WHYTE HIRSCHBOECK DUDEK S.C.

WHD LAW

ELIZABETH GAMSKY RICH
DIRECT DIAL (414) 274-3945
EGR@WHDLAW.COM

January 13, 1998

VIA FACSIMILE - 608-267-3579

Ms. Linda Meyer
State of Wisconsin
Department of Natural Resources
101 S. Webster Street
Box 7921
Madison, WI 53707-7921

Re: C.M. Christiansen Co., Inc.

Dear Linda:

Attached for your review is a black-lined copy of the Spill Response Agreement which you and I have been discussing over the past several weeks. Although I understand that we have not yet reached final agreement with respect to all of the proposed changes, I believe the changes accurately reflect the issues raised in our recent telephone conference with Laurie Parsons of Natural Resource Technology, Inc. and Chris Saari and Michelle Debrock-Owens of the DNR.

I am also forwarding the enclosed draft to Eric Christiansen of CMC and Laurie Parsons for their review, together with a copy of this letter. Accordingly, the enclosed draft is subject to their review and approval.

Please contact me at your convenience to discuss any questions or comments you may have concerning the revised agreement.

Very truly yours,

Elizabeth Gamsky Rich

Elizabeth Gamsky Rich

lmb
Enclosures

cc: Mr. Eric Christiansen (w/enclosures)
Ms. Laurie Parsons (w/enclosures)

SPILL RESPONSE AGREEMENT

1. This Agreement is entered into pursuant to s. 292.11(7)(d), Wis. Stats., and shall be construed in a manner consistent with s. 292, Wis. Stats. The Department of Natural Resources ("the Department") and C. M. Christiansen Co., Inc., a Michigan corporation ("CMC") hereby agree that CMC will conduct the activities listed below in compliance with the following schedule, except as provided in paragraph 2 of this agreement:

No.	Activity	Code Reference[1]	Compliance Date
1	Submittal of Revised Source Control Soil Remedial Action Options Report	722 [ ]	Within 30 days after the effective date of this agreement
2	Submittal of Update to Military Creek Sediment Sampling Plan	[ ]	Within 30 days after the effective date of this agreement
3	~~Baseline~~ Groundwater Monitoring		On or before the date on which the soil remedial action implementation begins (see Activity No. 6)
4	Military Creek Sampling Start		On or before May 30, 1998, subject to extension due to adverse weather conditions, or within 30 days after CMC receives DNR comments on Military Creek Investigation Plan and Updated Sediment Sampling Plan, whichever is later

[1]The Code references set forth herein are for informational purposes only and are not intended to expand the activity descriptions which precede them.

5	File soil remediation system design and application for variance with DNR		Within 60 days after the effective date of this agreement
6 [6]	Start Soil Remedial Action Implementation, including Free Product Removal [all deleted]	724 [ ]	On or before the later of June 1, 1998, or within 30 days after CMC and/or its contractors receives all permits, variances and DNR approvals [ ] needed for Soil Remedial Action Implementation including without limitation DNR approval of the Revised Source Control Soil Remedial Action Options Report and system design [ ]
7 [9]	Soil Remediation Construction Completion [all deleted]		Within 90 days after construction start [ ]
8 [10]	Submittal of [7] Soil Remedial Construction Documentation Report [all deleted]	724.15	Within 90 days after completion of soil remediation construction [ ]
9 [12,	Submittal of Final Military Creek Investigation Report 13, 14, 15, 16 — all deleted]	[ ]	Within 90 days after completion of the Military Creek sediment sampling
10	Submit Groundwater Monitoring Plan		Within 180 days after completion of soil remediation construction

2. CMC will perform all of the work required under this agreement within the time limits set forth herein, unless the

schedule is amended by mutual agreement of the parties or unless performance is delayed by events that constitute a "force majeure." The Department will not unreasonably refuse to amend the agreed-upon schedule if CMC submits credible evidence to the Department that new developments in the case required that the schedule be changed. For purposes of this agreement, a "force majeure" is an event arising from causes beyond the control of CMC or an entity controlled by CMC, which delays or prevents performance of any work required by this Order. Increases in cost or changes in economic circumstances which are not material do not constitute a force majeure. However, an event that would otherwise constitute a force majeure shall be deemed a force majeure even though such an event also results in increased costs or changed economic circumstances. CMC shall notify the Department in writing no later than ten (10) business days after CMC becomes aware of any event that CMC contends is a force majeure. If the Department agrees that a delay is attributable to a force majeure, the time period for performance under this agreement shall be extended by adding the time period attributable to the delay caused by force majeure event to the deadlines specified in this agreement. Nothing in this Agreement, including this force majeure provision is intended to expand any obligation which CMC may have pursuant to s. 292.11(3), Wis. Stats.

3. This agreement shall become effective on the date that it is signed by both CMC and the Department.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By _____
George E. Meyer
Secretary

C. M. CHRISTIANSEN CO., INC., a Michigan corporation

By _____
Printed Name:
Title:

ROUTING & REQUEST

Please...

- [x] Read
- [ ] Handle
- [ ] Approve

And...

- [ ] Forward
- [ ] Return
- [ ] Keep or Recycle
- [x] Review with Me

To: Chris Laari - Brule

(I've also sent a copy of the attached to Michelle Owens)

From: Linda Meyer

Date: 1/14/98

Post-it® 7664 ©3M 1995

WHYTE HIRSCHBOECK DUDEK S.C.
Law Offices

ELIZABETH GAMSKY RICH

111 East Wisconsin Avenue Suite 2100
Milwaukee, Wisconsin 53202
(414) 273-2100 Fax: (414) 223-5000 Direct Dial: (414) 274-3945
Email: egr@whdlaw.com

OFFICES IN MILWAUKEE, MADISON, MENOMONEE FALLS, MANITOWOC AND ZURICH, SWITZERLAND

C.M. CHRISTIANSEN CO., INC.

ERIC R. CHRISTIANSEN
PRESIDENT

PHELPS:
P.O. BOX 100
PHELPS, WI 54554
TEL: (715) 545-2333
FAX: (715) 545-2334

MILWAUKEE:
5501 N. SANTA MONICA
MILWAUKEE, WI 53217
TEL: (414) 963-9211
FAX: (414) 963-9213

EMAIL: erc@execpc.com

PHONE CONVERSATION RECORD

DATE: 1/15/98
TIME: 1005 hrs

CONVERSED WITH: Laurie Parson
NRT
414/523-9000

SUBJECT/PROJECT: C.M. Christiansen Co.

UNIQUE ID#.: 02-64-000068

Parsons called to discuss project. Parsons mentioned that Elizabeth Rich had supposedly sent a re-draft of the spill agreement to Linda Meyer recently.

Parsons said the results of the recent GW sampling were:

MW-10	PMW-11
17 ppb PCP	1300 ppb PCP

Results for PMW-11 have increased.

They will be making revisions to Soil Remedial Alternatives, and include test pit and GW sampling results. Parsons explained why they did this sampling (treatability vs. investigation) Results seem to show biological treatment will work.

Parsons also said revised report will be available by the timeline set forth in the pending agreement. Parsons also wanted to discuss some technical aspects of the site and how they relate to future timelines, but she thought it may

Signature: Christopher Adam
(please write legibly)

-over-

be easier to discuss these aspects with a copy of the most recent agreement in hand. I said I would contact Linda Meyer to try and get a copy.

Parsons and I then discussed "down the road" parts of the schedule, and trying to balance GW & sediment cleanups vs. available money.

I asked Parsons to send me an update including test pit narrative if the revised report would not be available for awhile.

Parsons also discussed some hazardous waste issues including investigative waste soil & water. I suggested Parsons talk to Don Miller about a response to their storage proposal.

I suggested that Parsons & I talk again next week once we both have a copy of the agreement, hopefully late next week.

Natural Resource Technology, Inc.

TRANSMITTAL

To:	**Wisconsin Dept. of Natural Resources**	**Date:**	**1/15/98**
	107 Sutliff Avenue	**Project No:**	**1226**
	P.O. Box 818	**From:**	**Laurie Parsons**
	Rhinelander, WI 54501		
Attn:	**Mr. Don Miller**	**Re:**	**C.M. Christiansen Co. Investigative Waste Management**

x For Your Information ☐ As Requested ☐ For Review ☐ Approve and Return

Copies:	Description
1	Nov. 19, 1997 Letter from NRT to Don Miller

Comments: Don -

It came to our attention that you may not have received the attached letter which was issued after our telephone conversations last November. We apologize for this oversight and look forward to your written response.

Laurie J. Parsons

cc: Mr. Eric Christiansen, C.M. Christiansen Co.
Ms. Elizabeth Gamsky Rich - Whyte, Hirschboeck, Dudek, S.C.
Mr. Chris Saari - WDNR - Brule Office

23713 W. Paul Road, Pewaukee, WI 53072 ■ Phone 414/523-9000 ■ Fax 414/523-9001

Natural
Resource
Technology, Inc.
N R T

November 19, 1997
(1226)

Mr. Don Miller
Wisconsin Department of Natural Resources
107 Sutliff Avenue
P.O. Box 818
Rhinelander, WI 54501

RE: Request for Extension of Investigative Waste Accumulation Time
C.M. Christiansen Company, Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Miller:

On behalf of C.M. Christiansen Co. (CMC) we are requesting an extension for continued accumulation of investigative waste at the above referenced site located in Phelps, Wisconsin. This request is made under the provisions of 615.05(4)11(b) and we believe is consistent with Department policy and guidance dated January 14, 1993 (Attachment 3) for long-term on-site accumulation of investigative wastes. CMC asked us to develop a plan to manage and consolidate the investigative waste which was accumulated at the site during previous investigation work. In our telephone conversation during the week of August 4, 1997, you concurred with our proposed plan to move the drums into a covered area for safety reasons and to keep them out of the weather.

During the week of November 3, 17 drums and 4 plastic pails of soil (drill cuttings/treatability samples) and used sampling materials, and 15 drums containing monitoring well purge water from prior investigations were transported a distance of about 900 feet. The drums will be maintained in a covered shed located across from and south of the site. The drums with water are half full or less, are in good condition, and will have secondary containment. Consistent with the intent of the Department's guidance on these matters, the containers will be labeled and inspected on a monthly basis. Records of inspections will be kept in a log and the frequency of inspections will be increased during freeze/thaw periods. Adequate head space will be maintained on the drums which contain water to allow for freezing.

Also by your verbal approval, approximately 10 gallons of a oil/water mixture from monitoring well MW-7 was also taken off-site and disposed through the Vilas County small quantity hazardous waste disposal program in August 1997.

Based on our follow-up conversation on November 13 and 17, we trust this approach to managing the investigative wastes will suffice until remedial actions are implemented. Your assistance and written approval of this request is greatly appreciated. Please do not hesitate to call should you have any questions.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Spiros L. Fafalios, E.I.T.
Project Engineer

Laurie J. Parsons, P.E.
Senior Environmental Engineer

cc Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.
Mr. Eric Christiansen, C. M. Christiansen Company

[1226dmiller.ltr2]

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Region Headquarters
PO Box 818, 107 Sutliff Ave.
Rhinelander, WI 54501-0818
TELEPHONE 715-365-8900
FAX 715-365-8932
TDD 715-365-8957

January 26, 1998

FID#

Mr. Eric Christiansen
C.M. Christiansen Co.
P.O. Box 100
Phelps, WI 54554

SUBJECT: Extension of Investigative Waste Accumulation Time

Dear Mr. Christiansen:

On January 20, 1998, the Department received a request on your behalf from Natural Resource Technology to extend the time which C.M. Christiansen may retain accumulated investigative hazardous waste on-site. This request was made under the provisions of ch. NR 615.05(4),l,(b), Wis. Adm. Code, and is consistent with Department policy and guidance dated January 14, 1993, (Attachment 3). Earlier, the Department verbally agreed to allow C. M. Christiansen to move the waste from the site to a nearby storage building for safety reasons and protected from the weather. This request for storage of accumulated waste is granted until January 1, 1999 with the following conditions:

The drums must be labelled as hazardous waste, inspected for leaks and defects monthly, with an increase in inspection frequency during the spring months when the water begins to thaw. As required by ch. NR 615.05(4),2.c., an inspection log including the date and time of inspection, name of inspector, and condition of the drums shall be kept for review by the Department for at least three years from the date of the inspection. The Department may revoke this extension at any time, should the facility not fully follow the requirements for accumulated waste, or the drums present an environmental hazard. The Department will allow C. M. Christiansen to add additional investigative wastes to this accumulation as long as records of the additions are kept with the waste, and the Department is notified of additional waste being added.

It is understood that the investigative waste will be treated on-site along with treatment of contaminated water at the facility. Should C. M. Christiansen decide not to treat water on site, the drums must be properly removed as hazardous waste within 90 days of this decision. If the waste will remain on-site after 1998, a request for another extension should be made prior to January 1, 1999. The Department reserves the right to inspect the drums at any time during normal working hours.

If you have any questions regarding this letter, please call me at 715/365-8980.

Sincerely,

Don Miller
Waste Management Specialist

c. Laurie Parsons, Natural Resource Technologies, 23713 W. Paul Rd., Pewaukee, WI 53072
Gary LeRoy, DNR-Spooner
Chris Saari, DNR -Brule

Rec'd 2/18/98
Brule

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Co-Regional Headquarters
PO Box 818, 107 Sutliff Ave.
Rhinelander, WI 54501-0818
TELEPHONE 715-365-8900
FAX 715-365-8932
TDD 715-365-8957

February 17, 1998

Ms. Elizabeth Gamsky Rich
Whyte, Hirschboeck, Dudek, S.C.
111 East Wisconsin Avenue, Suite 2100
Milwaukee, WI 53202-4894

SUBJECT: CM CHRISTIANSEN SPILL RESPONSE AGREEMENT

Dear Ms. Rich:

Please find enclosed another draft of the spill response agreement for the CM Christiansen case. Linda Meyer is going to be out of town until March 3rd and she asked me to mail this latest draft to you. Please review this latest draft and provide us with any comments you may have.

If you have any questions, please feel free to contact me at 715-365-8935.

Sincerely,

Michelle DeBrock-Owens
Environmental Enforcement Specialist

cc: Enforcement File, Rhinelander
Chris Saari, Brule
Linda Meyer, LS/5

SPILL RESPONSE AGREEMENT

1. This Agreement is entered into pursuant to s. 292.11(7)(d), Wis. Stats., and shall be construed in a manner consistent with s. 292.11, Wis. Stats. The Department of Natural Resources ("the Department") and the C.M. Christiansen Company, Inc., a Michigan corporation ("CMC") hereby agree that CMC will conduct the activities listed below in compliance with the following schedule, except as provided in paragraph 2 of this agreement:

No	Activity	Compliance Date
1	Submittal to DNR of a Revised Source Control Soil Remedial Action Options Report, that complies with the requirements of s. NR 722.13, Wis. Adm. Code	Within 30 days after the effective date of this agreement
2	Submittal to DNR of an Update to Military Creek Sediment Sampling Plan, that complies with the requirements of ss. NR 716.07, 716.09 and 716.13, Wis. Adm. Code	Within 30 days after the effective date of this agreement
3	Submittal to DNR of a Proposed ~~Quarterly~~ Groundwater Monitoring Plan ~~Program Implementation~~	Within 30 days after the effective date of this agreement~~, or as soon as the weather permits~~
4	Military Creek Sampling Start	On or before May 30, 1998, unless an extension is granted by DNR because of adverse weather, or within 30 days after CMC receives DNR comments on the Updated Military Creek ~~Investigation Plan and Updated~~ Sediment Sampling Plan, whichever is later

5	Submittal to DNR of Soil Remediation System Design that complies with the requirements of ss. NR 724.09, 724.11 and 724.13, Wis. Adm. Code, and application for any permits, variances and other approvals required from DNR	Within 60 days after the effective date of this agreement
6	Start Soil Remedial Action Implementation, including free product removal	On or before the later of June 1, 1998, or within 30 days after CMC or its contractors receive all permits, variances and DNR approvals needed for soil remedial action implementation, including without limitation DNR approval of the Revised Source Control Soil Remedial Action Options Report, and System Design
7	Soil Remediation Construction Completion	Within 90 days after the start of soil remediation construction
8	Submittal to DNR of a Soil Remedial Construction Documentation Report, that complies with the requirements of s. NR 724.15, Wis. Adm. Code	Within 90 days after completion of soil remediation construction
9	Submittal to DNR of Draft Military Creek Investigation Report, that complies with the requirements of s. NR 716.15, Wis. Adm. Code	Within 90 days after completion of the Military Creek sediment sampling
10	Submittal to DNR of Final Military Creek Investigation Report, that complies with the requirements of s. NR 716.15, Wis. Adm. Code	Within 30 days after CMC or its contractor receives DNR comments on draft report

11	Submittal to DNR of Military Creek & ~~Groundwater~~ Remedial Action Options Report that complies with the requirements of s. NR 722.13, Wis. Adm. Code, if DNR determines that remediation action is necessary.	Within 60 days after CMC or its contractor receives DNR approval of Final Military Creek Investigation Report
12	Submittal to DNR of Military Creek & ~~Groundwater~~ Remedial ~~Action Plan~~ Design Report, that complies with the requirements of ss. NR 724.09, 724.11 and 724.13, Wis. Adm. Code	Within 30 days after CMC or its contractor receives DNR comments on Military Creek & ~~Groundwater~~ Remedial Action Options Report
13	Military Creek ~~& Groundwater~~ Remedial Action Start	On or before May 1, 1999 or within 60 days after CMC or its contactor receives DNR comments on Military Creek & ~~Groundwater~~ Remedial Action Plan, whichever is later
14	Submittal of Military Creek Remedial Construction Documentation Report, that complies with the requirements of s. NR 724.15, Wis. Adm. Code	Within 60 days after completion of Military Creek remediation construction
15	Implementation of Groundwater Monitoring Plan	In compliance with the schedule contained in the DNR-approved Groundwater Monitoring Plan

2. CMC will perform all of the work required under this agreement within the time limits set forth herein, unless the schedule is amended by mutual agreement of the parties or unless performance is delayed by events that constitute a "force majeure." The Department will not unreasonable refuse to amend the agreed-upon schedule if CMC submits credible evidence to the Department that new developments in the case require that the schedule be changed. For purposes of this agreement, a "force majeure" is an event arising from causes beyond the control of CMC or an entity controlled by CMC which delays or prevents

performance of any work required by this agreement. Increases in cost or changes in economic circumstances do not by themselves constitute a force majeure. However, an event that would otherwise constitute a force majeure shall be deemed a force majeure even though such an event also results in increased costs or changed economic circumstances. CMC shall notify the Department in writing no later than ten (10) business days after CMC becomes aware of any event that CMC contends is a force majeure. If the Department agrees that a delay is attributable to a force majeure, the time period for performance under this agreement shall be extended by adding the time period attributable to the delay caused by the force majeure event to the deadlines specified in this agreement. Nothing in this agreement, including this force majeure provision is intended to expand any obligation which CMC may have pursuant to s. 292.11(3), Wis. Stats.

3. This agreement shall become effective on the date that it is signed by both CMC and the Department.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By_____
George E. Meyer
Secretary

C.M. CHRISTIANSEN CO., INC., a Michigan corporation

By_____
Printed Name:
Title:

Natural
Resource
Technology, Inc.
N R T

February 27, 1998
(1226)

Mr. Chris Saari
Northern Region, Wisconsin Department of Natural Resources
Highway 2, PO Box 125
Brule, WI 54820

RE: Test Pit Investigation Update,
Former Wood Treating Facility, C.M. Christiansen Company, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Saari:

The purpose of this letter and attachments is to provide an update of sampling and pre-remedial investigations performed at the referenced site in fall 1997. On November 6, 1997 NRT conducted a test pit investigation consisting of four test pits and groundwater sampling of monitoring wells MW-10 and PMW-11. Locations of test pits TP-1 through TP-4 are shown on attached Figure 2. Test pit soil sample results are summarized on Table 1 and the laboratory reports are attached. Test pit logs with photoionization detector readings are also attached. Groundwater analytical results are summarized on attached Figure 4 and the laboratory reports are attached.

The test pits were performed to evaluate the subsurface strata with regard to the distribution and magnitude of pentachlorophenol contamination identified near the lower wetlands area. We re-evaluated this area by collecting a more representative "composite" sample for remediation planning as discussed below.

Four composite samples were collected. In all composite samples, concentrations were significantly lower than that of discreet sampling conducted by Coleman in the same locations. From the laboratory results and our visual observations it is evident that the higher concentration identified by previous sampling at HA-17 (our Test Pit 1) was not representative of the entire soil profile at this location. Furthermore, the horizontal area of impact appeared to be limited in extent, within the approximate area of the test pit itself. As a result, iso-concentration contours of PCP levels in soil presented on attached Figure 2 are probably overstated. The two discreet samples collected at TP-1 and TP-4 confirm that highest PCP levels occur above a depth of 5.5 ft below ground surface.

Please contact us if any questions arise during your review of the attached information.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Spiros L. Fafalios, E.I.T.
Environmental Engineer

Laurie J. Parsons, P.E.
Senior Environmental Engineer

cc: Mr. Eric Christiansen, C. M. Christiansen Company (w/attach.)
Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C. (w/attach.)

Attachments: Table 1 - Test Pit Analytical Summary
Figure 4 -Extent of PCP in Groundwater
Figure 2 - Extent of PCP in Soil
Test Pit Logs (Form 4400-122)
Laboratory Analytical Results

[1226WDNR-Sarri 2.20.98.ltr]

Table 1 - Test Pit Analytical Summary
C.M. Christiansen Company, Inc.
Former Pole Treatment Yard
Phelps, Wisconsin

Sample Location	Sample Depth (ft)	PCP (mg/kg)
TP-1	1-4.5	2,100
TP-1	5.5	0.76
TP-2	1.5-3.5	0.95
TP-3	1.5-3.5	2.6
TP-4	1.5-4.5	290
TP-4	5.5	19

Notes:
Samples were collected on November 6, 1997. Select samples were composited for purposes of remedial evaluation.

by: DVP
chkd by: SLF

EXTENT OF PCP IN GROUNDWATER

SOIL REMEDIAL ACTION OPTIONS REPORT
C.M. CHRISTIANSEN COMPANY
FORMER POLE TREATMENT FACILITY
PHELPS, WISCONSIN

DRAWN BY: TAS — DATE: 4/29/97
CHECKED BY: SLF — DATE: 4/29/97
APPROVED BY: LJP — DATE: 4/29/97
AUTOCAD FILE: 1226-B04.DWG

ESTIMATED ZONE OF GROUNDWATER IMPACT EXCEEDING THE 1ppb PCP WAC NR 140 ENFORCEMENT STANDARD

PCP (µg/L)
ND
ND
ND
ND

MW-2

PCP (µg/L)
3.3
1.2
0.40
0.74

MW-8

PCP (µg/L)
NI
NI
350
2.5

MW-13

PCP (µg/L)
NI
NI
ND
ND

PMW-14
MW-12

PCP (µg/L)
NI
NI
ND
0.45

PCP (µg/L)
0.12
0.56
0.42
0.58

MW-5

PCP (µg/L)
1,500
5,200
NS
NS

MW-7
MW-6

PCP (µg/L)
NI
NI
0.15
0.14

MW-9

PCP (µg/L)
1,300
32
21
10

PCP (µg/L)
0.12
0.67
0.48
0.30

MW-3
MW-1
PMW-11
MW-10

PCP (µg/L)
0.18
0.73
27
4.8

PCP (µg/L)
ND
0.084
ND
ND

MW-4

PCP (µg/L)
NI
NI
820
720
1300

PCP (µg/L)
NI
NI
34
7.5
19

UPPER WETLANDS AREA
LOWER WETLANDS AREA
SCATTERED TREES & BRUSH IN CLEARING
SMALL GROWTH
GATE
GATE
MILITARY CREEK
STREAM FLOW
COUNTY "E"

LEGEND

- MW-12 — BORING/MONITORING WELL
- PMW-14 — PIEZOMETER
- ESTIMATED EXTENT OF FREE PRODUCT
- PCP — PENTACHLOROPHENOL
- µg/L — MICROGRAMS PER LITER
- ND — NOT DETECTED
- NI — NOT INSTALLED
- NS — NOT SAMPLED

DATE SAMPLE TAKEN
9/95
12/95
7/96
11/96
11/97 *

* Data added for MW-10, PMW-11 samples - 2/98, NRT.

N

0 40 80 160

SCALE IN FEET

SOURCE NOTE:
THIS MAP WAS MODIFIED FROM DRAWING BY COLEMAN ENGINEERING COMPANY (CEC), IRON MOUNTAIN, MICHIGAN, DATED FEBRUARY 1997, JOB NO. 95042 A7.

NOTE:
BASE MAP SURVEY COMPLETED BY CEC WITH ADDITIONAL INFORMATION OBTAINED FROM USDA-ASCS HISTORICAL AERIAL PHOTOGRAPHS, A 7/7/95 SITE VISIT WITH C M CHRISTIANSEN CO., AND A 5/21/96 FIELD INSPECTION.

Natural Resource Technology

PROJECT NO. 1226-SR-1.2

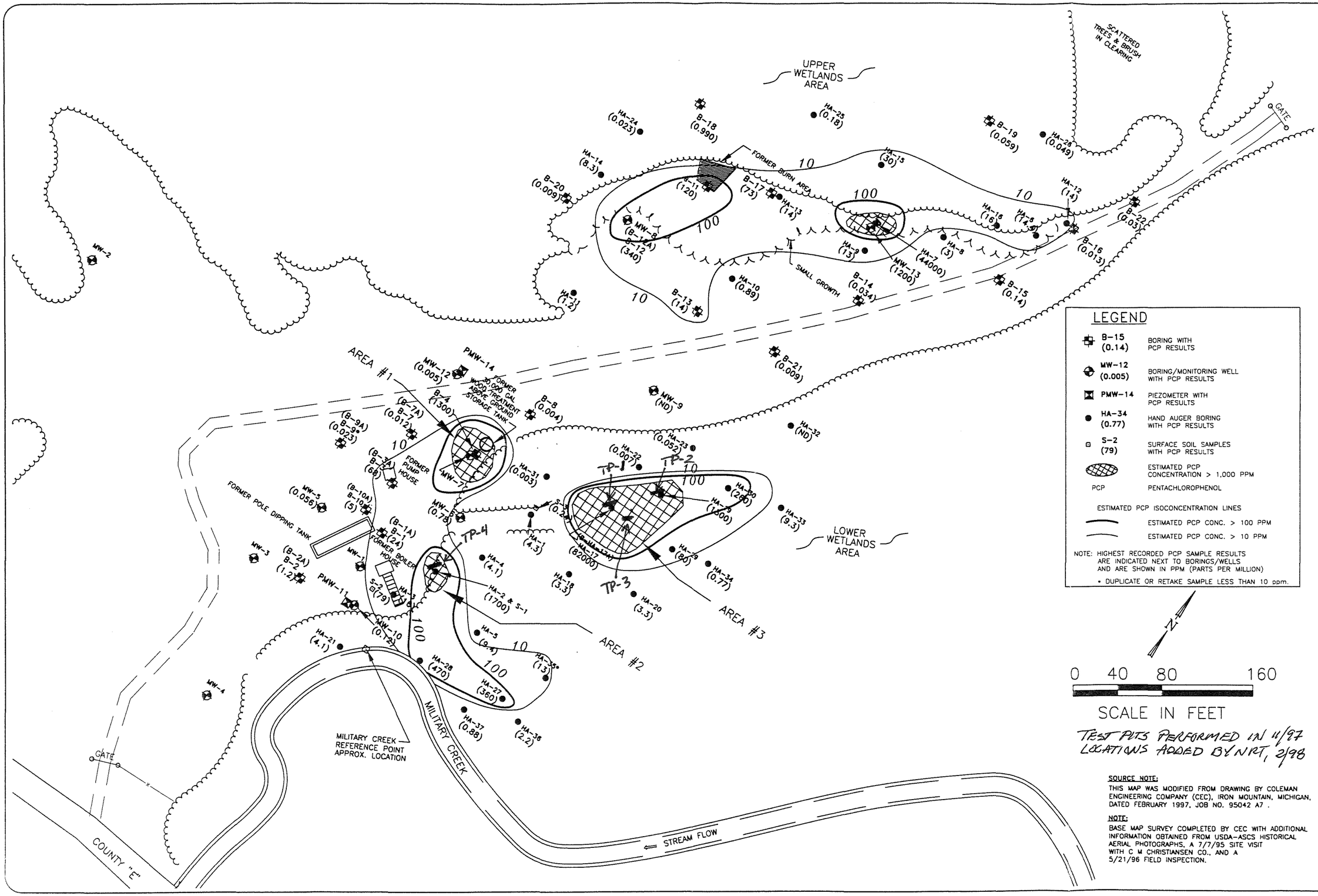
DRAWING NO. 1226-B04

FIGURE NO. 4

EXTENT OF PCP IN SOIL

SOIL REMEDIAL ACTION OPTIONS REPORT
C.M. CHRISTIANSEN COMPANY
FORMER POLE TREATMENT FACILITY
PHELPS, WISCONSIN

DRAWN BY: TAS	DATE: 4/29/97
CHECKED BY: SLF	DATE: 4/29/97
APPROVED BY: LJP	DATE: 4/29/97
AUTOCAD FILE: 1226-B03.DWG	



LEGEND

- B-15 (0.14) — BORING WITH PCP RESULTS
- MW-12 (0.005) — BORING/MONITORING WELL WITH PCP RESULTS
- PMW-14 — PIEZOMETER WITH PCP RESULTS
- HA-34 (0.77) — HAND AUGER BORING WITH PCP RESULTS
- S-2 (79) — SURFACE SOIL SAMPLES WITH PCP RESULTS
- ESTIMATED PCP CONCENTRATION > 1,000 PPM
- PCP — PENTACHLOROPHENOL

ESTIMATED PCP ISOCONCENTRATION LINES

- ESTIMATED PCP CONC. > 100 PPM
- ESTIMATED PCP CONC. > 10 PPM

NOTE: HIGHEST RECORDED PCP SAMPLE RESULTS ARE INDICATED NEXT TO BORINGS/WELLS AND ARE SHOWN IN PPM (PARTS PER MILLION)

• DUPLICATE OR RETAKE SAMPLE LESS THAN 10 ppm.

