 10 – *"Page 10, 2nd paragraph: The draft TMDL Report indicates that only uncensored data were used to graph observed pollutant loads against target pollutant loads at corresponding probability flows. This approach effectively ignores a substantial portion of the data, and presents a biased picture, since it does not show many load values that would fall below the TMDL curve."*

Censored data includes all data collected with results below the level of detection for the particular method or instrument used for measuring lead and zinc concentrations. The data recorded as being less than the detection level of the instrument or method of measurement were recorded into the Department's water quality database as half the detection level with a "99" flag at the end, such as 49.99 or 1.2499 or 2.499. The data for Indian Creek and Courtois Creek contained 41 and 18 samples below the detection level for dissolved lead and zinc, respectively. These data were derived by methods using at lease five different detection levels and show a large range of variability. For example, a value of 49.99 may be any number from zero to 100 µg/L. As noted in Section 4.5.2 of the TMDL document, the United States Geological Survey (USGS) collected the majority of the water quality data in the Courtois Creek watershed. USGS used two different laboratories that employed different analytical methods and various detection levels. As a result, a couple years of data were reported by the USGS as less-than values (i.e. <100 µg/L). Following the Department's request for more specific values, the USGS re-coded much of the data to be less than a smaller value based on analytical and quality assurance/quality control data on file. However, values lacking the appropriate documentation to allow re-coding remained less than the higher, originally recorded value. A list of censored dissolved lead and zinc data can be found in Appendix C of the TMDL document. Because the accuracy of these censored data was questioned, these values were not plotted on the TMDL load duration curves.

Comment 11 – *"Page 10, 2nd paragraph: The draft TMDL Report further indicates that 'Where sampling sites were upstream of the watershed outlet, the average daily flows at those sites were adjusted to the watershed area of the outlet.' This approach significantly overestimates the observed loads. It is appropriate to use, for example, Tributary to Indian Creek dissolved metal concentrations in conjunction with appropriately estimated Tributary flows to estimate loads from Tributary to Indian Creek. It is not, however, appropriate to use that same Tributary to Indian Creek dissolved metal concentration in conjunction with flows at the mouth of Indian Creek or Courtois Creek to estimate loads in Indian and Courtois Creeks.... This 'normalizing' of the loads makes it appear that loadings are much higher than the TMDL curve, when in many cases, they are not."*

Observed loads in the upper watershed were adjusted by normalizing the sample location flow to the watershed outlet flow, allowing the load values to be plotted on the TMDL load duration curve which represents the pollutant load at the watershed outlet. Given the

time of travel between Tributary to Indian Creek and downstream sampling locations on Indian Creek and Courtois Creek, differences in observed instream concentrations are expected. However, dissolved lead and zinc are conservative pollutants that do not decay or degrade as they are transported downstream. Normalization of flow is therefore a reasonable means to obtain estimates of instream pollutant loads at the watershed outlet and their probability of occurrence.

Comment 12 – *"Page 10, 2nd paragraph: Estimating flow probability for Tributary to Indian Creek and Indian Creek based on flows at USGS gage 07013000-Meramec River near Steelville, MO and a watershed area adjustment is not appropriate ... The drainage area ratio method should not be applied to such significant differences in areas, especially when the smaller watersheds have significant point source contributions. In the absence of sufficient flow data for these streams, the Load Duration Curve approach is not applicable ... As an alternative to the Load Duration Curve approach, we recommend a straightforward approach to the TMDL, setting the TMDL equal to the stream flow times the water quality criterion times the appropriate conversion factor."*

Due to an absence of flow data for the Courtois Creek and Indian Creek watersheds, flows for the TMDL were synthesized using long-term data from the USGS stream gage site on the Meramec River near Steelville, Missouri (07013000). This gage was chosen because it is within the same hydrologic unit as the impaired segments and is located in an area having similar physiography and geology. Correcting this data for the watershed area provides a reasonable approximation of the range of flows for the impaired watersheds. Using these derived flows, the load duration curve approach can be appropriately applied to determine a TMDL that is protective of water quality at all flows, during all seasons, and when implemented, will restore the affected streams to an unimpaired state. The approach recommended in the above comment would not provide sufficient protection at all flow regimes during all seasons and would be based on a less complete data set.

