FTN Associates Ltd.
water resources / environmental consultants
3 Innwood Circle, Suite 220 • Little Rock, AR 72211-2449 • (501) 225-7779 • Fax (501) 225-6738

July 19, 2013
benefield@adeq.state.ar.us

Mr. Ryan Benefield
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118

RE: Cooper Tire & Rubber Company
NPDES Permit # AR0038822
FTN No. R06038-0001-004

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Dear Mr. Benefield:

On behalf of Cooper Tire & Rubber Company (Cooper), FTN Associates, Ltd. (FTN) is submitting the enclosed information relative to the referenced National Pollutant Discharge Elimination System (NPDES) permit.

FTN has provided engineering and environmental services for the Cooper facility in Texarkana, Arkansas, since August 2005. During this period of time, FTN has provided assistance on various aspects of their NPDES permit and the compliance issues that have arisen for Outfall 001. The focus of this work has primarily been related to the evaluation of source control to achieve permit limitations, the review and interpretation of biomonitoring results, and the feasibility of other means for achieving compliance with the permit limitations including permit modifications and treatment options.

PURPOSE

It is our understanding the Arkansas Department of Environmental Quality (ADEQ) has requested that Cooper obtain the services of a professional engineer to review Best Management Practices (BMPs) currently employed at the facility and identify any additional BMPs that could reasonably be employed to reduce stormwater contaminants with a resulting meaningful environmental benefit. In addition to a review of facility BMPs, we understand that ADEQ is interested in documented results from previous receiving stream assessments that evaluate the downstream water quality relative to similar streams in the area.

BEST MANAGEMENT PRACTICES

The NPDES permit currently held by Cooper contains requirements limiting the concentrations of biochemical oxygen demand (BOD_5, previously COD), total suspended solids (TSS), zinc, and other technology based limits in the outfall. Outfall 001 receives stormwater from various areas of the Cooper plant (the facility), including the roofs of buildings and the grounds surrounding the Plant. Cooper personnel have certified that the discharge has been evaluated for the presence of non-stormwater and that there are no sources of process wastewater to this outfall.

Cooper has encountered difficulties in achieving the effluent limits for BOD_5/COD, TSS, and zinc that are listed in the permit. Source control has been a major focus to reduce the BOD_5/COD, TSS, and zinc concentrations in the discharged stormwater as well as for removing intermittent chronic toxicity.

Beginning in August 2003, Cooper identified and implemented several BMPs and construction projects intended to resolve COD and TSS issues at Outfall 001. Several BMPs were in place by early July 2005. Cooper contracted with FTN as an independent reviewer to evaluate the BMPs implemented as part of a Consent Administrative Order (CAO) and their effectiveness at improving the quality of the stormwater discharge. The BMPs that have been installed are documented in a report by FTN dated November 4, 2005. This report is included as Attachment 1. The report concluded that "Cooper has gone above and beyond the requirements of the Compliance Action Plan, at considerable expense, to improve the COD and TSS levels at Outfall 001. No additional BMPs were identified by FTN."

In 2006, prior to the new zinc effluent limits becoming effective, Cooper again enlisted FTN's assistance to perform another study of BMPs, this time as related specifically to the discharge of zinc. The evaluation of the plant site by FTN (as documented in a report dated June 27, 2006; see Attachment 2) identified potential sources of zinc. Galvanized sheet metal ducts, flashing on the roof, and naturally-occurring zinc non-point sources upstream of the outfall were identified as sources of zinc that would provide a relatively constant background concentration of zinc in the stormwater at Outfall 001. The study identified the zinc oxide used in tire production, primarily resulting from fugitive releases, as the focus of Cooper's source control efforts.

FTN's report concluded that Cooper had conducted appropriate efforts to reduce zinc concentrations in the effluent from Outfall 001. Those efforts had resulted in some reduction to the effluent values of zinc, but had not achieved compliance with the permit limitations. FTN further concluded that it was unlikely that compliance with the zinc effluent limits could be achieved by further efforts at source control/BMPs.

Following 2006, the focus of FTN's efforts at Cooper shifted to evaluations of water quality and toxicity issues as discussed later in this summary. However, Cooper continued to identify and implement BMPs that would reduce the contribution of BOD_5/COD, TSS, and zinc to the stormwater. FTN has reviewed these efforts, most recently in a site visit on September 26, 2012, when a reconnaissance was made of the plant site and the current set of stormwater BMPs were reviewed.

Based upon a review of the site and statements provided by the facility's staff, Cooper has implemented the following structural/non-structural BMP's:

<u>Process Releases/Fugitive Dust</u>

The facility utilizes a large amount of granular or dusty raw materials. These materials are received in either super sacks or smaller (approximately 50-lbs) bags. If released these materials could become airborne and contribute to such parameters as TSS and/or Zinc depending upon the material.

1. The facility utilizes dust collectors associated with production equipment that generates particulate matter. (As reflected in release prevention measures associated with sources 10, 11, 16, and 17 in the plant's SWPPP.)
2. The facility appears to have a robust preventive maintenance program with regular inspections on key collection equipment. There is a maintenance group assigned specifically to the dust collection system associated with the carbon black system and the mixing system.
3. The facility is currently storing all dry raw materials and in-process rubber within the plant to prevent stormwater contamination. (As described in release prevention measures associated with source 12 in the plant's SWPPP.)
4. The facility has implemented regular inspections of roof areas, and surrounding property, for evidence of released material. They have also employed the services of contract labor to respond to any identified materials and perform daily housekeeping activities outside the plant. (As described in release prevention measures associated with source 10 in the plant's SWPPP and in the facility's ISO 14001 operating instruction #512.)
5. The bulk (rail car and semi-trailer) unloading area appears to be a potential source of TSS for the facility due to the large volume of materials handled. However, the facility has installed a semi-enclosure around the unloading area to minimize these potential releases. They have also purchased a mobile vacuum system so that any released material can be readily cleaned-up. This area is staffed by employees who have been provided written procedures and specialized training. These activities are documented in the site procedure #540 and #541.
6. The plant has installed zinc injection systems with dust capture in place for fugitive dust from the process. Employees in these areas have been issued operating instructions and tasks that include regular housekeeping to minimize spilled material or fugitive emissions.
7. As described in section 6.1- Other Best Management Practices, of the facilities SWPPP, those operations that have associated control equipment

such as dust collectors or scrubbers have had interlocks installed so that the sources can only be operated if their control equipment is functioning.

8. The facility performs weekly observations of dust collection systems associated with its mixing, spray booths, and grinding operations for the presence of visible emissions. (As described in release prevention measures associated with source 10, 16, 17, and 18 in the plant's SWPPP.)

9. The facility has constructed a small secondary retention area to which most of the stormwater from the carbon black and mixing areas drain. This area is required to be manually released via a gate valve. The facility has documented procedures associated with this activity as well as an inspection log documenting the visual appearance and characteristics of the water that is released. (As described in the section 6.1- Other Best Management Practices, of the facility's SWPPP, as well as in their ISO 14001 system as operating instruction #548.)

Waste/Scrap Staging Areas

The facility has several waste and scrap accumulation areas throughout the property. These materials include uncured production scrap, metal scrap, and both regulated and non-regulated wastes.

1. The facility has a primary waste handling area that includes areas for sorting recyclable material as well as the plants trash compactor for its landfill wastes. This area is enclosed with no stormwater drains within the building. Any accumulated water in this area is collected and discharged to the local POTW. The employees working in this area are contracted from a waste handling company. (As described in release prevention measures associated with source 13 in the plant's SWPPP.)

2. Other industrial waste such as used oils, oil absorbents, waste paints, hazardous waste, etc. are handled in an enclosed building with secondary containment. Any spills or residuals from the sorting and handling process are confined within the secondary containment and immediately corrected. (As described in release prevention measures associated with source 1 in the plant's SWPPP.)

3. Uncured rubber materials that are to be shipped off-site are either stored within the building or are placed in enclosed trailers until the time of transportation.

4. The facility has designated an area on the south side of the property for the storage of both new and scrap metal storage. The metals stored in this area

have been provided roofing to prevent stormwater exposure. (As described in release prevention measures associated with source 21 in the plant's SWPPP.)

Erosion Control

As typical with a facility the size of the Cooper property any erosion of the grounds would be a contributing factor in TSS discharged from the site.

1. The plant has implemented numerous BMPs to plant grounds to minimize erosion such as installing gravel cover, berms, covered awnings and other runoff controls.

2. As the primary discharge point for the largest area of the property, NPDES Outfall 001 represents the largest potential source of erosion to the site. As such, the facility has made significant efforts in this area such as installing a concrete flume, ensuring the area is seeded, and including large stones in the design of the area to decrease the velocity of the discharge. These items are discussed in the facility's SWPPP in section 6.7.

Oil/Fuel Storage Areas

The facility utilizes a large amount of process and hydraulic oils throughout the site. These materials are received in tanker trucks, rail cars, drums, or totes. If released, these materials could contribute to such parameters as BOD_5/COD as well as oil & grease. The facility maintains a Spill Prevention Control and Countermeasure (SPCC) Plan that is certified by a corporate engineer on staff with Cooper.

1. Process oils utilized at the facility are contained within secondary containment areas that are sufficient to contain their contents plus an appropriate amount of rainfall. Unloading personnel are always attending the area during unloading. These areas are inspected daily for the presence of oil or oil sheen by maintenance personnel in this area and documented in daily preventative maintenance order. If oil, or oil sheen, is detected during any inspection of a storage or containment area, then proper measures are taken to remove the oil and contaminated water prior to release of the water. Stormwater accumulated in this area is required to be manually released via a gate valve. The facility has documented procedures associated with this activity as well as an inspection log documenting the visual appearance and characteristics of the water that is released. This water is then redundantly contained by a containment area located adjacent to the plants carbon black receiving area. Water accumulated in this area is likewise managed via inspections for the presence of oil and manually released as discussed above. (As described in the section 6.1- Other Best Management Practices, of the facility's SWPPP, as well as in their ISO 14001 system as operating instruction #548.)

2. Hydraulic, maintenance, and used oil are stored in an out building located at the southern end of the plant. This building has containment berms and roof over the majority of the materials stored there. Collected water is required to be inspected for the presence of oil and manually released as described above.

3. Rail and tanker car unloading operations are performed within secondary containment by designated receiving personnel who have been issued operating procedures and received stormwater related training. The tanker car unloading area is contained by a containment area located adjacent to the plants carbon black receiving area.

4. In addition to the materials discussed above, the facility also stores diesel fuel for the operation of emergency fire pumps and the semi-trailer yard truck in tanks located at the plant. These tanks have all been constructed with secondary containment and either located within a building or a roofing system to prevent exposure to stormwater. These areas are regularly inspected and are required to be drained of any inadvertently accumulated rainwater via manual methods after being evaluated for the presence of oil or oil sheen.

In addition to the control measures noted above, the facility has implemented additional steps to prevent/contain oil and oil related materials in their SPCC plan. These include tank testing and inspections as well as contingency planning and emergency response.

<u>TOXICITY</u>

FTN has assisted Cooper with the identification and mitigation of intermittent toxicity effects at Outfall 001. One of the reports (dated March 19, 2010) summarized the findings relative to toxicity (Attachment 3). The primary conclusions of that study were that zinc was the primary, if not sole, cause of toxicity in the NPDES whole effluent toxicity (WET) tests and that higher levels of hardness could possibly mitigate the effect of the zinc toxicity. Further toxicity testing results since 2010 have confirmed the basic conclusions of that report.

FTN is not recommending the manipulation of hardness at Outfall 001 for the following reasons:

1. Implemented BMPs appear to have a positive effect illustrated by the facility not experiencing a biomonitoring failure in the last 20 months;

2. Even during the period of the referenced study in Attachment 3, toxicity has been intermittent and unpredictable;

3. Stream assessments of the receiving stream conducted by FTN have not indicated impairments due to water quality in the Cooper discharge from Outfall 001 or relative to other streams in the area. (See below)

STREAM ASSESSMENTS

FTN has conducted at least three assessments of the receiving stream for Outfall 001 at Cooper. The initial assessment was conducted in 2005 and is documented in Attachment 1. Additional assessments were conducted in March 2009, documented in comments to draft permit dated March 16, 2009 and in the fall of 2012, documented in a technical memorandum dated December 6, 2012 (Attachment 4). These evaluations conclude that "there was no evidence of distinctly visible excess solids, bottom deposits, or shoaling in the receiving stream indicating that the narrative criteria are being met in the receiving stream." While the receiving streams do not support high-quality biological communities, neither do they show impacts due to inflow from the Cooper facility's discharge. The 2012 report concluded that there is "little if any impairment to downstream aquatic life due to water quality [in] the Cooper Tire & Rubber discharge from Outfall 001."

CONCLUSION

Based on 1) the studies that have been completed to-date; 2) personal knowledge of the site and 3) experience with other industries of similar size and resources, it is my stated opinion that the Cooper facility has implemented appropriate and reasonable best management practices (BMPs) at the facility to control TSS, BOD_5/COD and zinc sources. FTN does not have knowledge of, or recommendations for, additional BMPs that would be reasonable to implement and would hold potential for appreciably reducing the concentration of these parameters in the effluent from Outfall 001.

If you have any questions or require additional information concerning this submittal, please do not hesitate to contact me or Jim Malcolm at (501) 225-7779.

Respectfully submitted,
FTN ASSOCIATES, LTD.

Rex Robbins, PE
Project Manager

RMR/tas

Attachments

CC: Craig Lloyd & Craig Busenbark, Cooper

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ENGINEERING CERTIFICATION

"I certify that, to the best of my professional engineering judgment, that the above statements are true and correct. This certification is contingent on the fact that all information supplied, up to the date of this certification, is unquestionably accurate and was provided in good faith."