N

0 40 80 160

SCALE IN FEET

TEST PITS PERFORMED IN 4/97
LOCATIONS ADDED BY NRT, 2/98

SOURCE NOTE:
THIS MAP WAS MODIFIED FROM DRAWING BY COLEMAN ENGINEERING COMPANY (CEC), IRON MOUNTAIN, MICHIGAN, DATED FEBRUARY 1997, JOB NO. 95042 A7 .

NOTE:
BASE MAP SURVEY COMPLETED BY CEC WITH ADDITIONAL INFORMATION OBTAINED FROM USDA-ASCS HISTORICAL AERIAL PHOTOGRAPHS, A 7/7/95 SITE VISIT WITH C M CHRISTIANSEN CO., AND A 5/21/96 FIELD INSPECTION.

Natural Resource Technology

PROJECT NO. 1226-SR-1.2

DRAWING NO. 1226-B03

FIGURE NO. 2

State of Wisconsin
Department of Natural Resources

Ro To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
CM Christiansen - Former Pole Treatment Yard		*TP-1 (location of HA-17)*

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Contractor provided by Owner	*11/06/97*	*11/06/97*	*Test Pit - Backhoe*

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		NA	*Feet MSL*	*Feet MSL*	*6-10 feet*

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (If applicable)
SE 1/4 and SW 1/4, Sec. 35, T42N, R11E			☐ N ☐ E ☐ S ☐ W

County	DNR County Code	Civil Town/City/ or Village
Vilas	*64*	*Town of Phelps*

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0'-0.5'; SILT, dark brown, organic, moist, **petroleum odor and staining** in immediate area of former boring HA-17 (4 feet deep). Bentonite noted.	OL			421		M				
TP-1 (1)														
TP-1 (2)			2	0.5'-2'; PEAT, dark brown to black, moist, wood chips and fibers, **petroleum staining and odor**, ribbons of bark-like material present.	Peat			73.7		M				
TP-1 (3.5)			3	2'-4'; WOOD AND SAWDUST, light tan to brownish-gray, cobble to sawdust size with ribbons of bark. Underlain (interface varying between 3½ and 4') by **SAWDUST**, gray to brown, saturated with water and possibly oil, less moist and lighter in color to four feet, **petroleum odor**.	Wood Sawdust			64.7		M				Composite laboratory sample collected between 2'-4.5'
TP-1 (4.5)			4		SM			29.1		M/W				
TP-1 (5.5)			5					20.4		M/W				
			6	4'-5.5'; SAND WITH SILT, tannish-gray, trace clay, moist, no odor, increasing moisture and clay contect with depth.	SC			16.9		M/W				Discreet interval laboratory sample collected at 5.5'.
			7	5.5'-6.5'; CLAYEY SAND, gray, moist, no odor.										
			8	End of test pit at 6.5 feet below ground surface. Test pit advanced between 10:40 and 11:30 AM. Test pit backfilled with excavated soils.										
			9											
			10											
			11											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
	Natural Resource Technology

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

State of Wisconsin
Department of Natural Resources

Rc To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
CM Christiansen - Former Pole Treatment Yard		*TP-2 (location of HA-19)*

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Contractor provided by Owner *Spiros Fafalios*	*11/06/97*	*11/06/97*	*Test Pit - Backhoe*

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		NA	*Feet MSL*	*Feet MSL*	*4-5 feet*

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (If applicable)
SE 1/4 and SW 1/4, Sec. 35, T42N, R11E			☐ N ☐ E ☐ S ☐ W

County	DNR County Code	Civil Town/City/ or Village
Vilas	*64*	*Town of Phelps*

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0'-0.5'; SILT, brown, organic topsoil, with clay, dry, no staining, no odor.	OL									
TP-2 (1)			2	0.5'-3'; WOOD AND SAWDUST, brown to gray, 1 inch to sawdust size, some sand, trace clay, dry, becoming dark gray with depth and increasingly moist.	Wood			19.5		D				
TP-2 (2.5)			3					11.2		D/M				
TP-2 (3.5)			4	3'-4'; SAND, tannish-brown, little silt, poorly graded, moist, no odor, increasing silt with depth.	SM			16.6		M				Composite laboratory sample collected between 1.5'-3.5'
TP-2 (5)			5	4'-5.5'; SILT, brownish-tan, trace fine grained sand, trace reddish-brown mottles, wet, no odor, color changing to gray with depth.	ML			7.3		W				
			6	End of test pit at 5.5 feet below ground surface. Test pit advanced between 11:30 and 12:00 AM. Test pit backfilled with excavated soils.										
			7											
			8											
			9											
			10											
			11											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
Spiros Fafalios	**Natural Resource Technology**

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State of Wisconsin
Department of Natural Resources

Ro\ To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
CM Christiansen - Former Pole Treatment Yard		*TP-3 (40' S of TP-2, 40' E of TP-1)*

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Contractor provided by Owner *Spiros Fafalios*	*11/06/97*	*11/06/97*	*Test Pit - Backhoe*

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		NA	*Feet MSL*	*Feet MSL*	*4-5 feet*

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (If applicable)
SE 1/4 and SW 1/4, Sec. 35, T42N, R11E			☐ N ☐ E ☐ S ☐ W

County	DNR County Code	Civil Town/City/ or Village
Vilas	*64*	*Town of Phelps*

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0'-1.5'; SILT, brown, organic topsoil, some clay, moist, no odor, between 1 and 2 feet thick.	OL									
TP-3 (1.5)			2	1.5'-3'; PEAT AND WOOD, dark brown to black, with wood chips (black) and fibrous wood inclusions, trace sand, moist, **slight petroleum odor**. Becoming more saturated (water), and increasingly sandy with depth. Odor decreasing with depth.	Peat Wood			25.4		M				Composite laboratory sample collected between 1.5'-3.5'
TP-3 (2.5)			3					48.1		M				
TP-3 (3.5)			4					5.9		W				
TP-3 (4.5)			5	4'-5'; SAND, tannish-brown, few silt, trace rounded gravel, poorly sorted, wet, no odor.	SP			7.5		W				
TP-3 (5.5)			6	5'-6'; SANDY SILT, gray, wet, no odor.	ML			5.5		W				
			7	End of test pit at 6 feet below ground surface. Test pit advanced between 12:00 and 12:25 AM. Test pit backfilled with excavated soils.										
			8											
			9											
			10											
			11											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature] Firm **Natural Resource Technology**

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State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Superfund ☐ Other:

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 5-92

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
CM Christiansen - Former Pole Treatment Yard		*TP-4 (near former boring HA-2/S-1)*

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Contractor provided by Owner *Spiros Fafalios*	*11/06/97*	*11/06/97*	*Test Pit - Backhoe*

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		NA	*Feet MSL*	*Feet MSL*	*4-5 feet*

Boring Location State Plane	Feet N Feet E	Lat Long	Local Grid Location (If applicable)
SE 1/4 and SW 1/4, Sec. 35, T42N, R11E			☐ N ☐ E ☐ S ☐ W

County	DNR County Code	Civil Town/City/ or Village
Vilas	*64*	*Town of Phelps*

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0'-0.5'; SILT, black, organic topsoil, **petroleum staining**, dry.	OL									
TP-4 (1.5)			2	0.5'-2'; WOOD, brown, 1 inch chips, with silt and clay, trace sand, dry to moist, **slight petroleum odor.**	Wood			47.6		D/M				
TP-4 (2.5)			3	2-2.5'; SILT, black, organic, saturated with water and an **oil like substance**, wood chip inclusions up to 2-3 inches in length, **strong petroleum odor.**	OL			69.1		W				Composite laboratory sample collected between 1.5'-4.5'
TP-4 (3.5)			4					54.6		W				
TP-4 (4.5)			5	2.5-5.5'; SILT, gray, with fine sand, trace fine-grained well rounded gravel, saturated with water and an **oil like substance, petroleum odor**, color changing to tan with depth to 4 feet.	ML			25.1		M				
TP-4 (5.5)			6	At 4', trace sand, no gravel, brown color (oxidized), moist, **slight odor.**				16.3		M				Discreet interval laboratory sample collected at 5.5'.
			7	At 5', olive-gray color, wet, **no petroleum odor.**										
			8	End of test pit at 5.5 feet below ground surface. Test pit advanced between 12:25 and 13:10 AM. Test pit backfilled with excavated soils.										
			9											
			10											
			11											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
Signature	**Natural Resource Technology**

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EN CHEM INC.

1795 Industrial Drive
Green Bay, WI 54302
920-469-2436
800-7-ENCHEM
FAX: 920-469-8827

- Analytical Report -

Project Name : CMC

Project Number : 1226

WI DNR LAB ID : 405132750

Client: NATURAL RESOURCE TECHNOLOG

Report Date : 11/20/97

Sample No.	Field ID	Collection Date	Sample No.	Field ID	Collection Date
874210-001	TP-1 (1'-4.5')	11/6/97			
874210-002	TP-1 (5.5')	11/6/97			
874210-003	TP-2 (1.5'-3.5')	11/6/97			
874210-004	TP-3(1.5'-3.5')	11/6/97			
874210-005	TP-4 (1.5'-4.5')	11/6/97			
874210-006	TP-4 (5.5')	11/6/97			
874210-007	MW-10	11/6/97			
874210-008	PMW-11	11/6/97			

Soil VOC detects are corrected for the total solids, unless otherwise noted.

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and Laboratory Standard Operating Procedure. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this final report is authorized by Laboratory management, as is verified by the following signature.

J. Durocher — Approval Signature

11/20/97 — Date

EN CHEM INC.

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920-469-2436
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FAX: 920-469-8827

- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : TP-1 (1'-4.5')
Lab Sample Number : 874210-001
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : SOIL

Inorganic Results

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	74.3				%		11/13/97	SM 2540G	SM 2540G	MAD

Organic Results

PENTACHLOROPHENOL - SOIL Prep Method: SW846 3550 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	< 1.0				%Recov		11/17/97	SW846 8270
Phenol-d5	< 1.0				%Recov		11/17/97	SW846 8270
Nitrobenzene-d5	< 1.0				%Recov		11/17/97	SW846 8270
2-Fluorophenol	< 1.0				%Recov		11/17/97	SW846 8270
2-Fluorobiphenyl	< 1.0				%Recov		11/17/97	SW846 8270
2-Chlorophenol-d4	< 1.0				%Recov		11/17/97	SW846 8270
2,4,6-Tribromophenol	< 1.0				%Recov		11/17/97	SW846 8270
1,2-Dichlorobenzene-d4	< 1.0				%Recov		11/17/97	SW846 8270
Pentachlorophenol	2100000	41000	130000		ug/kg		11/17/97	SW846 8270

All soil results are reported on a dry weight basis unless otherwise noted.

EN CHEM INC.

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- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : TP-1 (5.5')
Lab Sample Number : 874210-002
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : SOIL

Inorganic Results

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	78.5				%		11/13/97	SM 2540G	SM 2540G	MAD

Organic Results

PENTACHLOROPHENOL - SOIL Prep Method: SW846 3550 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	80				%Recov		11/14/97	SW846 8270
Phenol-d5	76				%Recov		11/14/97	SW846 8270
Nitrobenzene-d5	78				%Recov		11/14/97	SW846 8270
2-Fluorophenol	76				%Recov		11/14/97	SW846 8270
2-Fluorobiphenyl	80				%Recov		11/14/97	SW846 8270
2-Chlorophenol-d4	74				%Recov		11/14/97	SW846 8270
2,4,6-Tribromophenol	89				%Recov		11/14/97	SW846 8270
1,2-Dichlorobenzene-d4	76				%Recov		11/14/97	SW846 8270
Pentachlorophenol	760	98	310		ug/kg		11/14/97	SW846 8270

All soil results are reported on a dry weight basis unless otherwise noted.

EN CHEM INC.

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- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : TP-2 (1.5'-3.5')
Lab Sample Number : 874210-003
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : SOIL

Inorganic Results

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	82.5				%		11/13/97	SM 2540G	SM 2540G	MAD

Organic Results

PENTACHLOROPHENOL - SOIL Prep Method: SW846 3550 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	87				%Recov		11/14/97	SW846 8270
Phenol-d5	79				%Recov		11/14/97	SW846 8270
Nitrobenzene-d5	81				%Recov		11/14/97	SW846 8270
2-Fluorophenol	79				%Recov		11/14/97	SW846 8270
2-Fluorobiphenyl	91				%Recov		11/14/97	SW846 8270
2-Chlorophenol-d4	77				%Recov		11/14/97	SW846 8270
2,4,6-Tribromophenol	97				%Recov		11/14/97	SW846 8270
1,2-Dichlorobenzene-d4	77				%Recov		11/14/97	SW846 8270
Pentachlorophenol	950	93	300		ug/kg		11/14/97	SW846 8270

All soil results are reported on a dry weight basis unless otherwise noted.

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- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : TP-3(1.5'-3.5')
Lab Sample Number : 874210-004
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : SOIL

Inorganic Results

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	28.5				%		11/13/97	SM 2540G	SM 2540G	MAD

Organic Results

PENTACHLOROPHENOL - SOIL Prep Method: SW846 3550 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	80				%Recov		11/14/97	SW846 8270
Phenol-d5	71				%Recov		11/14/97	SW846 8270
Nitrobenzene-d5	75				%Recov		11/14/97	SW846 8270
2-Fluorophenol	68				%Recov		11/14/97	SW846 8270
2-Fluorobiphenyl	92				%Recov		11/14/97	SW846 8270
2-Chlorophenol-d4	68				%Recov		11/14/97	SW846 8270
2,4,6-Tribromophenol	89				%Recov		11/14/97	SW846 8270
1,2-Dichlorobenzene-d4	68				%Recov		11/14/97	SW846 8270
Pentachlorophenol	2600	270	860		ug/kg		11/14/97	SW846 8270

All soil results are reported on a dry weight basis unless otherwise noted.

EN CHEM INC.

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- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : TP-4 (1.5'-4.5')
Lab Sample Number : 874210-005
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : SOIL

Inorganic Results

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	74.8				%		11/13/97	SM 2540G	SM 2540G	MAD

Organic Results

PENTACHLOROPHENOL - SOIL Prep Method: SW846 3550 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	< 1.0				%Recov		11/17/97	SW846 8270
Phenol-d5	< 1.0				%Recov		11/17/97	SW846 8270
Nitrobenzene-d5	< 1.0				%Recov		11/17/97	SW846 8270
2-Fluorophenol	< 1.0				%Recov		11/17/97	SW846 8270
2-Fluorobiphenyl	< 1.0				%Recov		11/17/97	SW846 8270
2-Chlorophenol-d4	< 1.0				%Recov		11/17/97	SW846 8270
2,4,6-Tribromophenol	< 1.0				%Recov		11/17/97	SW846 8270
1,2-Dichlorobenzene-d4	< 1.0				%Recov		11/17/97	SW846 8270
Pentachlorophenol	290000	20000	64000		ug/kg		11/17/97	SW846 8270

All soil results are reported on a dry weight basis unless otherwise noted.

EN CHEM INC.

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Green Bay, WI 54302
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- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : TP-4 (5.5')
Lab Sample Number : 874210-006
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : SOIL

Inorganic Results

Test	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Prep Method	Analysis Method	Analyst
Solids, percent	76.1				%		11/13/97	SM 2540G	SM 2540G	MAD

Organic Results

PENTACHLOROPHENOL - SOIL Prep Method: SW846 3550 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	95				%Recov		11/17/97	SW846 8270
Phenol-d5	80				%Recov		11/17/97	SW846 8270
Nitrobenzene-d5	77				%Recov		11/17/97	SW846 8270
2-Fluorophenol	82				%Recov		11/17/97	SW846 8270
2-Fluorobiphenyl	99				%Recov		11/17/97	SW846 8270
2-Chlorophenol-d4	83				%Recov		11/17/97	SW846 8270
2,4,6-Tribromophenol	92				%Recov		11/17/97	SW846 8270
1,2-Dichlorobenzene-d4	86				%Recov		11/17/97	SW846 8270
Pentachlorophenol	19000	500	1600		ug/kg		11/17/97	SW846 8270

All soil results are reported on a dry weight basis unless otherwise noted.

EN CHEM INC.

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Green Bay, WI 54302
920-469-2436
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- Analytical Report -

Project Name : CMC
Project Number : 1226
Field ID : MW-10
Lab Sample Number : 874210-007
WI DNR LAB ID : 405132750

Client : NATURAL RESOURCE TECHNOLOGY, INC
Report Date : 11/19/97
Collection Date : 11/6/97
Matrix Type : WATER

Organic Results

PENTACHLOROPHENOL - WATER Prep Method: SW846 3510 Prep Date: Analyst: MAD

Analyte	Result	LOD	LOQ	EQL	Units	Code	Analysis Date	Analysis Method
Terphenyl-d14	61				%Recov		11/13/97	SW846 8270
Phenol-d5	37				%Recov		11/13/97	SW846 8270
Nitrobenzene-d5	94				%Recov		11/13/97	SW846 8270
2-Fluorophenol	54				%Recov		11/13/97	SW846 8270
2-Fluorobiphenyl	97				%Recov		11/13/97	SW846 8270
2-Chlorophenol-d4	82				%Recov		11/13/97	SW846 8270
2,4,6-Tribromophenol	102				%Recov		11/13/97	SW846 8270
1,2-Dichlorobenzene-d4	91				%Recov		11/13/97	SW846 8270
Pentachlorophenol	17	2.4	7.6		ug/L		11/13/97	SW846 8270

PHONE CONVERSATION RECORD

DATE: 03/09/98
TIME: 1405 hrs.

CONVERSED WITH: Laurie Parsons
NRT, Inc.
414/523-9000

SUBJECT/PROJECT: C.M. Christiansen

UNIQUE ID#.: 02-64-000068

I returned a call to Parsons.

We first discussed the draft Spill Response Agreement.
- Activity 2: Parsons thinks that some of the NR code references may be unnecessary/ambiguous. Parsons' concerns included not having to repeat irrelevant information (eg. hydrogeologic info in sediment sampling work plan). Parsons said she would tell her client that the references would be o.k. based on her discussion with me.
- Act. 3: Parsons said the GW monitoring plan would be o.k. I explained that I did not feel that the degree & extent of contamination had been defined, and that more MWs & piezometers would be needed. We then discussed the potential difficulties in placing additional wells in/near the wetlands. Parsons also wanted to make sure the monitoring frequency would be reasonable, and not an arbitrary quarterly basis.
- Act. 5: Parsons had concerns with the NR 724.13 reference (O&M plan). Parsons said it would be hard to write the O&M

Signature: Christopher A. Saar
(please write legibly)

-over-

plan before the remedial "system" is constructed. I said as long as they give us something that says an NR 724.13 O&M plan will be included with the construction report, that would be acceptable.

- Act. 9#10: Parsons asked why we were asking for draft and final Military Ck. investigation reports. I replied that I couldn't remember why the requirement for a draft report was in the agreement.
- Act. 13: Parsons asked why there was still a "start" time for remedial action on Military Ck; was it because DNR anticipated that remediation would be needed on the creek, but not on GW? (Parsons noted that GW remediation had been stricken from the draft.) I replied that GW remediation was removed in response to concerns voiced by Elizabeth Rich; this was not an indication that remedial action was likely to be more necessary on the creek than on GW. We both agreed that GW was more likely to require remediation.

We then discussed NRT's 4/11/97 sediment work plan. Parson said she was in the process of budgetting this part of the project. Parsons said that her client was looking at doing something more than additional sampling (ie. ecological based studies), but this work stopped when the Consent Order was proposed. Parsons also mentioned that this work would have been more expensive. CMC has now decided to proceed with a step-wise approach, which will involve more sampling. I mentioned to Parsons that Tom Janisch had commented on the 4/11/97 proposal; Parsons asked me to fax Janisch's comments to her.

We next discussed the 2/27/98 Test Pit Update. Parsons said that their work showed that the soil conditions are probably better than previously thought, but GW conditions may be worse. Parsons said Test Pit 1, at the location of HA-17 (~80,000 ppm TCP) appeared to be an area where sludge/waste was dumped and then covered. Parsons said the original high-level detect was probably more of a point source type situation.

Parsons concluded the call by saying that she would relay our comments to Rich; we assumed that Rich would then contact Linda Meyer.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Co-Regional Headquarters
PO Box 818, 107 Sutliff Ave.
Rhinelander, WI 54501-0818
TELEPHONE 715-365-8900
FAX 715-365-8932
TDD 715-365-8957

March 27, 1998

Ms. Elizabeth Gamsky Rich
Whyte, Hirschboeck, Dudek, S.C.
111 East Wisconsin Avenue, Suite 2100
Milwaukee, WI 53202-4894

SUBJECT: CM CHRISTIANSEN SPILL RESPONSE AGREEMENT

Dear Ms. Rich:

Please find enclosed another draft of the spill response agreement for the CM Christiansen case. Changes to the agreement are underlined. If this agreement is acceptable to Mr. Christiansen, please have him sign it and return it to either Linda Meyer or myself.

The Department believes that this agreement does not necessarily cover all of the remedial actions that may eventually be required at this site. The Department does expect that all actions, deemed necessary, will be conducted at this site to ensure compliance with our laws and regulations (including but not limited to NR 140 groundwater standards and NR 700).

If you have any questions, please feel free to contact me at 715-365-8935.

Sincerely,

Michelle DeBrock-Owens
Environmental Enforcement Specialist

cc: Enforcement File, Rhinelander
Chris Saari, Brule
Linda Meyer, LS/5

SPILL RESPONSE AGREEMENT

1. This Agreement is entered into pursuant to s. 292.11(7)(d), Wis. Stats., and shall be construed in a manner consistent with s. 292.11, Wis. Stats. The Department of Natural Resources ("the Department") and the C.M. Christiansen Company, Inc., a Michigan corporation ("CMC") hereby agree that CMC will conduct the activities listed below in compliance with the following schedule, except as provided in paragraph 2 of this agreement:

No	Activity	Compliance Date
1	Submittal to DNR of a Revised Source Control Soil Remedial Action Options Report, that complies with the requirements of s. NR 722.13, Wis. Adm. Code	Within 30 days after the effective date of this agreement
2	Submittal to DNR of an Update to Military Creek Sediment Sampling Plan, that complies with the relevant requirements of ss. NR 716.07, 716.09 and 716.13, Wis. Adm. Code	Within 30 days after the effective date of this agreement
3	Submittal to DNR of a Proposed Groundwater Monitoring Plan	Within 30 days after the effective date of this agreement
4	Military Creek Sampling Start	On or before May 30, 1998, unless an extension is granted by DNR because of adverse weather, or within 30 days after CMC receives DNR comments on the Updated Military Creek Sediment Sampling Plan, whichever is later

5	Submittal to DNR of Soil Remediation System Design that complies with the requirements of ss. NR 724.09 and 724.11 and the relevant requirements of 724.13, Wis. Adm. Code, and application for any permits, variances and other approvals required from DNR	Within 60 days after the effective date of this agreement
6	Start Soil Remedial Action Implementation, including free product removal	On or before the later of June 1, 1998, or within 30 days after CMC or its contractors receive all permits, variances and DNR approvals needed for soil remedial action implementation, including without limitation DNR approval of the Revised Source Control Soil Remedial Action Options Report, and System Design
7	Soil Remediation Construction Completion	Within 90 days after the start of soil remediation construction
8	Submittal to DNR of a Soil Remedial Construction Documentation Report, that complies with the requirements of s. NR 724.15, Wis. Adm. Code	Within 90 days after completion of soil remediation construction
9	Submittal to DNR of Military Creek Investigation Report, that complies with the requirements of s. NR 716.15, Wis. Adm. Code	Within 90 days after completion of the Military Creek sediment sampling

10	Submittal to DNR of a Military Creek Remedial Action Options Report (which may include an evaluation of institutional controls and other non-remedial actions, if appropriate) that complies with the requirements of s. NR 722.13, Wis. Adm. Code, if remediation action is necessary.	Within 60 days after CMC or its contractor receives DNR approval of the Military Creek Investigation Report
11	Implementation of Groundwater Monitoring Plan	In compliance with the schedule contained in the DNR-approved Groundwater Monitoring Plan

2. CMC will perform all of the work required under this agreement within the time limits set forth herein, unless the schedule is amended by mutual agreement of the parties or unless performance is delayed by events that constitute a "force majeure." The Department will not unreasonable refuse to amend the agreed-upon schedule if CMC submits credible evidence to the Department that new developments in the case require that the schedule be changed. For purposes of this agreement, a "force majeure" is an event arising from causes beyond the control of CMC or an entity controlled by CMC which delays or prevents performance of any work required by this agreement. Increases in cost or changes in economic circumstances do not by themselves constitute a force majeure. However, an event that would otherwise constitute a force majeure shall be deemed a force majeure even though such an event also results in increased costs or changed economic circumstances. CMC shall notify the Department in writing no later than ten (10) business days after CMC becomes aware of any event that CMC contends is a force majeure. If the Department agrees that a delay is attributable to a force majeure, the time period for performance under this agreement shall be extended by adding the time period attributable to the delay caused by the force majeure event to the deadlines specified in this agreement. Nothing in this agreement, including this force majeure provision is intended to expand any obligation which CMC may have pursuant to s. 292.11(3), Wis. Stats.

3. This agreement shall become effective on the date that it is signed by both CMC and the Department.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By_____

C.M. CHRISTIANSEN CO., INC., a Michigan corporation

By_____
Printed Name:
Title:

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

101 S. Webster St.
Box 7921
Madison, Wisconsin 53707-7921
Telephone 608-266-2621
FAX 608-267-3579
TDD 608-267-6897

April 17, 1998

Elizabeth Gamsky Rich
Whyte, Hirschboeck, Dudek, S.C.
111 East Wisconsin Ave., Suite 2100
Milwaukee, WI 53202-4894

Subject: C.M. Christiansen Co., Inc. Spill Response Agreement

Dear Elizabeth:

I have enclosed one of the fully-executed duplicate originals of the above-referenced agreement. As I indicated in the voice-mail message that I left for you earlier today, the agreement became effective on April 17, 1998 when it was signed by DNR Secretary George Meyer.

The Department appreciates your client's willingness to sign this agreement and we look forward to working with you and your client as the agreement is implemented. Thank you.

Sincerely,

Linda Meyer

Linda Meyer
Staff Attorney
Bureau of Legal Services

cc: Michelle DeBrock Owens - NOR (Rhinelander)
Chris Saari - Brule

ROUTING & REQUEST

Please...

- ☐ Read
- ☐ Handle
- ☐ Approve

And...

- ☐ Forward
- ☐ Return
- ☐ Keep or Recycle
- ☐ Review with Me

To: Chris Saari - Brule

For your file.

(Please let me know ASAP if CMC fails to meet this schedule.)

From: Linda Meyer

Date: 4/17/98

5	Submittal to DNR of Soil Remediation System Design that complies with the requirements of ss. NR 724.09 and 724.11 and the relevant requirements of 724.13, Wis. Adm. Code, and application for any permits, variances and other approvals required from DNR	Within 60 days after the effective date of this agreement
6	Start Soil Remedial Action Implementation, including free product removal	On or before the later of June 1, 1998, or within 30 days after CMC or its contractors receive all permits, variances and DNR approvals needed for soil remedial action implementation, including without limitation DNR approval of the Revised Source Control Soil Remedial Action Options Report, and System Design
7	Soil Remediation Construction Completion	Within 90 days after the start of soil remediation construction
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9	Submittal to DNR of Military Creek Investigation Report, that complies with the requirements of s. NR 716.15, Wis. Adm. Code	Within 90 days after completion of the Military Creek sediment sampling

10	Submittal to DNR of a Military Creek Remedial Action Options Report (which may include an evaluation of institutional controls and other non-remedial actions, if appropriate) that complies with the requirements of s. NR 722.13, Wis. Adm. Code, if remediation action is necessary.	Within 60 days after CMC or its contractor receives DNR approval of the Military Creek Investigation Report
11	Implementation of Groundwater Monitoring Plan	In compliance with the schedule contained in the DNR-approved Groundwater Monitoring Plan

2. CMC will perform all of the work required under this agreement within the time limits set forth herein, unless the schedule is amended by mutual agreement of the parties or unless performance is delayed by events that constitute a "force majeure." The Department will not unreasonable refuse to amend the agreed-upon schedule if CMC submits credible evidence to the Department that new developments in the case require that the schedule be changed. For purposes of this agreement, a "force majeure" is an event arising from causes beyond the control of CMC or an entity controlled by CMC which delays or prevents performance of any work required by this agreement. Increases in cost or changes in economic circumstances do not by themselves constitute a force majeure. However, an event that would otherwise constitute a force majeure shall be deemed a force majeure even though such an event also results in increased costs or changed economic circumstances. CMC shall notify the Department in writing no later than ten (10) business days after CMC becomes aware of any event that CMC contends is a force majeure. If the Department agrees that a delay is attributable to a force majeure, the time period for performance under this agreement shall be extended by adding the time period attributable to the delay caused by the force majeure event to the deadlines specified in this agreement. Nothing in this agreement, including this force majeure provision is intended to expand any obligation which CMC may have pursuant to s. 292.11(3), Wis. Stats.

3. This agreement shall become effective on the date that it is signed by both CMC and the Department.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By George R. Meyer, Secretary 4/17/98

C.M. CHRISTIANSEN CO., INC., a Michigan corporation

By _____
Printed Name: ERIC R. CHRISTIANSEN
Title: PRESIDENT

PHONE CONVERSATION RECORD

DATE: 5/18/98
TIME: 1105 hrs.

CONVERSED WITH: Laurie Parsons
NRT
414/523-9000

SUBJECT/PROJECT: C.M. Christiansen Co.

UNIQUE ID#.: 02-64-000058

Parsons called to discuss the submittals required by the Spill Response Agreement. Parsons said the soil, creek and groundwater sampling reports were sent via certified mail on Friday (5/15/98) as two documents, so I should receive them today or tomorrow.