Please note that values for flow in the tables referenced represent the lowest flow within the given range. Therefore, flows greater than those associated with the 20th percent load exceeded are possible, even though they are not represented in the tables. Comparison of the flow rate frequency distributions provided in Comment 12 with the estimated distribution of flow values in Indian Creek and Tributary to Indian Creek indicate the two flow distributions are compatible. High flow values up to 1338 cfs are possible in Indian Creek and flows up to 133.8 cfs are estimated to be possible in Tributary to Indian Creek. These high flows cover the range of outfall flows provided in the flow rate frequency distributions submitted with the comment.

Comment 13 – Regarding page 15, Section 6.1 and page 17, Section 7. *"The WLA in the TMDL should be set consistent with the development of a WLA used in calculating a water quality-based effluent limitation (WQBEL). There is no reason for a WLA in a TMDL to be more stringent than a WLA for purposes of developing a WQBEL considering a sufficient Margin of Safety is implicitly included in the calculation of the water quality criterion using the 25th percentile hardness."*

The wasteload allocations (WLAs) developed for the Indian Creek, Tributary to Indian Creek, and Courtois Creek TMDLs are the maximum pollutant loading that may be discharged from point sources within the impaired watersheds. It is important to distinguish TMDL WLAs from water quality based effluent limitations (WQBELs), which use effluent variability and the assimilative capacity of the water body to determine limitations protective of in-stream water quality. Differences in facility performance, in-stream assimilative capacity, mixing considerations, and the amount of any explicit margin of safety may result in a TMDL WLA less than WQBELs or vice versa. There are also times where technology based effluent limits may be lower than either effluent limits generated from WLAs or WQBELs. For these reasons, any future permit limits will need to be at least as stringent as the WLAs derived in the TMDL. Should technology or water quality based effluent limits result in more protective effluent limitations, the more protective limits must be used.

Regarding the margin of safety (MOS), the use of the 25th percentile hardness value in calculating dissolved metals water quality criteria is required by state rule at 10 CSR 20-7.031(1)(Y); however, meeting the required water quality criteria does not in and of itself provide a MOS. Therefore, other rationale must be used for an implicit MOS, or an explicit MOS must be stated. Due to conservative assumptions used in developing and setting the TMDL load capacities, the MOS for these TMDLs is implicit. For additional information on the MOS, please see Section 7 of the TMDL document.

Comment 14 – *"Page 15, Section 6.3: The draft TMDL states: 'The difference between the load capacity and wasteload allocation at each flow interval will be allocated as the load allocation since the margin of safety is implicit.' Allocating all additional load capacity at higher flow intervals to the load allocation is arbitrary and capricious. This approach provides no recognition that the point sources may be significantly impacted by precipitation and runoff, not only from Doe Run facilities, but including runoff from the City of Viburnum. The TMDL must include recognition of the increased loadings driven by precipitation events within the WLA."*

The TMDL load duration curves for the impaired water bodies are expected to be protective of water quality under all flow conditions, including critical low flow. Critical low flow conditions are used to set effluent limitations for permitted facilities that cause or contribute to the water quality impairment. This ensures water quality in the impaired receiving stream is not impacted at an unacceptable frequency of occurrence. As noted in the response to Comment 6, the Department cannot implement flow-variable WLAs for the Indian Creek, Tributary to Indian Creek, and Courtois Creek TMDLs. While nonpoint sources of dissolved lead and zinc are minor or negligible under critical low-flow conditions, historic and legacy lead and zinc within the stream system can be sources of these metals, especially during higher flows. As conservative pollutants, these metals do not degrade and historic lead and zinc can become re-suspended into the water column and carried downstream via natural fluvial processes. Significant metal suspension and re-deposition can occur during and immediately following high-flow storm events. This process allows previously unavailable lead and zinc to enter the water column and become a water quality concern. It is therefore reasonable to have load allocations for lead and zinc at higher flows to account for non-point source instream loading of these pollutants.

Thank you again for your comments and for your interest in protecting the quality of Missouri's waters. If you should have questions or would like to discuss this TMDL further, please contact me at (573) 526-1446 or by mail at the Missouri Department of Natural Resources, Water Protection Program, P.O. Box 176, Jefferson City, Missouri 65102.

Sincerely,

WATER PROTECTION PROGRAM

John Hoke, TMDL Unit Chief
Water Quality Monitoring and Assessment Section

JH:mkl