Rex Robbins, PE
Arkansas PE License #4946

7/19/13
Date

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No.4946
REX M. ROBBINS
7-19-13

ATTACHMENT 1

Evaluation of Best Management Practices and Outfall 001 Receiving Stream Water Quality at the Cooper Tire & Rubber Company, Texarkana, AR, Facility

FTN Associates, Ltd.
November 4, 2005

EVALUATION OF BEST MANAGEMENT PRACTICES AND OUTFALL 001 RECEIVING STREAM WATER QUALITY AT THE COOPER TIRE & RUBBER COMPANY TEXARKANA, AR FACILITY

November 4, 2005

EVALUATION OF BEST MANAGEMENT PRACTICES AND OUTFALL 001 RECEIVING STREAM WATER QUALITY AT THE COOPER TIRE & RUBBER COMPANY TEXARKANA, AR FACILITY

Prepared for

Cooper Tire & Rubber Company
3500 Washington Road
Texarkana, AR 71854

Prepared by

FTN Associated, Ltd.
3 Innwood Circle; Suite 220
Little Rock, AR 72211

November 4, 2005

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 BACKGROUND

On July 1, 2003, the Arkansas Department of Environmental Quality (ADEQ) reissued National Pollutant Discharge Elimination System (NPDES) Permit No. AR0038822 to Cooper Tire & Rubber Company (Cooper Tire). Under the authority of this permit, Cooper Tire discharges stormwater runoff, groundwater seepage, and air conditioner condensate (i.e. no process water) via Outfall 001. The reissued permit contained the same effluent concentrations for Outfall 001 as the previously issued permit for chemical oxygen demand (COD) and total suspended solids (TSS). These permit limitations are summarized in Table 1.1 According to the Permit's Statement of Basis, these limitations were based on the best engineering judgment (BEJ) of the permit writer and not on established effluent guidelines or water quality standards (WQS). During the public comment period for the renewed permit, Cooper Tire submitted comments questioning the need for COD and TSS limitations. In their Response to Comments, ADEQ stated that the permit would be reopened to include less stringent effluent limitations and/or water quality based limits if justified by an approved study.

Table 1.1. COD and TSS permit limits for Cooper Tire Outfall 001.

Parameter	Monthly Average (mg/L)	Daily Maximum (mg/L)
COD	50	75
TSS	20	30

On or about August 10, 2003, Cooper Tire entered into a Consent Administrative Order (CAO) with ADEQ (LIS 03-068) because of exceedances of the permitted effluent concentrations for COD and TSS for Outfall 001 between January 2000 and April 2003. The CAO required Cooper Tire to improve the quality of the stormwater discharge to comply with the limitations given in Table 1.1. Beginning in August 2003, Cooper Tire identified and implemented several best management practices (BMPs) and construction projects intended to resolve COD and TSS issues at Outfall 001. All BMPs were in place by early July 2005. Cooper Tire contracted with FTN Associates, Ltd. (FTN) as an independent reviewer to evaluate the best

what was required by the Plan. Table 2.1 provides a listing of these projects and their associated costs. In total, Cooper Tire has spent over $2.17 million on projects to improve COD and TSS levels at Outfall 001. In addition, Cooper Tire will continue to incur approximately $87,000 in annual maintenance costs associated with these BMPs.

Table 2.1. Summary of CAO related expenses (2003 to present).

1. Mixing Building Roof and Curing/Finishing Roof	**$134,000**
$134,000 Labor costs ($67,000 annually)	
2. Carbon Black Handling System	**$1,547,500**
$7,500 Cover for carbon black unloading area	
$80,000 Hoods on mixer dewatering shakes No. 1 and No. 7	
$15,000 Level indicators on carbon black dust bags	
$1,445,000 Dust Collectors	
3. Tank Farm	**$8,000**
$8,000 Inspections of containment structures ($4,000 annually)	
4. Scrap Metal Hopper	**$20,000**
$20,000 Cover for scrap metal hopper	
5. Track Mobile	**$73,230**
$38,387 Cleaning track mobile	
$32,000 Routine maintenance ($16,000 annually)	
$2,843 Cleaning track mobile	
6. Waste Storage Area	**$217,800**
$25,000 Roof over oil storage area	
$187,000 Cover for south trash compactor area	
$5,800 Containment around oil storage building	
7. Erosion and Sediment Control	**$89,710**
$23,367 Replaced ballasts	
$3,406 Street sweeper	
$11,785 Clean areas around mixing / receiving	
$3,936 Clean out storm drains	
$6,460 Dig up concrete and replace	
$5,906 Riprap at Outfall 001	
$21,070 Dig out stained rock and soil	
$9,780 Additional riprap / rock around plant	
$4,000 Remove / replace rock	
8. Miscellaneous Maintenance Activities	**$82,995**
$1,600 Covers for oil pumps	
$745 Covers for oil pumps	
$4,650 Reinsulate and recover tank (removed oil-soaked insulation)	
$51,000 Improvements to Outfall 001	
$25,000 Spill response equipment	
Total Expenditures	**$2,173,235**

3.0 RESULTS AND DISCUSSION

Before the CAO, carbon black, soil erosion, exposure of oily areas, and general maintenance were issues requiring more attention. As discussed above, inspection of the site by FTN personnel on two separate occasions showed that the improvements in all areas, particularly the carbon black handling system, have been effective. No carbon black was visible in any area where it would be readily susceptible to entering stormwater runoff.

Figure 3.1 shows the monthly average TSS concentrations in the stormwater discharge at Outfall 001 from August 2003, when the CAO was issued, through July 2005. As a result of the stormwater improvement projects and BMPs, the average TSS concentration in the stormwater discharge has shown a slight downward trend. As a point of reference, the Benchmark TSS concentration contained in ADEQ's General Industrial Stormwater Permit is also shown on Figure 3.1. This concentration (100 mg/L), which applies to other industrial stormwater discharges, is considerably higher than the 20 mg/L limitation contained in Cooper Tire's NPDES permit. All but one observed TSS concentration at Outfall 001 since August 2003 are below the Benchmark concentration.

Figure 3.2 shows the monthly average COD concentrations in the stormwater discharge at Outfall 001 from August 2003 through July 2005. Despite the stormwater drainage improvement projects and BMPs, there has been little to no trend in the observed COD concentrations. As a point of reference, the Benchmark COD concentration contained in ADEQ's General Industrial Stormwater Permit is also shown on Figure 3.2. This concentration (120 mg/L), which applies to other industrial stormwater discharges, is more than twice the 50 mg/L limitation contained in Cooper Tire's NPDES permit. Four observed COD concentrations at Outfall 001 are above the Benchmark concentration. Observed 5-day biochemical oxygen demand (BOD) concentrations are also included in Figure 3.2 as well as the Benchmark BOD concentration. All but two observed BOD concentrations since August 2003 are below the Benchmark concentration. These BOD values are basically equivalent to or less than values expected in an urban stream.

Figure 3.1. Monthly Average TSS Concentrations August 2003 to July 2005

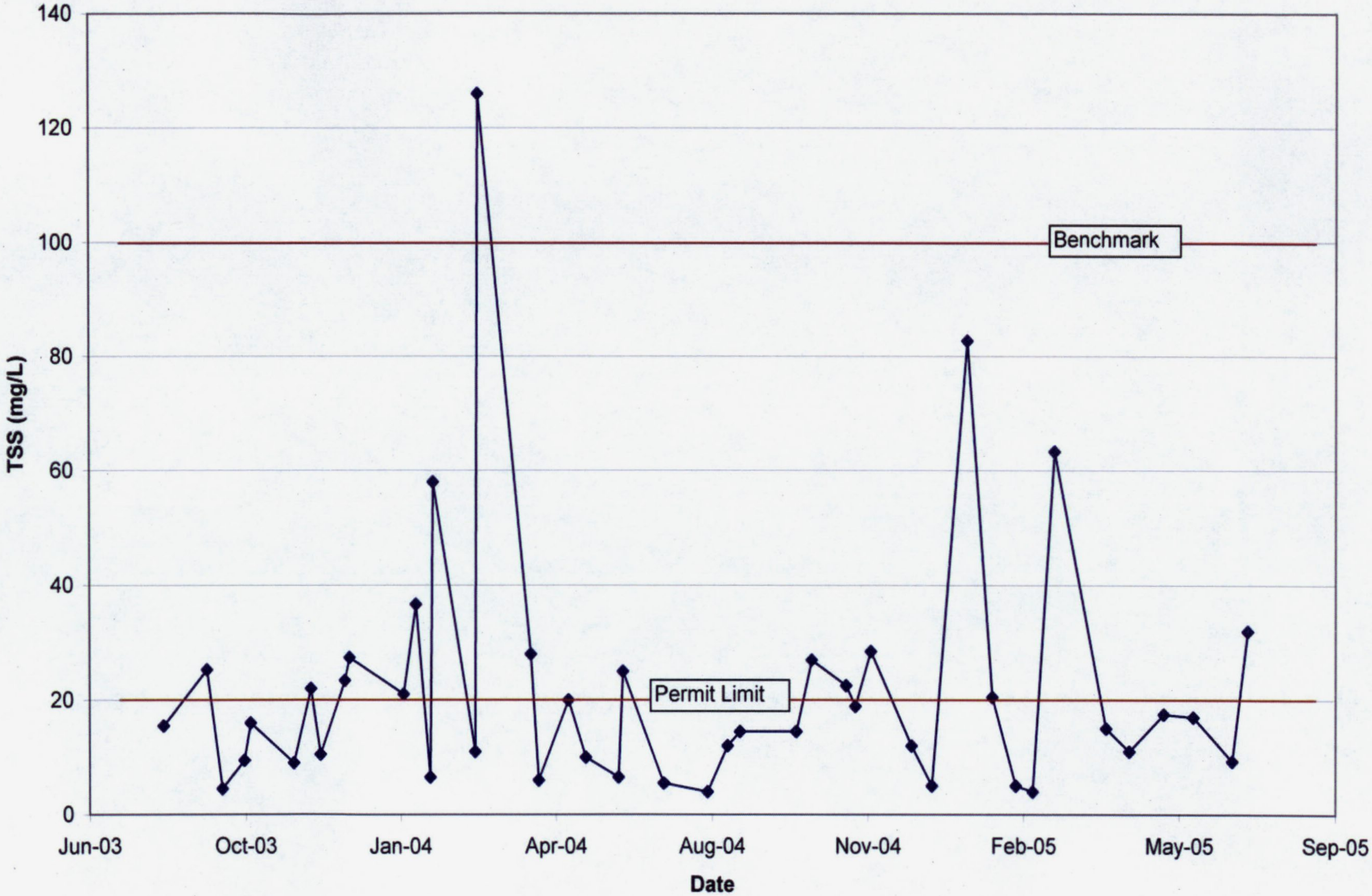
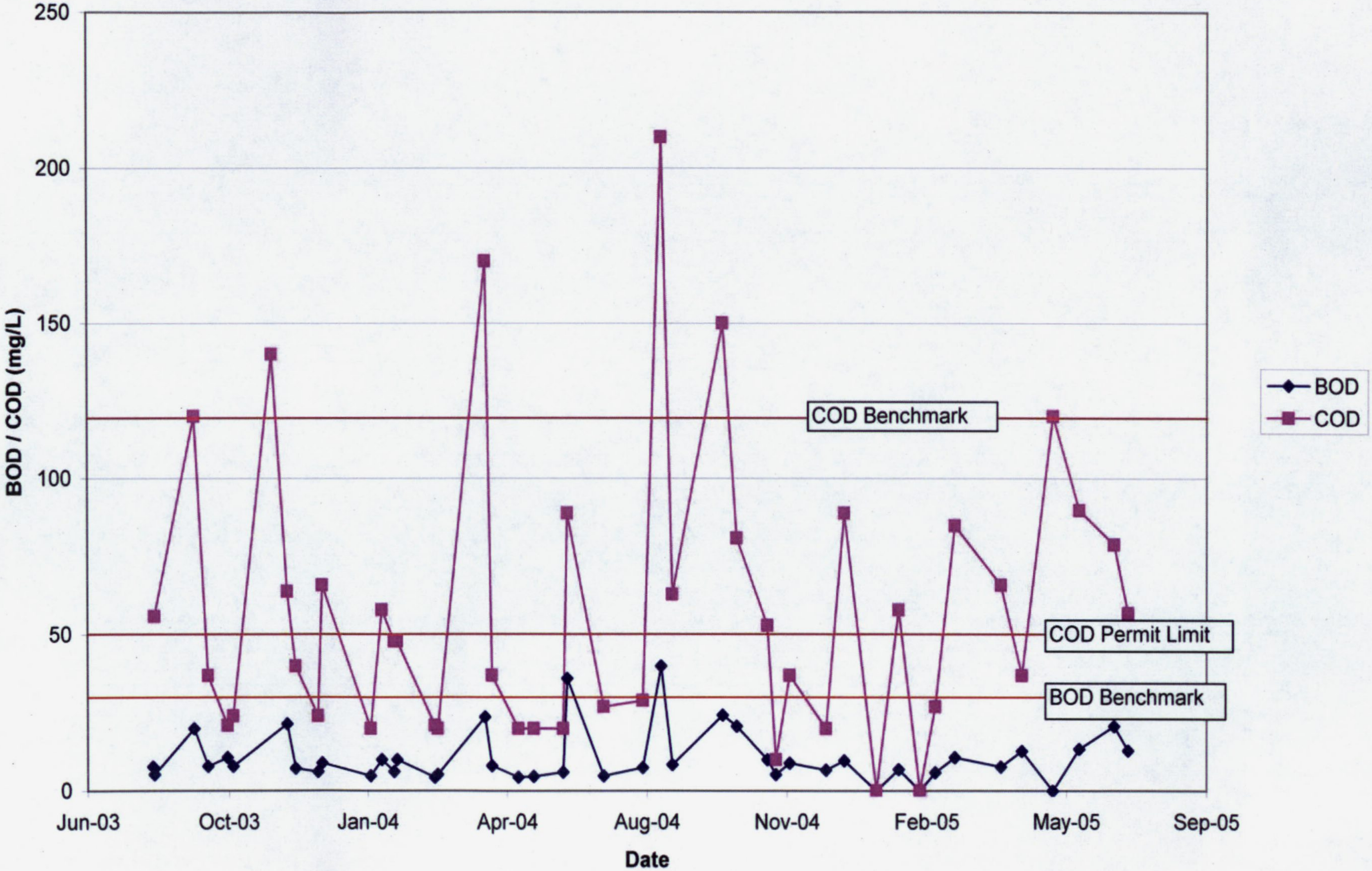


Figure 3.2. Monthly Average BOD and COD Concentrations August 2003 to July 2005



4.0 STREAM ASSESSMENT

On September 22, 2005, FTN performed a cursory assessment of the Outfall 001 receiving stream. The main outfall for the Cooper Tire facility is located on the western side of the facility between the plant and the warehouse. Figure 4.1 shows the facility and sampling locations. Outfall 001 was discharging at low flow conditions (approximately 100 gpm) at the time of the survey.