We then discussed the dates specified in the agreement. I said that I had calculated 30 days to fall on 5/17, and 60 days to fall on 6/16. Parsons said they are now working on the remedial system design report (due at 60 days), and that NRT wanted to include the hazardous waste variance in that report. I explained that it be OK with me to combine the two, but that Parsons should check with Don Miller to get Millers comments on combining the submittals.

We then briefly discussed the creek sediment plan. Parsons said she expected that Tom Janisch would need to look at and comment on this plan, and that maybe we could get

Signature: Christopher A. Lohman
(please write legibly)

-over-

together on a conference call to discuss NRT's proposal. Parsons said that they had removed DRO from the analytical list, and had also modified the dioxin sampling plan due to the new TEQ's which just came out.

PHONE CONVERSATION RECORD

DATE: 6/9/98
TIME: 1500 hrs

CONVERSED WITH: Laurie Parsons
NRT
414/523-9000

SUBJECT/PROJECT: CM Christiansen

UNIQUE ID#.: 02-64-000068

I returned a call to Parsons.

Parsons had a couple items to discuss. First was treatment of water from the excavation. Parsons has spoken with Steve Ohm (WW, ANR Rhinelander) about options, and Parsons wanted to propose discharge of treated water to seepage cells. The cells would be upgradient of the source, near MW-8 and MW-9. This should avoid flushing of contaminants. Parsons also said she wants the discharge to be temporary and limited.

Parsons then said that the hazardous waste variance request will be submitted with the System Design Report. Don Miller will get the original variance request with a copy of the report. Parsons said the variance request wouldn't include water, because Parsons understood the requirements to be that a WPDES permit eliminates the need for/covers the variance.

Parsons also had a question about excavation near/in the wetland

Signature: Christopher A Saar
(please write legibly)

-over-

(Area 2B). NRT intends to excavate the top 12" for treatment, but Parsons has concerns about the NR103 process. I said that I would talk to the WRE contact for Vilas County, then act as the middleman between WRE & NRT.

We then discussed the issue of a soil performance standard for groundwater. I explained that my thought was to remove the source soil, complete the definition of degree and extent, and see if groundwater cleans itself up.

I told Parsons we would talk more once I had reviewed the soil remediation report and had received the system design report. I also mentioned that the sediment sampling plan had been sent to Tom Janisch.

Natural
Resource
Technology, Inc.

N R T

June 12, 1998
(1226/3.5)

Mr. Christopher A. Saari
Northern Region – Brule Area Headquarters
Wisconsin Department of Natural Resources
6250 South Ranger Road
Highway 2, PO Box 125
Brule, WI 54820-0125

RE: **Design Report and Plan of Operation**
Former Wood Treating Facility, C.M. Christiansen Co., Inc., Phelps, Wisconsin
Case #02-64-000068; Ref: WID998639035

Dear Mr. Saari:

On behalf the C.M. Christiansen Co., Inc., Natural Resource Technology, Inc. (NRT) is submitting this *Design Report and Plan of Operation* for the above referenced facility for your review. Also attached are two copies of the *Notification to Treat or Dispose of Contaminated Soil and Groundwater* for this project. Please transmit one copy of the notification package to the appropriate DNR Air Management staff and retain one for your file. The hazardous waste variance request and WPDES permit application are also being submitted concurrently to the respective hazardous waste and wastewater program staff at DNR, copies of which are attached for your file.

Submittal of this report and associated permit applications/requests satisfies Item 5 (Soil Remediation System Design) of the Spill Response Agreement, dated April 17, 1998, between CMC and the WDNR. We encourage you to contact us if any questions arise during your review of the report or associated permit applications.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Julie A. Griswold, P.E.
Project Engineer

Laurie J. Parsons, P.E.
Senior Environmental Engineer

Encl.: Design Report and Plan of Operation
Notification to Treat or Dispose (2 copies)
Hazardous Waste Treatment Variance Request
WPDES Application

cc: Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.
Mr. Eric Christiansen, C. M. Christiansen Company, Inc.

w:\soil\1226 plan of oper dnr cov.ltr

State of Wisconsin
Department of Natural Resources

NOTIFICATION TO TREAT OR DISPOSE OF PETROLEUM CONTAMINATED SOIL & WATER

Form ~~4700-119~~ 4500-168 Rev. 10-95

This form is required by the Department of Natural Resources (DNR) to ensure that the remediation of petroleum contaminated soil and water is in compliance with NR 158, NR 500-540, NR 419 and NR 445, Wis. Adm. Code. Failure to comply with applicable statutes and administrative rules may lead to violations of subchapters III and IV of Ch. 144, Wis. Stats. and may result in forfeitures of not less than $10 or more than $25,000 for each violation, pursuant to ss. 144.426(1), 144.74(1), 144.99, Wis. Stats., or fines of not less than $100 or more than $150,000 or imprisonment for not more than 10 years, or both, pursuant to s. 144.74(2), Wis. Stats. Each day of a continuing violation constitutes a separate violation. Except for the remediation of virgin petroleum spills, this form needs to be submitted to the DNR 10 business days prior to the commencement of the remediation. Personally identifiable information found on this form is not intended to be used for any other purpose.

DIRECTIONS: 1) complete both sides of the form. 2) Have the responsible party sign the form. This signature certifies that the information on this form and in all supporting documents is accurate. 3) Submit the form with supporting documentation, lab reports and any maps to the appropriate District Air Management Program at least 10 business days prior to the commencement of remediation. 4) Submit a copy of this form to the DNR project manager and retain a copy for your records.

PART I - GENERAL INFORMATION

Site Name & Address: C.M. Christiansen Company, Inc. Former Pole Treatment Facility P.O. Box 100, County E Phelps, WI 54554	Date of Form Completion: 6/8/98
Site Number: Case #02-64-000068 WID 998639035	Do Other Remediation Systems Exist at This Site: ☐ Yes ☒ No
County: Vilas	Site Type: ☐ LUST ☒ ERP ☐ CERCLA ☐ Other, Explain:
Responsible Party Name & Address: C.M. Christiansen Company, Inc. P.O. box 100 Phelps, WI 54554 Mr. Eric R. Christiansen, President	Responsible Party Signature: Telephone Number: (715) 545-2333
Consulting Firm Name & Address: Natural Resource Technology, Inc. 23713 W. Paul Rd., Unit D Pewaukee, WI 53072 Ms. Laurie Parsons/Ms. Julie Griswold	Consulting Firm Contact: Ms. Laurie Parsons/Ms. Julie Griswold Telephone Number: (414) 523-9000

PART II - SOIL AND WATER DATA (Attach Lab Reports and Calculations)

Type of Contamination: ☐ Gasoline ☐ Diesel ☒ Fuel Oil ☐ Waste Oil
☒ Chlorinated Organics (PCP) ☐ Other: Pentachlorophenol

Soil Concentration:

~~GRO~~: Total VOCs	3	mg/kg/10^6	x	2800 lb/yd^3	x	2,500	yd^3	=	21 lb
~~DRO~~: Total PAHs	24	mg/kg/10^6	x	2800 lb/yd^3	x	2,500	yd^3	=	168 lb
Benzene:		mg/kg/10^6	x	2800 lb/yd^3	x		yd^3	=	lb
Chlorinated Organics: (PCP)	600	mg/kg/10^6	x	2800 lb/yd^3	x	2,500	yd^3	=	4,200 lb
Other:		mg/kg/10^6	x	2800 lb/yd^3	x		yd^3	=	lb

Also see attached tables for metals and dioxin/furan analysis results.

Water Concentration:

Total VOCs ~~GRO~~: 0.049 mg/L Total PAHs ~~DRO~~ 0.064 mg/L Benzene: _____ mg/L

Chlorinated Organics: (PCP) 2.55 mg/L Other: _____ mg/L

PART III - TREATMENT OR DISPOSAL FACILITY INFORMATION

Treatment/Disposal Facility Name & Address:	Facility ID: Air Pollution Control Permit Number:
Facility Contact: Telephone Number: ( )	Facility Located in 10-county Area in Southeast Wisconsin? ☐ Yes ☐ No Distance to Nearest Residence or Business:
Headquarter Address:	Portable Sources Only: Has a Portable Source Relocation Notification (Form 4500-25) Been Submitted for This Location? ☐ Yes ☐ No

PART III - SOIL VACUUM EXTRACTION OR GROUNDWATER REMEDIATION

Site Contact : Ms. Julie Griswold Natural Resource Technology, Inc. Telephone Number: (414) 523-9000	Proposed Operations: (Attach Calculations) Excavation Dewatering with Treatment on-site using oil/water sep., filtration and carbon adsorption. Anticipated Start-Up Date: Summer 1998 Estimated Project Duration: 1 week
Site Located in 10-county Area in Southeast Wisconsin? ☐ Yes ☒ No	Number of Wells: 1 sump in Excavation near MW-7
Distance to Nearest Residence or Business: 500 ft.	Number of Emission Points: none
Pilot Test/Soil Venting Only: (Attach Lab Reports and Calculations) Date of Test:	Stack Height: --
Flow Rate (scfm):	Maximum Equipment Flow Rate (scfm or gpm): 50 gpm
Total Withdrawal of Air (scf):	Total VOC Emission Rate (lb/hr): --
Total VOC Emission Rate (lb/hr):	Benzene Emission Rate (lb/hr): --
Benzene Emission Rate (lb/hr):	Benzene Emission Rate (lb/yr): --

PART III - OTHER REMEDIATION METHODS (Attach Lab Reports and Calculations)

Proposing Other Remediation Method? ☒ Yes Method Name: On-site Biological Treatment in Above-ground cell.

Attach a project description for other remediation methods including landspreading, passive aeration and bioremediation. At a minimum, the information submitted should include the following items (with any supporting lab reports and calculations):

- √ Address/Location of Remediation Site - Indicate if this location is in the 10-county area in Southeast Wisconsin and the distance to the nearest residence or business. Include a map or site plan if appropriate.
- √ Description of Remediation Method.
- √ Project Contact & Telephone Number.
- √ Anticipated Start-Up and Estimated Project Duration.
- √ Highest Estimated Hourly VOC Emissions.
- √ Highest Estimated Hourly and Annual Benzene Emissions.
- √ Emission Testing Methodology.
- √ Final Destination of Soil.

PART III - OTHER REMEDIATION METHODS - On-Site Biological Treatment in an Aboveground Cell

Site: C.M. Christiansen Co., Inc.
Former Pole Treatment Facility
P.O. Box 100, County E
Phelps, WI 54554

Contact: Ms. Laurie Parsons/Ms. Julie Griswold
Natural Resource Technology, Inc.
(414) 523-9000

Remediation Method: The contaminated soil will be treated in an aboveground biological treatment cell located on the property. Indigenous microbes will be used for biological degradation. Nutrients and water (if needed) will be added initially during placement of the soil in the cell. The soil in the cell will be passively aerated using wind-driven turbines and passive air intakes. The cell will be covered and lined with impervious polyethylene sheeting.

Anticipated Start-up and Project Duration: The aboveground cell may be constructed in Summer 1998 depending on the timing of WDNR review and approval. Completion of treatment of the soil may be 5 years.

Estimated Emissions and Testing Methods: The aeration method is passive and exceedence of air emission limits is unlikely [9 lb/hr VOC limit (NR 419) and the 0.0408 lb/hr PCP limit (NR 445, <25 ft emission point)]. In addition, the contaminant of concern, pentachlorophenol, is not a volatile compound; only low levels of volatile compounds are present. Dust control measures will be taken if necessary during construction of the treatment cell. According to the Guidance on Air Sampling and Emission Monitoring, dated September 1, 1995, covered passive ventilation biopiles have no VOC limits.

Final Destination of Soil: The treated soil will be removed from the treatment cell and replaced on-site in an approved location with engineering or institutional controls as appropriate.

WATER DIVERSION SWALE
SLOPE AT 1% MINIMUM IN
DIRECTION OF ARROWS
(SEE FIGURE 8 FOR DETAIL)

APPROXIMATE AREA OF
CONSTRUCTED SEEPAGE CELL
FOR TREATED GROUNDWATER
(SEE FIGURE 8 FOR DETAIL)

TREATMENT CELL
LOCATION
130 FT. x 130 FT.

MATERIAL
PROCESSING AND
SOIL STAGING AREA

AREA #1
6-14' DEPTH

AREA #2A
5' DEPTH

AREA #2B
1' DEPTH

AREA #3
2-5' DEPTH

AREA #4
4-6' DEPTH

UPPER
WETLANDS
AREA

LOWER
WETLANDS
AREA

FORMER BURN AREA

FORMER
WOOD TREATMENT
ABOVE GROUND
STORAGE TANK

FORMER
PUMP
HOUSE

FORMER POLE DIPPING TANK

FORMER BOILER
HOUSE

SMALL GROWTH

SCATTERED
TREES & BRUSH
IN CLEARING

SILT
FENCE

SILT
FENCE

SILT
FENCE

SILT
FENCE

SILT FENCE

GATE

GATE

MILITARY CREEK
REFERENCE POINT
APPROX. LOCATION

MILITARY CREEK

STREAM FLOW

COUNTY "E"

REL. B.E.
+2.5'

REL. B.E.
+3'

REL. B.E.
0'

REL. B.E.
+1.5'

LEGEND

	ESTIMATED EXCAVATION EXTENT
B-15 (0.14)	BORING WITH PCP RESULTS
MW-12 (0.005)	BORING/MONITORING WELL WITH PCP RESULTS
PMW-14	PIEZOMETER WITH PCP RESULTS
HA-34 (0.77)	HAND AUGER BORING WITH PCP RESULTS
S-2 (79)	SURFACE SOIL SAMPLES WITH PCP RESULTS
TP-1	TEST PIT (BY NRT)
PCP	PENTACHLOROPHENOL
REL. B.E.	RELATIVE BASE ELEVATION

N

0 40 80 160

SCALE IN FEET

SOURCE NOTE:
THIS MAP WAS MODIFIED FROM DRAWING BY COLEMAN ENGINEERING COMPANY (CEC), IRON MOUNTAIN, MICHIGAN, DATED FEBRUARY 1997, JOB NO. 95042 A7 .

NOTE:
BASE MAP SURVEY COMPLETED BY CEC WITH ADDITIONAL INFORMATION OBTAINED FROM USDA-ASCS HISTORICAL AERIAL PHOTOGRAPHS, A 7/7/95 SITE VISIT WITH C M CHRISTIANSEN CO., AND A 5/21/96 FIELD INSPECTION.

SITE PLAN WITH ESTIMATED AREAS OF EXCAVATION

DESIGN REPORT AND PLAN OF OPERATION
C.M. CHRISTIANSEN COMPANY, INC.
FORMER POLE TREATMENT FACILITY
PHELPS, WISCONSIN

DRAWN BY: TAS	DATE: 6/12/98	
CHECKED BY: JHL	DATE: 6/12/98	
APPROVED BY: LJP	DATE: 6/12/98	

AUTOCAD FILE: 1226-B05.DWG

Natural Resource Technology

PROJECT NO.
1226-DR-3.5

DRAWING NO.
1226-B05

FIGURE NO.
2

Table 1 - Test Pit Analytical Summary
Soil Remedial Action Options Report
C.M. Christiansen Co., Inc. Former Pole Treatment Facility
Phelps, Wisconsin

Sample Location	Sample Depth (ft)	PCP (mg/kg)	
TP-1	1-4.5	2,.00	*
TP-1	5.5	0.76	
TP-2	1.5-3.5	0.95	*
TP-3	1.5-3.5	2.6	*
TP-4	1.5-4.5	290	*
TP-4	5.5	19	

Notes:
Samples were collected on November 6, 1997. Select samples were composited for purposes of remedial evaluation.

by: DVP
chkd by: SLF

* Samples located in Excavation Areas

Average PCP of * samples = 600 mg/kg

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	B-1001	B-1002	B-2001	B-2002	B-2001	NR 720
Depth (ft)	5-6	7.5-9	2.5-4	7.5-9	10-11.5	Standard
Pentachlorophenol (mg/Kg)	24.0	13.0	1.20	0.220	68.0	NS
Volatile Organic Compounds (ug/kg)						
Methylene Chloride	86	120	78	260	69	NS
1,1,1-Trichloroethane	ND	ND	280	ND	ND	NS
o-Xylene	35	ND	ND	ND	ND	4,100
Styrene	450	73	190	170	240	NS
Isopropylbenzene	ND	ND	ND	ND	76	ND
n-Propylbenzene	250	84	ND	ND	ND	NS
1,3,5- Trimethylbenzene	860	140	ND	ND	210	NS
t-Butylbenzene	500	ND	ND	ND	130	NS
1,2,4-Trimethylbenzene	3,000	300	ND	ND	510	NS
s-Butylbenzene	100	ND	ND	ND	ND	NS
p-Isopropyltoluene	81	ND	ND	ND	ND	NS
n-Butylbenzene	5,500	430	ND	ND	1,100	NS
Naphthalene	10,000	1,000	ND	ND	2,600	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Naphthalene	2,400	100	46	ND	1,100	NS
Acenaphthalene	ND	ND	22	ND	ND	NS
Acenaphthene	2,700	1,600	ND	ND	1,000	NS
Fluorene	3,800	2,200	24	ND	1,800	NS
Phenanthrene	6,300	3,800	290	ND	2,700	NS
Anthracene	ND	ND	44	ND	ND	NS
Fluoranthene	ND	ND	320	ND	ND	NS
Pyrene	430	260	340	ND	ND	NS
Benzo(a) anthracene	ND	ND	160	ND	ND	NS
Chrysene	ND	ND	210	ND	ND	NS
Benzo(b) fluoranthene	ND	ND	110	ND	ND	NS
Benzo(k) fluoranthene	ND	ND	110	ND	ND	NS
Benzo(a)pyrene	ND	ND	100	ND	ND	NS
Indeno(1,2,3-cd) pyrene	ND	ND	42	ND	ND	NS
Benzo(g,h,i) perylene	ND	ND	49	ND	ND	NS
Total PAH	15,630	7,960	1,367	ND	6,800	NS
Metals (mg/Kg)						
Arsenic	3.00	2.3	2.4	2.5	1.3	0.039
Barium	54	59	75	7.1	NA	NS
Copper	24	16	25	7.0	9.5	NS
Cadmium	0.04	0.04	0.58	0.06	0.03	8
Chromium (Total)	0.02	10.2	8.3	5.7	4.1	*
Lead	5.6	4.7	78	2.5	1.2	50
Selenium	1.6	0.8	1.0	0.5	0.3	NS
Silver	ND	ND	ND	ND	ND	NS
Zinc	29	23	15	13	14	NS
Nickel	20.6	10.8	10.0	7.4	6.3	NS

NOTE: Refer to the end of the table for footnotes.

* Samples located in Excavation Areas

Geom. Mean Total PAHs of * samples = 24 mg/kg

Average Total VOCs of * samples = 3 mg/kg

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	B-3002	B-4001	B-4001 DUP	B-4002	B-4003	NR 720
Depth (ft)	15-16.5	7.5-9	7.5-9	12.5-14	17.5-19	Standard
Pentachlorophenol (mg/Kg)	2.30	1.50	1,300	140	56.0	NS
Volatile Organic Compounds						
Methylene Chloride	180	ND	170	120	NA	NS
Ethylbenzene	ND	ND	64	ND	NA	2,900
m/p-Xylene	ND	50	ND	ND	NA	4,100
o-Xylene	ND	ND	200	ND	NA	4,100
Styrene	88	210	190	ND	NA	NS
1,3,5- Trimethylbenzene	ND	67	ND	150	NA	NS
t-Butylbenzene	77	ND	500	ND	NA	NS
1,2,4-Trimethylbenzene	ND	270	ND	540	NA	NS
n-Butylbenzene	140	310	98	500	NA	NS
Naphthalene	130	2,300	590	2,200	NA	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Acenaphthene	ND	220	ND	4,600	NA	NS
Fluorene	ND	380	ND	7,400	NA	NS
Phenanthrene	64	1,300	1,900	20,000	NA	NS
Anthracene	ND	170	ND	ND	NA	NS
Fluoranthene	ND	250	ND	2,300	NA	NS
Pyrene	ND	270	ND	2,500	NA	NS
Benzo(a) anthracene	ND	53	ND	ND	NA	NS
Chrysene	ND	96	ND	ND	NA	NS
Benzo(b) fluoranthene	ND	37	ND	ND	NA	NS
Benzo(k) fluoranthene	ND	30	ND	ND	NA	NS
Total PAH	64	2,806	1,900	36,800	NA	NS
Chlorinated Dioxins & Furans (ng/Kg)						
Total TCDF	NA	NA	13	NA	NA	NS
Total TCDD	NA	NA	22	NA	NA	NS
23478-PeCDF	NA	NA	38	NA	NA	NS
Total PeCDF	NA	NA	640	NA	NA	NS
12378-PeCDD	NA	NA	39	NA	NA	NS
Total PeCDD	NA	NA	210	NA	NA	NS
123678-HxCDF	NA	NA	140	NA	NA	NS
234678-HxCDF	NA	NA	240	NA	NA	NS
123789-HxCDF	NA	NA	200	NA	NA	NS
Total HxCDF	NA	NA	7,400	NA	NA	NS
123478-HxCDD	NA	NA	94	NA	NA	NS
123678-HxCDD	NA	NA	860	NA	NA	NS
123789-HxCDD	NA	NA	180	NA	NA	NS
Total HxCDD	NA	NA	3,000	NA	NA	NS
1234678-HpCDF	NA	NA	4,300	NA	NA	NS
1234789-HpCDF	NA	NA	550	NA	NA	NS
Total HpCDF	NA	NA	20,000	NA	NA	NS
1234678-HpCDD	NA	NA	18,000	NA	NA	NS
Total HpCDD	NA	NA	28,000	NA	NA	NS
Total OCDF	NA	NA	13,000	NA	NA	NS
Total OCDD (S)	NA	NA	110,000	NA	NA	NS
Total Dioxins & Furans	NA	NA	182,285	NA	NA	NS
Metals (mg/Kg)						
Arsenic	1.3	2.6	1.4	2.7	NA	0.039
Barium	11	38	29	NA	NA	NS
Copper	10	8.8	9.3	16	NA	NS
Cadmium	0.04	0.08	0.04	0.05	NA	8
Chromium (Total)	4.3	8.6	6.7	8.2	NA	*
Lead	1.3	5.5	2.2	2.0	NA	50
Selenium	0.3	1.1	0.3	0.4	NA	NS
Silver	0.010	0.005	ND	ND	NA	NS
Zinc	15	26	18.5	15	NA	NS
Nickel	6.1	10.8	9.1	11.5	NA	NS

NOTE. Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	B-7001	B-7002	B-8001	B-8002	B-9001	NR 720
Depth (ft)	7.5-9	15-16.5	5-6.5	20-21.5	2.5-4	Standard
Pentachloropnenol (mg/Kg)	0.004	0.012	0.004	0.004	12.0	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)	(ND)	(ND)	(ND)	(ND)	(ND)	NS

Sample ID	B-9002	B-10001A	B-10002A	B-11001	B-11002	NR 720
Depth (ft)	15-16.5	5-6.5	7.5-9	3.5-5	11.5-13	Standard
Pentachlorophenol (mg/Kg)	0.009	5.00	3.50	120	ND	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Acenaphthene	ND	ND	59	ND	ND	NA
Fluorene	ND	150	150	ND	ND	NA
Phenanthrene	ND	690	560	2,000	ND	NA
Anthracene	ND	ND	ND	1,000	ND	NA
Fluoranthene	ND	200	100	4,800	ND	NA
Pyrene	ND	230	110	6,100	ND	NA
Benzo(a) anthracene	ND	60	25	1,100	ND	NA
Chrysene	ND	100	39	3,700	ND	NA
Benzo(b) fluoranthene	ND	58	ND	2,400	ND	NA
Benzo(k) fluoranthene	ND	53	ND	1,600	ND	NA
Benzo(a)pyrene	ND	34	ND	ND	ND	NA
Total PAH	ND	1,575	1,043	22,700	ND	NA

Sample ID	B-13001	B-13002	B-13003	B-14001	B-14002	NR 720
Depth (ft)	5.5-7.5	11-13	13-14.5	2.5-4.5	20-22	Standard
Pentachlorophenol (mg/Kg)	14.00	5.60	2.30	0.034	0.005	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Naphthalene	NA	2,400	170	ND	ND	NS
Acenaphthene	NA	2,100	190	ND	ND	NS
Fluorene	NA	2,900	300	ND	ND	NS
Phenanthrene	NA	6,000	520	ND	ND	NS
Pyrene	NA	ND	46	ND	ND	NS
Total PAH	NA	13,400	1,326	ND	ND	NS
Metals (mg/Kg)						
Arsenic	NA	10.0	10.0	7.375	5.955	0.039
Barium	NA	45.0	48.0	13	13	NS
Copper	NA	50.0	5.00	22.750	13	NS
Chromium (Total)	NA	20.0	20.0	13.000	13.483	*
Lead	NA	6.00	4.00	1.500	0.674	50

Sample ID	B-15001	B-15002	B-16001	B-16002	B-17001	NR 720
Depth (ft)	0-2	17.5-19.5	5-7	12.5-14.5	7-9	Standard
Pentachlorophenol (mg/Kg)	0.140	ND	0.013	0.008	73.00	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)	(ND)	(ND)	(ND)	(ND)	(ND)	NS
Metals (mg/Kg)						
Arsenic	12.784	10.000	7.526	13.474	2.50	0.039
Barium	32	10	11	16	81	NS
Copper	21.546	34.405	15.876	21.895	ND	NS
Chromium (Total)	15.258	52.024	16.598	21.263	2.50	*
Lead	ND	4.286	1.237	ND	3.75	50

NOTE. Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	B-17002	B-17003	B-18001	B-18002	NR 720
Depth (ft)	12-14	17-19	2.5-4.5	9.5-11.5	Standard
Pentachlorophenol (mg/Kg)	0.530	0.012	0.990	ND	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)					
Benzo(a)pyrene	ND	200	ND	ND	NS
Total PAH	ND	200	ND	ND	NS
Metals (mg/Kg)					
Arsenic	2.97	2.30	3.08	3.29	0.039
Barium	61	11	76	8.5	NS
Copper	10.66	15.17	ND	16.90	NS
Chromium (Total)	34.55	29.54	3.85	29.58	*
Lead	2.16	2.18	20.00	4.46	50

Sample ID	B-19001	B-19002	B-19003A	B-19003B	B-20001	NR 720
Depth (ft)	2.5-4.5	12.5-14.5	7.5-9.5	7.5-9.5	2.5-4.5	Standard
Pentachlorophenol (mg/Kg)	0.047	ND	0.032	0.059	0.009	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Benzo(a)pyrene	ND	220	ND	ND	ND	NS
Total PAH	ND	220	ND	ND	ND	NS
Metals (mg/Kg)						
Arsenic	3.09	1.00	2.50	4.17	1.37	0.039
Barium	ND	22	ND	ND	22	NS
Copper	ND	2.81	ND	ND	3.62	NS
Chromium (Total)	8.25	15.63	5.00	2.78	11.73	*
Lead	9.28	1.40	11.25	6.94	3.37	50

Sample ID	B-20002	B-21001	B-21002	B-22001	B-22002	B-9A	NR 720
Depth (ft)	10-12	4.5-6.5	19.5-21.5	0-2	10-12	2-4	Standard
Pentachlorophenol (mg/Kg)	ND	0.002	0.009	0.030	ND	0.023	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)	(ND)	(ND)	(ND)	(ND)	(ND)	(ND)	NS
Metals (mg/Kg)							
Arsenic	1.93	1.38	2.58	2.33	1.63	2.95	0.039
Barium	16	18	10	21	13	16	NS
Copper	15.74	7.41	10.42	11.12	28.00	16.10	NS
Chromium (Total)	13.17	8.90	15.10	13.35	6.41	10.09	*
Lead	1.71	1.38	2.11	17.80	1.53	1.24	50

NOTE: Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	MW-5001	MW-5002	MW-6001	MW-6002	B-12/ MW-8001A	NR 720
Depth (ft)	0-1.5	4.5-6	5-6.5	10-11.5	0-2	Standard
Pentachlorophenol (mg/Kg)	0.056	0.002	0.250	0.780	340	NS
Volatile Organic Compounds (ug/Kg)						
Methylene Chloride	80	650	NA	NA	910	NS
Bromobenzene	ND	ND	NA	NA	1,200	NS
Naphthalene	ND	ND	NA	NA	25,000	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Phenanthrene	ND	ND	ND	ND	4,200	NS
Fluoranthene	ND	ND	ND	ND	750	NS
Pyrene	ND	ND	ND	ND	2,400	NS
Benzo(a)anthracene	ND	ND	ND	ND	500	NS
Total PAH	ND	ND	ND	ND	7,850	NS
Metals (mg/Kg)						
Arsenic	**2.8**	**2.2**	NA	NA	**1.2**	0.039
Barium	38	27	NA	NA	22	NS
Copper	36	15	NA	NA	588	NS
Cadmium	0.140	0.030	NA	NA	0.23	8
Chromium (Total)	24	17	NA	NA	10	*
Lead	8.2	3.7	NA	NA	4.7	50
Selenium	1.1	0.4	NA	NA	0.22	NS
Silver	ND	ND	NA	NA	5.5	NS
Zinc	45	20	NA	NA	24	NS
Nickel	10.6	9.4	NA	NA	NA	NS

Sample ID	B-12/ MW-8001B	B-12/ MW-8002	B-12/ MW-8003	MW-9001	MW-9002	NR 720
Depth (ft)	0-2	12-14	10-12	5-7	17.5-19.5	Standard
Pentachlorophenol (mg/Kg)	220	0.049	0.670	ND	ND	NS
Volatile Organic Compounds (ug/Kg)						
Methylene Chloride	570	NA	130	NA	NA	NS
Benzene	**400**	NA	ND	NA	NA	5.5
1,2-Dichloroethane	ND	NA	570	NA	NA	4.9
Toluene	1,400	NA	1,500	NA	NA	1,500
Chlorobenzene	ND	NA	140	NA	NA	NS
Isopropylbenzene	740	NA	ND	NA	NA	NS
n-Propylbenzene	590	NA	ND	NA	NA	NS
Naphthalene	21,000	NA	ND	NA	NA	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Phenanthrene	ND	ND	ND	ND	ND	NS
Fluoranthene	ND	ND	ND	ND	ND	NS
Pyrene	1,100	ND	ND	ND	ND	NS
Benzo(a) anthracene	ND	ND	ND	ND	ND	NS
Total PAH	ND	ND	ND	ND	ND	NS
Metals (mg/Kg)						
Arsenic	**0.300**	NA	NA	**10.575**	**6.528**	0.039
Barium	NS	NA	14	22	21	NS
Copper	365	NA	NA	26.897	24.028	NS
Cadmium	0.170	NA	NA	NA	NA	8
Chromium (Total)	12	NA	NA	13.908	22.778	*
Lead	5.4	NA	NA	ND	1.806	50
Selenium	0.38	NA	NA	NA	NA	NS
Silver	1.5	NA	NA	NA	NA	NS
Zinc	29	NA	NA	NA	NA	NS

