State of Wisconsin

CORRESPONDENCE/MEMORANDUM

DATE: November 2, 2000 FILE REF: 3200

TO: Tom Kendzierski - NOR/Spooner

FROM: Tom Janisch - WT/2 Tom Janisch

Memo # 1

SUBJECT: Kopper's Meeting On Nov. 2

In regard to the meeting on Thursday to discuss the results of the Sediment investigation in Crawford Creek, the following are some of the points I would like to include in the discussions.

Observations I Made On Site Visits

More currently, I have visited the site on two occasions - 8/18/99 at the time BB&L was doing their sample collection for the current report and 9/20/00. Some observations during each visit are as follows:

1. On site visits previous to my 8/18/99 visit, water levels especially in the lower portion of the Creek were much higher which meant there was standing water outside of the banks on the floodplain and the Crawford Creek Pond consisted of a relatively large open water expanse. During my 8/18/99 visit, water levels were much lower in the lower creek which resulted in water being confined to the Creek channel with bank sides exposed and the open water of the Crawford Creek Pond being confined to a relatively small surface area. The latter meant the latter could be accessed on foot for probing of the sediments. Apparently downstream blockage of the Creek by the beaver dams on the other side of the railroad grade must have been removed or for other reasons water levels were lower.

   My probing and observations on 8/18/99 principally started at the BB & L macroinvertebrate Location 2, just downstream of Transect 31 and went downstream to just upstream of Transect 34. I also probed the channel from the remnant of Crawford Creek Pond to its juncture with the Creek and the bottom area of some of the Pond. I have some photographs that I will bring to the Thursday meeting.

   The most significant thing I observed especially in the lower portions of the Creek segment I looked at was the visible presence of black creosote/fuel oil strata in the vertical bank that extended above the water line and some distance below the water line. The strata above the black strata and formed the surface strata was clay deposited after the creosote materials had been deposited.

   Another significant observation I made was that starting in the channel that connects the remnants of Crawford Creek Pond to the Creek and underlying the Pond, creosote-dominated strata and substrata were found. It is possible that a large area underlying the Pond and the surrounding

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floodplain on the north side of the Creek are underlain by creosote contaminated materials. It would appear the extent of this contamination needs to be better characterized (note the Beazer results from below 0.5 ft. of the bottom of the Pond in 1996 of 5,782 mg/kg TPAH and a TPAH value of 11,336 mg/kg from a sample in the middle of the Pond area taken by La Valley in 1992).

BB & L indicates that probing along the floodplain transects was conducted at two locations, typically mid-way and further from the Creek (i.e., typically at 15 to 25 feet, and 50 feet). My probing observations were that creosote in the floodplain in the substrata can be found in the distance between the water line and the first probe location 15 to 25 feet from the water line.

2. As I summarized to you previously, we had an opportunity to take our boat up the Nemadji River to the mouth of Crawford Creek to do some probing on 9/20/00. The idea was to do some probing in the Nemadji River in this area. Since we had an afternoon meeting on another matter we did not have a lot of time to spend at the site. We did probe up the creek a ways at and slightly upstream of BB & L Transect 51. While BB & L indicated no odors, oil sheen or staining were observed from this transect or the next 4 transects upstream (T-49, T-47, T-45, and T-43), we did observe the characteristics of odor, staining and sheening in sediment probes we took in the area of T-51 which consisted of using our 3 in. diameter core sampler and shovel cores. The metal rod we used to gauge the depth of soft sediment penetrated the bottom sediments approximately 5 ft.

   The farthest we probed downstream in the Nemadji River from the mouth of the Creek was approximately 150 - 200 feet. There are softer clay dominated sediments along the south outside bank of the River downstream from the creek mouth. No evidence of creosote was found in sediments along the outside bend of the river. At the farthest downstream point we probed in the River along an inside bend that was dominated by sand-sized particles, we believe we encountered some creosote odor and some sheening when the core samples where brought up through the water column (water depth 1.0 - 1.5 feet). However, there was no visible presence of creosote in the sediment samples.

Some Comments On the Supplemental Surface Water and Streambed Sediment Investigation Report, July 2000.