The main outfall contains a total of five concrete pipes that empty into a concrete chute. Below the chute, the channel contains riprap along the banks within the Cooper Tire property boundary. Water samples were taken in the pool below the concrete chute and *in situ* measurements were taken in that pool and further downstream. *In situ* measurements were also taken upstream of the outfall. The channel contained water up to about 100' upstream of the outfall. The *in situ* measurements are given in Table 4.1.

Daytime temperature on the day of the survey was in the mid to high 90s (or in the range of 37 to 38°C). The stream was basically a series of pools on this date as evidenced by the water temperature data. Based on the specific conductivity, the outfall is a potential source for dissolved constituents, however conductivity values increased further downstream indicating a continuous source along the stream downstream of the plant.

Table 4.1. *In situ* data collected during stream survey.

Station	Location	Temp (°C)	pH	Specific Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)
1	Channel upstream of Outfall 001	29.2	6.9	492	2.8
2	Channel just downstream of Outfall 001	29.9	6.9	609	4.9
3	Channel just west of Highway 254 bridge	28.5	6.8	600	1.4
4	Channel at West Road intersection	25.6	6.8	622	3.6

Figure 4.1. Site map and sample locations.

Dissolved oxygen (DO) levels are significantly higher in the pool immediately downstream from the outfall than at other pool locations within the channel. However, at the time of the survey, the stream was comprised of small individual pools with little to no flow between them. The DO reading at Station 3 was taken from a stagnant pool explaining the low reading.

Below the outfall, the riparian zone was approximately 5 meters wide on each bank and was vegetated with shrubs and grass. Further downstream, at the intersection with West Street, the riparian zone was wider and forested. Aquatic vegetation was present in the channel.

Benthic invertebrate collections indicated a moderate level of abundance and diversity consistent with expectations based on the small size of the creek and low flows at the time of sampling. Members of the following families of benthic macroinvertebrate organisms were observed within the channel:

1. Aeschnidae,
2. Cambaridae,
3. Chironomidae,
4. Coenagrionidae,
5. Culicidae,
6. Hydrophilidae,
7. Hydrophsychidae, and
8. Libellulidae.

The following insect orders were present:

1. Coleoptera,
2. Decapoda,
3. Diptera,
4. Odonata, and
5. Trichoptera.

Upstream of the outfall, the channel appeared similar to the downstream reaches observed, however, it lacked the added riprap along its banks. It should also be noted that upstream of the outfall the stream has been channelized. The channel was dry beginning at a point approximately 100' upstream of the outfall, and what water was observed in the channel between this point and the outfall lacked any obvious flow. The riparian zone upstream of the outfall was similar to the reach immediately downstream of the outfall, and the vegetative community was very similar. The upstream substrate was similar, however, it appeared less rocky than the downstream reaches. The benthic community was similarly diverse, however, it appeared less dense than below the outfall.

5.0 CONCLUSIONS

- Cooper Tire has gone above and beyond the requirements of the Compliance Action Plan, at considerable expense, to improve the COD and TSS levels at Outfall 001. No additional BMP recommendations were identified by FTN. The BMPs effectively control the exposure of potential contaminants to stormwater runoff. We recommend that Cooper Tire commit to including these BMPs and maintenance of these BMPs in their Stormwater Pollution Prevention Plan. Despite the BMPs and other improvements, there has been little observed change in the effluent concentration of COD and TSS at Outfall 001.
- The permitted limits for COD and TSS for stormwater discharges at Outfall 001 are much more stringent than the Benchmark concentrations required for stormwater discharges from other industrial facilities. These more stringent requirements were based on best engineering judgment of the permit writer and not on established effluent guidelines, water quality standards, or observed toxicity to the receiving stream.
- Discharge of COD and TSS at current levels does not appear to adversely affect the water quality or biology of the receiving stream (a small urban ditch). The BMPs that have been implemented should protect the receiving stream from sources of COD and TSS within the Cooper Tire site. Based on the findings of this study, the stringent COD and TSS limitations in Cooper Tire's permit for Outfall 001 do not appear necessary.

ATTACHMENT 2

Zinc Source Control and Treatment, Cooper Tire & Rubber Company, Texarkana, AR, Facility

FTN Associates, Ltd.
June 27, 2006

ftn Associates Ltd.
water resources / environmental consultants

ZINC SOURCE CONTROL AND TREATMENT COOPER TIRE & RUBBER COMPANY TEXARKANA, AR FACILITY

June 27, 2006

ZINC SOURCE CONTROL AND TREATMENT
COOPER TIRE & RUBBER COMPANY
TEXARKANA, AR FACILITY

Prepared for

Cooper Tire & Rubber Company
3500 Washington Road
Texarkana, AR 71854

Prepared by

FTN Associates, Ltd.
3 Innwood Circle; Suite 220
Little Rock, AR 72211

June 27, 2006

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

The National Pollutant Discharge Elimination System (NPDES) permit currently held by the Cooper Tire & Rubber Company (Cooper) in Texarkana, Arkansas contains requirements limiting the concentration of zinc in the outfall. Outfall 001 receives stormwater from various areas of the Cooper's Plant (the Plant) including the roofs of buildings and the grounds surrounding the Plant. There are no sources of process wastewater that are allowed to discharge to this outfall according to Cooper personnel.

Cooper has reported difficulties in achieving the effluent limits that will become effective on July 1, 2006 in the permit. Source control has been a major focus in attempting to reduce or eliminate zinc from the discharged stormwater. In anticipation of the permit limits becoming effective, Cooper has obtained the services of FTN Associates, Ltd. (FTN) to evaluate recent control improvements that it has undertaken as well as to suggest any additional improvements that should be considered for adoption.

2.0 ZINC SOURCES

Based on the evaluation of the Plant site conducted on May 1, 2006 the potential sources of zinc are zinc oxide used in the tire production process, galvanized sheet metal ducts, flashing on the roof and naturally occurring zinc deposits. Galvanized sheet metal ducts, flashing on the roof and naturally occurring zinc are sources of zinc that will provide a relatively constant background concentration of zinc in the storm water at Outfall 001. Zinc oxide used in tire production represents a potential source of zinc in the outfall resulting from fugitive releases.

Zinc oxide is delivered to the plant in one ton super sacks by over-the-road trucks. The material is stored inside the facility in its raw material storage area. The super sacks of zinc oxide are then carried into the mixing department where the sacks are individually mounted on automatic weigh dispensing equipment. The zinc oxide is injected into mixers through closed piping systems off the weigh system. The zinc oxide is then incorporated into the rubber products being produced in the mixing operation. Zinc oxide and other dry ingredients generate dust at the opening to the mixer throat. The potential exists for zinc oxide release during the loading of the super sacks onto the dispensing equipment and then while the material is being injected into the mixers.

Mixed and layered rubber is transported to rubber extrusion, milling and calendering processes where the different tire components are produced. All tire components are taken to the assembly area for final tire construction. The tires are then transferred to the curing area where they undergo controlled vulcanization (curing). As all of these operations are conducted inside the facility and do not involve powdered material, no potential releases of zinc were identified.

Cured tires are inspected, and the white sidewall (WSW) tires are routed to various automatic WSW buffers. WSW tires must be buffed to remove the black rubber veneer coating over the sidewall. After WSW buffing, these tires are inspected and sent to the uniformity machines. If specified uniformity force values are not met, the tire shoulder and/or tread area is ground. As the rubber being removed from the tires contain zinc oxide, should this rubber be discharged from the facility it has the potential of increasing the zinc concentration of the facility's stormwater.

After being evaluated by the uniformity machines, the tires are conveyed to be sorted, labeled, and loaded onto pallets. The pallets are stretch-wrapped and then sent to the warehouse until such time as they are shipped to customers for sale. Since all of these operations are conducted inside the facility and involve only whole cured tires, no potential releases of zinc were identified.

Waste material removed from the two grinding operations, raw material containers, and scrap rubber are stored outside the facility in either roll-off containers or in trash compactors. Exposure of these containers to stormwater would allow for increased zinc concentrations in the facility's stormwater.

Based on the evaluation, it is concluded that the zinc oxide receiving and usage operations associated with the rubber mixing operations, tire buffing and grinding operations as well as waste management at this facility are the major sources of the zinc in the discharged stormwater.

3.0 SOURCE REDUCTION EFFORTS

Cooper has spent significant time, effort and money to identify and eliminate the sources of the elevated zinc concentrations in the stormwater at Outfall 001. The following summary describes the progress and status of various activities Cooper has implemented to control the potential release sources noted above.

Raw Material Receiving and Dispensing

1. Warehousing and Storage of Zinc Oxide:

   The plant provides constant inspection of trailers containing zinc oxide as they are delivered to the plant. Broken super sacks are not removed from the trailer if noted during the inspection. In the storage area daily routine inspections are conducted of the area. Housekeeping is maintained at a high standard by having immediate response and cleanup of any zinc oxide.

2. Zinc Oxide Dispensing:

   Dust collection at the dispensing and weigh system is provided for each mixer by high removal efficiency dust collectors. The plant conducts daily monitoring and maintenance of the dust collectors to ensure proper operations. Operations personnel conduct routine inspections and housekeeping at the dispensing operations in order to minimize the loss of zinc oxide to the work environment as fugitive emissions. The empty bags from the dispensing operations are collected and reused in the plant to collect the dry material captured by the dust collectors.

At the time of FTN's site evaluation, there was no indication of fugitive emissions from the receiving and dispensing of the zinc oxide product (i.e., all sources were being controlled by the measures that have already been implemented). Therefore, FTN could not identify other controls or procedures that would likely make a significant reduction in the concentrations of zinc in the stormwater at the outfall.

Rubber Mixing Operations

1. Mixer Raw Material Usage

   Dust collection is provided at the miscellaneous raw material compounding station and undergoes routine maintenance. Operations personnel conduct routine inspections of the exhaust stacks to monitor for zinc emissions and to ensure dust collector efficiency.

2. Mixer Exhaust Fumes

   Dust collection is provided at the rubber mixer charge doors and at the drop mills. These dust collectors undergo routine maintenance. Operations personnel conduct routine inspections of the exhaust stacks to monitor for zinc emissions and to ensure dust collector efficiency.

At the time of FTN's site evaluation, the above control efforts appeared to be controlling this potential source of zinc. Therefore, FTN did not identify other controls or procedures that are recommended to be implemented.

Buffing and Grinding Operations

1. White Sidewall Buffing

   The plant has installed and maintains wet scrubbers on the discharge of all buffing equipment to remove any particulate matter generated by the buffing operations. The plant has developed daily visual inspections and house keeping procedures for this source.

2. Tire Uniformity Grinding

   The plant has installed and maintains cyclone type dust collectors to remove any particulate matter generated by the grinding operations. The plant has also developed daily visual inspections and house keeping procedures for this source.

At the time of FTN's site evaluation, the above control efforts appeared to be adequate for controlling this potential source of zinc. FTN could not identify other controls or procedures that would likely be effective at reducing zinc concentrations in the discharge from the outfall.

Waste Material Management

1. Dust Collector Dust Removal

   The zinc oxide captured in the dust collector is collected in super sacks. The super sacks are stored inside the building. Approximately once per week, the super sacks are placed into a closed container for transport off-site for disposal.

2. Buffer Dust Waste

   The buffing dust from the wet scrubbers is placed into a closed waste collection container for transfer off-site. The area around the collectors and the waste container are routinely inspected and housekeeping is maintained to minimize the potential for impact upon the storm water. Any material that would be found is promptly removed.

3. Rubber scrap products

   The plant controls scrap rubber by effectively containing the scrap inside and under roof. Scrap rubber is transferred to waste collection containers inside the waste handling building.

4. Empty Container Management

   The plant has constructed roofing over its trash compactor and non-hazardous waste areas. Also, the plant has implemented a daily inspection program and cleaning of the south trash compactor and waste handling area.

At the time of FTN's site evaluation, the above control efforts appeared to be controlling potential sources of zinc. FTN could not identify other controls or procedures that would be recommended to reduce the concentrations of zinc in the stormwater at the outfall.

General Plant Property

1. General Housekeeping

   The plant spends considerable energy and expense to maintain the areas outside the manufacturing building. Daily inspection and clean-up is performed by both plant personnel and outside contractors.

2. Erosion Control and Discharge Outfall

   Recent improvements to the plants outfall have been made to improve the accuracy of sampling and discharge data. At this time, Cooper also implemented several stream bank stabilization improvements along the outfall stream.

At the time of FTN's site evaluation, the above control efforts appeared to be controlling potential sources of zinc in the general plant property. FTN did not identify other controls or procedures that are recommended to be implemented.

Despite the above efforts conducted by Cooper to control the sources of zinc, effluent monitoring conducted by Cooper over the past few years has indicated that zinc concentrations have only decreased slightly (See Figure 1). Based on observations of the plant's facilities and housekeeping by FTN personnel, it is believed that further efforts to control fugitive emissions or dust will likely only result in minor improvements and will not result in meeting upcoming concentration permit limitations for zinc. Therefore, treatment of the storm water for zinc represents the control method that could potentially reduce zinc concentrations sufficiently to meet the permit requirements.