NOTE. Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	MW-10001	MW-12001	MW-12002	MW-12003	NR 720
Depth (ft)	4-6	5-7	15-17	22.5-24.5	Standard
Pentachlorophenol (mg/Kg)	0.120	ND	0.005	ND	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)					
Naphthalene	580	ND	NA	NA	NS
Acenaphthene	110	ND	NA	NA	NS
Fluorene	130	ND	NA	NA	NS
Phenanthrene	150	ND	NA	NA	NS
Fluoranthene	44	ND	NA	NA	NS
Pyrene	120	ND	NA	NA	NS
Benzo(a)pyrene	490	ND	NA	NA	NS
Total PAH	1,624	ND	NA	NA	NS
Metals (mg/Kg)					
Arsenic	**8.519**	**11.134**	NA	NA	0.039
Barium	180	16.016	NA	NA	NS
Copper	47.407	25.155	NA	NA	NS
Chromium (Total)	22.963	5.567	NA	NA	*
Lead	5.556	ND	NA	NA	50

Sample ID	MW-13001	MW-13002	MW-13003A	MW-13003B	NR 720
Depth (ft)	2.5-4.5	10-12	15-17	15-17	Standard
Pentachlorophenol (mg/Kg)	1,200	0.096	0.036	0.028	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)					
Pyrene	4,800	ND	ND	ND	NS
Benzo(a)pyrene	ND	330	ND	ND	NS
Total PAH	4800	330	ND	ND	NS
Metals (mg/Kg)					
Arsenic	**15.584**	**10.132**	3.140	2.289	0.039
Barium	22	13	10	6.1	NS
Copper	25.325	5.132	8.605	10.843	NS
Chromium (Total)	22.597	19.605	8.488	10.602	*
Lead	26.234	2.763	2.093	10.964	50

NOTE: Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	HA-1001	HA-2001	HA-3001	HA-3002	HA-4001	HA-5001	NR 720
Depth (ft)	2-2.5	2-2.8	2-2.5	3-3.5	1.5-2	1.7-2.3	Standard
Pentachlorophenol (mg/Kg)	4.30	1,700	0.24	16.0	4.10	9.40	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)							
Naphthalene	82	10,000	ND	1,800	ND	ND	NS
Acenaphthalene	59	ND	ND	ND	ND	ND	NS
Acenaphthene	ND	21,000	ND	300	ND	ND	NS
Fluorene	ND	24,000	ND	500	ND	ND	NS
Phenanthrene	180	42,000	ND	320	ND	ND	NS
Anthracene	150	ND	ND	ND	ND	300	NS
Fluoranthene	1,700	9,000	ND	ND	ND	210	NS
Pyrene	2,300	34,000	ND	ND	ND	310	NS
Benzo(a)anthracene	660	4,400	28	ND	ND	ND	NS
Chrysene	880	8,600	62	ND	ND	ND	NS
Benzo(b) fluoranthene	670	ND	ND	ND	ND	220	NS
Benzo(k) fluoranthene	680	ND	43	ND	ND	160	NS
Benzo(a) pyrene	430	ND	ND	ND	ND	ND	NS
Indeno(1,2,3-cd) pyrene	140	ND	ND	ND	ND	ND	NS
Total PAH	7,931	153,000	133	2,920	ND	1,200	NS

Sample ID	HA-6001A	HA-6001B	HA-7001	HA-7002	HA-3001	NR 720
Depth (ft)	0.8-1.3	0.8-1.3	0.1-0.8	1.3-2	2.7	Standard
Pentachlorophenol (mg/Kg)	9.60	14.4	11,000	44,000	3.00	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Acenaphthene	ND	ND	280,000	28,000	ND	NS
Fluorene	ND	ND	460,000	40,000	ND	NS
Phenanthrene	ND	ND	950,000	80,000	ND	NS
Anthracene	ND	ND	ND	8,300	ND	NS
Fluoranthene	ND	ND	ND	3,000	ND	NS
Pyrene	ND	ND	75,000	8,100	ND	NS
Chrysene	ND	ND	ND	2,300	ND	NS
Total PAH	ND	ND	1,765,000	169,700	ND	NS

Sample ID	HA-9002	HA-10001	HA-11001	HA-12001	HA-13002	NR 720
Depth (ft)	0.3-0.8	1.3	1	0.5-0.7	1.25-2.2	Standard
Pentachlorophenol (mg/Kg)	13.0	0.89	1.20	14.0	14.0	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Phenanthrene	230	ND	ND	40	ND	NS
Anthracene	ND	ND	ND	18	ND	NS
Fluoranthene	250	ND	ND	21	ND	NS
Pyrene	840	ND	ND	31	ND	NS
Benzo(a)anthracene	ND	ND	ND	27	ND	NS
Chrysene	260	ND	ND	28	ND	NS
Total PAH	1,580	ND	ND	165	ND	NS

NOTE: Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	HA-14002	HA-15002	HA-16001	HA-17001A	HA-17001B	NR 720
Depth (ft)	2.2-2.7	3-5	1.25-2	0-0.8	0-0.8	Standard
Pentachlorophenol (mg/Kg)	8.30	30.0	16.0	140	130	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Fluorene	ND	ND	150	ND	ND	NS
Fluoranthene	ND	ND	ND	160	560	NS
Pyrene	ND	ND	ND	3,700	11,000	NS
Total PAH	ND	ND	150	3,860	11,560	NS

Sample ID	HA-17002	HA-18002	HA-19001A	HA-19001B	HA-19002	NR 720
Depth (ft)	2.4-3.2	2.1-2.7	0.2-1	0.2-1	2.3-3	Standard
Pentachlorophenol (mg/Kg)	82,000	3.30	13.0	18.0	1,300	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Naphthalene	220,000	ND	ND	ND	38,000	NS
Acenaphthene	100,000	ND	ND	ND	ND	NS
Fluorene	160,000	ND	ND	ND	ND	NS
Phenanthrene	570,000	ND	180	280	70,000	NS
Fluoranthene	24,000	ND	ND	ND	27,000	NS
Pyrene	110,000	ND	1,300	1,400	150,000	NS
Benzo(a)anthracene	17,000	ND	ND	ND	18,000	NS
Chrysene	31,000	ND	320	510	38,000	NS
Total PAH	1,232,000	ND	1,800	2,190	341,000	NS

Sample ID	HA-20001	HA-21002	HA-22	HA-23	HA-24	NR 720
Depth (ft)	0.8-1.7	2.25-3	2.1-2.8	2.1-2.8	1-1.7	Standard
Pentachlorophenol (mg/Kg)	3.30	4.10	0.007	0.052	0.023	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Naphthalene	ND	57	ND	ND	ND	NS
Acenaphthalene	ND	45	ND	ND	ND	NS
Acenaphthene	42	ND	ND	ND	ND	NS
Phenanthrene	49	110	ND	ND	ND	NS
Anthracene	92	65	ND	ND	ND	NS
Fluoranthene	170	230	ND	ND	ND	NS
Pyrene	200	260	ND	ND	ND	NS
Benzo(a)anthracene	85	110	ND	ND	ND	NS
Chrysene	250	210	ND	ND	ND	NS
Benzo(b) fluoranthene	200	220	ND	ND	ND	NS
Benzo(k) fluoranthene	130	180	ND	ND	ND	NS
Benzo(a) pyrene	140	130	ND	ND	ND	NS
Indeno(1,2,3-cd) pyrene	100	ND	ND	ND	ND	NS
Benzo(g,h,i) perylene	120	ND	ND	ND	ND	NS
Total PAH	1,578	1,617	ND	ND	ND	NS
Metals (mg/Kg)						
Arsenic	NA	NA	14.525	5.556	0.59	0.039
Barium	NA	NA	31.0	24.0	100	NS
Copper	NA	NA	3.571	4.198	0.71	NS
Chromium (Total)	NA	NA	15.476	9.259	3.32	*
Lead	NA	NA	3.333	3.086	1.18	50

NOTE: Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	HA-25	HA-26	HA-27	HA-28	HA-29	NR 720
Depth (ft)	0-1.7	0-1.3	0-0.7	0-0.7	0-1.3	Standard
Pentachlorophenol (mg/Kg)	0.180	0.049	360	470	80.0	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Acenaphthalene	ND	ND	ND	68	ND	NS
Phenanthrene	ND	ND	110	100	190	NS
Anthracene	ND	ND	ND	140	ND	NS
Fluoranthene	ND	ND	120	190	240	NS
Pyrene	ND	ND	170	230	230	NS
Chrysene	ND	ND	130	170	170	NS
Benzo(b) fluoranthene	ND	ND	190	230	180	NS
Total PAH	ND	ND	720	1,128	1,010	NS
Metals (mg/Kg)						
Arsenic	**4.08**	**2.31**	**4.50**	**5.91**	**3.58**	0.039
Barium	ND	120	82	73	3,400	NS
Copper	1.02	3.47	15.31	22.33	23.16	NS
Chromium (Total)	2.04	4.05	13.96	20.69	6.53	*
Lead	7.14	6.36	23.87	26.60	15.37	50

Sample ID	HA-30	HA-31	HA-32	HA-33	HA-34	NR 720
Depth (ft)	0-1.4	3.0-3.3	1.5-2.5	0.9-1.7	1.7-2.5	Standard
Pentachlorophenol (mg/Kg)	260	0.003	ND	9.30	0.770	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Phenanthrene	ND	NA	ND	84	ND	NS
Fluoranthene	190	NA	ND	ND	ND	NS
Pyrene	300	NA	ND	ND	ND	NS
Benzo(a)antnracene	270	NA	ND	ND	ND	NS
Chrysene	300	NA	ND	ND	ND	NS
Benzo(b) fluoranthene	300	NA	ND	ND	ND	NS
Benzo(k) fluoranthene	220	NA	ND	ND	ND	NS
Benzo(a) pyrene	ND	NA	19	ND	ND	NS
Benzo(g,h,i) perylene	ND	NA	100	ND	ND	NS
Total PAH	1,580	NA	119	84	ND	NS
Metals (mg/Kg)						
Arsenic	**2.26**	NA	NA	NA	NA	0.039
Barium	180	NA	NA	NA	NA	NS
Copper	18.12	NA	NA	NA	NA	NS
Chromium (Total)	4.21	NA	NA	NA	NA	*
Lead	6.47	NA	NA	NA	NA	50

Sample ID	HA-35	HA-35 DUP.	HA-36	HA-36 DUP.	HA-37	NR 720
Depth (ft)	0.7-1.5	0.7-1.5	0.7-1.7	0.7-1.7	0.6-1.7	Standard
Pentachlorophenol (mg/Kg)	13.0	8.90	2.20	NA	0.880	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)						
Phenanthrene	93	NA	ND	ND	ND	NS
Fluoranthene	ND	NA	ND	ND	80	NS
Pyrene	110	NA	ND	ND	100	NS
Benzo(a)anthracene	ND	NA	ND	ND	110	NS
Chrysene	ND	NA	ND	ND	120	NS
Benzo(b) fluoranthene	ND	NA	ND	ND	100	NS
Benzo(k) fluoranthene	ND	NA	ND	ND	73	NS
Total PAH	93	NA	ND	ND	583	NS

NOTE: Refer to the end of the table for footnotes.

Table 6
Soil Sample Results
CMC Co. Pole Treatment Facility
Phelps, Wisconsin

Sample ID	S-1001	S-2001	S-3001	NR 720
Depth (ft)	0.3-0.6	0.5	0.5	Standard
Pentachlorophenol (mg/Kg)	750	79.0	0.240	NS
Polynuclear Aromatic Hydrocarbons (ug/Kg)				
Acenaphthalene	2,400	ND	ND	NS
Phenanthrene	4,800	ND	ND	NS
Fluoranthene	25,000	1,000	ND	NS
Pyrene	34,000	2,800	ND	NS
Benzo(a)anthracene	3,200	ND	ND	NS
Chrysene	14,000	ND	28	NS
Benzo(b) fluoranthene	4,400	ND	62	NS
Benzo(k) fluoranthene	2,600	ND	ND	NS
Benzo(a) pyrene	ND	ND	43	NS
Total PAH	90,400	3,800	133	NS

Note: 1. Only those parameters detected are identified in the above Table. Refer to Table 1 in Section III.A. for complete analyte list
2. Soil samples with suffixed Sample ID such as B-19003A and B-19003B were collected as duplicated samples.
3. Bold lettering denotes concentrations which exceed NR 720 Standards.

Footnotes:
ND - Not Detected
NA - Not Analyzed
NS - No Standard
(ND) - Not Detected for Specific Scan
B-1001 - Soil Boring Samples
MW-1001 - Monitoring Well Boring Samples
HA-1001 - Hand Auger Boring Samples
S-1001 - Surface Soil Samples
NR 720 Standard - As found in Wisconsin Administrative Code NR 720
mg/Kg - Milligram per kilogram or parts per million
ug/Kg - Microgram per kilogram or parts per billion
ng/Kg - Nanogram per kilogram or parts per trillion
DUP - Duplicate Sample

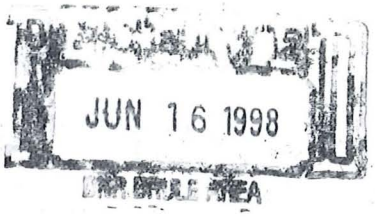
*NR 720 standard for chromium, hexavalent, is 14 mg/Kg. The standard for chromium, trivalent, is 16,000 mg/Kg.

Estimated Influent Concentrations to Carbon Treatment System
Former Pole Treatment Facility
Phelps, Wisconsin

Sample ID	Date	Pentachlorophenol (µg/L)	Volatile Organic Compounds (µg/L)												Polynuclear Aromatic Hydrocarbons (µg/L)							
			Toluene	Xylenes (total)	n-Propylbenzene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	n-Butylbenzene	1,1,1-Trichloroethane	1,2,4-Trichlorobenzene	Hexachlorobutadiene	Naphthalene	1,2,3-Trichlorobenzene	Total VOCs	Acenaphthene	Dibenzo (a,h) anthracene	Flouranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
MW-7	9/14/95	960	1.2	2.2	nd	1.6	4.9	nd	4.3	2.8	1.5	1.2	16	1.8	37.5	7 J	nd	nd	12 J	nd	21	3	40
(dup.)	9/14/95	1,500	nd	2.0	nd	1.5	4.9	nd	4.1	nd	nd	nd	16	1.3	29.8	9 J	nd	2	16 J	nd	31	4	62
	12/15/95	5,200	2	13	1	4	16	1	7	nd	nd	nd	36	nd	80	16	nd	nd	28	nd	45	nd	89
	AVERAGE	**2553.3**	**1.6**	**5.7**	**1.0**	**2.4**	**8.6**	**1.0**	**5.1**	**2.8**	**1.5**	**1.2**	**22.7**	**1.6**	**49.1**	**16.0**	**nd**	**2.0**	**28.0**	**nd**	**38.0**	**3.5**	**63.7**

Natural Resource Technology, Inc.

N R T



June 12, 1998
(1226/3.6)

Mr. Don Miller
Wisconsin Department of Natural Resources
107 Sutliff Avenue
P.O. Box 818
Rhinelander, WI 54501

RE: Variance Request for Soil Remediation Project
C.M. Christiansen Company, Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Miller:

Attached for your review is a hazardous waste treatment variance request for the above referenced remediation project. This request is submitted on behalf of C.M. Christiansen Co., Inc. (CMC) for remediation of soils at the former wood pole treatment facility in Phelps, Wisconsin. The attached Design and Plan of Operation Report provides supporting information consistent with the requirements of NR 680.50. A review fee will be submitted under separate cover by a CMC representative. Please do not hesitate to call should you have any questions as you review this request.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Julie A. Griswold KMZ
Julie A. Griswold, P.E.
Project Engineer

Laurie J. Parsons
Laurie J. Parsons, P.E.
Senior Environmental Engineer

Encl: Hazardous Waste Treatment Variance Request
Design and Plan of Operation Report

cc Mr. Chris Saari, Wisconsin Department of Natural Resources, Brule Office
Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.
Mr. Eric Christiansen, C. M. Christiansen Company, Inc.

w:\soil\1226 Variance cov.ltr

Natural
Resource
Technology, Inc.

N R T

HAZARDOUS WASTE TREATMENT VARIANCE REQUEST

FORMER POLE TREATMENT FACILITY
COUNTY E
PHELPS, WISCONSIN

Project No: 1226

Prepared For:

C.M. Christiansen Co., Inc.
P.O. Box 100
Phelps, WI 54554

Prepared By:

Natural Resource Technology, Inc.
23713 W. Paul Road, Unit D
Pewaukee, WI 53072

June 12, 1998

WISCONSIN
JULIE A. GRISWOLD
E-31,452
Germantown
WI
PROFESSIONAL ENGINEER

Julie A. Griswold, P.E.
Environmental Engineer

"I, Julie A. Griswold, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

WISCONSIN
LAURIE J. PARSONS
E-27812
Hartford,
WI
PROFESSIONAL ENGINEER

Laurie J. Parsons, P.E.
Sr. Environmental Engineer

"I, Laurie J. Parsons, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code."

Hazardous Waste Treatment Variance Request
Former Pole Treatment Facility
County E
Phelps, Wisconsin

C.M. Christiansen Company, Inc. (CMC) requests a variance from the hazardous waste treatment requirements of Chapters NR 600 to 685, Wis. Adm. Code, and s. 291.23 through 291.33 Stats., for the storage and treatment of pentachlorophenol (PCP) contaminated soil at the Former Pole Treatment facility because without a variance, undue and unreasonable hardship would be imposed. This request is made consistent with the provisions of NR 680.50, Wis. Adm. Code and includes the following submittals:

- Statement of Undue and Unreasonable Hardship per NR 680.50 (contained herein)
- Feasibility Report and Plan of Operation in accordance with NR 680.06 (separate document)
- Review Fee of $1,200 per NR 680.45 (to be submitted under separate cover)

General Facility Information

Site Owner:	C.M. Christiansen Company, Inc. P.O. Box 100 Phelps, WI 54554 Site Contact: Mr. Eric R. Christiansen 715/545-2333
Site Location :	County E Phelps, WI Vilas County Part of government lot 3 and Northeast ¼ of the Southwest ¼ all in Section 35, T42N, R11E
BRR Case #: EPA ID #:	02-64-000068 WID998639035
Consultant:	Natural Resource Technology, Inc. 23713 West Paul Road, Unit D Pewaukee, WI 53072 Contact: Ms. Laurie Parsons. P.E. 414/523-9000

Natural Resource Technology

N R T

Brief Site History

Pole-dipping operations at the site began in the 1950s. The use of pentachlorophenol (PCP) in wood treating solution ended in the late 1970s. The operations involved treating wood telephone poles and posts to retard biological decay. The treating solution consisted of #2 fuel oil mixed with approximately 5 percent PCP. The pre-mixed solution was shipped to the site via rail cars or tanker trucks. The solution was stored onsite, and used in a dip tank for treatment. The solution from the dip-tank was recirculated for re-heating and re-use through a boiler house.

Historical activities at the facility resulted in releases of treatment product in localized areas of the site which were discovered and investigated between 1987 and 1997. Currently, the facility is decommissioned and vacant.

Previous Investigations

Previous environmental investigation activities pertinent to soil and groundwater contamination conducted at the site include:

- Wisconsin Department of Natural Resources, Preliminary Assessment, USEPA ID # WID998639035, 1993.
- Wisconsin Department of Natural Resources, Screening Site Inspection, USEPA ID # WID998639035, 1993 (actual date not listed on report).
- Various Coleman Engineering Co. correspondence and data transmittals to WDNR on behalf of CMC, 1995-1996.
- Coleman Engineering Company, Site Investigation Report, February 1997.
- Natural Resource Technology, February 27, 1998 letter transmitting test pit investigation and supplemental groundwater data.
- Natural Resource Technology, Remedial Action Options Report, May 15, 1998.

Results of the soil and groundwater investigations performed to date are summarized in the above reports. Significant additional investigation was performed as is ongoing related to the sediments in Military Creek.

Reasons for Variance Request

Remediation of PCP contaminated soil will be performed at this site. Remediation activities will consist of excavating approximately 2,500 cubic yards of soil, stockpiling the soil, mixing soil with nutrient amendments, and constructing one on-site biological treatment cell to treat the soil. The soil remediation process will treat potentially hazardous waste. Under existing rules, the site

could be classified as a hazardous waste treatment facility if levels of PCP in soil are characteristically hazardous. In that case, a license per NR 600-685 would be required.

As stated under NR 680.50, the use of the variance authority of the WDNR is intended to promote activities such as the cleanup of hazardous waste contamination. This request is consistent with the intent of NR 680.50 if the soil is treated under the terms of a variance. Awaiting the issuance of a license to treat hazardous waste would cause undue and unreasonable hardship due to delays involved in obtaining such licensing. The following factors further support this request:

- Treatment under the variance would be on a one-time basis;
- CMC no longer operates the wood treating facility and does not have the financial resources to obtain a hazardous waste license for a one-time only remediation;
- CMC has consented to a Spill Response Agreement, dated April 17, 1998, with the WDNR which requires timely action with respect to remediation activities;
- The most effective option for soil remediation was determined through a NR 722 assessment and that is to excavate and treat the material on-site; and,
- The design and plan of operation for the treatment will include sufficient containment of the waste in accordance with NR 655 (Waste Pile Standards) such that granting a variance will not result in harm to human health or the environment.

Natural
Resource
Technology, Inc.

N R T

June 12, 1998
(1226/3.6)

Mr. Jim Hansen
Area Wastewater Specialist
Wisconsin Department of Natural Resources
875 South 4th Avenue
Park Falls, WI 54552

RE: Application for WPDES Permit for Temporary Remedial Action
C.M. Christiansen Company, Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035, BRR Case # 02-64-000068

Dear Mr. Hansen:

Natural Resource Technology Inc. is submitting the attached application on behalf of C.M. Christiansen Co., Inc. for temporary treatment and discharge of groundwater at the above referenced former wood pole treatment facility in Phelps, Wisconsin. We initially contacted Steve Ohm of the Rhinelander office regarding this issue and he indicated we should submit the application to you. Details of the proposed remedial actions requiring a general WPDES permit are explained in the attached permit and in design documents recently submitted to Mr. Chris Saari, the WDNR project manager we are working with on this case.

Please do not hesitate to call should you have any questions or require additional information as you review this application.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Julie A. Griswold, P.E.
Project Engineer

Laurie J. Parsons, P.E.
Senior Environmental Engineer

Encl: WPDES Permit Application and Attachments

cc Mr. Chris Saari, Wisconsin Department of Natural Resources, Brule Office
Mr. Steve Ohm, Wisconsin Department of Natural Resources, Rhinelander
Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.
Mr. Eric Christiansen, C. M. Christiansen Company, Inc.

w:\soil\1226 WPDES Permit Cov.ltr

Date Received _____
(Leave blank)

APPLICATION FOR ISSUANCE OF

Wisconsin Pollutant Discharge Elimination System (WPDES)
Wastewater Discharge Permit for
Contaminated Groundwater from Remedial Action Operations

(Revised 11-19-96)

Please type or print required informanon, except for the signature.

I. GENERAL INFORMATION

A. 1. Name of Facility/Project: C.M. Christiansen Co., Inc., Former Pole Treatment Facilit

2. Location Address: County E

Phelps, Wisconsin 54554

(Number and Street, City, Town or Village) or
(Highway or Road with Distance and Direction from nearest City)

3. County and TRS: Vilas, Northeast 1/4 of Southwest 1/4 Section 35, T42N, R11E

(Give quarter-quarter, Section, Town, and Range Description)

4. Official Representative's Name: ERIC R CHRISTIANSEN Title: PRESIDENT

(Person signing this form if he/she is located at this facility's address)

B. Individual, parent company, or organization with direct control over the facility. Enter full official legal name of the owner or parent company, if there is one, the mailing address, and the name and title of the official representative (responsible party) signing this application if he/she is located at address of parent company.

1. Owner/Company Name: C.M. Christiansen Co., Inc.

2. Mailing Address: P.O. Box 100, Phelps, WI 54554

(Number and Street, Box and/or Route, City, State, Zip Code)

3. Official Representative's Name: Mr. Eric R. Christiansen Title: President

(Person signing this form if he/she is located at the address of parent company)

4. Responsible Party's Name: _____ Title: _____

(If different from official representative)

C. 1. Consulting Firm: Natural Resource Technology, Inc.

2. Mailing Address: 23713 W. Paul Road, Pewaukee, WI 53072

(Number and Street, Box and/or Route, City, State, Zip Code)

3. Contact's Name: Ms. Laurie Parsons Title: Senior Environmental Engineer

D. Name of Person to Receive Discharge Monitoring Report Forms from Department:

Ms. Laurie Parsons

E. Name of DNR Environmental Response & Repair Program Manager for this Project:

Mr. Christopher Saari, Brule Area Headquarters

II. SPECIFIC INFORMATION ON PROJECT

A. Pollutants

1. The suspected sources of the pollutants (estimate quantity of material released and activities that contributed to the contamination): Former wood treating site. Wood telephone poles were dipped in a treating solution consisting of #2 fuel oil mixed with 5 percent pentachlorophenol (PCP).

2. Check all fuel and waste types suspected in the contamination at this site:

_____ Unleaded Gasoline	_____ Jet Fuel	_____ Pesticides
_____ Leaded Gasoline	_____ Waste Oil	_____ Fertilizers
_____ Diesel Fuel	_____ Solvents	
_____ Heating Oil	__X__ Other: Fuel Oil, Chlorinated Organics (PCP)	

3. Check all pollutants identified at this site: (Also see attached tables)

_____ BETX (Benzene, Ethylbenzene, Toluene, Xylene)	_____ Pesticides/Fertilizers
__X__ PAHs (Polynuclear aromatic hydrocarbons)	_____ Total Recoverable Lead *
__X__ VOCs (Volatile Organic Chemicals)	__X__ Other Chlorinated Organics (PCP)

* Include upstream receiving water hardness analysis if lead is detected.

B. Treatment

1. Describe the proposed treatment system: During soil excavation activies, temporary dewatering will occur in Excavation Area #1 near MW-7 (see site plan). Water will be pumped from a sump in the excavation to an oil/water separator tank. Water will then be pumped through two bag filters in parallel and 2-750 to 1,000lb granular activated carbon units in series. A totalizing flow meter will measure the volume of water treated.

2. Identify any additives to be used for cleaning, softening, or descaling of the treatment system. Provide Material Safety Data Sheets. None

3. Anticipated discharge startup and duration: Summer 1998, 1 week duration

4. Anticipated rate and volume of treated water to be discharged: 50 gpm; 100,000 gallons total

5. Proposed discharge location: An on-site contructed seepage cell (see attached figures for location and details/dimensions).

6. Is an air permit from the DNR air management program required? If not, why not? No, not required.

III. DISCHARGE MANAGEMENT PLAN

Include the following information:

1. A **summary** of analytical results for contaminants detected at the site. Attached

2. The results from the most recent volatile organic compounds (VOC) scan, including methods used and detection levels. Laboratory Reports – Provided upon request

3. The results from an analysis of the following polynuclear aromatic hydrocarbons (PAHs), including methods used and detection levels: Laboratory Reports – Provided upon request

benzo(a)anthracene	dibenzo(a,h)anthracene
benzo(a)pyrene	fluoranthene
benzo(b)fluoranthene	indeno(1,2,3-cd)pyrene
benzo(g,h,i)perylene	naphthalene
benzo(k)fluoranthene	phenanthrene
chrysene	pyrene

The lab should attempt to reach the lowest detection level achievable for each parameter because of the low limit for total PAHs. (EPA test method SW-846 8310 is recommended)

4. The contaminants proposed for periodic monitoring and demonstration of why any monitoring required in the permit should be exempted due to low level of contaminants in the wastewater discharge. NA

5. Information to support request for any alternate effluent limit for discharges to groundwater (Part E. of permit) or request for temporary exemption for in-situ discharges (Part F. of permit). See attached sheet.

6. Plans and specifications of the proposed treatment system identifying sampling points; for supplier furnished package treatment units: only a flow diagram, design summary, and unit sizing calculations are required. See equipment specifications and carbon usage calculation provided.

7. A site plan that identifies general land uses, UST's and pipelines, groundwater monitoring and recovery wells, contaminant plume definition and zone of influence, other known spills in the area, septic tanks and drain fields, separation distances to potable water supply wells and residences, and other pertinent information. See attached figures.

8. A detailed map of the proposed discharge location, showing if discharge is direct or via a storm sewer or other conveyance. Indicate distance from site to discharge location and other impacted water bodies or wetlands. See attached figures.

   - If a city storm sewer is used, approval from the municipality is required.

   - If a new outfall structure is proposed, the plans should identify the outfall and incorporate appropriate erosion control methods. A permit for riprap projects (available at most DNR offices) should be obtained.

   - Wetland discharges are not allowed unless they meet wetland protection requirements of Ch. NR 103, Wis. Admin. Code.

III. SIGNATURES

A. Signature of person completing the form, attesting to the accuracy and completeness of the statements made.

Julie A. Driscoll NRT | Environmental Engineer | 6/12/98

Name | Title | Date Signed

23713 W. Paul Rd, Pewaukee, WI 53072 | (414) 523-9000

Address | Telephone Number

B. This application must be signed by the official representative of the permitted facility (responsible party) who is: the owner, the sole proprietor for a sole proprietorship, a general partner for a partnership, or by a ranking elected official or other duly authorized representative for a unit of government, or an executive officer of at least the level of vice president for a corporation, having overall responsibility for the operation of the facility. If the application is not signed, or is found to be incomplete, it will be returned.