For the ecological part of the study, I am having someone with more working knowledge look over the biotic indices that were developed and compared in the writeup. I may be able to get this to you before the meeting, or if not, I should have the comments available for the meeting. Some immediate comments are:

1. A comment is made in the report (e.g. pages 6-5 and 7-3) that comparison of the dredge sample results for macroinvertebrates to sediment PAH concentrations does not indicate a correlation between PAHs and benthic metric scores. The sample sites for the analytical results that are being used to compare with the results from the macroinvertebrate results were at sites that were approximately 150 ft.(C-5), 80 ft.(C-12) and 100 ft. (C-10) upstream, respectively, of the macroinvertebrate study locations 1, 2, and 3. Given the likely heterogeneity of the distribution of creosote in the sediments along the creek, it would not an appropriate assumption to use the TPAH concentrations at the separated sites to apply to the concentrations that may be at the macroinvertebrate collection sites. It would have been better to have collected sediments for TPAH analysis at the same location that the macroinvertebrate samples were collected, e.g. collect samples on an alternative basis. Collect a dredge sample for macroinvertebrates, then a core for TPAH analysis, then another dredge sample, then a

core, etc. The four cores would be combined from the appropriate depths (0 - 3 in and 3 - 6 inches) for two TPAH analysis.

Additional Ecological Risk Assessment Components

I typically use a weight-of-evidence approach when doing risk assessments, both at the screening level and baseline level. One thing I do is compare the sediment concentrations at the study site with published guidelines for the PCOC. The recent trend is to combine several sets of published guidelines from a number of sources to develop "consensus" guidelines. This is the approach I have used on the following tables for the TPAH concentrations in the sediments.

Also, in one of the following tables I have compared the resulting dioxin and furan values expressed as pg Total TCDD-EQ / g of sediment or soil with several reference values to gauge the relative risks of the levels found in the soils and sediments. The biggest concern would appear to be exposure to wildlife through bioaccumulation in the food chain.

While not an intended goal of the study, a closer look needs to be taken at the implications of risks to human from exposure to the levels of PAHs and dioxins/furans found at the site.

cc: Ted Smith - NOR/Spooner
Lee Liebenstein - WT/2
Bob Masnado - WT/2

TPAH Concentrations In Surficial Sediments (0 -3 and 3 - 6 inches) From the Drainage Ditch and Crawford Creek Samples

Transect Location	Total PAHs - mg/kg					
	A - Left Bank at waterline		B - Mid-channel		C - Right Bank at waterline	
	0 - 3 in.	3 - 6 in.	0 - 3 in.	3 - 6 in.	0 - 3 in.	3 - 6 in.
Reference Site CB	----	----	0.21	0.091	----	----
Drainage Ditch						
C 1	----	----	200	130	----	----
C 2	----	----	180	32	----	----
C 3	----	----	420	(1.4)	----	----
C 4	----	----	350	2000	----	----
Crawford Creek						
C 5	4.3	1.5	1300	590	11	0.068
⇧ 150 ft. Location 1 - Macroinvertebate Collection Site (Dredge and Hester-Dendy) ⇩ 690 ft.						
C 6	110	660	56	180	37	7.7
C 7	110	5800	10	89	5.0	4100
C 12	24000	2200	5300	1000	8100	800
⇧ 80 ft. Location 2 - Macroinvetebrate Collection Site (Dredge and Hester Dendy) ⇩ 400 ft.						
C 8	1200	4900	4800	1300	54000	33000
C 9	720	960	1200	170	1000	3200
C 13	250	(1.3)	0.17	0.38	13	1.2
Below RR Grade						
C 10	4.2	24	390	1400	19	0.27
⇧ 100 ft. Location 3 - Maccroinvertebrate Collection Site (Dredge and Hester Dendy) ⇩ 150 ft.						
C 11	17	160	2500	1600	2.9	0.49
C-14	(1.2)	(1.2)	130	54	(1.2)	(1.1)
C 15	(1.2)	(1.1)	1.2	34	0.80	0.86
C 16	(1.1)	(1.2)	2.3	43	6.6	2.8
Juncture with Nemadji						

Based on the Consensus Sediment Quality Guidelines above, the following effect levels are exceeded based on the above results:

	< TEC	>TEC < MEC	> MEC < EEC	> EEC
Number of Samples	28	10	13	29
Percent of Total Samples (80)	35	13	16	36
		65 % of samples > TEC		
			52 % of samples > MEC	

Effect-Based Values From Integrated SQGs To Evaluate TPAH Values in the Bioactive Zone (0 - 6 inches) of Newton Creek Sediments (From Swartz, 1999)