4.0 TREATMENT

The collection and treatment of the stormwater from this site represents a significant technical problem. The primary problem results from the unsteady flow rates associated with the stormwater. During an intense rain event, the flow of water would overwhelm the capacity of a continuous treatment system. The storage of wastewater would be required to modulate the flows from intense stormwater runoff. Unfortunately, the installation of a holding pond is not feasible within the path of the existing drainage due to size constraints. The outfall is located very close to the property line that also marks the right of way for Highway 245. Placing a pond on the opposite side of the highway is not feasible due to the existence of residential areas.

1. Collection/Treatment Options

The treatment would involve first collecting the water and providing some storage to allow the construction of a reasonably sized treatment system. The first stage of this system would take the form of a large pumping station with a holding basin. The size of the holding basin would be limited by the amount of land available in this area. Given this restriction, it would not be possible to collect and treat all of the stormwater (the peak stormwater flow from a 50 acre site could easily exceed 20,000 gpm). However, it will be possible to collect the first flush of stormwater runoff and to provide a more constant stream of outflow. In this way, periodic sampling of the discharge would be required. Using the pumping system, water would be pumped to a treatment system on the east side of the plant where a pond could be installed to handle the water. For estimating purposes, a 2,000 gpm pumping system is considered along with a Pond/Wetland system with a total extent of about 2 acres. A conceptual arrangement or layout of this treatment system is shown in Figure 2.

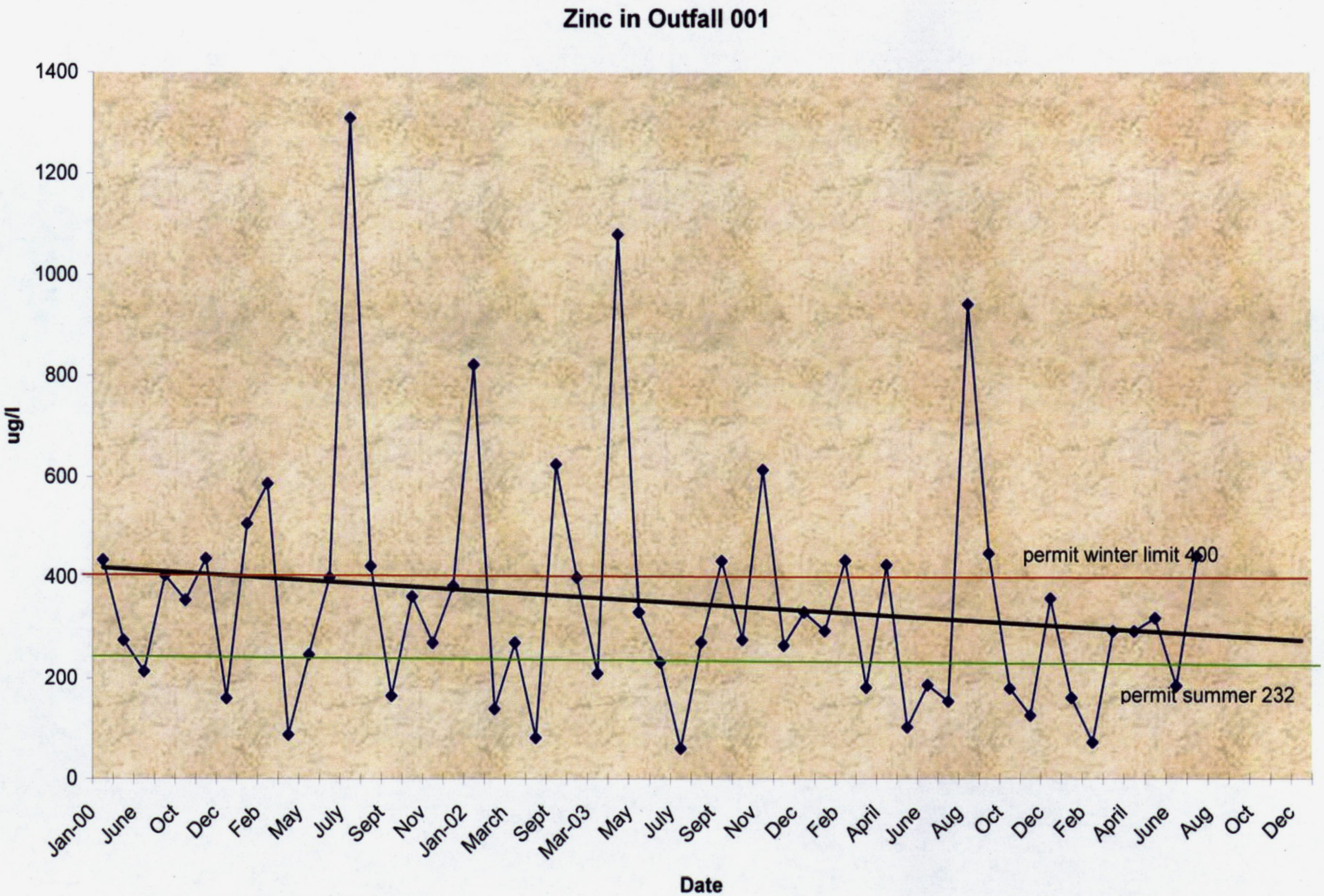


Figure 1. Zinc in Outfall 001.

One option for the treatment of the zinc would consist of a constructed wetland. This type of system has been used to remove heavy metals at other installations in Arkansas and provides a relatively low maintenance treatment system. Mainly due to the low cost of operation and maintenance, this system would represent the most cost effective treatment system that could be installed at this site. This system could utilize mechanisms that could settle or filter suspended solids from the water, incorporate select plants and algae that can remove dissolved metal through uptake, and could be designed to facilitate the conversion of soluble metal to the highly insoluble metal sulfide.

To facilitate FTN's evaluation of the need for such a treatment system, FTN performed a biotic ligand model (BLM) screening analysis to assess the possibility that the receiving stream may be able to receive a higher concentration of zinc than allowed in Cooper;s current permit. The results obtained from this model indicate that the stream water effects ratio (WER) for zinc may be more stringent than required to be protective of stream uses. A zinc WER of at least twice the current WER could be potentially justified, according to the BLB. In order to verify these results a formal WER study would have to be conducted. However, based upon the models initial results FTN does not believe that a treatment system should be necessary to protect the receiving stream. This is based on a biological evaluation of the stream given the existing condtions.

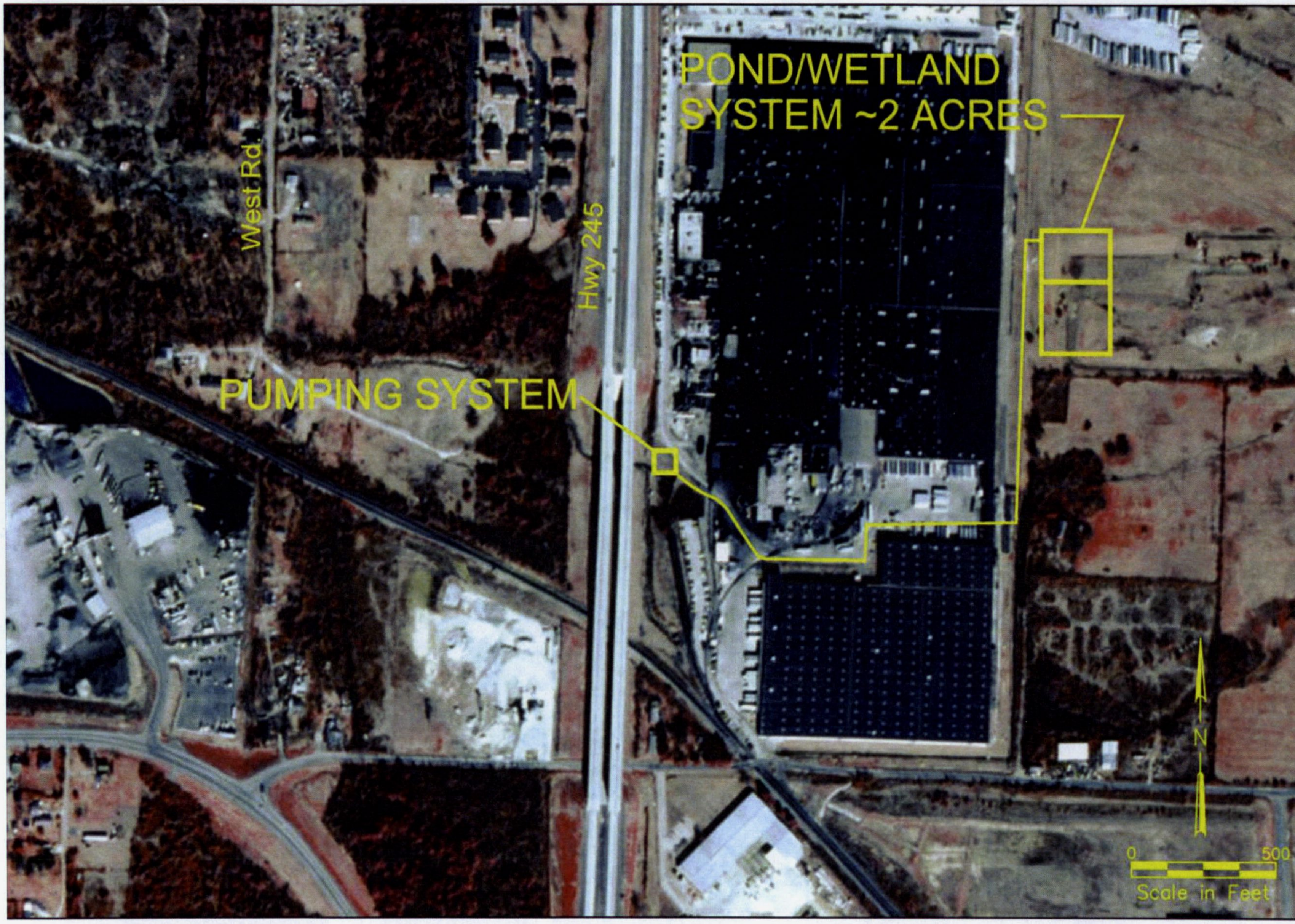


Figure 2. Layout of treatment system.

5.0 SUMMARY

Cooper has spent considerable time and expense to reduce zinc concentrations in the effluent from Outfall 001. These efforts have resulted in some reduction to the effluent values, but has not achieved compliance with the upcoming permit limitations.

Based on the efforts that have been made to date, it is not expected that immediate compliance can be achieved by further efforts at source control.

This report has investigated an alternative for treatment that represents the most cost effective method for potentially achieving compliance. However, based on initial modeling results of the receiving stream, FTN believes that the cost of such a system potentially would be unnecessary to protect the water quality of the receiving stream.

Therefore, it is FTN's recommendation that Cooper contact the Arkansas Department of Environmental Quality to begin discussing the possibility of conducting a formal water effects ratio study of the receiving stream, with the goal of modifying the discharge limits in the permit.

ATTACHMENT 3

Evaluation of Zinc Toxicity and Water Chemistry in Cooper Tire & Rubber Company Stormwater Discharge

FTN Associates, Ltd.
March 19, 2010

ftn Associates Ltd.
water resources / environmental consultants

EVALUATION OF ZINC TOXICITY AND WATER CHEMISTRY IN COOPER TIRE & RUBBER COMPANY STORMWATER DISCHARGE

DRAFT
MARCH 19, 2010

EVALUATION OF ZINC TOXICITY AND WATER CHEMISTRY IN COOPER TIRE & RUBBER COMPANY STORMWATER DISCHARGE

Prepared for

Cooper Tire & Rubber Company
3500 Washington Road
Texarkana AR 71854

Prepared by

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

FTN No. 6038-023

DRAFT
March 19, 2010

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This document summarizes testing and data analysis performed during 2009 and 2010 to evaluate factors causing and affecting toxicity in 48-hour static renewal acute whole effluent toxicity (WET) tests in the Cooper Tire & Rubber Company (Cooper Tire) stormwater discharges from Outfall 001. Toxicity has affected the fathead minnow (*Pimephales promelas*) almost exclusively with virtually no episodes of toxicity to the water flea (*Daphnia pulex*).Toxicity identification evaluation (TIE) testing conducted in January 2009 indicated the following:

- Toxicity was eliminated by addition of ethylenediaminetetraacetic acid (EDTA), which is known to chemically bind with divalent metals such as Zn;
- Toxicity was eliminated by increasing sample hardness[1] through the addition of calcium chloride (Zn toxicity is known to be inversely related to hardness).

TIE followup studies with Zn-spiked samples showed:

- Zinc-spiked effluent and laboratory water prepared to match the ionic composition of the effluent showed substantially more toxicity to *P. promelas* than to *D. pulex*; and
- The toxic concentration of Zn in the spiked artificial matrix was comparable to the toxic concentration of Zn in the effluent (LC50 of Zn = 135 ug/L and 153 µg/L in the effluent and spiked lab matrix, respectively).

These results strongly suggest that the cause of toxicity in WET tests is Zn.

Results of the 35 WET tests using *P. promelas* between January 12, 2006, and February 10, 2010, are summarized on Figure 1.1. Results on Figure 1.1 suggest that the frequency of toxicity has increased since mid-2007. This increase occurred during a period in which there has been a demonstrable decrease in stormwater concentrations of total recoverable Zn. This observation suggested that additional toxicants might be present in the effluent.

[1] Expressed in mg/L as $CaCO_3$

Accordingly, further analyses were performed to evaluate the potential for additional toxicants besides Zn.

The toxicity of metals, including Zn, to aquatic organisms is determined by the amount of dissolved metal present as it interacts with the organism and other aspects of water chemistry such as pH, other ions, and dissolved organic carbon. This study was not an exhaustive study of Zn bioavailability in the Cooper Tire effluent. A significant weakness of the analysis was the low number of paired measurements of dissolved Zn and toxicity. Available measurements of total and dissolved Zn indicate an average dissolved fraction 0.5, ranging from 0.2 to 0.9. Therefore, a given concentration of total recoverable Zn can be toxic or non-toxic depending on how much is present in the dissolved fraction. Despite this limitation the following analysis provides information that 1) reinforces Zn as the primary, if not sole, cause of toxicity and 2) suggests the amount of hardness that could be added to stormwater discharges to remove toxicity.