ERIC R. CHRISTIANSEN | PRESIDENT

Typed or Printed Name of Official Representative | Title

Signature of Official Representative | 6-12-98

Date Signed

Please submit the application to the DNR district office nearest you, or to:
Department of Natural Resources, WPDES Permit Applications-WT/2,
P.O. Box 7921, Madison, WI 53707

A copy of the submittal should also be sent to the Department LUST or ERF Project Manager.

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C.M. Christiansen Co., Inc.
June 12, 1998
WPDES Permit Application

Additional Information for the WPDES Permit Application

- Floating product is present at monitoring well MW-7 at a thickness between 0.005 to 0.65 feet. An oil/water separator tank will be used to separate any free product which is pumped from the excavation. Free product separated (if any) and removed will be containerized and treated/disposed off-site as hazardous waste.

- Discharge Management Plan Item 5 - CMC requests that an alternate effluent limit using the NR 140 enforcement standard (1 ug/L) in lieu of the preventive action limit (0.1 ug/L) be established for pentachlorophenol. This request is based on the temporary nature of the discharge and the fact that the constructed seepage cell is located directly up-gradient of the excavation dewatering area (treated water which is discharged will be recaptured). Also, the detection limit for semi-volatile method 8270 is typically greater than 1 ug/L.

- The seepage cell will be located near existing monitoring well MW-12. Hydraulic conductivity data and the soil boring log for MW-12 is attached for reference.

- The effluent sampling point will be located after both granular activated carbon units just prior to discharge.

[w:/1226/permits]

WATER DIVERSION SWALE
SLOPE AT 1% MINIMUM IN
DIRECTION OF ARROWS
(SEE FIGURE 8 FOR DETAIL)

APPROXIMATE AREA OF
CONSTRUCTED SEEPAGE CELL
FOR TREATED GROUNDWATER
(SEE FIGURE 8 FOR DETAIL)

TREATMENT CELL
LOCATION
130 FT. x 130 FT.

MATERIAL
PROCESSING AND
SOIL STAGING AREA

AREA #1
6-14' DEPTH

AREA #2A
5' DEPTH

AREA #2B
1' DEPTH

AREA #3
2-5' DEPTH

AREA #4
4-6' DEPTH

SILT FENCE

UPPER
WETLANDS
AREA

LOWER
WETLANDS
AREA

FORMER BURN AREA

FORMER POLE DIPPING TANK

FORMER BOILER HOUSE

FORMER PUMP HOUSE

FORMER 20,000 GAL WOOD TREATMENT ABOVE GROUND STORAGE TANK

SMALL GROWTH

SCATTERED TREES & BRUSH IN CLEARING

GATE

MILITARY CREEK

MILITARY CREEK
REFERENCE POINT
APPROX. LOCATION

STREAM FLOW

COUNTY "E"

REL. B.E. +3'

REL. B.E. +2.5'

REL. B.E. +1.5'

REL. B.E. 0'

MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7 MW-8 MW-9 MW-10 MW-11 MW-12 MW-13

PMW-14

B-1 B-1A B-2 B-2A B-3 B-3A B-4 B-7 B-7A B-8 B-9 B-9A B-10 B-10A B-11 B-12 B-12A B-13 B-14 B-15 B-16 B-17 B-18 B-19 B-20 B-21 B-22

HA-1 HA-2 HA-3 HA-4 HA-5 HA-6 HA-7 HA-8 HA-9 HA-10 HA-11 HA-12 HA-13 HA-14 HA-15 HA-16 HA-17 HA-17A HA-18 HA-19 HA-20 HA-21 HA-22 HA-23 HA-24 HA-25 HA-26 HA-27 HA-28 HA-29 HA-30 HA-31 HA-32 HA-33 HA-34 HA-35 HA-36 HA-37

S-1 S-2 S-3

TP-1 TP-2 TP-3

LEGEND

	ESTIMATED EXCAVATION EXTENT
B-15 (0.14)	BORING WITH PCP RESULTS
MW-12 (0.005)	BORING/MONITORING WELL WITH PCP RESULTS
PMW-14	PIEZOMETER WITH PCP RESULTS
HA-34 (0.77)	HAND AUGER BORING WITH PCP RESULTS
S-2 (79)	SURFACE SOIL SAMPLES WITH PCP RESULTS
TP-1	TEST PIT (BY NRT)
PCP	PENTACHLOROPHENOL
REL. B.E.	RELATIVE BASE ELEVATION

0 40 80 160

SCALE IN FEET

SOURCE NOTE:
THIS MAP WAS MODIFIED FROM DRAWING BY COLEMAN ENGINEERING COMPANY (CEC), IRON MOUNTAIN, MICHIGAN, DATED FEBRUARY 1997, JOB NO. 95042 A7 .

NOTE:
BASE MAP SURVEY COMPLETED BY CEC WITH ADDITIONAL INFORMATION OBTAINED FROM USDA-ASCS HISTORICAL AERIAL PHOTOGRAPHS, A 7/7/95 SITE VISIT WITH C M CHRISTIANSEN CO., AND A 5/21/96 FIELD INSPECTION.

SITE PLAN WITH ESTIMATED AREAS OF EXCAVATION

DESIGN REPORT AND PLAN OF OPERATION
C.M. CHRISTIANSEN COMPANY, INC.
FORMER POLE TREATMENT FACILITY
PHELPS, WISCONSIN

DRAWN BY: TAS	DATE: 6/12/98	
CHECKED BY: JHG	DATE: 6/12/98	
APPROVED BY: LJP	DATE: 6/12/98	

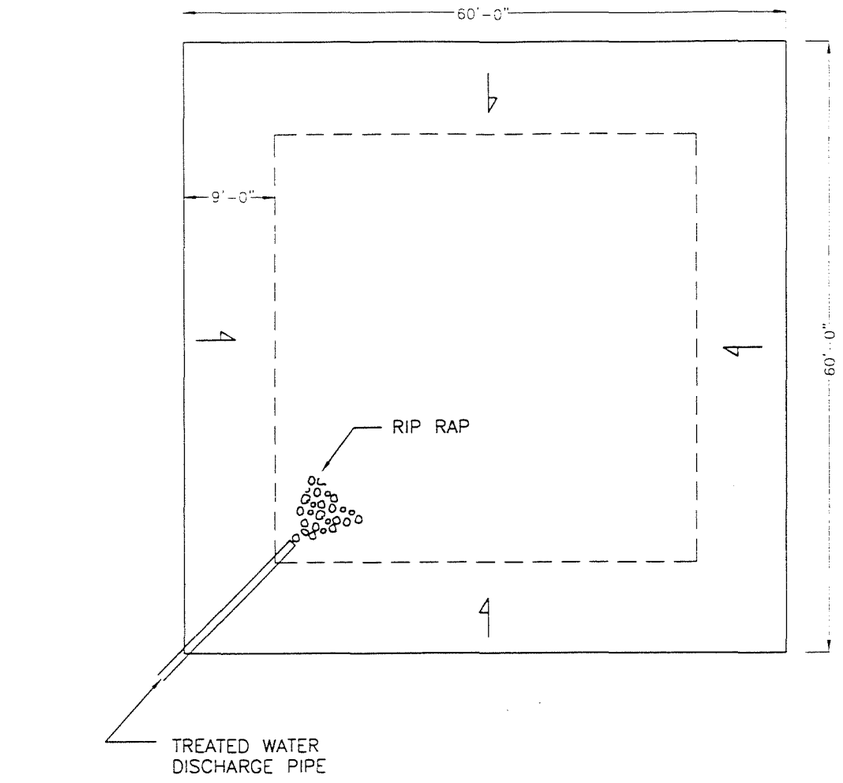
AUTOCAD FILE: 1226-B05.DWG

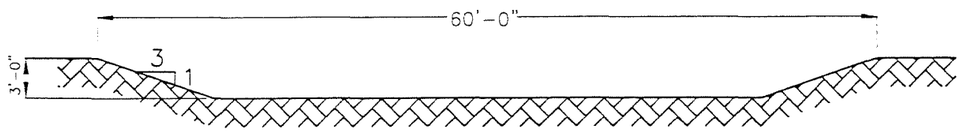
Natural Resource Technology

PROJECT NO.
1226-DR-3.5

DRAWING NO.
1226-B05

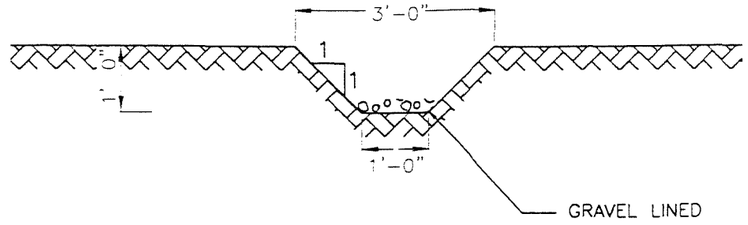
FIGURE NO.
2





SEEPAGE CELL PLAN VIEW
AND CROSS SECTIONAL VIEW

NOT TO SCALE



DIVERSION SWALE CROSS SECTIONAL VIEW

NOT TO SCALE

NOTES:
1. SWALE TO BE SLOPED AT 1% MINIMUM.

2. SOIL EXCAVATED DURING SWALE CONSTRUCTION WILL BE USED AS A BERM ON THE SIDE NEAREST TO TREATMENT CELL.

SEEPAGE CELL AND
DIVERSION SWALE DETAILS
DESIGN REPORT AND PLAN OF OPERATION
C.M. CHRISTIANSEN COMPANY, INC.
FORMER POLE TREATMENT FACILITY
PHELPS, WISCONSIN

DRAWN BY: IAS	DATE: 6/12/98
CHECKED BY: JMC	DATE: 6/12/98
APPROVED BY: LJP	DATE: 6/12/98
AUTOCAD FILE: 1226-B08	

Natural Resource Technology

PROJECT NO.
1226-DR-3.5

DRAWING NO.
1226-B08

FIGURE NO.
8

State of Wisconsin
Department of Natural Resources

Route To:
☐ Solid Waste ☐ Haz. Waste
☐ Emergency Response ☐ Underground Tanks
☐ Wastewater ☐ Water Resources
☐ Other

SOIL BORING LOG INFORMATION
Form 4400-122 7-91

Page 1 of 2

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
C M Christiansen Co.		MW-12-96

Boring Drilled By (Firm name and name of crew chief)	Date Drilling Started	Date Drilling Completed	Drilling Method
Coleman Engineering Company of Iron Mountain Pat McClanahan	06/20/96 (MM/DD/YY)	06/20/96 (MM/DD/YY)	4¼" HSA

DNR Facility Well No.	WI Unique Well No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			1684.5 Feet MSL	1709.0 Feet MSL	7¼ inches

Boring Location
State Plane _____ N. _____ E S/C/N
Lat - -
Long - -
SW 1/4 of SE 1/4 of Section 35, T 42 N, R 11 (E)W

Local Grid Location (If applicable)
☒ N 10156.7 Feet ☐ S ☐ E 10120.4 Feet ☐ W

County	DNR County Code	Civil (Town)/City/ or Village
Vilas	64	Phelps

Sample Number	Sample Length Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Standard Penetration	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
		6		Topsoil 0.3'										
1	18	6 10 18	2	SAND, brown, fine to coarse, trace of silt, with gravel, medium dense, moist (USDA-sand)	SP				16					
2	14	3 7 12 12	4		SP				19					
3	13	5 5 7 6	6	. . . some gravel, cobbles and/or boulders from 5.0' to 7.0'	SP				12					
4	3/4	9 11 12 19	8	. . . gravelly	SP				23					
5	12	7 11 11 11	10 12	Cobbles and/or boulders from 10.0' to 32.0'	SP				22					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm Coleman Engineering Company of Iron Mountain

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than $10 nor more than $5,000 for each violation. Fined not less than $10 or more than $100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

Table 2 - Groundwater Analytical Summary

Soil Remedial Action Options Report

CM Christiansen Co., Inc. Former Pole Treatment Facility

Phelps, Wisconsin

			Volatile Organic Compounds (µg/L)												Polynuclear Aromatic Hydrocarbons (µg/L)									Metals (µg/L)							
Sample ID	Date	Pentachlorophenol (µg/L)	Toluene	Xylenes (total)	n-Propylbenzene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	n-Butylbenzene	1,1,1-Trichloroethane	1,2,4-Trichlorobenzene	Hexachlorobutadiene	Naphthalene	1,2,3-Trichlorobenzene	Acenaphthene	Dibenzo (a,h) anthracene	Flouranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	Total PAHs	Dioxin (2378-TCDD) (ng/L)	Arsenic	Barium	Cadmium	Copper	Chromium (total)	Lead	Selenium	Zinc
MW-1	9/14/95	0.18	nd	nd	nd	nd	2.1	nd	1.4	nd	nd	1.1	14	nd	nd	nd	nd	nd	19 J	nd	nd	19	--	3	95	nd	nd	nd	nd	2	20
(dup.)	9/14/95	--	nd	nd	nd	nd	1.6	nd	1.1	nd	nd	nd	13	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12/15/95	0.73	nd	nd	nd	nd	2	nd	1	nd	nd	nd	8	nd	nd	--	--	nd	9	nd	nd	9	--	7	99	nd	nd	1	nd	nd	16
	7/24/96	**27**	--	--	--	--	--	--	--	--	--	--	--	--	3	nd	nd	4	32	0.6	nd	40	--	6	110	--	4	nd	nd	--	--
	11/18/96	**4.8**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	16	nd	nd	16	--	nd	98	--	nd	nd	nd	--	--
MW-2	9/14/95	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	nd	nd	2	2	nd	nd
	12/14/95	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	1	41	nd	nd	2	nd	2	nd
	7/24/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	1	nd	--	1	2	nd	--	--
	11/18/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	nd	nd	nd	--	--
MW-3	9/14/95	0.12	nd	nd	nd	nd	nd	nd	nd	1.0	nd	nd	2.3	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	0.2	nd	nd	nd	nd	10
	12/14/95	0.67	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	2	18	nd	nd	1	nd	nd	nd
	7/24/96	0.48	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	3	nd	nd	--	--
	11/18/96	0.3	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	1	nd	nd	--	--
MW-4	9/14/95	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	690	nd	nd	3	3	nd	10
	12/15/95	0.084	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	5	770	nd	nd	1	nd	nd	22
	7/24/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	2	710	--	1	1	nd	--	--
	11/18/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	710	--	4	nd	nd	--	--
MW-5	9/14/95	0.12	nd	nd	nd	nd	nd	nd	nd	nd	nd	2.1	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	nd	1	nd	nd	nd	nd
	12/15/95	0.56	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	16	nd	nd	1	nd	nd	10
	7/24/96	0.42	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	1	nd	--	2	2	nd	--	--
	11/18/96	0.58	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	1	nd	nd	--	--
(dup.)	11/18/96	0.28	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	2	nd	nd	--	--
MW-6	9/14/95	**1,300**	nd	1.2	nd	1.3	3.5	nd	2.6	nd	nd	nd	13	nd	nd	nd	nd	nd	13 J	nd	nd	13	--	nd	nd	nd	2	nd	nd	nd	nd
(dup.)	9/14/95	**--**	nd	0.8	nd	0.9	2.7	nd	1.9	nd	nd	nd	12	nd	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
*	12/15/95	**32**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	16	nd	2	nd	nd	nd	12
	7/25/96	**21**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	1	nd	--	8	nd	nd	--	--
(dup.)	7/25/96	**16**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	9	4	nd	--	--
	11/19/96	**10.0**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	5	nd	nd	--	--
MW-7	9/14/95	**960**	1.2	2.2	nd	1.6	4.9	nd	4.3	2.8	1.5	1.2	16	1.8	7 J	nd	nd	12 J	nd	21	3	40	nd E	nd	nd	nd	nd	nd	3	nd	nd
(dup.)	9/14/95	**1,500**	nd	2.0	nd	1.5	4.9	nd	4.1	nd	nd	nd	16	1.3	9 J	nd	2	16 J	nd	31	4	62	nd E	nd	nd	0.2	1	nd	nd	nd	nd
	12/15/95	**5,200**	2	13	1	4	16	1	7	nd	nd	nd	36	nd	16	nd	nd	28	nd	45	nd	89	--	2	37	0.1	nd	nd	nd	nd	29
(dup.)	12/15/95	--	nd	11	1	6	11	nd	7	nd	nd	nd	22	nd	nd	nd	nd	29	nd	52	nd	81	--	1	34	nd	nd	nd	nd	nd	10
MW-8	9/14/95	**2.5**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	2	nd	nd	4	2	2	nd	nd
(dup.)	9/14/95	**3.3**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	nd	3	2	2	nd	20
	12/15/95	**1.2**	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	--	3	28	nd	nd	2	nd	nd	45
	7/25/96	0.4	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	1	nd	--	2	2	nd	--	--
	11/19/96	0.74	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	nd	nd	nd	--	--
Wisconsin Groundwater Quality Standards																															
NR 140 ES		**1**	**343**	**620**	**NS**	**480***	**480***	**NS**	**NS**	**200**	**70**	**NS**	**40**	**NS**	**NS**	**NS**	**NS**	**400***	**400**	**40**	**NS**	**250***	**NS**	**0.03**	**50**	**2,000**	**5**	**1,300**	**100**	**15**	**50**	**5,000**
NR 140 PAL		**0.1**	**68.6**	**124**	**NS**	**96***	**96***	**NS**	**NS**	**40**	**14**	**NS**	**8**	**NS**	**NS**	**NS**	**NS**	**80***	**80**	**8**	**NS**	**50***	**NS**	**0.003**	**5**	**400**	**0.5**	**130**	**10**	**1.5**	**10**	**2,500**

** Located in area to be dewatered.

* Located near area to be dewatered.

Table 2, continued - Groundwater Analytical Summary
CM Christiansen Co., Inc. - Phelps, WI

Sample ID	Date	Pentachlorophenol (µg/L)	Volatile Organic Compounds (µg/L)												Polynuclear Aromatic Hydrocarbons (µg/L)								Dioxin (2378-TCDD) (ng/L)	Metals (µg/L)							
			Toluene	Xylenes (total)	n-Propylbenzene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	n-Butylbenzene	1,1,1-Trichloroethane	1,3,4-Trichlorobenzene	Hexachlorobutadiene	Naphthalene	1,2,3-Trichlorobenzene	Acenaphthene	Dibenzo (a,h) anthracene	Flouranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	Total PAHs		Arsenic	Barium	Cadmium	Copper	Chromium (total)	Lead	Selenium	Zinc
MW-9	7/24/96	0.15	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	2	nd	--	2	nd	nd	--	--
	11/18/96	0.14	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	5	nd	nd	--	--
MW-10	7/25/96	**34**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	22	nd	nd	22	--	nd	170	--	nd	3	nd	--	--
	11/18/96	**7.5**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	29	nd	nd	29	--	nd	170	--	1	nd	nd	--	--
	11/6/97	**17**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PMW-11	7/25/96	**820**	--	--	--	--	--	--	--	--	--	--	--	--	1	nd	nd	1	20	nd	nd	22	--	3	71	--	nd	nd	nd	--	--
	11/18/96	**720**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	15	nd	nd	15	--	nd	61	--	nd	nd	nd	--	--
	11/6/97	**1300**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-12	7/24/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	2	nd	nd	--	--
	11/18/96	0.45	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	nd	nd	nd	--	--
MW-13	7/25/96	**350**	--	--	--	--	--	--	--	--	--	--	--	--	2	nd	nd	2	nd	1	nd	5	--	4	71	--	1	2	nd	--	--
	11/19/96	**2.5**	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	13	nd	nd	13	--	6	nd	--	nd	nd	nd	--	--
PMW-14	7/24/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	3	nd	nd	--	--
	11/18/96	nd	--	--	--	--	--	--	--	--	--	--	--	--	nd	nd	nd	nd	nd	nd	nd	nd	--	nd	nd	--	nd	nd	nd	--	--
Wisconsin Groundwater Quality Standards																															
NR 140 ES		**1**	**343**	**620**	**NS**	**480***	**480***	**NS**	**NS**	**200**	**70**	**NS**	**40**	**NS**	**NS**	**NS**	**400***	**400**	**40**	**NS**	**250***	**NS**	**0.03**	**50**	**2,000**	**5**	**1,300**	**100**	**15**	**50**	**5,000**
NR 140 PAL		**0.1**	**68.6**	**124**	**NS**	**96***	**96***	**NS**	**NS**	**40**	**14**	**NS**	**8**	**NS**	**NS**	**NS**	**80***	**80**	**8**	**NS**	**50***	**NS**	**0.003**	**5**	**400**	**0.5**	**130**	**10**	**1.5**	**10**	**2,500**

Notes: 1. Only those parameters detected are identified in the above Table. Refer to laboratory reports for complete analyte list.
2. Some of the laboratory reports use GW instead of a MW designation for Sample ID.
3. Bold and shading denotes concentrations in exceedance of NR 140 enforcement standards.
4. Multiple duplicates were collected from many of the monitoring wells on September 14, 1995. Highest concentrations detected at each monitoring point on each date are noted on this table. In some instances, results from two or more duplicates are compiled in the same line. Some duplicates are included on this table as noted.

Footnotes:
nd = parameter not detected above laboratory method detection limit.
-- = parameter not analyzed.
NR 140 ES and PAL - Enforcement Standards and Preventive Action Limit, WAC NR 140.
NS = no standard exists for compound.
* = Proposed Public Health Groundwater Quality Standards. No established ESs or PALs exists for compound.
J = assumed to be an estimated concentration of tentatively identified compound
E = PCDPE interference, Total-TCDD concentrations of 0.270 E ng/L and 0.3800 E ng/L reported in MW-7. Totals include 2378-substitute isomers.

µg/L = micrograms per liter or parts per billion.
ng/L = nanograms per liter or parts per trillion.
(dup.) = duplicate sample.

Estimated Influent Concentrations to Carbon Treatment System
Former Pole Treatment Facility
Phelps, Wisconsin

Sample ID	Date	Pentachlorophenol (µg/L)	Volatile Organic Compounds (µg/L)												Polynuclear Aromatic Hydrocarbons (µg/L)							
			Toluene	Xylenes (total)	n-Propylbenzene	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	sec-Butylbenzene	n-Butylbenzene	1,1,1-Trichloroethane	1,2,4-Trichlorobenzene	Hexachlorobutadiene	Naphthalene	1,2,3-Trichlorobenzene	Total VOCs	Acenaphthene	Dibenzo (a,h) anthracene	Flouranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	Total PAHs
MW-7	9/14/95	960	1.2	2.2	nd	1.6	4.9	nd	4.3	2.8	1.5	1.2	16	1.8	37.5	7 J	nd	nd	12 J	nd	21	3	40
(dup.)	9/14/95	1,500	nd	2.0	nd	1.5	4.9	nd	4.1	nd	nd	nd	16	1.3	29.8	9 J	nd	2	16 J	nd	31	4	62
	12/15/95	5,200	2	13	1	4	16	1	7	nd	nd	nd	36	nd	80	16	nd	nd	28	nd	45	nd	89
	AVERAGE	2553.3	1.6	5.7	1.0	2.4	8.6	1.0	5.1	2.8	1.5	1.2	22.7	1.6	49.1	16.0	nd	2.0	28.0	nd	38.0	3.5	63.7

CARBTROL® Corporation

PROJECT: Natural Resource Technology

FLOW IN GPM: 50.00
FLOW IN GPD: 72000.00

PERFORMANCE:

CONTAMINANT	CONC(ppb)	#CONT /DAY	# CARBON /DAY	# CONT /1000 gal	# CARBON /1000 gal
Pentachlorophenol	2553	1.53	5.75	0.02	0.08
Toluene	1.6	0.00	0.15	0.00	0.00
Xylene	16.7	0.01	0.28	0.00	0.00
Ethylbenzene	7.1	0.00	0.64	0.00	0.01
1,1,1-Trichloroethane	2.8	0.00	1.65	0.00	0.02
Chlorobenzene	3.1	0.00	4.79	0.00	0.07
Naphthalene	22.7	0.01	0.38	0.00	0.01
Phenanthrene	64	0.04	0.56	0.00	0.01
TOTALS	2671	1.60	14.20	0.02	0.20

Calculation based on CARBTROL CSL carbon having an Iodine number of: 1200.00

Note:
- Propylbenzene, Butylbenzenes Calculated as Ethylbenzene
- Trichlorobenzenes calculated as Chlorobenzene
- All polynuclear aromatics calculated as phenanthrene

CARBTROL®

ENGINEERED SYSTEMS FOR ENVIRONMENTAL CONTROL

51 RIVERSIDE AVENUE
WESTPORT, CT 06880

(203) 226-5642
(800) 242-1150
FAX: (203) 226-5322

TO: Julie Griswold
COMPANY: Natural Resource Technology
REF: PCP Site: Carbon Application

FAX NUMBER: 414 523 9001
DATE: 6/5/98 STATE: WI
TOTAL PAGES: 2
TEL. NUMBER:9000

MESSAGE:
Julie:

As shown in attached Carbon Usage Estimate, at flow 50 gpm and using average concentrations (your fax to Tom Lawn), carbon usage rate is about 14 pounds per operating day. Our L-4 Assorber with 1000 pounds liquid phase activated carbon when piped in series will have a bed life before changeout of roughly 70 operating days.

Did not have isotherm data on hexachlorobutadiene, but compound should have high adsorption capacity on carbon and will not contribute to carbon usage to any degree, particularly at 1.2 ppb.

Call if any questions.

Sincerely

Charles E. Kourke

CC Tom Lawn
Walter Teke

FROM: C.E. O'Rourke

CARBTROL

LIQUID FILTERS - HIGH PRESSURE STEEL TANK SERIES

GENERAL DESCRIPTION

Designed for water treatment applications from 17 to 250 GPM, the High Pressure Series vessels provide the base for a full-scale high pressure adsorption system. With three models designed to hold between 1000 to 3000 lbs of media these versatile vessels are ideal for a variety of treatment applications where pressure design is a criteria. The High Pressure Series is available with pre-engineered valving and skid systems. Custom systems up to 20,000 LB media capacity are also available.

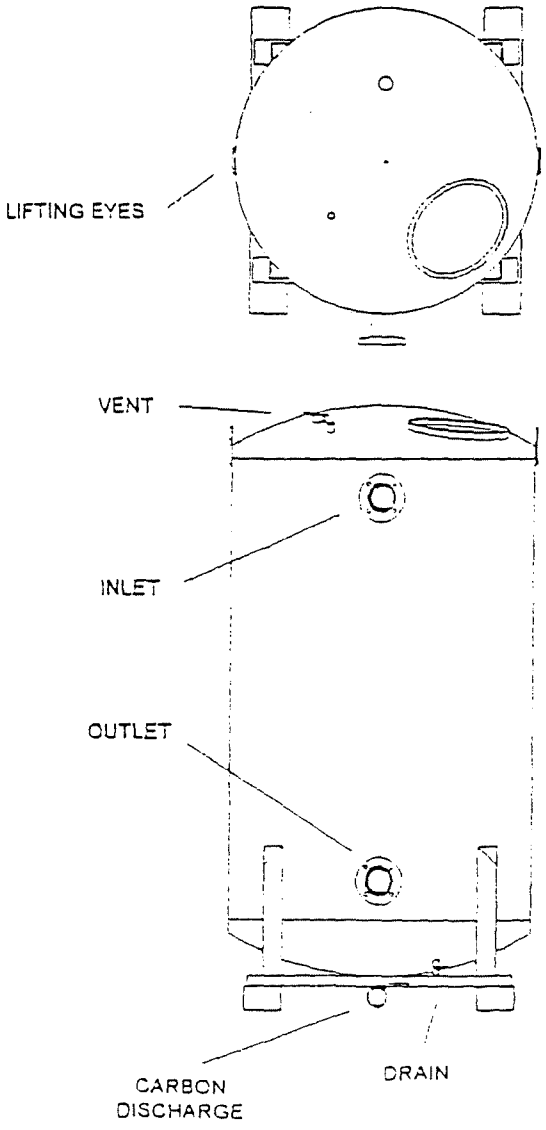
ASME Code certified vessels are available.

The High Pressure series are the ideal base for a long term trouble free liquid phase treatment system.

FEATURES

High Pressure Series filters offer several features and benefits for environmental, industrial and municipal users including:

- Quality Steel Construction
- Epoxy Interior Coating
- Enamel Exterior Coating
- PVC Distributor System with Large Coverage Area
- Rinse Down and Slurry System
- Backflushing Capacity Standard
- Re-Activation and Disposal Available
- Clear Water Drain Fitting 3/4" Brass Ball Valve
- Vent 3/4" Brass Ball Valve



SPECIFICATIONS

Model # (Add "HPAF-")	1000	2000	3000
Overall Height	85"	95"	96"
Footprint (Square)	36"	48"	60"
Inlet / Outlet (ANSI Flange)	2"	3"	3"
Design Pressure (PSI)	90	90	90
Max. Temperature (F)	140	140	140
Design Flow (GPM) *	50	90	135
Carbon Capacity (Lbs.)	1000	2000	3000
Shipping Weight (Lbs.)	1800	3100	4600

** Design Flow based on 10 min contact time, (2) filters series operation.*

TetraSolv, Inc.