Consensus Sediment Quality Guidelines For TPAHs to Protect Benthic Macroinvertebrates		
Sediment Quality Guidelines	**TPAH (ug TPAH / g organic Carbon)**	**TPAH ug TPAH / g Sediment based on an average site specific TOC of 2.81 %**
Mean Threshold Effects Concentration (TEC)	290	8.2
95 % Confidence Limits	119 - 461	3.34 - 12.95
Mean Median Effects Concentration (MEC)	1,800	50.6
95 % Confidence Limits	682 -2,854	19.2 - 80.2
Extreme Effects Concentration (EEC)	10,000	281

Swartz, R.C. 1999. Consensus Sediment Quality Guidelines For Polycyclic Aromatic Hydrocarbon Mixtures. Environ. Toxicol. Chem. 18:780-787.

Ug TPAH / g Organic Carbon x Site Specific Ave. Organic Carbon expressed a decimal fraction (e.g. 2.81% = 0.0281).

Threshold Effects Concentration (TEC) - At or below the **TEC**, it is predicted that adverse biological effects (in terms of impacts to survival, reproduction and / or growth to benthic macroinvertebrates) will minimal or unlikely to be seen.

Median Effects Concentration (MEC) - At or above the **MEC**, it is predicted that adverse biological effects are highly probable or will frequently be seen.

At contaminant concentrations between the **TEC and MEC**, effects are possible or occasionally present with the possibility of effects increasing as the contaminant concentrations increase towards the **MEC**.

Extreme Effects Concentration (EEC) - If the **EEC** is exceeded, there is virtual certainty of adverse effects.

Comparison of Dioxin and Furan Values Expressed as Total pg TCDD-EQ / g Found in the Creek Sediments and Floodplain Soils With Reference Concentrations to Gauge Relative Risks

Sample Site	pg TCDD-EQ / g
CB - Reference Site	0.11
Drainage Ditch	
C1A	690
C3A	550
D2A Ditch Bank	5,500
D3 Ditch Bank	92
FP 15	51
Crawford Creek	
FP 34	17
T 18-A	0.70
T 18-B	1.5
T 18-C	11
T 18-D	15
T 18-E	82
T 29-A	45
T 29-B	370
T 29-C	6.3
T 29-D	43
T 29-E	19
T 34-A	32
T 34-B	490
T 34-C	0.78
T 34-D	120
T 34-E	77

Reference Values to Gauge Relative Risks

Level 1 Sediment Quality Thresholds for protecting:
Aquatic Life and Human Health - 100 pg TCDD-EQ / g
Wildlife - 60 pg TCDD-EQ / g

CCME. 1999. Canadian Environmental Quality Guidelines. Guidelines and Standards Division. Environment Canada. Winnipeg, Manitoba.

EPA OSWER Dioxin Disposal Advisory Group has established that if the TCDD equivalency in soils is greater than **1,000 pg /g** in a residential setting, remedial action is necessary.

Wisconsin's landspreading program for paper mill sludges sets the following concentrations limits for spreading based on the following land uses and concerns for bioaccumulation in the food chain:

	pg TCDD-EQ / g
Silviculture	**10**
Agriculture	**1.2**
Agriculture with Grazing	**0.5**

Previous maximum pg TCDD-EQ / g at a sediment site was 2,504 which is surpassed by the above value of 5,500 pg TCDD-EQ / g in the ditch bank soils.

Calculation of Sediment Quality Objective Concentrations To Protect the Ambient Water Quality Criteria in NR 105 Based on Human Health and Wildlife and on a Limited Forage Fish Use Classification of Crawford Creek

0.014 pg/L - WQC to protect Human Health
foc = TOC - 0.0281
Log Kow = TCDD - 6.8→ OCDD - 8.2; Use 7.8
Log Kow of 7.8 = 63,095,734
SQO = (WQC) (foc) (Koc)
SQO = (0.014)(0.0281)(63,095,734)

SQO = 24.8 pg TCDD-EQ / g Sed.

0.003 pg/L -WQC to protect Wildlife
SQO = (WQC) (foc) (Koc)
{Same as left column for Log Kow }
SQO = (WQC) (foc) (Koc)
SQO = (0.003)(0.0281)(63,095,734)

SQO = 5.3 pg TCDD-EQ / g Sed.

(Doesn't address Bioaccumulation Equivalency Factor differences (e.g between TCDD and OCDD)