A classic approach based on a TIE was not used in this evaluation because the level of toxicity found in the effluent (typically < 50% mortality in undiluted effluent) and its irregular frequency (only present in some storm samples) complicates the identification of multiple toxicants. Therefore this analysis focused on examining the properties of episodes of toxicity for their consistency with known properties of Zn toxicity, specifically, the relationship with water chemistry and the response to hardness manipulation.

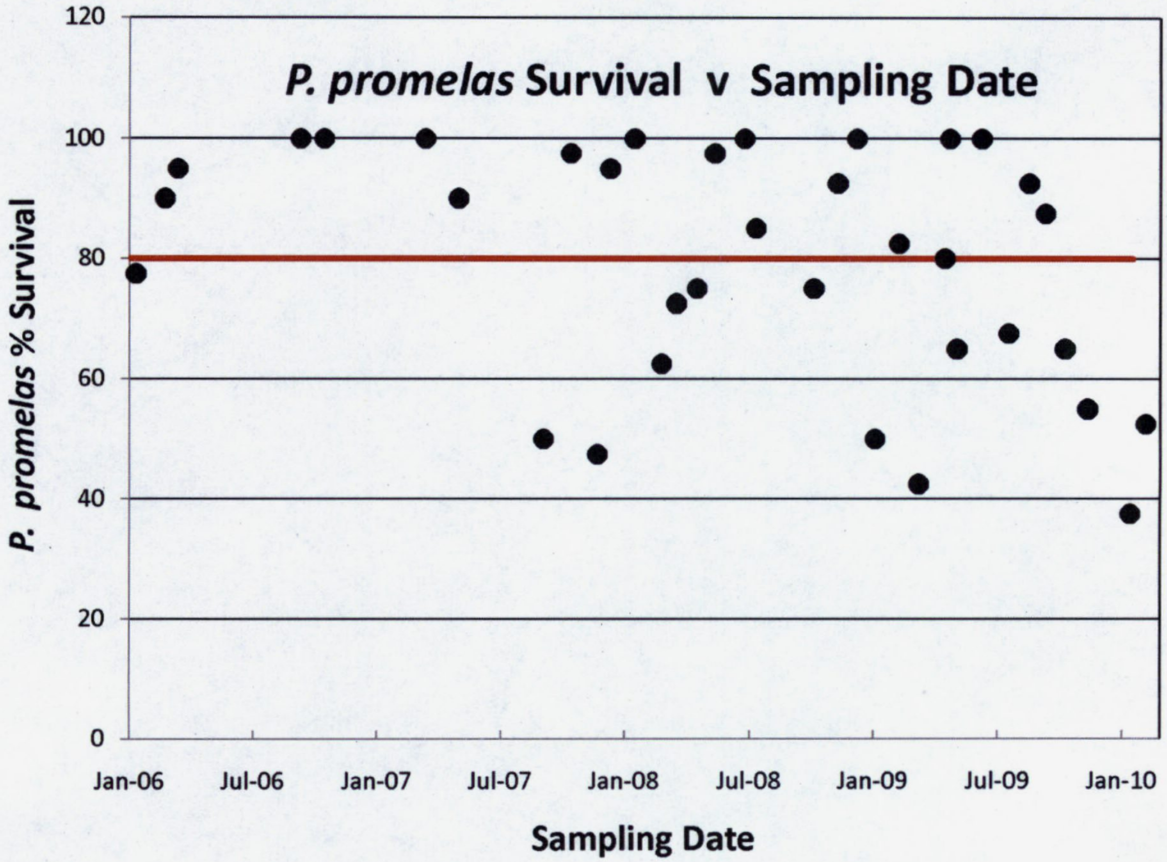


Figure 1.1. Percent *P. promelas* survival in undiluted effluent in NPDES biomonitoring tests conducted from January 2006 through February 2010.

2.0 PROPERTIES OF ZINC TOXICITY

Zinc toxicity is strongly affected by pH and hardness, as shown on Figures 2.1 and 2.2. The figures were based on water chemistry from samples collected January 7 through 9, 2009, used as input to the Biotioc Ligand Model (BLM; Di Toro et al. 2001). The effect of hardness (Figure 2.1) on the 48-hour LC50 (the concentration causing 50% mortality after 48 hours of exposure) is essentially linear with a positive slope of approximately 0.8 (i.e., approximately 0.8 unit increase in the LC50 for each unit increase in hardness). The effect of pH (Figure 2.2) is non-linear and shows a minimum LC50 (maximum toxicity) between pH 6.5 to 7.5.

Although the effect of hardness and Zn concentration on toxicity expressed as an LC50 is essentially linear, the toxicity response when expressed as percent survival (or mortality) is sigmoidal, as shown on Figure 2.3. Figure 2.3 shows how changes in Zn concentration and hardness show threshold effects rather than smooth linear changes. Since Cooper Tire's National Pollutant Discharge Elimination System (NPDES) biomonitoring requirements focus on survival rather than the LC50, Figure 2.3 provides the more appropriate framework for evaluating changes in hardness and concentration in the Cooper Tire effluent. Therefore, changes in Zn and hardness in the Cooper Tire discharge are likely to show threshold effects in terms of "pass/fail" biomonitoring results. The "pass/fail" response to changes in pH might show similar threshold properties but are likely more complicated due to the non-linear effect of pH on toxicity.

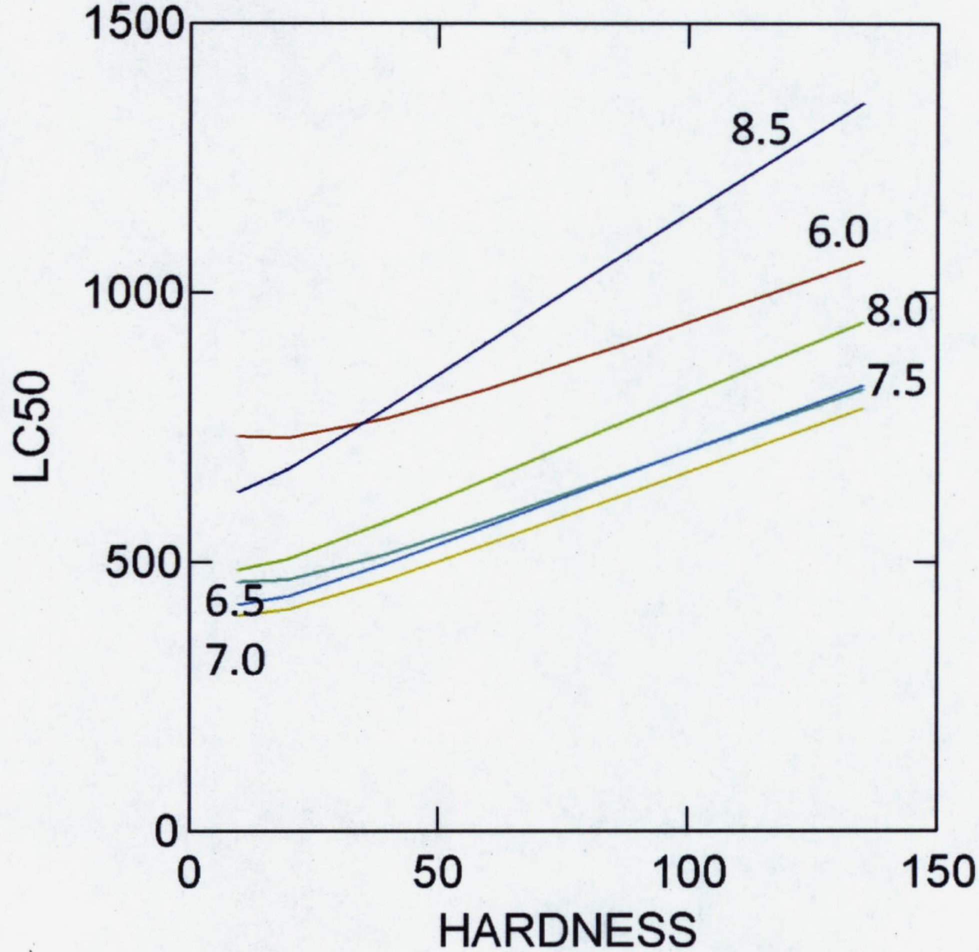


Figure 2.1. BLM generated toxicity-hardness relationships for selected pH levels (values next to curves) based on water chemistry from biomonitoring samples collected January 7 through 9, 2009.

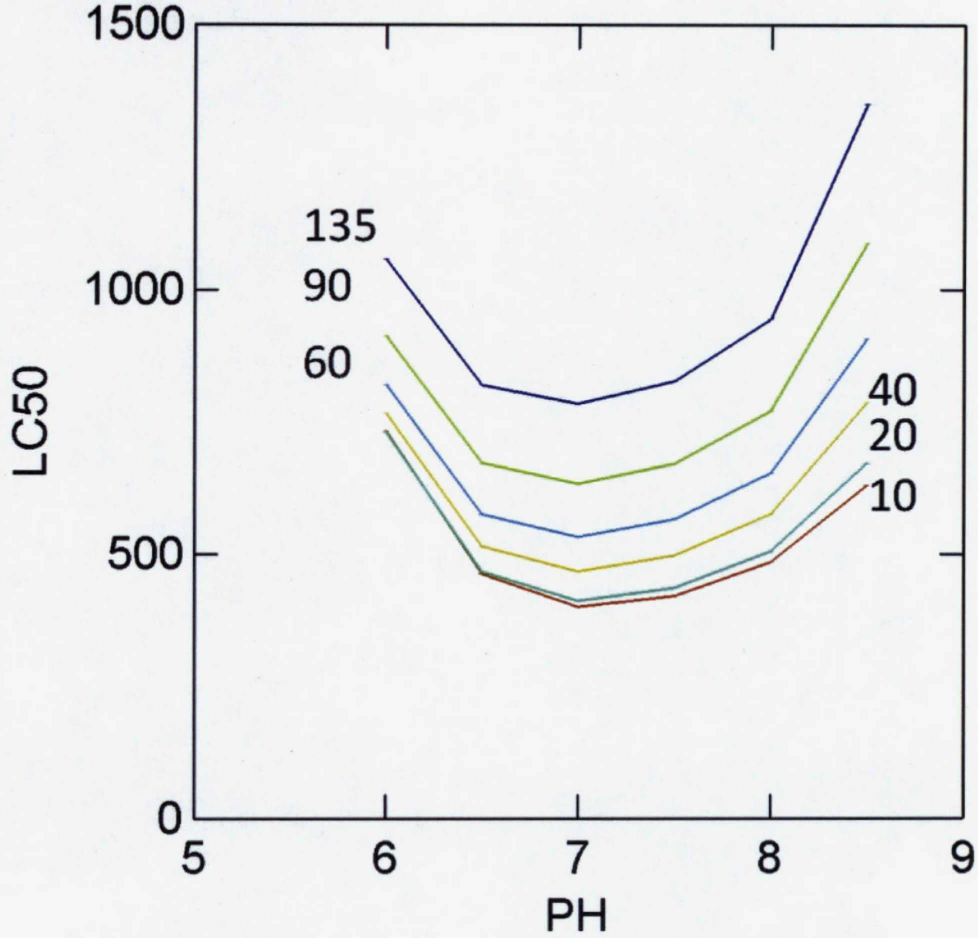


Figure 2.2. BLM-generated toxicity-pH relationships for selected hardness levels (values next to curves) based on water chemistry from biomonitoring samples collected January 7 through 9, 2009.

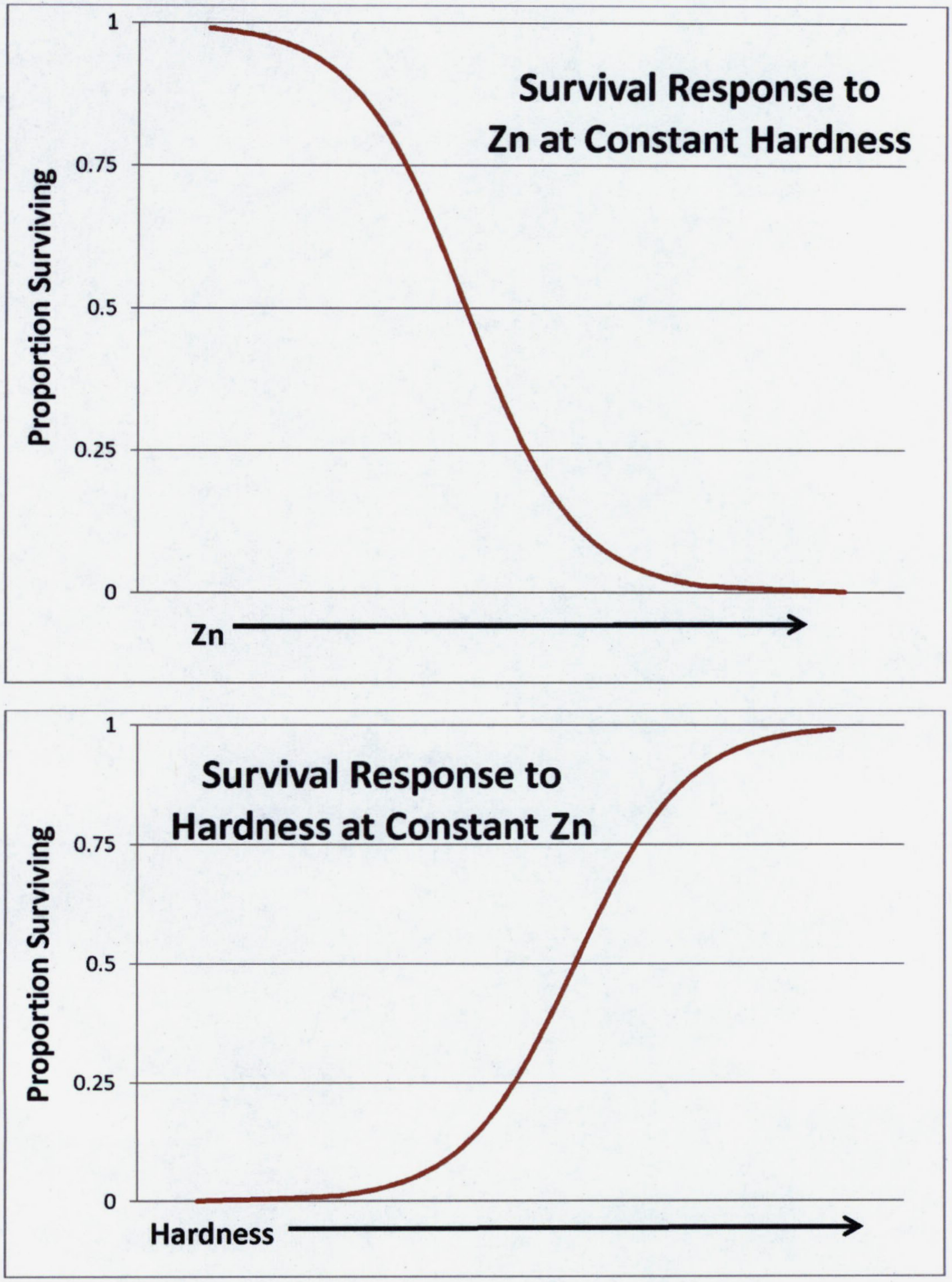


Figure 2.3. Expected dose-response relationships for survival vs increasing Zn concentration at constant hardness (top figure) and increasing hardness as constant Zn concentration (bottom figure).