MEDIAS

Steel tank series filters are available with the following medias:

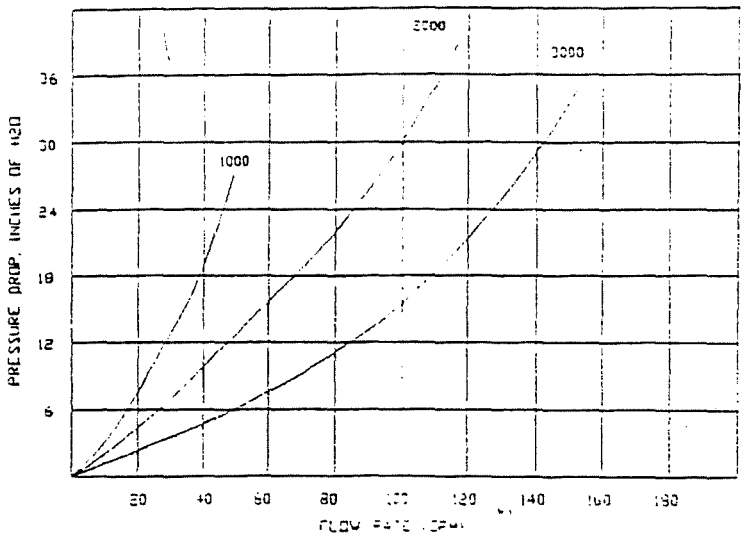
- Re-activated 8 x 30 mesh carbon
- Virgin 8 x 30 mesh carbon
- Organifilic clay/anthracite
- Filter-Lite, iron removal media

The standard media supplied is re-activated 8 x 30 coal based carbon. Call for pricing on alternate medias.

Many other medias are available and our sales staff suggest a media which would best meet the needs of your application.

STEEL TANK SERIES PRESSURE DROP

8 x 30 Activated Carbon (Back-flushed clean bed)

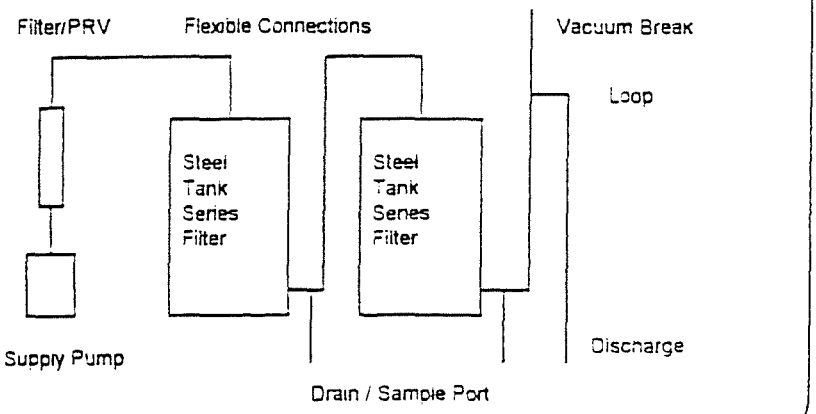


INSTALLATION

Filters should be installed on a level surface capable of supporting the filter at operational weight. Prior to connection, fill the filter with water and allow to soak for 24 hours. Backflushing the bed is also recommended prior to use. Connect the filter to the process line. Two filters in 'series' operation is generally recommended. Where there is insufficient back pressure on the discharge line to keep the adsorbers 'wet' the use of a 'loop' is recommended.

Additional accessories such as pressure relief valves and filter housings are also recommended when the pressure may exceed the design limitations or there may be excess particulates in the liquid stream. As always we recommend you review the specific installation with a sales representative.

STEEL TANK SERIES TYPICAL INSTALLATION



OPERATION

Operation of the steel tank series filters requires little more than periodic monitoring of the following:

Pressure reading at primary and secondary influent. A normal increase in the amount of pressure drop will occur throughout filter operation. In long term treatment systems it may become necessary to backflush the unit as the pressure nears design limitations.

Inspect discharge stream for filter media. In the event of distributor failure filter media could escape into the discharge stream. Additional monitoring of accessories may be necessary, please refer to your operational manual.

LIQUID FILTERS
HIGH PRESSURE STEEL TANK SERIES
INSTALLATION & OPERATION INSTRUCTIONS

TetraSolv's High Pressure Steel Tank Series Adsorbers are supplied individually or coupled with additional accessories such as TetraSolv Series I Valve Systems and other OEM equipment. High Pressure Series Adsorbers are generally serviced on-site utilizing either vacuum or slurry service equipment. For service please contact your sales representative. TetraSolv offers many types of GAC which can be selected for the specific treatment application.

High Pressure Series Adsorbers are carbon steel pressure vessels with vinyl ester lining (other systems available). The High Pressure Series Adsorbers are available with ASME code stamped as an option.

The specific data sheet with drawing may be referred in these instructions.

SHIPMENT

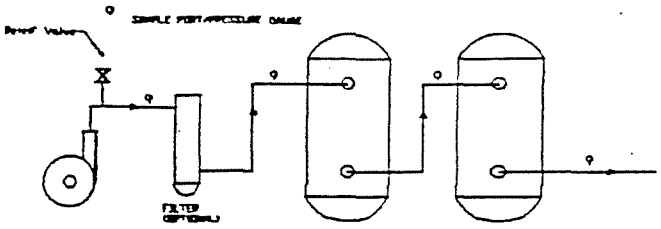
High Pressure Tank Series Adsorbers are shipped when possible upright with GAC pre-loaded. However, with larger systems it may become necessary to ship the High Pressure Tank unit on it's side with or without the GAC pre-loaded. The High Pressure Tank series Adsorbers when shipped upright are generally bolted to timbers for forklift movement. All High Pressure Tank Adsorbers are fitted with lifting eyes capable of lifting the vessel with dry media only. Certain special systems may be pre-plumbed and skid mounted and may require specific shipment methods. Contact your sales representative if you have any questions regarding shipment.

WETTING AND DEAERATION

Dry activated carbon must be wetted and deaerated prior to use. This procedure displaces air from the internal structure of the carbon granule, thus assuring that the liquid to be treated is in contact with the carbon surface.

Prior to operation, the adsorber must be filled with clean, uncontaminated liquid. The recommended method for filling the vessel is through the outlet line. Open the inlet line to purge air from the system. Feed water into the outlet line until water flows from the inlet line. The wet carbon should be allowed to set for a minimum of 24 hours, but preferably for 72 hours, to allow most of the carbon internal surface to be wetted. A guide is available to indicate how much of the internal surface becomes wetted over time.

After wetting, the carbon bed can be deaerated by draining the adsorber, and again filling the adsorber upflow with uncontaminated water. This procedure will eliminate any air pockets which may have formed between the carbon granules. The Adsorber is now ready for operation.



TYPICAL HIGH PRESSSURE STEEL TANK SERIES INSTALLATION

INSTALLATION

The Adsorber(s) should be set on a flat surface, capable of supporting the operating weight of the unit or system. Operating weights are listed on the specification sheet.

If the filter(s) is supplied individually the inlet and outlet piping should be connected to the unit using either flexible hose or hard piped. The outlet piping should be designed to allow flooded operation of the Adsorber at all times to assure effective operation. If the outlet line does not provide for back pressure on the Adsorber unit, then the discharge piping should include an elevated piping loop to assure flooded operation.

If the supply pump is capable of producing pressure greater than the design limitation of the filter it is recommended that a rupture disk or pressure relief valve be installed

Carbon filters can be manifolded in parallel operation for higher flowrates. Series operation is the preferred method of operation as it provides for the greatest degree of bed utilization.

If water conditions such as high suspended solids exist a filter should be installed prior to the Adsorber. A simple cartridge or screen filter helps prevent pressure buildup in the GAC bed. Many other water issues may effect Adsorber operation and we therefore recom-

WATER TEK SERVICES
39 Clayton Avenue
Lake Villa, Illinois 60046
(847) 356-1414 Fax 356-6967

mend you discuss your specific installation with your sales representative.

OPERATION

With the Adsorber full of liquid, flow can be introduced to the unit. Liquid enters through the inlet connection, flows downward through the carbon bed and exits through the outlet connection.

Flowrates to the Adsorber should be determined based upon the required contact time between the liquid and the carbon media. The required contact time normally is determined prior to installation and operation of the Adsorber.

BACKFLUSHING

It is generally recommended that carbon beds be backflushed periodically. Backflushing helps to reduce and equalize pressure drop across the GAC bed as well as removes collected particulate from the top of the bed. Backflow rates generally are 4 to 20 GPM/ FT^2 . Backflushing should begin at a low rate and proceed upwards.

Clean, uncontaminated liquid should introduced to the unit through the outlet connection. This liquid flows upwards through the unit and should exit through the inlet line - directed to a backflush water collection point or drain. The flow rate should not be high enough to cause a significant quantity of carbon granules to exit.

MONITORING

Adsorber units only require periodic monitoring if properly installed. The following items may be monitored:

1) Pressure: Check inlet and outlet pressure. Increase in pressure differential may indicate build-up of filtered solids. Never exceed maximum design pressure of filter.

2) Samples: Inlet and outlet sample points if provided for liquid analysis to determine system performance.

3) Air: Check for trapped air by opening upper vent valve and allowing small amount of liquid to flow out. If your system was provided with automatic vent systems it is still necessary to periodically verify their operation.

ADSORBER SERVICING

The Adsorber may be serviced on-site using either vacuum or slurry removal methods. Prior to servicing the unit should be closed off from influent and effluent lines and any electrical devices or connections should be tagged off. If the unit is to be vacuum serviced it is recommended that the filter be drained of all water 24 hours prior to service.

After removal of the spent carbon is complete, it is recommended that the inside of the Adsorber be washed to remove all contamination and any trace of spent carbon. After system is washed, the Adsorber should also be checked thoroughly and any minor maintenance conducted.

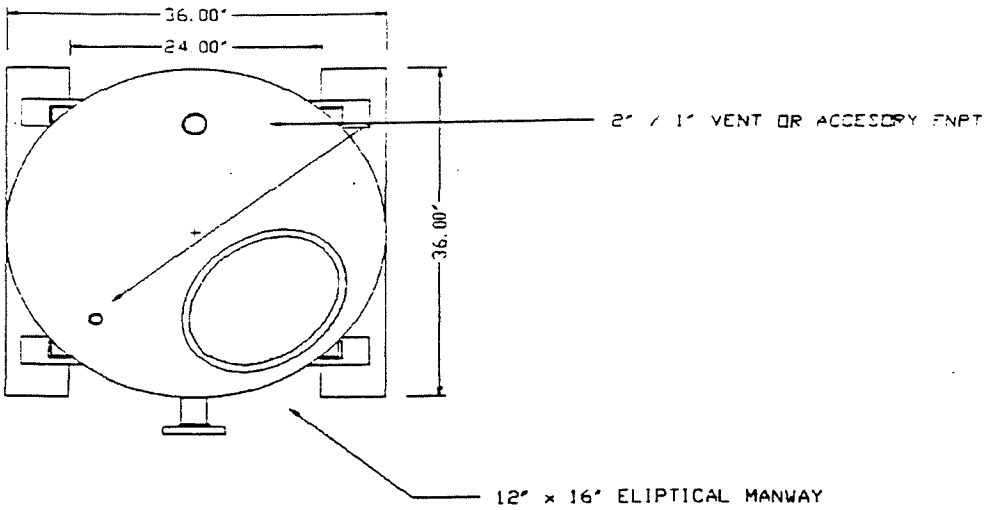
WINTERIZING

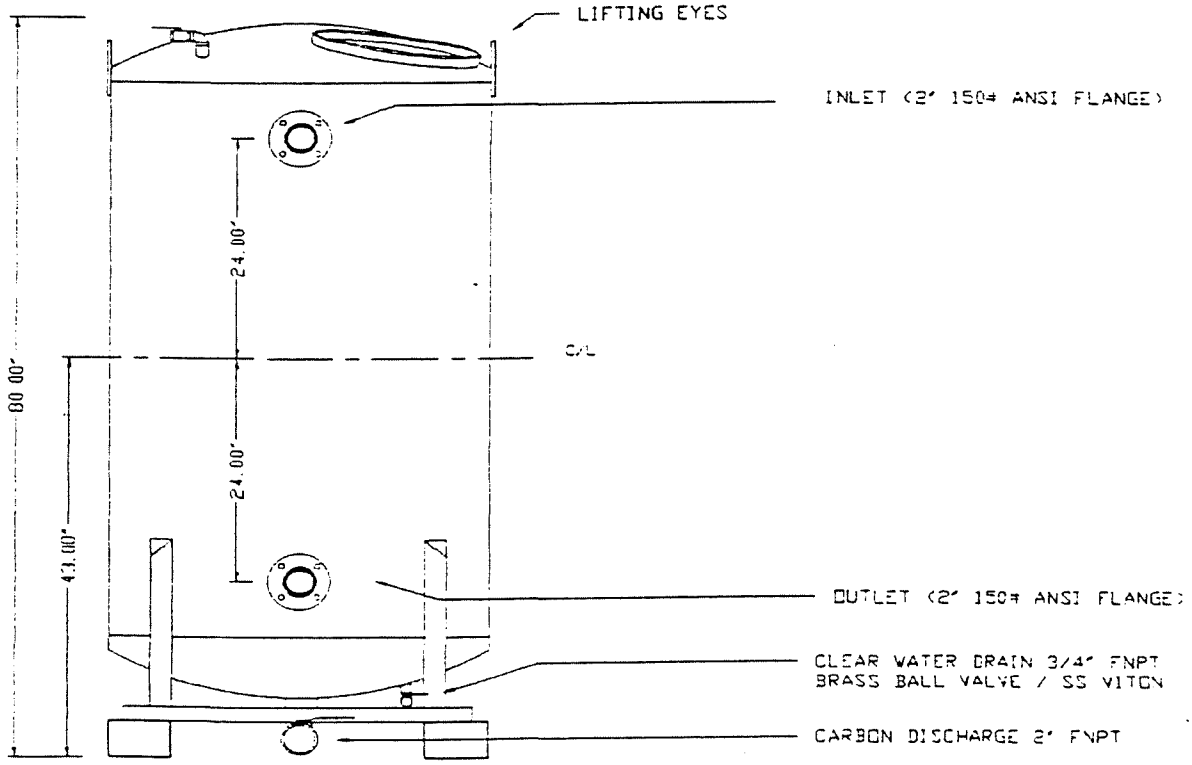
If adsorber will be shutdown for extended periods in climates where freezing may be a problem certain procedures should be taken to protect the adsorber. If possible backflush the unit. Drain all water from the adsorber utilizing the effluent connection and the drain port if available. When draining allow air to enter the system by venting the influent line. Store the drained filter with system vented. Caution should be taken during system startup following exposure to freezing conditions as the carbon may still be in a frozen state days or weeks after. Refer to the startup procedure earlier in this document.

SAFETY CONSIDERATIONS

Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a container containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces - including all applicable federal and state requirements.

Never exceed maximum operating pressure of the adsorber.





TetraSolv, Inc.

GENERAL NOTES

DESIGN PRESSURE 90 PSI - NON-CODE - DESIGN CARBON LOAD 1000# @ 33 LF (33 FT3) - BED 7 FT2
BED DEPTH 4'-7" - SHIP WT 1800# - OPER WT 3000# - FORK CHANNELS 4" x 6" TUBE
UNIT CAN BE LIFTED BY FORKLIFT

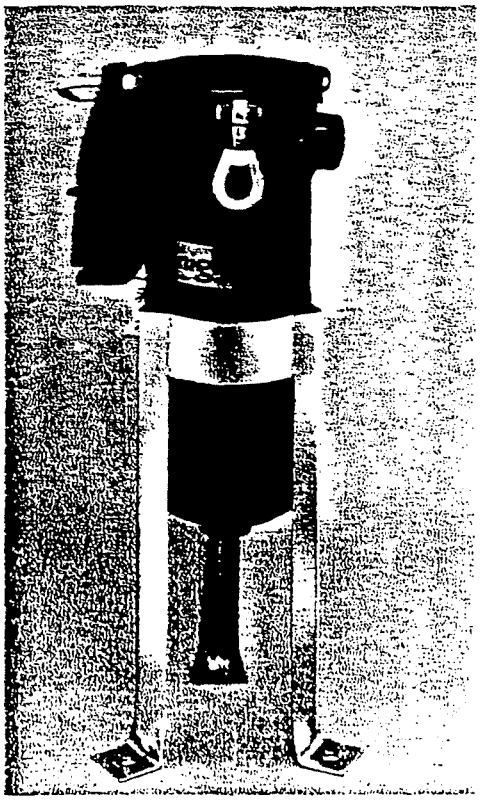
TITLE	
HPAF-1000	
FILE NAME 1028	DATE 3/13/97

Strainers or Bag Filters: Your Choice!

Knight strainer/filter housings are made in many sizes, and all can serve as basket strainers (for particle retention down to 74 micron size) or as bag filters (for particle retention down to 1 micron size). In all cases, covers are easily removed, without tools, and the basket or bag is easily cleaned or replaced.

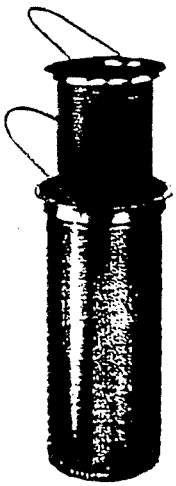
FEATURES

- Large-area, heavy-duty baskets
- Low pressure drops
- Housings are permanently piped
- Covers are O-ring sealed
- Carbon steel, or stainless steel (304 or 316) housings
- All housings are electropolished to resist adhesion of dirt and scale
- Adjustable height legs
- Easy to clean
- ASME code stamp for 150 or 300 psi
- Liquid displacers for easier servicing
- Special options include filter bag hold-down devices, sanitary construction, different outlet connections, higher pressure ratings, extra-length legs, heat jacketing, and adapters for holding filter cartridges.
- Multiple-basket and duplex units are available

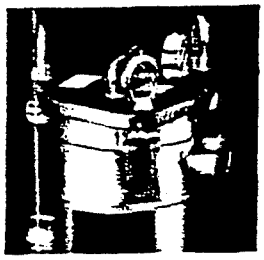


Dual Stage Straining/Filtering

All Knight RK-CK housings can be supplied with a second, inner basket which is supported on the top flange of the regular basket. Both baskets can be strainers (with or without wire mesh linings) or both can be baskets for filter bags. They can also be mixed; one a strainer basket, the other a filter bag basket. Dual-stage action will increase strainer or filter life and reduce servicing needs.



Covers are secured by three eyenut assemblies. One of them acts as a hinge when cover is opened. PK-GK can also be ordered with a lighter cover, held in place with a single quick-opening clamp (photo on cover).



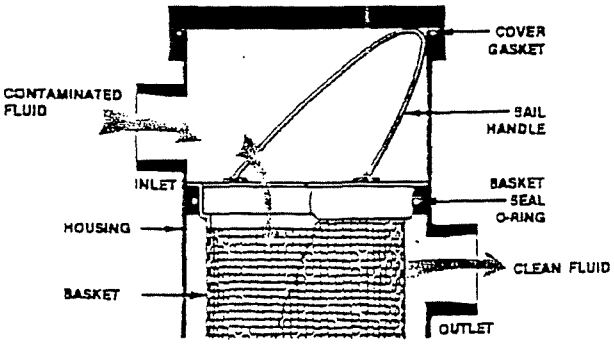
MULTI-BASKET MODELS

Larger units with multiple baskets (from 2 to 17) are also made. They can handle flows from 400 to 3500 gpm.

DUPLEX MODELS

Most of the models described here are also available as duplex systems. Two units come piped together with valves to permit continuous use of either unit while servicing the other. One lever actuates all valves simultaneously.

Operation

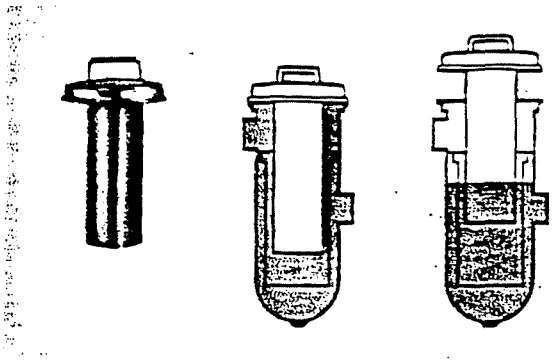


Unfiltered liquid enters the housing above the bag or basket and passes down through them. Solids are contained inside the bag or basket where they're easily and completely removed when the unit is serviced. A hinged basket bail is pushed down by the closed cover, to hold the basket against a positive stop in the housing. It helps prevent bypassing of unfiltered liquid.

Fluid bypass around the basket is prevented by an optional O-ring seal between the basket rim and the housing ID. This seal is required on RK-CK bag filters. The PK, GK, JK, AK and UK filters don't need this O-ring because the OD of the filter bag seals against the housing itself, rather than against the ID of the basket rim.

A single cover gasket is used to seal the opening, and covers can be installed and removed without tools.

Liquid Displacer Option



All strainers or filters can be supplied with a liquid displacer. When in use the displacer (a sealed 304 stainless steel cylinder) is inside the strainer basket or filter bag, displacing liquid that would otherwise fill the inner space. When the cover and displacer are removed, the level of liquid within the strainer basket or filter bag is lowered which results in less product loss, and fast, easy changes.

If the weight of the cover-displacer assembly is a concern (the heaviest, on an RK 30, is 20 pounds) you can easily detach the displacer.

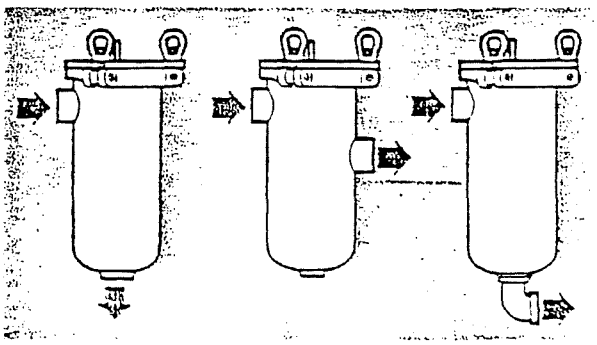
Construction Materials

All housings and other wetted parts not otherwise specified can be ordered in carbon steel, 304 stainless steel, or 316 stainless steel.

Four different materials can be ordered for all seals involved.

All baskets and mesh linings are made of stainless steel. 304 stainless will be supplied with carbon and 304 housings, 316 stainless with 316 housings.

Convenient Piping Arrangements



Style 1 Bottom outlet | Style 2 Side outlet | Style 3 Bottom outlet with elbow

Many basket options

The baskets offered will permit the straining and filtering of a wide variety of fluids, to retain solids of almost any size.

All baskets are easily removed and cleaned. All are made in depths to suit the housing selected.

Plain perforated strainer basket.
Choose from the following perforation sizes: 1/4, 3/16, 9/64, 3/32, and 1/16 inch.

Perforated strainer basket with wire mesh linings.
High quality wire is used, in mesh sizes 20, 30, 40, 50, 60, 70, 90, 100, 150, and 200.

Filter bag basket.
They have 9/64-in.-diameter perforations, for a 51 percent open area. They accept standard size filter bags.

Choosing a basket strainer or bag filter

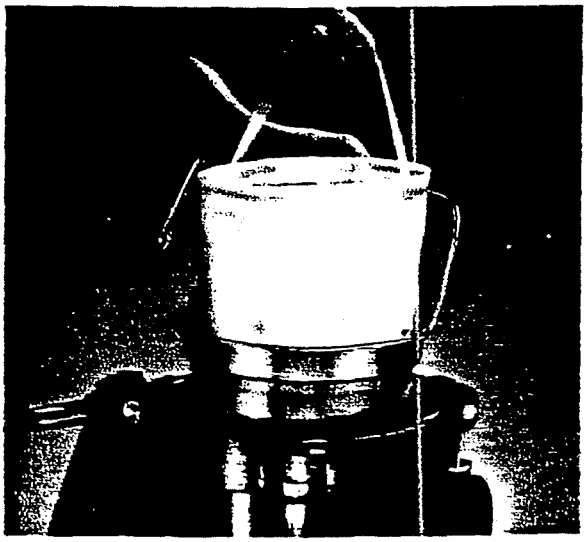
Once the choice between **straining** a fluid (removing particles down to 74 micron size) and **filtering** it (removing particles down to one micron) has been made, the choice of which size Knight model must be made. All seven models and the baskets and bags that go in them, are of the same basic design. They differ in dimensions, capacities, maximum pressure ratings, and pipe size. Selection is based on these variables.

PRESSURE DROP DATA
Basket strainers and bag filters are usually selected so that the pressure drop does not exceed 2 psi, when they are clean. Higher pressure drops may be tolerated when contaminant loading is low.

The pressure drop data is accurate for all housings with strainer or filter bag baskets. When filter bags are added, total pressure drop becomes the sum of the pressure drop as determined by the steps below.

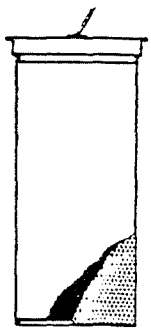
Follow these easy steps:

1. Using the desired pipe size and approximate flow rate, determine the basic pressure drop from the appropriate graph.
2. Multiply the pressure drop obtained in step 1 by the viscosity correction factor found in the accompanying table. This is the adjusted (clean) pressure drop for all baskets, without filter bags.

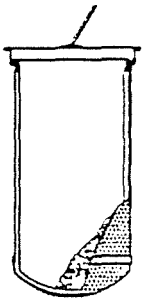


	Viscosity, cps								
	1 (H$_2$O)	50	100	200	400	600	800	1000	2000
All unlined baskets	.55	.85	1.00	1.10	1.20	1.40	1.50	1.60	1.80
40-mesh lined	.73	.95	1.20	1.40	1.50	1.80	1.90	2.00	2.30
60-mesh lined	.77	1.00	1.30	1.60	1.70	2.10	2.20	2.30	2.80
80-mesh lined	.93	1.20	1.50	1.90	2.10	2.40	2.60	2.80	3.50
100-mesh lined	1.00	1.30	1.60	2.20	2.40	2.70	3.00	3.30	4.40
200-mesh lined	1.30	1.70	2.10	3.00	3.40	3.90	4.40	5.00	6.80

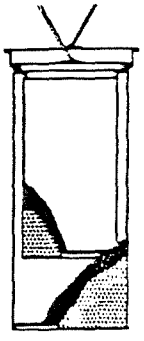
SINGLE-STAGE BASKETS
(all models)



Single-stage perforated strainer basket, with or without wire mesh liner.

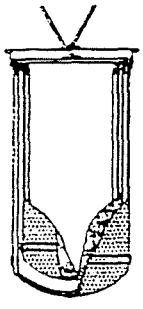


Single-stage filter bag, within perforated basket. Can also be wire mesh lined, or be made entirely of heavy wire mesh.

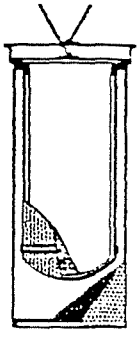


Dual-stage straining can be done with two perforated strainer baskets, with or without wire mesh linings.

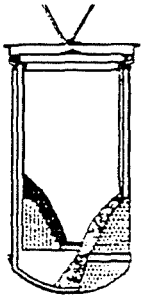
TWO-STAGE BASKETS
(RK 30 only)



Both inner and outer filter bags in this dual-stage configuration can be of the throw-away or cleanable type.



A filter bag within a wire mesh-lined outer basket. Mesh is backstop if bag ruptures or is missing.



A perforated strainer basket (with or without wire mesh lining) inside a filter bag gives effective dual-stage straining-filtering.

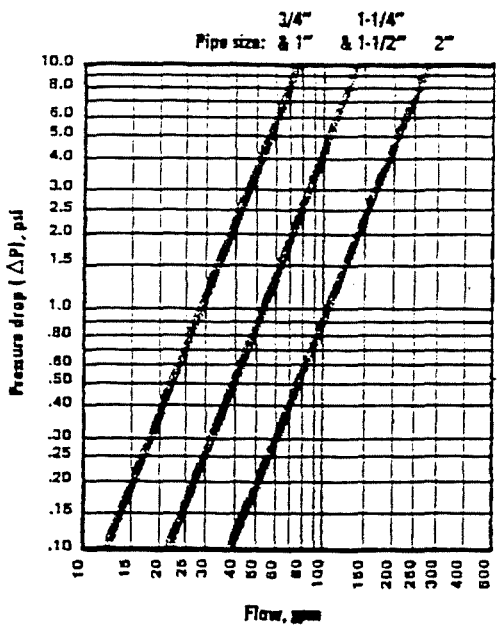
The following model descriptions and flow tables can be used to aid in selection, and make comparisons between the various styles.

GK-PK—For flow rates to 50 gpm

- Pipe sizes 3/4 thru 3-inch, NPT or flanged
- Two basket depths: 6 or 12 inches (nominal)
- Three pressure ratings: 200 psi (with clamp cover) and 300 or 500 psi (with eyenut cover)
- ASME code stamp available

BASKET DATA

Depth Nominal (inches)	Diameter (inches)	Surface Area (sq. ft.)	Volume (cu. in.)
6	3.9	0.5	65
12	3.9	1.0	130

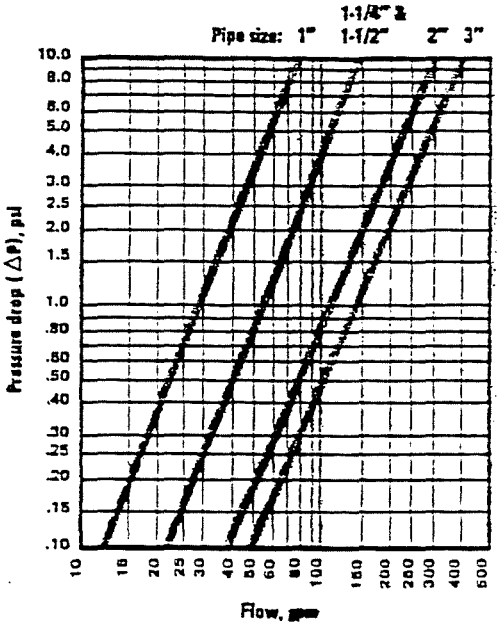


JK, AK and UK—For flow rates to 100 gpm

- Delivers 3.4 square feet of basket or bag surface area without need for ASME code construction
- Pipe sizes 3/4 thru 4-inch, NPT or flanged
- Three basket depths: 12, 18 or 30 inches (nominal)
- Two pressure ratings: 150 psi or 300 psi
- ASME code stamp available

BASKET DATA

Depth Nominal (inches)	Diameter (inches)	Surface Area (sq. ft.)	Volume (cu. in.)
12	5	1.3	235
18	5	2.0	350
30	5	3.4	630

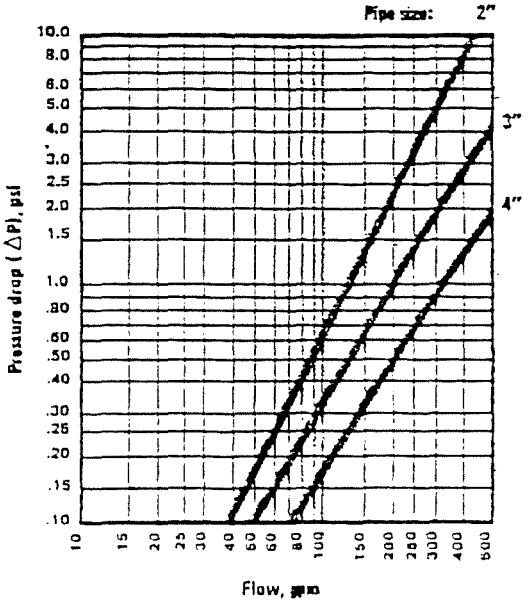


CK-RK—For flow rates to 220 gpm

- Pipe sizes 3/4 thru 4-inch, NPT or flanged
- Two basket depths: 15 or 30 inches (nominal)
- Two pressure ratings: 150 or 300 psi
- ASME code stamp available.

BASKET DATA

Depth Nominal (inches)	Diameter (inches)	Surface Area (sq. ft.)	Volume (cu. in.)
15	6.7	2.3	500
30	6.7	4.4	1000



DIMENSIONS (IN.)

Model	Pipe Size	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T
PK 6	3/4	5.5	5.2	3.5	5.0	10.1	12.0	3.0	10.1	10.4	4.0	11.2	1.3	4.5	1/2	3.5	3.6	14.0	6.8	5.6
	1	5.5	5.2	3.5	5.0	10.1	12.0	3.0	10.1	10.9	4.0	11.5	1.5							
Bag Size P3S	1-1/4	6.0	5.8	3.5	5.0	9.4	12.0	4.3	9.5	10.5	4.0	11.1	1.8							
	1-1/2	6.0	5.8	3.5	5.0	9.3	12.0	4.3	9.5	10.8	4.0	11.3	2.0							
	2	6.0	5.8	3.5	5.0	9.3	12.0	4.3	9.5	11.6	4.0	11.8	2.3							
GK 12	3/4	5.5	5.2	3.5	5.0	16.1	18.0	3.0	16.1	16.4	4.0	17.2	1.3	4.5	1/2	3.5	3.6	14.0	6.8	5.6
	1	5.5	5.2	3.5	5.0	16.1	18.0	3.0	16.1	16.9	4.0	17.5	1.5							
Bag Size P4S	1-1/4	6.0	5.8	3.5	5.0	15.4	18.0	4.3	15.5	16.5	4.0	17.1	1.8							
	1-1/2	6.0	5.8	3.5	5.0	15.3	18.0	4.3	15.5	16.8	4.0	17.3	2.0							
	2	6.0	5.8	3.5	5.0	15.3	18.0	4.3	15.5	17.6	4.0	17.8	2.3							
JK-12	1	6.1		4.3	6.0	17.3	19.8	4.3	17.3	18.1	5.0	18.6	1.5	6.0	3/4	5.0	5.3	18.0	9.5	
	1-1/4	6.1		4.3	6.0	17.3	19.8	4.8	17.3	18.4	5.0	19.0	1.8							
Bag Size P7S	1-1/2	6.1	N/A	4.3	6.0	17.3	19.8	4.8	17.3	18.8	5.0	19.3	2.0							N/A
	2	6.1		4.3	6.0	17.2	19.7	4.8	17.3	19.6	5.0	19.7	2.3							
	3	7.0		4.3	6.0	18.2	20.7	6.6	18.2	22.0	4.8	21.9	3.1							
AK-18	1	6.1		4.3	6.0	23.3	25.8	4.3	23.3	24.1	5.0	24.6	1.5	6.0	3/4	5.0	5.3	18.0	9.5	
	1-1/4	6.1		4.3	6.0	23.3	25.8	4.8	23.3	24.4	5.0	25.0	1.8							
Bag Size P8S	1-1/2	6.1	N/A	4.3	6.0	23.3	25.8	4.8	23.3	24.8	5.0	25.3	2.0							N/A
	2	6.1		4.3	6.0	23.2	25.7	4.8	23.3	25.6	5.0	25.7	2.3							
	3	7.0		4.3	6.0	24.2	26.7	6.6	24.2	28.0	4.8	27.9	3.1							
UK-30	1	5.5		4.3	6.0	35.3	37.8	4.3	35.3	36.1	5.0	36.6	1.5	6.0	3/4	5.0	5.3	18.0	9.5	
	1-1/4	6.0		4.3	6.0	35.3	37.8	4.8	35.3	36.4	5.0	37.0	1.8							
Bag Size P9S	1-1/2	6.1	N/A	4.3	6.0	35.3	37.8	4.8	35.3	36.8	5.0	37.3	2.0							N/A
	2	6.1		4.3	6.0	35.2	37.7	4.8	35.3	37.6	5.0	37.7	2.3							
	3	7.0		4.3	6.0	36.2	38.7	6.6	36.2	40.0	4.8	39.9	3.1							
CK-15	2	6.6		5.9	7.5	20.9	23.5	4.8	21.0	23.2	3.3	23.1	2.3	8.6	1	5.8	6.3	22.0	12.0	
Bag Size P1S	3	7.4	N/A	6.8	7.5	21.7	24.6	6.6	21.9	25.5	4.8	25.9	3.1							9.5
	4	7.4		6.8	8.6	21.5	25.1	8.4	21.9	26.8	6.3	27.6	3.8							
RK-30	2	6.6		5.9	7.5	35.9	38.5	4.8	36.0	38.2	3.3	38.1	2.3	8.6	1	5.8	6.3	22.0	12.0	
Bag Size P2S	3	7.4	N/A	6.8	7.5	36.7	39.6	6.6	36.9	40.5	4.8	40.9	3.1							9.5
	4	7.4		6.8	8.6	36.5	40.1	8.4	36.9	41.8	6.3	42.6	3.8							

Hersey MEASUREMENT COMPANY

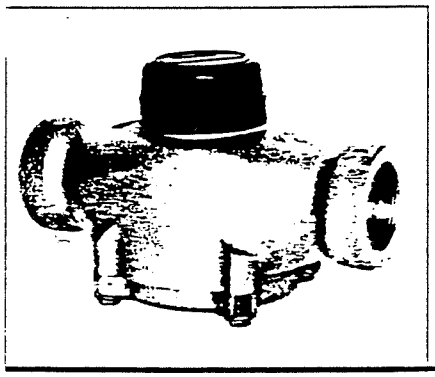
FEB 2 6 1998

S 215

MVR Series Turbine Meters

Features

- Compatible with a broad range of liquids
- Durable
- Only one moving part in the flow stream
- Magnetically coupled
- Exclusive Retro Thrust® feature
- Easily installed and maintained
- Lightweight compact design
- Internal strainer



The MVR Series turbine meters are accurate, rugged, inexpensive, and compatible with a wide range of liquids.

The MVR Series meters have only one moving part, the rotor. The rotor is magnetically coupled to the totalizer or pulse transmitter.

Hersey's exclusive Retro-Thrust® feature and jewel sapphire bearings significantly reduce wear and extend the operating life of each MVR meter. Retro-Thrust® allows the rotor's shaft to float against the downstream bearing at low flow. As flow rate increases, the rotor floats away from the bearings. At high flow rates, the rotor shaft floats against the upstream bearing.

MVR meters include the Hersey Dura-Dri™ totalizer for local totalization without external power. The Dura-Dri™ totalizer is permanently sealed to prevent moisture damage.

The MVR meters are available in sizes 1 through 4 inches in standard or industrial construction with square wave pulsed output or calibrated contact closure.

Specifications

Flow rates:

Size (in)	Model	gpm
1	MVR 30	1 - 30
1 1/4	50	1.5 - 50
1 1/2	100	2 - 100
2	160	3 - 160
3	350	4 - 350
4	650	5 - 650

Accuracy: ±1.50% over full flow range. ±0.50% over reduced flow range

Pressure: Bronze: 150 psi max.

Temperature: Standard: 130° F
Industrial: 200° F max.

Materials:

Standard

Body - Bronze
Bearings - Jewel Sapphire
Bushings - Graphitar
Inlet hub - Polypropylene
Rotor - Noryl
Rotor shaft - Chrome plated 316 Stainless Steel
Strainer: Noryl

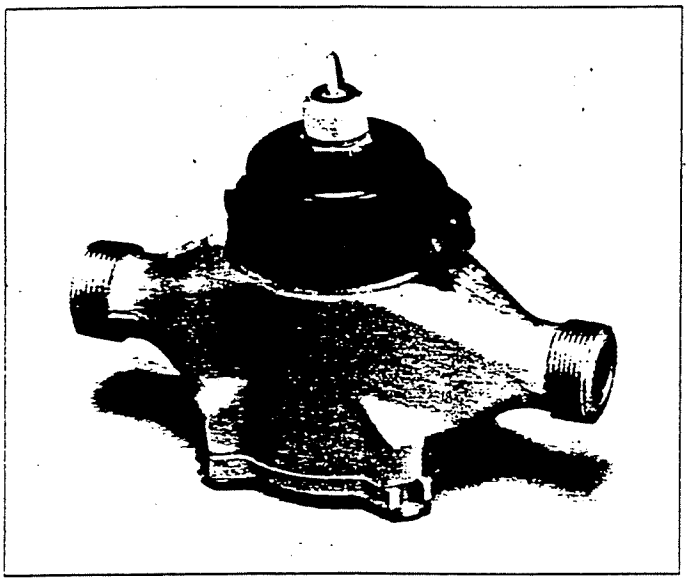
Industrial

Body - Bronze
Bearings - Jewel Sapphire
Bushings - Graphitar
Inlet hub - Foamed Polypropylene
Rotor - Polypropylene
Rotor shaft - Chrome plated 316 Stainless Steel
Strainer - Stainless Steel

Unit of measurement:

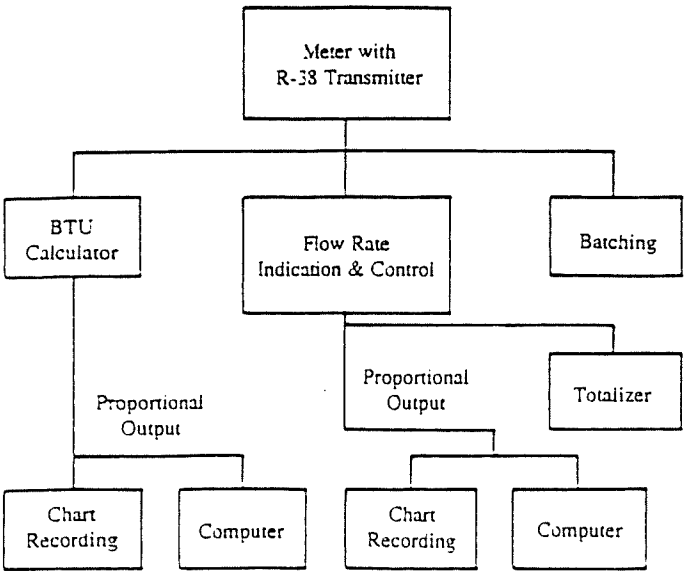
Model	gallons/ sweep hand rev.
30 & 50	10
100 & 160	100
350 & 650	100

Note: 4" is available for cold water only.



MVR with R-38 Transmitter

Typical Applications



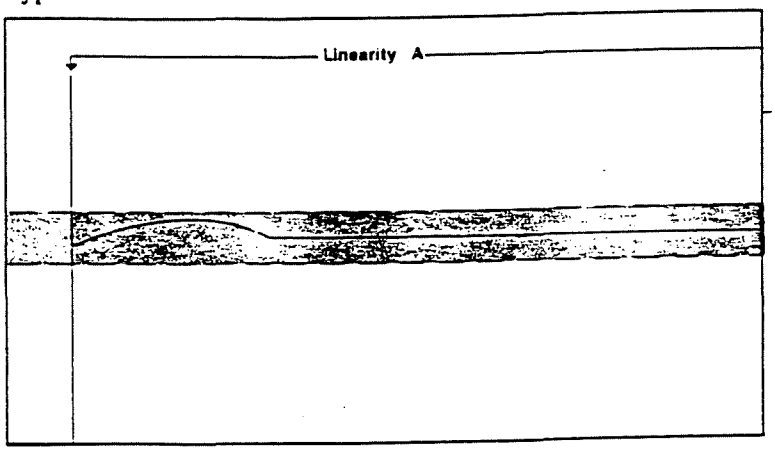
Typical Performance

(gpm)

Size	Model	Linearity A	Max. Pressure Drop
1"	30	±1.50% 1-30	7 psi @ 30 gpm
1 1/4"	50	±1.50% 1.5-50	6 psi @ 50 gpm
1 1/2"	100	±1.50% 2-100	11 psi @ 100 gpm
2"	160	±1.50% 3-160	11 psi @ 160 gpm
3"	350	±1.50% 4-350	11 psi @ 350 gpm
4"	650	±1.50% 5-650	14 psi @ 650 gpm

20 psi @ 50 gpm

Typical Performance Curve



☐ Linearity A

Options

R-38 Electronic Pulse Output
The R-38 is a blind, uncalibrated pulse output for use with the MVR Series turbine meters. The R-38 easily replaces existing registers. It uses a Hall Effect Switch to sense a magnetic south pole and produce a pulse output.

Model	Nominal Pulses/Gallon
MVR 30	140.0
MVR 50	69.2
MVR 100	52.2
MVR 160	15.8
MVR 350	7.9
MVR 650	4.9

R-39 Totalizer with Form C Reedswitch Contact Closure
The R-39 provides a total of liquid metered and a calibrated contact closure. It can also be used to switch a remote totalizer.

Model	Contact Closure/Gals.
MVR 30	1 pulse = 1 gallon
MVR 50	1 pulse = 1 gallon
MVR 100	1 pulse = 10 gallons
MVR 160	1 pulse = 10 gallons
MVR 350	1 pulse = 10 gallons
MVR 650	1 pulse = 10 gallons

Accessories

- Pulse to DC Converter - Model 1005
- Flow Rate Indicator/Totalizer - Models 1020 and 1030
- Batch Controller - Model 3030
- Btu Calculators - Models 7001, 7002, 7003, 7102, and 7020

Selection Guide

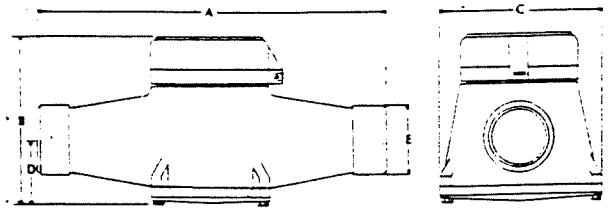
Use this selection guide to create the model number of the MVR turbine meter that best fits your application. When ordering, advise your local Hersey representative of the liquid to be measured, viscosity, minimum and maximum flow rates, and temperature and pressure ranges.

Typical Meter Number

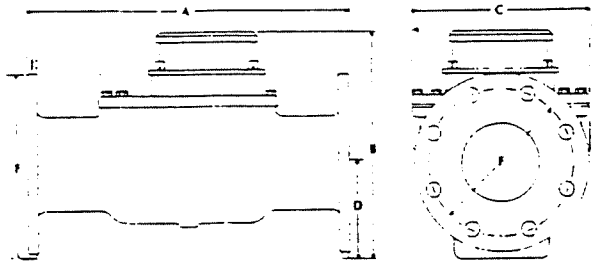
MVR - B - I - 100 - P - G - F

Body
B - Bronze
Construction
S - Standard (up to 130° F)
I - Industrial (up to 200° F)
Line size
30 - 1 inch
50 - 1 1/4 inch
100 - 1 1/2 inch
160 - 2 inch
350 - 3 inch
650 - 4 inch
Output
T - Dura-Dri™ Totalizer
P - R-38 Pulse Output
C - R-39 Contact Closure
Units of measure
G - Gallons
Adaptors
C - Couplings
F - Companion Flanges (3" and 4")
N - None

Dimensions



MVR 30, 50, 100 and 160



MVR 350 and 650

Size (inches)	1	1 1/4	1 1/2	2	3	4
Model	30	50	100	160	350	650
A. Length	7 1/2	9	9	10 1/2	12	14
B. Height	5	5 1/2	5 3/4	6 1/4	8 7/16	9 3/8
C. Width	3 3/4	4 1/4	4 3/8	5 3/8	7 7/8	9 3/4
D. Centerline to base	1 13/16	2 3/8	2 3/8	3	3 7/8	4 5/8
E. End Connections	1" NPSM* external	1 1/4" NPSM* external	1 1/2" NPT internal	2" NPT internal	3" 150 lbs flange	4" 150 lbs flange
F. No. bolt holes					4	8
G. Bolt hole diameter					5/8"	5/8"
H. Bolt circle diameter					6"	7 1/2"
Net Weight (lbs.)	5	8	10	16	38	68

* Couplings are available to adapt to NPT (National Pipe Thread)

PHONE CONVERSATION RECORD

DATE: 6/29/98
TIME: 1130 hrs.

CONVERSED WITH: Don Miller
Haz Waste Spec - Rhinelander
715/365-8980

SUBJECT/PROJECT: C. M. Christiansen

UNIQUE ID#.: 02-64-000068

Miller called to discuss the hazardous waste variance request. Miller said he had received the check for the review fee on 6/26/98, and had just spoken with Laurie Parsons of NRT.

Miller said the request didn't make the waste code determination (F039) that Haz. Waste would have wanted. Miller said this was probably intentional on NRTs part, so that they wouldn't be tied into an F-listing. Miller said he will probably put the F-listing into the variance approval (if approved).

Miller also said that he attended a Haz. Waste Team meeting last week, and 2 things came up which may pertain to this site. ① Miller said he will likely be able to waive the financial assurance provision. ② Miller also said the variance request did not make mention of what will happen to the soil once treatment is complete. I described NRT's performance standard approach for groundwater; I also mentioned that NRT may have to come up with a direct contact number for PCP. Miller said he would probably

Signature: Christopher A Lamb
(please write legibly)

-over-

need something in writing from me saying that the performance standard approach is OK. Miller also said my approval will be worded very carefully. Miller also said that the site could get a variance to the LDR for the treated soil, pending the outcome of federal rulemaking.

Miller said that Larsen was going to talk to Eric Christiansen again. Christiansen is apparently still mulling over shipping soil to a landfill.

Miller said he will look the request over again within 10 days, and get back to NRT if the request is considered incomplete. Miller said another question that came to mind was whether the proposed remedial action would address all of the contaminated soil. I relayed my concern to Miller that a portion of the "upper wetlands" was not proposed for remediation.

I then asked Miller for the name of the NRT person for Vilas County. Miller could not remember the name, but said that a woman had transferred to that position from SER within the last month; she works in the Woodruff office, and she is nearly impossible to reach by phone.

Miller and I agreed to look over the variance request and supporting documents in the next few days, and talk again around 7/7/98.

Saari, Christopher A
From: Miller, Donald L
Sent: Tuesday, June 30, 1998 7:51 AM
To: Flaherty, Peter D; Mulholland, Timothy S; Kafura, David J
Cc: Saari, Christopher A; Hosch, James A
Subject: RE: Waste Determination - Penta contaminated soil

Dave, first of all thanks for the comments. Second, I don't know why F032 was even suggested, but it was. I think they are "farming" for a waste code. I agree that F032 would be a poor choice even if it was possible to use, for many reasons, but the LDR's are certainly a major one if they decide to replace treated soil onsite. Third, I spoke with Chris and he is reviewing the RCL proposals, and your comment that they need to look at ***all*** the contaminants of concern is a good one. As I stated in my note, I don't see how they can say their waste will be D037. If the facility decides to do this, I will not issue the variance. This could result with their digging up the soil, doing tclp and if it does not trip tclp, they could claim it is not a hazardous waste. Then, we go to court, I guess. That is why I want to be certain that if they don't call this a listed waste, (F027) I will require that of them before they can get a variance. My question to Pete is if we get into a legal issue with the waste code, are we ready to take them to court to make another determination, and what does this do to their agreement to clean up this year? Potentially, we could have an illegal treatment facility. I am quite certain they will want a meeting or conference call to discuss these issues. I want to send a letter back to the facility stating I have received their variance request and the plan review fee, and think I should state at that time that we will not issue a variance unless the waste code issue is resolved. What do you all think?

From: Kafura, David J
Sent: Monday, June 29, 1998 2:58 PM
To: Flaherty, Peter D; Miller, Donald L; Mulholland, Timothy S
Cc: Saari, Christopher A; Hosch, James A
Subject: RE: Waste Determination - Penta contaminated soil

Time out. First, for the wood treating HW codes to apply, in this instance F032, the wood treating process had to be pressure treating with pentachlorophenol. It is/was my impression that the wood treating rules do not apply to surface protection (pole dipping) operations. This is why EPA went from F032 to F034, F035 under listings in FR. They have deferred on F033 which is reserved for surface protection using chlorophenolics. This is based on the 12/06/90, FR Wood Preserving Final Rule. So, I believe F032 is not available to CM Christiansen. And actually Don, it is a good thing because EPA would have to issue the LDR variance for F032 because we don't have the wood treating LDR's in our code yet. Pre-RCRA doesn't matter for wood treating HW codes as what is being proposed would be active management of a HW anyway.

Next. The D037 TCLP is great for everyone else that followed the F027 EPA listing, because there was a flaw in the federal listing. That flaw was corrected at the state level when WI incorporated F027 to include; used and unused formulations containing pentachlorophenol, etc, etc. It is my opinion that if someone finds pentachlorophenol contamination and cannot find any reason whatsoever for it to be there, then the TCLP level is appropriate. On the other hand, a wood treatment (pressure or surface coat) facility that has penta contamination better be calling it an F027, because it is appropriate in Wisconsin.

Finally, I assume that the treatment request also plans for the remediated soil to be put back onto the ground. For the variance approval (and request) the consultant needs to request a LDR variance to re-deposit the treated soils onto the site. This is where you would want to work closely with Chris on reviewing the proposed NR 720 RCL's for the site. Hopefully they have included all the potential RCL parameters; penta, dioxin,

PAH's, furans. Based on the technical review of the 720 numbers as being appropriate for the site, then issue the treatment variance with a couple of Findings, Conclusions of Law that would allow redeposition above the LDR numbers, as long as the treated numbers are below the calculated 720 numbers. That's my 'learnt opinion'.

From: Miller, Donald L
Sent: Monday, June 29, 1998 11:45 AM
To: Flaherty, Peter D; Kafura, David J
Cc: Saari, Christopher A
Subject: Waste Determination - Penta contaminated soil

I recently received the variance request for soil treatment of PCP contaminated soil at CM Christiansen in Phelps. The request for variance came with the plan of operation and I now have a $1,200 plan review fee. After *briefly* reviewing and just checking for a few details, I realized that they did not call their remedial soil wastes an F027 hazardous waste. I called the engineer at Natural Resource Technologies, Laurie Parsons, and she said the generator did not think F027 was appropriate and is suggesting D037 for pentachlorophenol. I asked if she had seen the 'Balko Trailer" memo, and she, as well as the client have. Ok, I said, it IS up to the generator to make a waste determination, BUT how can they tell me it is NOT a discarded used or unused formulation containing PCP? She also said that Christiansens were wondering if F032 could apply? This code is for preservative drippage and process residuals, but certainly may apply here if the generator knows for certain that the penta in the soil came from drippage, which they seem to know, but haven't exactly said yet, right Chris? However, this may have been pre-RCRA, so we get into that whole business then too. She stated that the generator has NOT determined this as yet however. I cannot see how they would choose F032 over F027 as the latter would probably allow for solid waste disposal in Minnesota, another option they have considered, certainly they can't do that with an F032 listing. Chris, do we have any documentation that they managed the treated poles by allowing them to drip over something other than a drip pad or tank? Like, maybe, the ground?

CM Christiansen ran a PCP pole dipping operation in Phelps from the 1950's until the late 1970's. They are now a holding company no longer doing lumber business, and have a consent agreement under spill law to clean up their contaminated soil in 1998.. They are willing to do this, but don't have endless deep pockets. It would seem that bio-remediation with redisposal on site would be the best way to go, and is what is being proposed. Whether or not F027 is used for the waste code should not hinder this remediation. I can do a conditional approval, if all the ducks are in line, and state in the approval that this is an F027 waste, and not allow treatment unless the generator agrees, or I can do an incompleteness report and possibly hold up the cleanup, which gives the RP an out if they want it. Not a real good idea, it seems. So my question to Pete and Dave-Should I just do a conditional approval, if everything else checks out and call the waste soil an F027 waste, saying that the generator should acknowledge this before we do the final variance approval? I await your learned opinions.

Don

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Don

Saari, Christopher A
From: Mulholland, Timothy S
Sent: Tuesday, July 07, 1998 4:44 PM
To: Kafura, David J; Miller, Donald L; Saari, Christopher A
Cc: Hosch, James A; Flaherty, Peter D
Subject: RE: Waste Determination - Penta contaminated soil

I've been trying to follow this thread after having been out of the office for not long enough. (Sometimes, it makes my head hurt *more* to come back from a vacation than to just skip the vacation and keep on working!) I think that you all are handling this situation quite well and I have no major comments. (Well, maybe just a few...)

It appears to me that there needs to be either an "informal" discussion with Laurie Parsons at NRT or the folks at the CM Christiansen site to see if Don or Dave can help them to better understand the errors of their ways. Based on the info the Chris has mentioned, the case seems to be pretty compelling that the waste really is F027. Also, it seems to me that there are two options for addessing this situation - either Christiansen/NRT agree that the contamination is F027 or we don't have to issue a variance. And, regarding the LDRs and RCLs, it seems that they need to do a bit more work on that aspect; I'm not clear how you can propose the use of a performance standard and then NOT propose the standard. I would anticipate that penta wastes wouldn't be extremely mobile, so excavating to the limits of contamination (which will be determined how based on what parameters?) followed by GW monitoring may have some merit. In terms of the use of a biopile, the final treated contaminated soil must meet the RCLs prior to redeposition onto/into the land (right Dave?). Therefore, I don't see how the variance can propose a performance standard without RCLs. Based on the logic that I think has been presented by Christiansen/NRT (per these long email messages), the contaminated soil could be excavated, placed into a "biopile" for a day or two and then replaced into the ground; from there, they'll just monitor to see if there's GW contamination? This doesn't work very well for me...

(and then again, I'm just back from vacation and my mind isn't into this work thing yet...)

Tim

Tim

From: Saari, Christopher A
Sent: Tuesday, June 30, 1998 10:59 AM
To: Kafura, David J; Miller, Donald L
Cc: Hosch, James A; Mulholland, Timothy S; Flaherty, Peter D
Subject: RE: Waste Determination - Penta contaminated soil

Don, to answer your questions first: According to the Site Investigation report and other information supplied by representatives of CMC, the poles were dipped, air dried over the tank, and loaded directly on to trucks. If there was excess production of treated poles, the poles were stacked on site, probably near the dip tank. They also said that residues from the dip tank were periodically removed and placed at unknown locations on the property, but probably in the "upper wetland" (which is an area targeted for remediation). There was also obvious leakage/spillage from treatment product storage tanks; free product has been encountered in a monitoring well near the former 30,000 gallon aboveground storage tank.

Dave: I have only briefly gone through the *Design Report and Plan of Operations*, but from what I've read, the consultant isn't proposing site specific RCLs. Instead, they intend to use a performance standard approach per s. NR 720.19; once contaminated soil has been removed, they will monitor groundwater quality to demonstrate the performance of the

remedy. As I said, I've only gone through this report once, but I also have the same concerns raised earlier; namely, they have not specifically addressed other contaminants of concern (e.g. dioxins/furans, PAHs, or VOCs) in their sampling and monitoring plans. I haven't seen a mention of a direct contact hazard, either. They seem to take the approach that treatment of PCP-impacted soil will address the other contaminants as well. I will certainly comment to this in my review letter.

I guess I wouldn't have as much of a problem accepting the performance standard approach if they weren't intending to replace the soil on site after treatment. If they have no RCLs to go by, there is no objective way to tell when the treatment is finished. Maybe it will make more sense when I review it again.

Let me know if you need anything else.

From: Miller, Donald L
Sent: Tuesday, June 30, 1998 7:51 AM
To: Flaherty, Peter D; Mulholland, Timothy S; Kafura, David J
Cc: Saari, Christopher A; Hosch, James A
Subject: RE: Waste Determination - Penta contaminated soil

Dave, first of all thanks for the comments. Second, I don't know why F032 was even suggested, but it was. I think they are "farming" for a waste code. I agree that F032 would be a poor choice even if it was possible to use, for many reasons, but the LDR's are certainly a major one if they decide to replace treated soil onsite. Third, I spoke with Chris and he is reviewing the RCL proposals, and your comment that they need to look at ***all*** the contaminants of concern is a good one. As I stated in my note, I don't see how they can say their waste will be D037. If the facility decides to do this, I will not issue the variance. This could result with their digging up the soil, doing tclp and if it does not trip tclp, they could claim it is not a hazardous waste. Then, we go to court, I guess. That is why I want to be certain that if they don't call this a listed waste, (F027) I will require that of them before they can get a variance. My question to Pete is if we get into a legal issue with the waste code, are we ready to take them to court to make another determination, and what does this do to their agreement to clean up this year? Potentially, we could have an illegal treatment facility. I am quite certain they will want a meeting or conference call to discuss these issues. I want to send a letter back to the facility stating I have received their variance request and the plan review fee, and think I should state at that time that we will not issue a variance unless the waste code issue is resolved. What do you all think?