3.0 TOXICITY AND WATER CHEMISTRY IN THE COOPER TIRE DISCHARGE

3.1 Trends in pH and Hardness

Temporal trends in pH and hardness are illustrated on Figures 3.1 and 3.2. Although there is considerable variability, the overall trends indicated a tendency towards lower hardness and pH levels near neutrality. These trends both indicate general trends in water chemistry that increase the toxicity of Zn.

3.2 Effluent Toxicity Versus Hardness

3.2.1 Routine Biomonitoring

Figure 3.3 provides a plot of survival versus minimum hardness in biomonitoring tests conducted from January 2006 through February 2010. Several factors besides hardness (e.g. pH and dissolved Zn concentration) affect the pattern of the plot on Figure 3.3. However, assuming that 80% survival represents an approximate conservative "pass/fail" threshold in the toxicity tests, it is apparent from the figure that the probability of a passing test increases above a minimum hardness of approximately 70 mg/L. In fact, with the exception of two tests (a clearly toxic result from September 7, 2007, and a marginally toxic result from April 20, 2008), all tests conducted since January 2006 having a minimum hardness of approximately 70 mg/L were "passing" tests.

3.2.2 Graduated Hardness Experiments

The effect of hardness on toxicity was examined experimentally on four sets of biomonitoring samples collected between March 2009 and January 2010. In these experiments, samples that showed significant toxicity to *P. promelas* were manipulated by increasing the sample hardness by 20 and 40 mg/L. Unadjusted and adjusted samples were then tested for toxicity to *P. promelas* in simultaneous 48-hour acute static non-renewal tests with appropriate controls. Total recoverable Zn was measured in the unadjusted sample and hardness was measured in the unadjusted and both adjusted samples. Zinc and hardness concentrations varied by factors of approximately 2 and 4, respectively. In all four sets of tests (two hardness concentration series per set), there was a significant reduction in toxicity at the low hardness addition and elimination of toxicity at the high hardness addition (Figure 3.4). Figure 3.5 presents a comparison of hardness and survival at comparable Zn concentrations (120 to 134 µg/L) and indicates a "pass/fail" threshold of approximately 75 mg/L hardness over that range of Zn concentrations. This result is in close agreement with the routine biomonitoring results summarized on Figure 3.3.

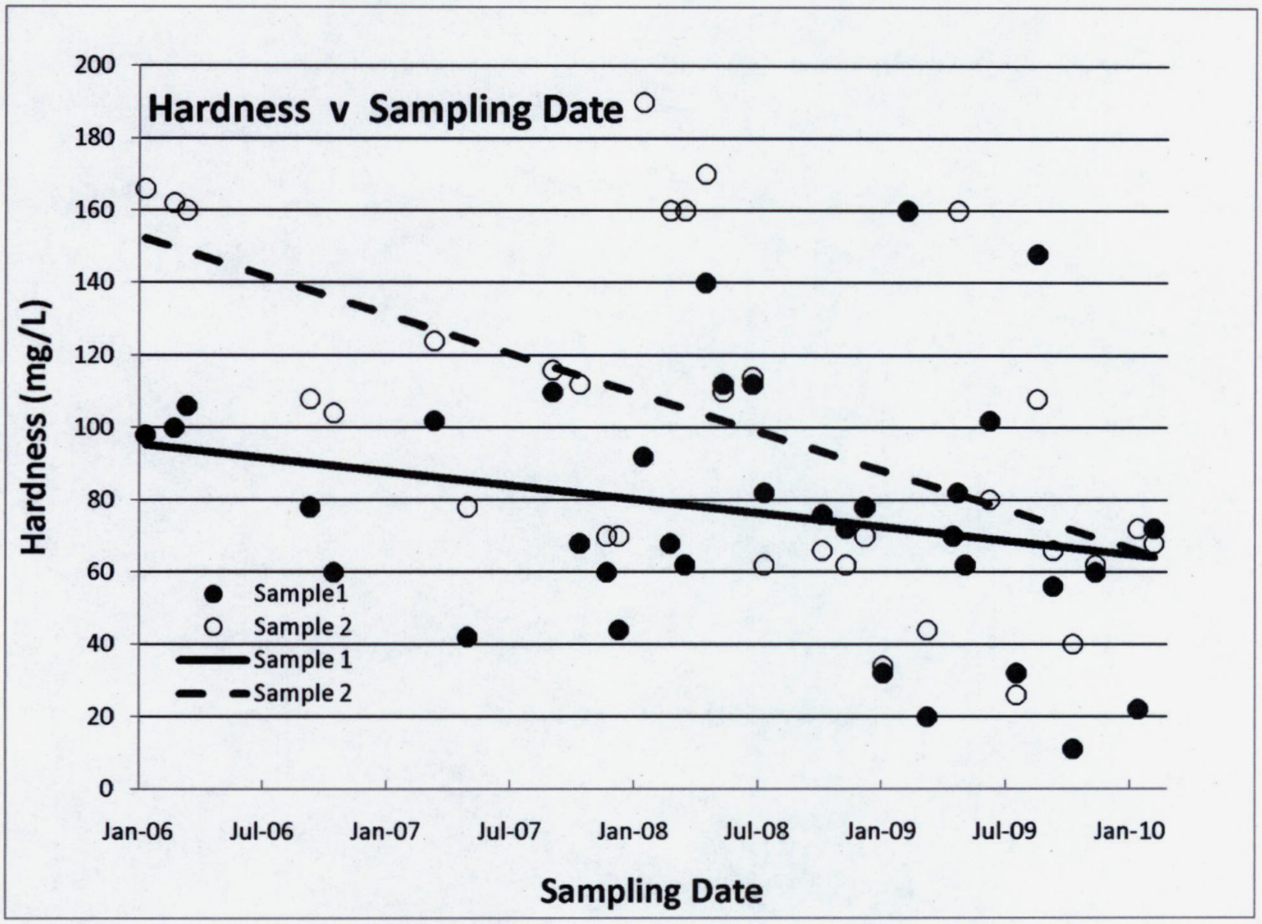


Figure 3.1. Measured hardness in the first and second samples collected during NPDES biomonitoring tests conducted January 2006 through February 2010.

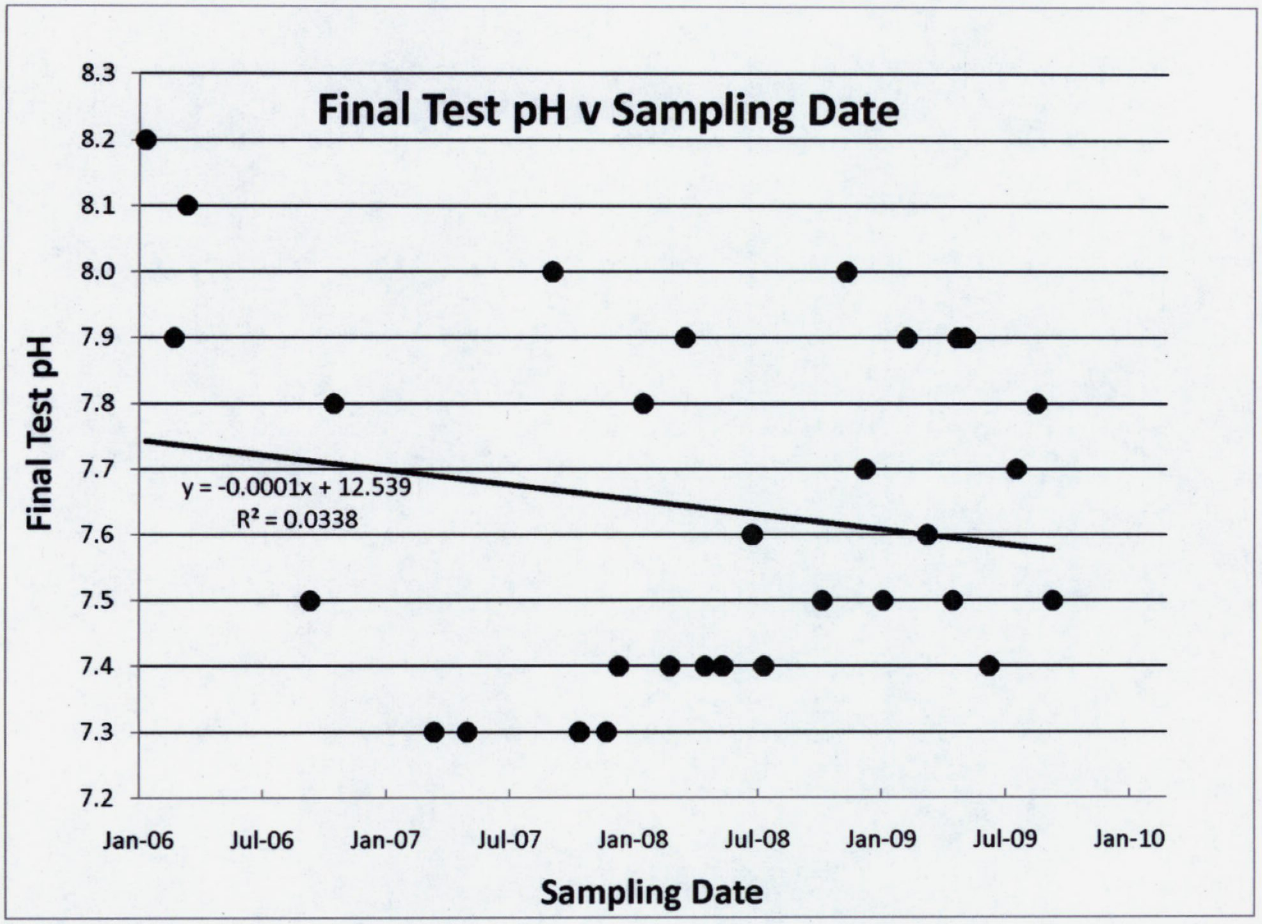


Figure 3.2. Final test pH during NPDES biomonitoring tests conducted January 2006 through February 2010.

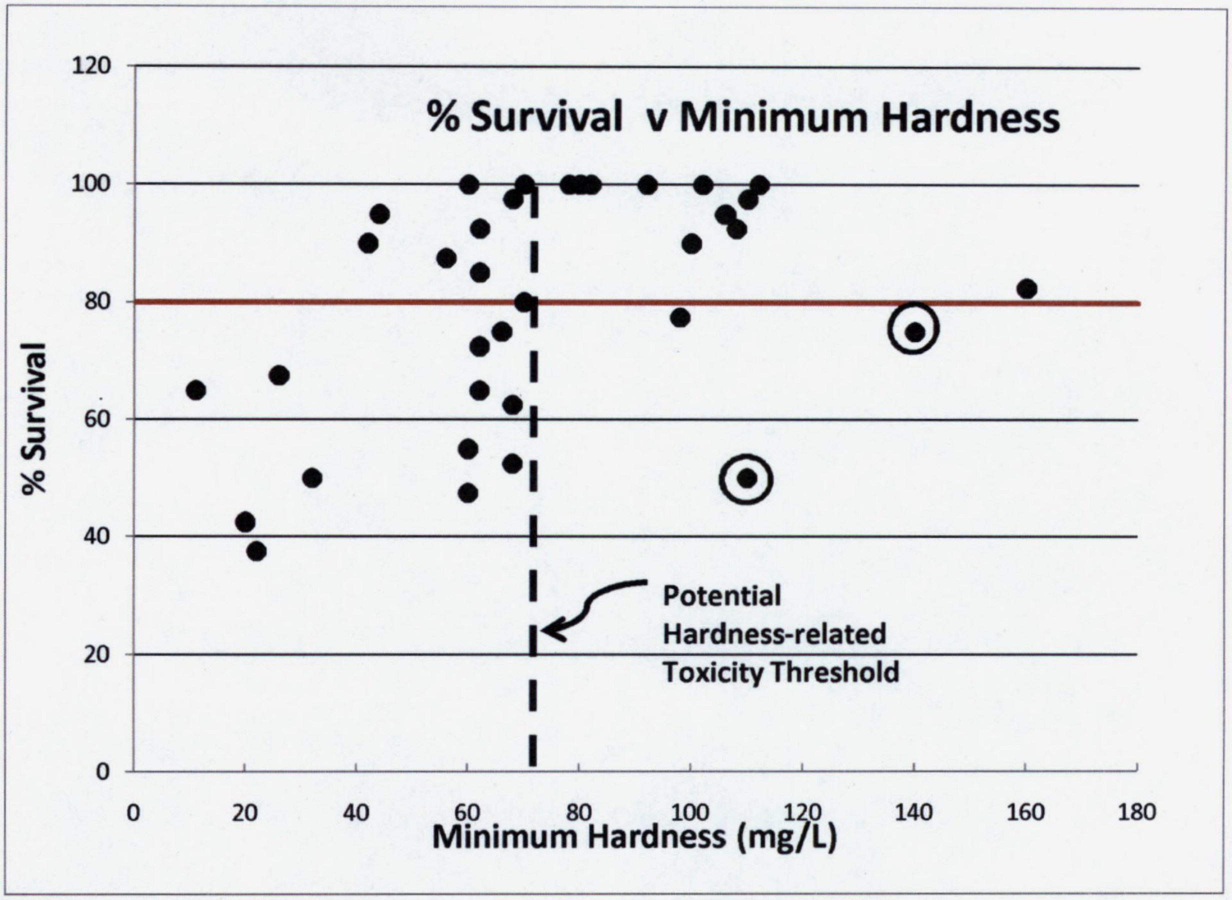


Figure 3.3. Percent survival of *P. promelas* in undiluted effluent sample versus minimum hardness in NPDES biomonitoring tests. Vertical dotted line indicates possible hardness threshold. Horizontal red line at 80% survival indicates approximate "pass/fail" threshold. All data points to the right of the dotted line are "passing" results except for those circled.

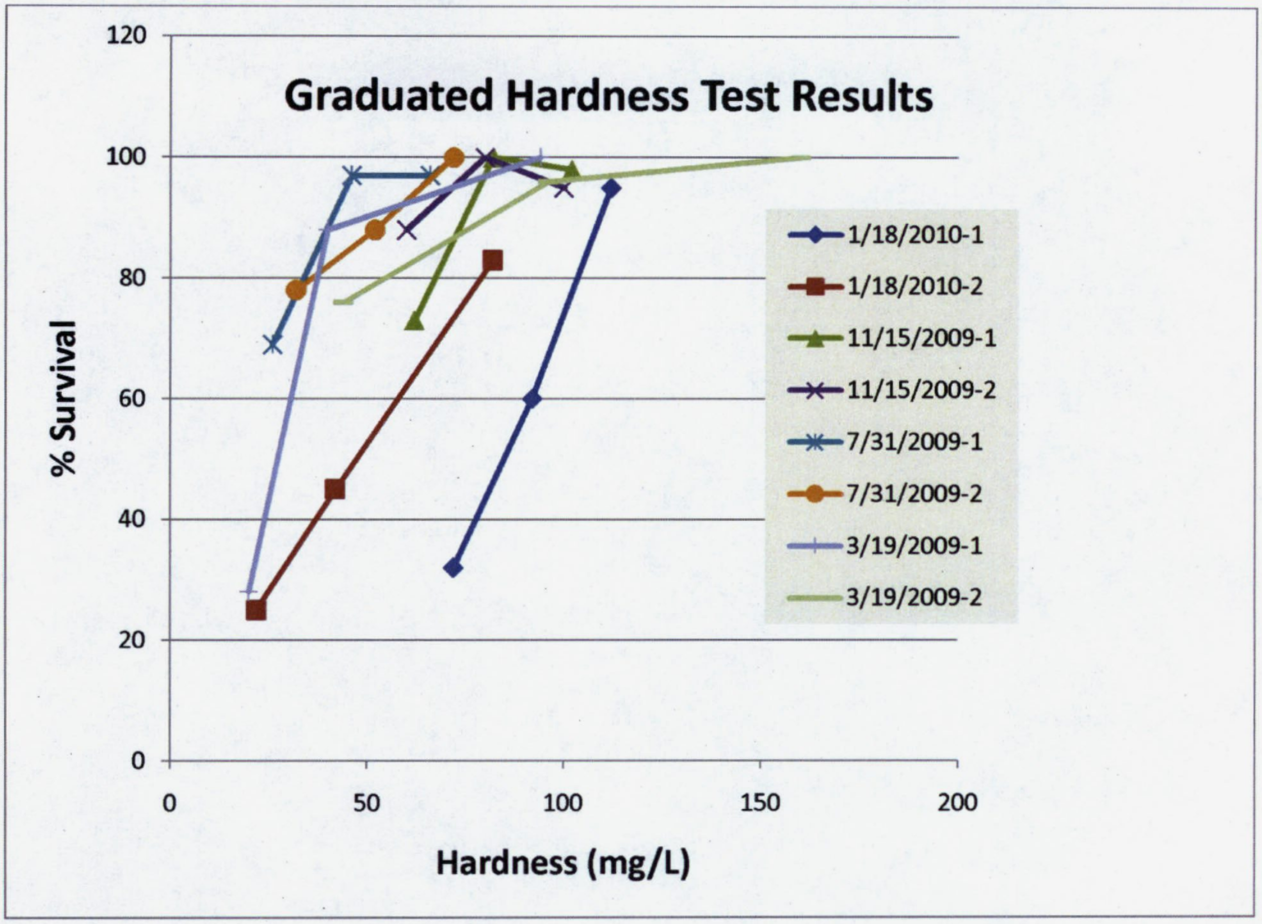


Figure 3.4. Percent survival of *P. promelas* vs hardness in "Graduated Hardness" experiments.

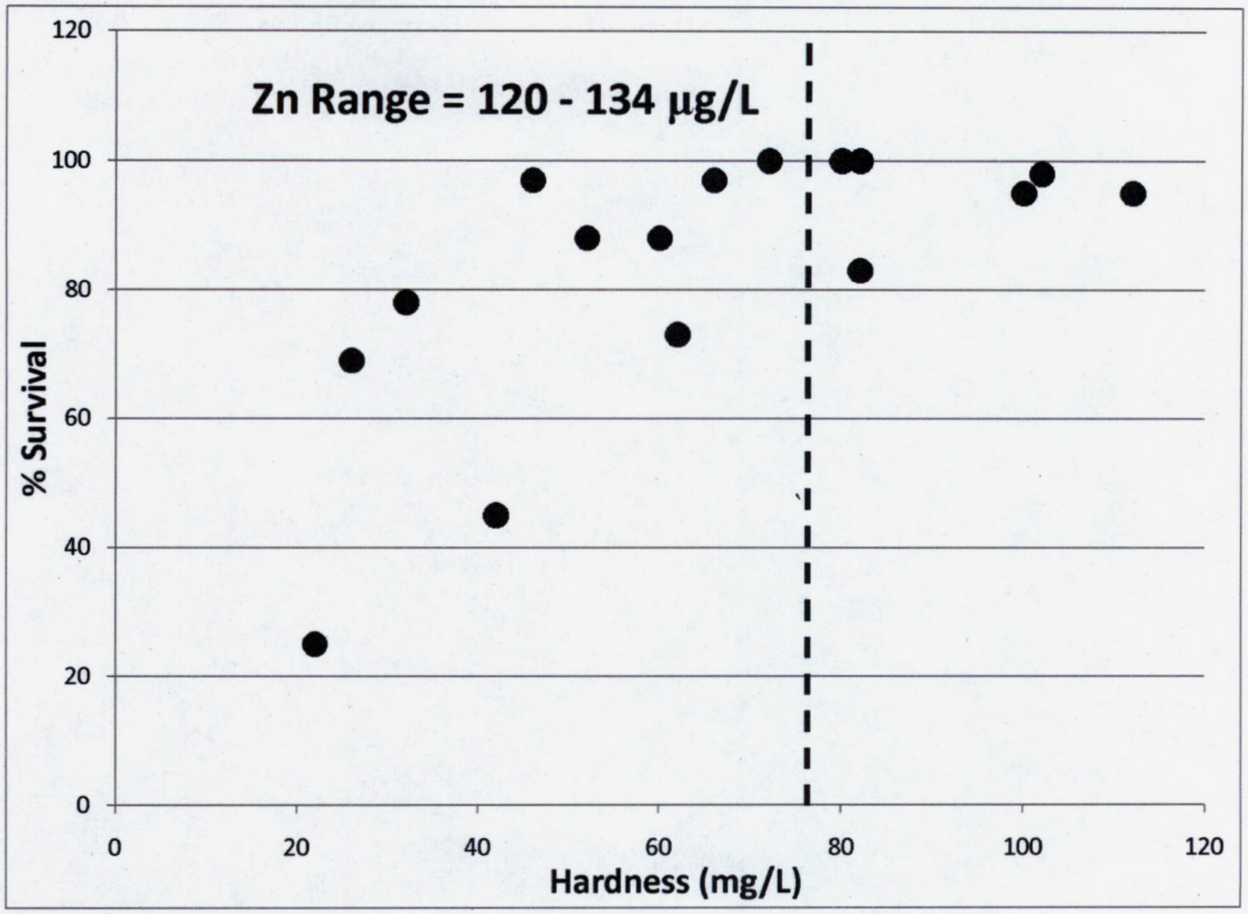


Figure 3.5. Percent survival of *P. promelas* vs hardness in "Graduated Hardness" experiments in selected samples with comparable Zn concentrations. Vertical dotted line indicates possible hardness threshold.

3.2.3 Effluent Hardness Distribution

Approximately one half of the hardness measurements from WET tests are below 70 mg/L (Table 3.1) suggesting that approximately one half of WET tests should fail. The actual proportion of failing WET tests was 0.42. If this analysis is correct, increasing effluent hardness by approximately 40 mg/L would result in a 10^{th} percentile hardness value of 72 mg/L and a greatly reduced probability of toxicity in WET tests.

Table 3.1. Percentile summary of hardness concentration in regulatory WET tests conducted from January 2006 through February 2010.

Percentile	Hardness Concentration (mg/L)
10	32
20	59
30	62
40	68
50	71
60	85
70	103
80	112
90	131

3.3 Effluent Toxicity Versus Zinc Concentration

The relatively narrow range of Zn concentrations (a factor of approximately 2) prevented the use of a similar approach to estimate a Zn toxicity threshold. A statistical analysis of the data (multiple logistic regression) showed that most of the variability in percent survival was related to variability in hardness. Spiked artificial matrix and effluent tests showed Zn LC5Os = 135 and 153 µg/L in hardness ranging from 33 to 61 mg/L, respectively. Using a hardness-LC50 relationship slope of 0.8473 (Environmental Protection Agency [EPA] 1987) these values can be normalized to a hardness of 70 mg/L. The resulting normalized LC50 values are 255 µg/L ($135(70/33)^{0.8473} = 255$) and 174 µg/L ($153(70/61)^{0.8473} = 174$). A general "rule of thumb" approach to estimating a threshold toxic concentration involves applying a factor of 0.5 to convert the normalized LC50s to "no observed effect concentrations" (NOECs) and computing the geometric mean. This approach gives an estimated acute Zn toxicity threshold 105 µg/L at a hardness of 70 mg/L. This result suggests that even if Zn permit limits are met, there will still be episodes of toxicity in regulatory WET tests at Outfall 001 when hardness is near or below 70 mg/L. A percentile summary of Zn concentrations from recent (January 2008 through February 2010) discharge monitoring report (DMR) monitoring at Outfall 001 (Table 3.2) indicates that virtually all Zn measurements at Outfall 001 exceed this threshold.

Table 3.2. Percentile summary of Zn concentrations from DMR monitoring at Outfall 001, January 2008 through February 2010.

Percentile	**Total Zn (µg/L)**
10	112
25	130
50	169
75	243
90	313

4.0 FINDINGS AND CONCLUSIONS

The analyses described herein indicate the following:

1. Zinc is the primary, if not sole, cause of toxicity in NPDES WET tests as evidenced by TIE results, species sensitivity, agreement between spiked effluent and spiked lab water tests, and response to hardness;
2. The increase in frequency of failing WET tests is likely due to increased bioavailability of Zn caused by trends of decreasing hardness and decreasing pH toward neutrality;
3. Under current conditions, the majority of WET tests with hardness greater than approximately 70 mg/L show no toxicity to *P. promelas*; and
4. The estimated Zn toxicity threshold at a hardness of 70 mg/L is 105 µg/L, which is below current permit limits and the majority of Outfall 001 measurements.

These findings suggest that WET toxicity will persist as long as effluent Zn concentrations are above approximately 105 µg/L and hardness concentrations are at or below approximately 70 mg/L. Increasing hardness by 40 mg/L would raise the majority of effluent hardness concentrations to above 70 mg/L and should greatly reduce the frequency of toxicity in WET tests.

5.0 LITERATURE CITED

Di Toro, DM, HE Allen, HL Bergman, JS Meyer, PR Paquin and RC Santore. 2001. A biotic ligand model of the acute toxicity of metals. 1. Technical Basis. *Environ. Toxicol. Chem*. 20:2383-2396.

EPA. 1987. Ambient water quality criteria for Zn. US Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC. February 20, 1987.

ATTACHMENT 4

Evaluation of Biological Communities and Habitat in Outfall 001 Receiving Stream

Technical Memorandum from FTN to
Cooper Tire & Rubber Company
December 6, 2012

Associates Ltd.
water resources / environmental consultants
3 Innwood Circle, Suite 220 • Little Rock, AR 72211-2449 • (501) 225-7779 • Fax (501) 225-6738

TECHNICAL MEMORANDUM

DATE: December 6, 2012

TO: **Mr. Charles Allen**
Cooper Tire & Rubber Company

FROM: **Pat Downey** PJD
FTN Associates, Ltd.

SUBJECT: Evaluation of biological communities and habitat in Outfall 001 receiving streams
FTN No. 6038-023

1.0 BACKGROUND

Cooper Tire and Rubber Company (Cooper) contracted with FTN Associates, Ltd. (FTN) of Little Rock, Arkansas, to conduct an aquatic life attainment evaluation in the unnamed tributary and Nix Creek downstream of the mouth of the unnamed tributary. The purpose of the evaluation was to assess whether or not existing wastewater discharges from Outfall 001 impair aquatic life in the unnamed tributary or Nix Creek.

The evaluation of aquatic life included a field survey of benthic macroinvertebrates and habitat during low-flow conditions. Low-flow conditions of late summer and early fall should represent the highest pollutant concentrations and the lowest amount of available habitat. Therefore, this period of the year is likely to represent limiting conditions for middle instar invertebrates. A total of four sites were assessed on October 9, 2012 (Figure 1). A reach on Nix Creek immediately upstream from the unnamed tributary was assessed to identify reference conditions and used to scale the assessment of the unnamed tributary and Nix Creek downstream of the unnamed tributary (test sites) to the "best attainable" situation.

The results and discussion provided herein represent a synopsis of the study. A detailed data summary, analysis, and evaluation of the results can be provided upon request.

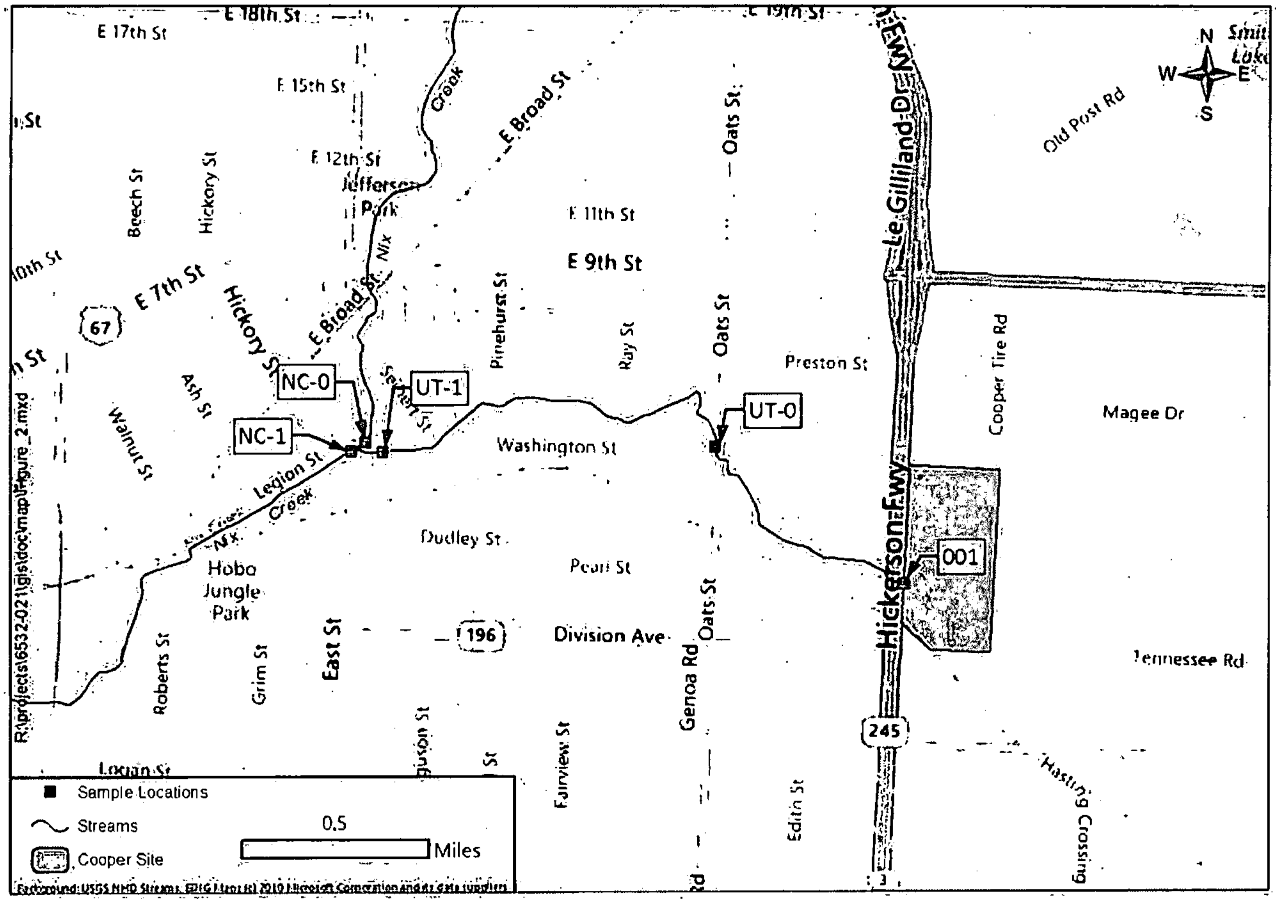


Figure 1. Area map showing the locations of Outfall 001 and downstream sampling sites.

The comparisons of primary interest were:

1. UT-0 versus UT-1 to assess instream differences within the unnamed tributary (if any),
2. UT-0 versus NC-1 to assess downstream recovery from effects shown at UT-0, and
3. NC-0 versus NC-1 to assess effects on Nix Creek due to the Cooper discharge after it enters Nix Creek via the unnamed tributary.

Comparisons require that habitat is at least roughly equivalent between comparison locations or that the confounding effects of habitat can be resolved based on habitat preferences of the biota.

2.0 FIELD METHODS

Water Quality and Habitat

Physical characterization and physical habitat assessment procedures followed those outlined for low-gradient streams (Barbour et al., 1999).

Grab samples of water were collected from each location for the analysis of biochemical oxygen demand (BOD), total suspended solids (TSS), hardness and total recoverable zinc.

Benthic Macroinvertebrates

Macroinvertebrate sampling was conducted at four sites on October 9, 2012, following the proportional sampling method outlined in Arkansas Department of Environmental Quality's *Standard Operating Procedure for Macroinvertebrate Sampling Methodology for Wadable Streams* (2010).

Taxonomic identifications were carried out to the lowest practical taxon according to Merritt and Cummins (1996), Thorp and Covich (2001) and Houston (1980). In general, macroinvertebrates were identified to genus except for bivalve mollusks, gastropods, dipteran larvae, and decapod shrimp, which were identified to family. All invertebrate taxa were classified into functional feeding groups (Predator, Shredder, Omnivore, Gatherer/Collector, Scraper, and Filterer/Collector) (Barbour et al.,1999).

3.0 RESULTS

Water Quality and Habitat

Results of the assessment of physical characteristics and physical habitat variables for each of the four sites are presented in Tables 1 and 2. Local land use was primarily residential. Grasses dominated all riparian zones and no canopy cover was present. Nonpoint runoff from roads and/or lawns potentially affected all locations. All of the assessed stream reaches were channelized.

The physical habitat scoring (Table 2) indicated similar habitat at UT-0 NC-0, and NC-1. The habitat at these three sites was comprised almost entirely of pools with depths averaging 0.4 to 0.6 meters and coarse substrate dominated by gravel with moderate siltation. The habitat at UT-1 was almost entirely comprised of runs with an average depth of 0.1 meter and coarse substrate comprised of gravel with heavy siltation and was different from the other three sites.

Results of water quality analyses are presented in Table 3. Analyte concentrations were highest in the outfall sample and at the unnamed tributary location closest to the outfall (UT-0).

Table 1. Summary of physical characterization assessment performed on October 9, 2012.

Category		**UT0**	**UT1**	**NC0**	**NC1**
Canopy Cover		Open	Open	Open	Open
Inorganic Substrate (% coverage)	Bedrock	5	0	0	0
	Boulder	0	0	0	0
	Cobble	0	10	0	0
	Gravel	80	50	75	75
	Sand	0	0	0	0
	Silt	15	40	25	25
	Clay	0	0	0	0
Organic Substrate (% composition)	CPOM	0	0	0	0
	FPOM	0	0	0	0
	Shell	0	0	0	0
Dominant Aquatic Vegetation		Ludwigia	Unidentifed sp.	Typha	Typha
Percent of reach with aquatic vegetation		15	80	60	60
Pool/Riffle Ratio		9:1	5:1	n/a	n/a
Average Stream Depth (m)		0.4	0.1	0.6	0.5
Average Stream Width (m)		2	3	10	10
Average Current Velocity (m/s)		< 0.1	<0.1	< 0.1	< 0.1
Substrate odors		Normal	Normal	Normal	Normal
Substrate oils		None	None	None	None
Substrate deposits		None	None	None	None
Embedded stones black on underside?		No	No	No	No
Dominant Riparian Vegetation		Grasses	Grasses	Grasses	Grasses
Watershed Features	Land use	Field/pasture/ commercial	Field/pasture/ residential	Field/pasture/ residential	Field/pasture/ residential
	Pollution sources	Yes	Yes	Yes	Potential
	Erosion	Moderate	Moderate	Moderate	Moderate
Weather		Cloudy	Cloudy	Cloudy	Cloudy

Table 2. Summary of physical habitat evaluation performed on October 9, 2012.

Category	UT0	UT1	NC0	NC1	Range Among UT and NC Locations
Epifaunal Substrate/Available Cover	16	10	18	18	8
Pool Substrate Characterization	20	20	18	18	2
Pool Variability	10	8	14	14	6
Sediment Deposition	17	9	14	15	8
Channel Flow Status	18	15	19	19	4
Channel Alteration	15	15	15	15	0
Channel Sinuosity	3	3	3	1	2
Bank Stability	8/8	1/5	8/8	8/8	7/3
Vegetative Protection	8/8	1/3	8/8	8/8	7/5
Riparian Vegetative Zone Width	1/1	1/1	1/1	1/1	0
Total Habitat Score	133	92	135	134	43

Table 3. Results of water quality analyses.

Location	BOD 5-day	TSS	Zinc	Hardness
Outfall 001	3.6	20	0.058	170
UT-0	<2	8.4	0.007	92
UT-1	<2	<4	0.002	73
NC-0	<2	<4	0.002	44
NC-1	<2	<4	0.003	44

The scored habitat of the sampling sites per Table 2 can be ranked in descending order as follows, where locations connected by underscoring indicate locations with roughly similar habitat:

NC-0 NC-1 UT-0 UT-1

Benthic Macroinvertebrates Results

Benthic counts and associated community metrics are summarized in Tables 3 and 4. Comparisons of interest can be summarized as follows where locations connected by underscoring indicate locations with roughly similar biota.

NC-0 NC-1 UT-0 UT-1

4.0 DISCUSSION

Benthic metrics at all locations were consistent with perturbed systems based on the observed low abundance of ephemeroptera, plecoptera, trichoptera (EPT) species, high abundance of chironomids, and low abundance of intolerant species. For the purpose of interpreting differences in benthic communities based on habitat vs. water quality, the abundance and diversity of benthic marcroinvertebrates is expected to follow the same general pattern as habitat quality. Large deviations from this expectation indicate other limiting factors such as water quality.

The following results indicate that the outfall has minimal impact to aquatic life in the receiving streams:

1. The unnamed tributary location (UT-O) nearest the outfall with, presumably, the greatest exposure to potential water quality impacts had similar biological communities and habitat compared to the Nix Creek location (NC-O) upstream of the confluence with the unnamed tributary;
2. In Nix Creek, habitat and biological communities upstream (NC-0) of the confluence with the unnamed tributary were similar to habitat and biological communities downstream (NC1) of the confluence; and
3. Similarities and differences in benthic communities were consistent with expectations based on habitat.

The results of this evaluation strongly suggest that there are little if any impairments to downstream aquatic life due to water quality the Cooper Tire and Rubber Company discharge from Outfall 001.

Table 4. Summary of selected benthic macroinvertebrate metrics from October 9, 2012.

Category	Metric	UT-0	UT-1	NC-0	NC-1
Richness Measures	Total No. Organisms	161	93	168	115
	Total No. Taxa	9	7	12	12
	No. EPT Taxa (= No. of Ephemeroptera Taxa)	1	0	1	1
	No. of Trichoptera and Plecoptera Taxa	0	0	0	0
	SW Diversity	1.21	1.49	1.91	2.12
Composition Measures	% EPT (= % Ephmeroptera)	1.24	0	5.95	6.96
	% Plecoptera, Trichoptera, Hydropsychidae	0	0	0	0
	No. Diptera Taxa	1	1	1	2
	% Diptera	42.86	24.73	42.26	37.39
	No. Chironomidae Taxa	1	1	1	1
	% Chironomidae	42.86	24.73	42.26	34.78
	% Oligochaeta	44.72	33.33	9.52	3.48
	% Amphipoda	0	0	7.74	12.17
Trophic Measures	% Collector/filterers	0	0	1.79	6.96
	% Collector/gatherers	91.3	75.27	66.07	57.39
	% Scrapers	3.11	1.08	12.5	20
	% Predators	4.35	23.66	19.64	15.65
	% Shredders	1.24	0	0	0
Habitat Measures	% Herpobenthos (BU+SP)	94.41	80.65	78.57	77.39
	% Haptobenthos (CR+CLG)	0.62	0	7.74	12.17
	% Clingers	0.62	0	0	0
	% Crawlers	0	0	7.74	12.17
	% Burrowers	87.58	58.06	53.57	47.83
Tolerance Measures	Hilsenhoff Biotic Index (HBI)	6.05	6.72	6.24	6.08
	HBI Interpretation	fair	fairly poor	fair	fair
	%EPT- %Hydropsychidae	1.24	0	5.95	6.96
	No. Intolerant Taxa	1	1	1	1
	No. Facultative Taxa	5	3	5	4
	No. Tolerant Taxa	3	3	5	6
	% Intolerant (1-3)	1.24	1.08	11.9	6.09
	% Facultative Taxa (4-6)	50.31	51.61	18.45	17.39
	% Tolerant (7-10)	48.45	47.31	67.86	69.57
	No. Individuals in Dominant Taxon	72	31	71	40
	No. Individuals in Top 2 Dominant Taxa	141	54	91	54
	% of Dominant Taxon	44.72	33.33	42.26	34.78
	% of Top 2 Dominant Taxa	87.58	58.06	54.17	46.96

We appreciate the opportunity to work with you on this project. If you have any questions regarding this technical memorandum, please do not hesitate to contact Jim Malcolm or Pat Downey at (501) 225-7779.

PJD/skj

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