From: Kafura, David J
Sent: Monday, June 29, 1998 2:58 PM
To: Flaherty, Peter D; Miller, Donald L; Mulholland, Timothy S
Cc: Saari, Christopher A; Hosch, James A
Subject: RE: Waste Determination - Penta contaminated soil

Time out. First, for the wood treating HW codes to apply, in this instance F032, the wood treating process had to be pressure treating with pentachlorophenol. It is/was my impression that the wood treating rules do not apply to surface protection (pole dipping) operations. This is why EPA went from F032 to F034, F035 under listings in FR. They have deferred on F033 which is reserved for surface protection using chlorophenolics. This is based on the 12/06/90, FR Wood Preserving Final Rule. So, I believe F032 is not available to CM Christiansen. And actually Don, it is a good thing because EPA would have to issue the LDR variance for F032 because we don't have the wood treating LDR's

in our code yet. Pre-RCRA doesn't matter for wood treating HW codes as what is being proposed would be active management of a HW anyway.

Next. The D037 TCLP is great for everyone else that followed the F027 EPA listing, because there was a flaw in the federal listing. That flaw was corrected at the state level when WI incorporated F027 to include; used and unused formulations containing pentachlorophenol, etc, etc. It is my opinion that if someone finds pentachlorophenol contamination and cannot find any reason whatsoever for it to be there, then the TCLP level is appropriate. On the other hand, a wood treatment (pressure or surface coat) facility that has penta contamination better be calling it an F027, because it is appropriate in Wisconsin.

Finally, I assume that the treatment request also plans for the remediated soil to be put back onto the ground. For the variance approval (and request) the consultant needs to request a LDR variance to re-deposit the treated soils onto the site. This is where you would want to work closely with Chris on reviewing the proposed NR 720 RCL's for the site. Hopefully they have included all the potential RCL parameters; penta, dioxin, PAH's, furans. Based on the technical review of the 720 numbers as being appropriate for the site, then issue the treatment variance with a couple of Findings, Conclusions of Law that would allow redeposition above the LDR numbers, as long as the treated numbers are below the calculated 720 numbers. That's my 'learnt opinion'.

From: Miller, Donald L
Sent: Monday, June 29, 1998 11:45 AM
To: Flaherty, Peter D; Kafura, David J
Cc: Saari, Christopher A
Subject: Waste Determination - Penta contaminated soil

I recently received the variance request for soil treatment of PCP contaminated soil at CM Christiansen in Phelps. The request for variance came with the plan of operation and I now have a $1,200 plan review fee. After *briefly* reviewing and just checking for a few details, I realized that they did not call their remedial soil wastes an F027 hazardous waste. I called the engineer at Natural Resource Technologies, Laurie Parsons, and she said the generator did not think F027 was appropriate and is suggesting D037 for pentachlorophenol. I asked if she had seen the 'Balko Trailer" memo, and she, as well as the client have. Ok, I said, it IS up to the generator to make a waste determination, BUT how can they tell me it is NOT a discarded used or unused formulation containing PCP? She also said that Christiansens were wondering if F032 could apply? This code is for preservative drippage and process residuals, but certainly may apply here if the generator knows for certain that the penta in the soil came from drippage, which they seem to know, but haven't exactly said yet, right Chris? However, this may have been pre-RCRA, so we get into that whole business then too. She stated that the generator has NOT determined this as yet however. I cannot see how they would choose F032 over F027 as the latter would probably allow for solid waste disposal in Minnesota, another option they have considered, certainly they can't do that with an F032 listing. Chris, do we have any documentation that they managed the treated poles by allowing them to drip over something other than a drip pad or tank? Like, maybe, the ground?

CM Christiansen ran a PCP pole dipping operation in Phelps from the 1950's until the late 1970's. They are now a holding company no longer doing lumber business, and have a consent agreement under spill law to clean up

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Region Headquarters
107 Sutliff Ave.
Rhinelander, Wisconsin 54501-0818
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TDD 715-365-8957

July 9, 1998

Mr. Eric Christiansen
P.O. Box 100
Phelps, WI 54554

Subject: Receipt of Variance Request and Review Fee-Request for Additional Information

Dear Mr. Christiansen:

The Department of Natural Resources received the request for a variance from licensing a hazardous waste treatment facility for the CM Christiansen closed pole treatment facility on County Highway E in Phelps, Wisconsin on June 16, 1998. A check for $1,200.00 was received on June 24, 1998 for the review fee. Please submit four additional copies of the variance request and design report to me at the above address.

I have briefly viewed the report, and made a call to Laurie Parsons, your consultant engineer. We discussed financial assurance at that time and also discussed the issue of a waste code for the soil that will be excavated during the remedial activities at the site. Ms. Parsons said that you had not yet determined the hazardous waste code for the excavated Penta contaminated soils.

The Department is willing to review your variance request and make a determination regarding your request to construct a hazardous waste bioremediation unit at your site. However, we cannot issue a variance until a waste code determination has been made. We are asking you to make a good faith effort to determine the waste code based on your knowledge of the site. My discussion with Laurie Parsons included a discussion of waste code F032. I have discussed the use of this code with other members of the hazardous waste team, and it is our opinion that this waste code is for facilities that pressure treated wood. It is my understanding that your facility dipped poles, never pressure treated wood.

The report also did not include a determination of the Residual Contaminant Levels (RCLs) for the site. RCLs must be developed *for all contaminants of concern* prior to the Department issuing a variance to the Land Disposal Restrictions (LDRs). We cannot issue an LDR variance to redeposit soils based on a performance standard only. When site-specific RCLs are determined, the facility may submit an addendum request for a variance to the LDRs to allow redisposal of treated soils on site. If the RCLs are determined to be protective of the environment, we can proceed with issuing the variance. Should CM Christiansen decide to not submit a request for an LDR variance, on site disposal would not be acceptable. For the Department to approve the treatment variance, the ultimate disposition of the treated soil must first be determined.

The Department is willing to waive the proof of financial responsibility for this remedial action if the design report indicates that the soils will be treated to below site specific RCLs in a reasonable period of time. If you have any questions regarding this letter please call me at 715/365-8980.

Sincerely,

Don Miller
Waste Management Specialist

c. Laurie Parsons, Natural Resource Technologies, 23713 W. Paul Rd. Pewaukee, WI 53702
Dave Kafura, DNR Spooner
Chris Saari, DNR Brule
Tim Mulholland, DNR Madison WA/3
Gary LeRoy, DNR Spooner
Susie Sutton, DNR Spooner

Saari, Christopher A
From: Nesta, Liesa K
Sent: Monday, July 13, 1998 5:44 PM
To: Saari, Christopher A
Subject: RE: C.M. Christiansen Co., Phelps

Chris - I just ran across this message and realized I did not respond earlier. Sorry about that.

Work in wetlands, such as filling or excavating, requires a US Army Corps of Engineers permit, with subsequent DNR approval under NR 103. Some types of projects have automatic DNR approval based on a Corps/DNR negotiation every 5 years. I'm not sure if what you describe is one of those or not.

So, first step is to contact the Corps. Call Mike O'Keefe at the Corps' Stevens Point office. The number is (715)345-7911. I think he's on vacation this week so you may have to leave a message and wait to hear back. You could also send him some details in writing to make it easier for him to see what's being proposed. Depending on the type of permit Mike applies, DNR may need to be involved in the review. If that's the case, the consultant would need to demonstrate to you that they meet the NR 103 requirements. The two primary requirements are 1)lack of practicable alternatives, and 2)no significant impacts to wetland functions and values. Mike can help you with that last step by evaluating the wetland system and its functions. Since NR 103 is a state code that all programs apply to their decisions, I think you would just certify that the project meets NR 103 within the context of whatever other approvals you issue for the project.

Hope this information is helpful. Good luck with your review!
Liesa Nesta, Water Management Specialist
DNR Woodruff Service Center
(715) 358-9214

From: Saari, Christopher A
Sent: Wednesday, July 01, 1998 11:33 AM
To: Nesta, Liesa K
Subject: C.M. Christiansen Co., Phelps

Hi Liesa! My name is Chris Saari, and I am a hydrogeologist working in the Remediation and Redevelopment program out of the Brule office. I understand that you might be hard to reach by telephone, so I'll try the e-mail route.

I am currently working on a cleanup at a site in Vilas County (C.M. Christiansen Co. or CMC) which will likely have WR&Z implications. The site is located along Military Creek north of CTH E near the Town of Phelps (SE ¼ and SW ¼, Sec. 35, T42N, R11E). The site was a former wood treating facility which made telephone poles preserved in a solution of 95% fuel oil and 5% pentachlorophenol. Some of these contaminants have migrated into Military Creek sediments and the soil in the adjacent wetland area. The environmental consultant hired by CMC wants to excavate some of the contaminated soil from the wetland for biological treatment further upland on the site.

Since I haven't worked on many cleanups which were in wetland areas, I was wondering what steps the consultant will need to take (e.g. NR 103 and/or Corps of Engineers permits) to conduct this remediation. I would like to discuss this with you in the near future if possible. I can be reached at 715/372-8539, ext. 120. After today, I will be out of the office until July 7, so if you have some time next week, please call me. Thanks.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Brule Area Headquarters
6250 South Ranger Road
Brule, WI 54820
TELEPHONE 715-372-4866
TELEFAX 715-372-4836

July 14, 1998

DNR Case #02-64-000068

FILE COPY

MR MIKE O'KEEFE
USACOE
3105 MACARTHUR WAY
PLOVER WI 54467

Re: Remediation of Environmental Contamination in a Wetland Area, C.M. Christiansen Co., Inc. (SE 1/4 and SW 1/4, Sec. 35, T42N, R11E), Vilas County

Dear Mr. O'Keefe:

I am writing to you at the suggestion of Liesa Nesta, a Water Management Specialist with the Wisconsin Department of Natural Resources (WDNR). Ms. Nesta suggested that I contact you regarding permit requirements for a project which I am currently working on at the above named site. I am a hydrogeologist in the WDNR's Remediation and Redevelopment program, and I am overseeing the remediation of wood preserving chemicals which have been discharged at this site.

The site is located along Military Creek north of CTH E in Phelps, Vilas County (see enclosed Figure 1). Contamination at the site is a result of the treatment of poles dipped in a solution of fuel oil and pentachlorophenol; pole dipping operations occurred from the 1950s until the late 1970s. Some of the treatment chemicals have impacted soil and groundwater in the wetland area associated with Military Creek, adjacent to the site.

Natural Resource Technology, Inc. (NRT) has been hired by the C.M. Christiansen Co., Inc., to conduct this remediation. The proposed cleanup will include excavation of approximately the top 1 foot of impacted material from the wetland area (Area 2B on enclosed Figure 2), and treatment of this material on an upland portion of the site. The excavated area would then be backfilled with clean material.

My questions concern the types of permits which C.M. Christiansen Co., Inc., and/or NRT may have to obtain from the Corps of Engineers prior to conducting this remedial action. Ms. Nesta has indicated to me that the WDNR may or may not be involved in the review process, depending on the type of permit which the Corps will apply. WDNR review, if necessary, would involve certification that NRT's proposal complies with the requirements of ch. NR 103, Wis. Adm. Code (i.e. lack of practicable alternatives and no significant impacts to wetland functions and values).

I understand that you are out of the office for the rest of this week. I would very much like to discuss this project with you once you have a chance to review the enclosed maps. I can be reached by telephone at 715/372-8539, extension 120. If you have more specific questions about NRT's proposal, please contact Laurie Parsons at NRT, telephone 414/523-9000. Thank you.

Sincerely,

Christopher A. Saari
Hydrogeologist

encl.

cc: Laurie Parsons - NRT (w/o encl.)
Eric R. Christiansen - C.M. Christiansen Co., Inc. (w/o encl.)
Liesa Nesta - DNR Woodruff
Gary Kulibert - DNR Rhinelander (w/o encl.)

PHONE CONVERSATION RECORD

DATE: 7/14/98
TIME: 0941 hrs

CONVERSED WITH: Jim Hansen
WW Specialist Park Falls

SUBJECT/PROJECT: C. M. Christiansen

UNIQUE ID#.: 02-64-000068

Hansen called with questions about the WPDES permit application. Hansen said he had already spoken with Dave Katura, who said that monitoring should include PAHs, including benzo(a)pyrene, and breakdown products of PCP, plus dioxins/furans.

I told Hansen that a soil sample from the site did contain dioxins/furans, but not much of 2,3,7,8-TCDD; I also said that water samples from MW-7 (with free product) didn't detect 2,3,7,8-TCDD.

Hansen then asked about the possibility of the seepage cell pushing the groundwater plume away; I said I didn't think that would be a big problem. Hansen asked about the soil near the seepage cells; I said soil was coarse & sandy. Hansen then said he would contact NRT about modeling of the change-out life of the carbon units.

I then asked Hansen about the possible need for a hazardous waste treatment variance for the water. I said that NRT had implied that the variance wouldn't be needed because it would be

Signature: Christopher Adams
(please write legibly)

- over -

covered/superceded by the WPDES permit. Hansen said he wasn't sure about that, and that he would do some checking.

PHONE CONVERSATION RECORD

DATE: 7/30/98
TIME: 1532 hrs.

CONVERSED WITH: Laurie Parsons
NRI
414 523-9000

SUBJECT/PROJECT: C.M. Christiansen

UNIQUE ID#.: 02-64-000068

Parsons returned my call.

I explained my efforts to find out what permits might be needed for wetlands excavation - no luck yet. Parsons said Elizabeth Rich sent Parsons a copy of a recent legal decision that said the Corps of Engineers didn't have authority to enforce regulations on small wetland excavations.

I said that I had spoken with Jim Hansen regarding the WPDES application; Parsons said she had also spoken with Hansen. The issue of dioxin sampling was discussed; Parsons thinks that CMC will balk at spending this money.

Parsons said that Eric Christiansen would be sending a letter to Don Miller in regards to the waste code issue. Parsons said that it was CMC's understanding that Scott Watson had agreed to a D037 listing previously; CMC will apparently go with the F027 code, as long as they have the right to change the code in the

Signature: Christopher A. Saari
(please write legibly)

-over-

future if conditions dictate, to avoid further legal costs. Parsons also said per her most recent conversation with Miller the DNR's concern over RCLs & LDRs had more to do with separate applications and fees than on issues relating to land disposal. I replied that I needed to talk to Miller about this issue.

I brought up the seemingly inconsistent biopile decommissioning approach between the RAOR and the System Design. Parsons said the biopile will be placed on-site, not capped. Parsons then said that NRT couldn't be too specific in the design report about what would happen at the end of treatment, due to the performance standard approach.

I brought up the lack of an RCL for direct contact. Parsons said an RCL hasn't been calculated, but she thought the value would be lower than the groundwater leaching RCL. Parsons said the intent was to calculate a direct contact RCL once the performance standard had been met. I then asked how NRT would know they had met the direct contact standard; for example, near-surface soil around MW-8 had over 300 ppm PCP - is this a direct contact threat? Parsons said NRT had planned to re-evaluate this soil, and they will likely either excavate the soil or place additional cover-soil over it. In response to another question, Parsons said they would try not to take out MW-13 in the excavation.

I then suggested that an additional well (west) was needed downgradient from Areas 3 & 4. Parsons said this would have to be put in my response letter. We also discussed the location of PMW-16. I also said that wells which have already been sampled for VOC could probably switch to PVOC.

Parsons asked that I call her prior to writing my letter, so that NRT can start making preparations. Parsons also said again that the direct contact RCL would probably be less than 200 ppm, and Parsons suspected that EPA would leave the site before cleaning up "every last speck".

CORRESPONDENCE/MEMORANDUM — **State of Wisconsin**

DATE: July 31, 1998 FILE REF: 3200

TO: Chris Saari - NOR/Brule

FROM: Tom Janisch - WT/2 Tom Janisch

SUBJECT: Bureau of Watershed Management Comments on the May 13, 1998 Supplemental Evaluation of Military Creek and Revised Work Plan for Screening Level Assessment Associated with the C.M. Christiansen Co., Inc., Phelps, WI.

Overall Comment

An important aspect of the Military Creek system to keep in mind is that of its 5 mile length, miles 0 (juncture with North Twin Lake) to 1.7 miles upstream are classified as Class I trout water and miles 1.7 to 5.0 are classified as Class II trout water. Also miles 0 to 1.7 are classified as an Exceptional Resource Water. It is especially important to identify any impairments to the approximately first 1,200 feet of the creek associated with the site in order to restore and/or allow the stream quality to recover to attain its full stream use classification.

Summary of Comments

1. We recommend that definitive sampling and analysis for the 2,3,7,8-substituted dioxin and furan congeners as established in the draft April 11, 1997 be conducted to complete an assessment of both the ecological and human health risk factors of the site sediments.

2. We recommend that sampling and analyses for diesel range organics (DRO) be conducted in the site sediments. We have correlated effects to benthic organisms from DROs at another site involving releases of petroleum products to a surface waters. A fraction of released petroleum compounds can become integrated into sediments where the residuals can remain little changed over years and apparently retain their toxic properties.

3. Toxicity testing of the sediments using established protocols should be retained as a tool in the phased or tiered approach to assessing sediment quality. Decisions to use toxicity testing should be based on the results of the chemical testing of the bulk sediments. The toxicity test results need to be interpreted carefully and put into context of the results from all the other tools and methods used to assess the quality

of the sediments.

4. Since there generally is a difference between the distance a hand pushed corer can penetrate into soft sediments and the depth a probing pole can be pushed into the same sediments, we would want penetration measurements from both methods in order to know what portion of the overall depth of the soft sediments is being characterized. We recommend that at least 50% of the total depth of deeper soft sediments as measured by a probing pole be characterized.

5. Past sampling results have shown elevated levels of chlorinated pesticides in site soils and low levels in the creek sediments. It has been discussed that these are false positive readings due to analytical interferences by ether compounds. For the report that will be generated as a result of the Work Plan, this issue should be discussed and supported.

Comments

1. Sampling and Analysis of the Sediments for 2,3,7,8-Substituted Forms of Dioxins and Furans

The draft of the April 11, 1997 NRT Sediment Sampling Plan provided for initially analyzing 6 sediment samples representative of a cross section of sediment types and depths from the Creek for dioxins and furans. Unfortunately, the May 13, 1998 Sampling Plan now has deleted the sampling and analysis for these compounds. Reasons given for the deletion in the work plan are low mobility, lower toxicity of the congeners previously detected in the Creek sediments, and non-detect of the congeners in fish sampled to date from the site.

Page 5 of the May 13 Work Plan discusses the toxic equivalency factors (TEFs) for the various 2,3,7,8-substituted dioxin and furan congeners related to the most toxic form -- 2,3,7,8-TCDD. The Work Plan discusses the proposed revisions to the TEF values based on a 1997 conference in Sweden. The TEF values that WDNR used to calculate the TCDD-equivalency of the congeners in the Military Creek sediments related to human health concerns in 1995 were based on the TEF values published in the Federal Register (Vol. 60, No. 56) that contained the Final Water Quality Guidance for the Great Lakes System; Final Rule. The 1997 Stockholm conference <u>proposed</u> revisions to some of the TEF values for humans and proposed separate sets of TEF values to protect the health of fish and piscivorous birds that consume fish. The revisions and additions to the TEF values are proposed. This does not mean that they become automatically adopted and replace existing values in published guidelines. The TEF values related to human health as published in the Final Water Quality Guidance for the Great Lakes System will continue to be used until such time as they are formally revised.

Table 1 attached compares the TEF values from the Great Lakes Guidance and the revisions and additions proposed from the Stockholm conference. Related to human health, the Stockholm proposed revisions result in doubling the TEF value for the pentachlorinated dibenzo-dioxin (PeCDD) congener and decreasing the TEFs by an order of magnitude for the octachlorinated dibenzo-dioxin (OCDD) and furan (OCDF) congeners. Based on the sets of TEF values from the two sources, the total TCDD-equivalent concentrations in the sediments from Military Creek based on the WDNRs 1993 samples are shown in Table 2. It is noted that the resulting TCDD-equivalencies for humans are somewhat less based on the Stockholm TEF values but they have not decreased significantly to put them out of a range of potential concern.

The objective of the WDNR 1993 sediment sampling was to collect enough data to do an initial screening for site scoring purposes. The results indicated a potential problem based on the concentrations of 2,3,7,8-substituted congeners found in the sediments that originated as impurities in the manufactured PCP product. Based on existing data, the TCDD-equivalent concentrations in the Military Creek sediments for the dioxins and furans are over six times greater than concentrations measured in sediments anywhere else in the state. The Military Creek results are based on compositing either the one foot or two foot length of core retrieved at each sample site for analysis. The next logical step would be to do additional sampling to determine if there is any variability in concentrations within segments of the core to help to determine risks from exposure to surface sediments and future exposure risks if any elevated concentration at depth become exposed through removal of overlying sediments. We have measured soft sediment depths in areas of the creek at and immediately downstream of the site of seven feet and greater. How stable these sediment deposits are is unknown. Any dioxins and furans sequestered in these sediments could become exposed and serve as an exposure pathway to future users of the site.

If all the dioxins and furans measured in a composited core of two feet were present in only the surface six inches, the concentration in the six inches could be four times greater than that measured in the entire composited core. For example, if the composited two foot core had a total TCDD equivalent concentration of 2.5 ug TCDD-EQ / kg of sediment (as is the case for WDNR sample S-22 from Military Creek) and the dioxins and furans are only present in the surface six inches of sediment, the actual concentration could be 10 ug TCDD-EQ / kg. As a point of reference, the EPA OSWER Dioxin Disposal Advisory Group has established that if the TCDD equivalency in soils is greater than 1 ug/kg in a residential setting, remedial action is necessary. If the concentration is 20 ug/kg or greater in a non-residential setting, remediation is necessary. Background total TCDD-EQ values in sediments from an unimpacted site generally could be expected to range from 0.00015 to 0.00245 ug/kg based on available statewide data.

While the above are not entirely applicable to the Creek sediments and future uses of the land making up the site are unknown, the above values serve as reference points. Other useful reference points include TCDD values in Wisconsin's land spreading program for paper mill sledges. This program restricts TCDD content in the sledges based on the use of the land on which the sludge is applied. The permitted TCDD levels in sludge are 0.010 ug/kg for silviculture; 0.0012 ug/kg for agriculture; and 0.0005 ug/kg for agriculture with grazing. It is assumed that these values are based principally on the bioaccumulation potential of the 2,3,7,8-TCDD form in the food chain. The BEF column in Table 1 shows the bioaccumulation equivalency factors for the 2,3,7,8-substituted dioxins and furans. The dioxins and furans in the sediments of Military Creek that contribute to the largest proportion of the TCDD equivalency have BEF values that generally range from 0.02 to 0.1.

One of the comments in our August 26, 1997 memo in regard to the April 11, 1997 Work Plan was the need to look at human health risks from exposure to site-related contaminants in the creek in addition to the ecological risks. Table 3 presents a very preliminary risk assessment that looks at only one possible exposure pathway to a child who accesses then ingests the sediments of creek above County Highway E in a standard exposure scenario. If 1.0×10^{-6} is used as an initial baseline to screen the resulting calculated lifetime cancer risks, it can be seen from Table 3 that all of the risk values considering a number of variables are greater than this. At the highest assumed TCDD-EQ concentration in the surface sediments of the creek, a lifetime cancer risk value of 1.22×10^{-4} was calculated. It is assumed that it may be necessary to consider actions to mitigate or minimize exposures to contaminants when estimated lifetime cancer risks are in the 1.0×10^{-5} to 1.0×10^{-6} range. Remedial actions would almost certainly be needed where risk was in the 1.0×10^{-4} range.

The above represents only the exposure pathway of ingestion of creek sediments by a child. Other possible exposure routes that would increase this risks would be dermal contact of the sediments and ingestion of creek water in which the dioxins and furans may be present largely associated with suspended particulate matter or colloidal material. The risks may also be increased by exposure to the site soils as well as the sediments.

Preliminary calculation of a hazardous quotient (HQ) based on the estimated non-carcinogenic intake of the dioxin/furan contaminated sediments ingested by a child divided by a reference dose 1.3×10^{-7} mg/kg-day (Human Noncancer Criteria from the 1995 EPA Great Lakes Water Quality Initiative Criteria Document) yields a value of 0.15 for the highest assummed ingestion of contaminated sediments. Since an HQ value less than 1 indicates that exposures are not likely to be associated with adverse noncarcinogenic effects (for reproductive toxicity in regard to the above value), site exposures through ingestion would not appear to be of concern. However, not all noncarcinogenic effects may be addressed by the above value (for example potential immune system problems).

Based on the above, it is recommended that sampling and analysis for 2,3,7,8-substituted dioxins and furans in segmented sediment cores upstream of Co. Highway E be retained in the sampling plan as the next step in the assessment of the creek sediments for these compounds. The initial information indicates these compounds are present at levels of potential concern from a human health standpoint based on the exposure assumptions used. More site specific information is needed in order to make a more definitive determination of the level of current and future risks.

2. WDNR Requests For DRO Analysis of Sediment Samples

The Work Plan on page 6 questions the necessity of testing for diesel range organic (DRO) compounds in the creek sediments that WDNR had requested in previous comments based on the use of fuel oil as a carrier. The reasons listed for not doing DRO analysis are basically as follows:

1) No toxicological evidence that DRO compounds are of concern in close proximity of the creek.

2) Petroleum products are labile in the environment, readily degraded, and are degraded faster in an aquatic environment than soils.

3) WDNR did not find detectable concentrations of these compounds in floodplain soils, it would not be expected the DROs would be found in the sediments, and

4) DRO analysis is an indicator parameter but does not yield compound specific information and is difficult to interpret with respect to its effect in an aquatic environment. PCP can be used as an indicator of impacts to the creek instead of DRO.

Briefly, the following responds to each of the above points:

1) and 4) In association with the triad sediment quality assessment approach we used on the Newton Creek/Hog Island Inlet site in Superior that involves contamination from historical petroleum product spills and discharges, we established concentrations of DROs that were related to effect levels to benthic macroinvertebrates (WDNR, 1995). Using DROs concentrations in this manner did not necessitate identifying specific compounds that may have caused the effect. Many compounds within the DRO range may have been responsible for the observed effects either acting alone or in an additive or synergistic manner. What we don't know is if similar hydrocarbons in the DRO of the Newton Creek sediments that are correlated to the impacts to organisms are possible present in the Military Creek sediments.

The DRO test represents a somewhat non-specific measurement of different mixtures of hydrocarbon compounds based on the methodology of their determination. Right

now it is enough to say that DRO levels can be related to impacts to benthic organisms and where potential releases of a petroleum product may have occurred to a surface water, even after a number of years, that can be measured by DRO analysis, DRO analysis needs to be conducted. Attached Appendix D from 1995 WDNR study reviews the potential biological effects from petroleum components to aquatic systems. In the case of Newton Creek in Superior, it is believed the majority of petroleum product spills occurred to the system over 40 years ago, yet the residual petroleum fractions remaining today in the bottom sediments remain toxic to aquatic life.

Once released to the surface waters, the fate and transport of PCP and those hydrocarbon compounds represented by DRO measurements were different. For this reason it is not believed that PCP can serve as a surrogate for DRO in determining the total impacts of all the potential contaminants released from the site.

2) Fate and transport of released petroleum products to surface waters is reviewed in the attached Appendix C from the WDNR (1995) study of the Newton Creek system. As the review notes, differentiating between the petroleum fractions is of ecological importance. Some components of the released oils are labile and are subject to volatilization and dissolution. Other fractions are not and can end up deposited in the bottom sediments through various mechanisms. Once deposited in the bottom sediments under anaerobic conditions, microbes cannot degrade the hydrocarbon components effectively. Compared to decomposition under aerobic conditions, anaerobic bacteria degrade petroleum components very slowly. Some hydrocarbon persist indefinitely in anoxic sediments and retain their toxicity.

3) While we did not find detectable levels of DROs in any of our 1995 samples of floodplain soils, only two site were sampled plus a reference site. At the two sites, two segments (0 -3 in. and 3 to 8 in.) were analyzed. The two sites were selected based on an available site map and a site visit. This limited sampling did not cover the entire linear area of the site along the Creek from which fuel oil may have entered the creek. Maybe the area from the site where fuel oil may have entered the creek is no longer evident. It does not automatically follow that because we did not have detects in two samples from floodplain soils that DROs would not expected to be found in the sediments. One thing that was evident to WDNR personnel while sampling and probing in the creek sediments next to the site was a fuel oil-type odor at some sample sites and some sheening on the water surface.

NRTs work plan indicates they do not have the DRO results from WDNRs 1995 sampling and would like the results to consider DRO analysis for the current study. The requested results are attached for providing to NRT.

The bottom line is that we continue to feel DRO analysis of the creek sediments is necessary to fully characterize the potential past contaminant release from the site to the creek.

3. 1995 WDNR Toxicity Testing Results for the Military Creek Sediments

Pages 3 and 8 of the Work Plan discusses the results of the 1995 toxicity tests performed on the creek sediments. The Work Plan states that for a number of reasons the toxicity tests performed did not measure the specific toxicity to Military Creek biota. Although not stated, it would seem to follow that for the reasons given all toxicity testing performed on sediments from any site do not have the ability to measure toxicity. We do not agree with the Work Plan points as to the inability of testing to measure toxicity. Toxicity testing of sediments using test organisms representative of several levels in the aquatic food chain and different exposures routes following accepted protocols is a standard component of generally most published guidelines and recommendations for assessing sediment quality. The WDNR has and will continue to use toxicity testing as one tool used in conjunction with others to assess sediment quality for any impacts to aquatic systems. Extrapolation of the toxicity testing results performed under controlled conditions in the laboratory to the conditions in the field is a standard part of interpreting and weighing the test results assuming all the testing protocols and test control criteria are met.

The results of the WDNR 1995 toxicity testing showed that in the testing using the water column organism *Daphnia magna* in a 10-day chronic test (survival and reproduction), test organisms exposed to the sediments from site MC-3A experienced statistically significant mortality and subsequently significantly reduced reproduction relative to both the lab control and field reference. In the testing using the benthic organism *Chironomus tentans* also in a 10-day chronic test (survival and growth), organisms exposed to the sediments from site MC-3A also experienced significant mortality and subsequently reduced growth. Also, while not statistically significant, survival in the 48 hour acute toxicity test for *Ceriodaphnia dubia* was greatly reduced at site MC-4A and MC-6A. Variability in survival within the replicates from each site however, render the results somewhat inconclusive.

Overall, the results were not as inconclusive as to the toxicity of the of the Military Creek sediments as the Work Plan states. Any further toxicity testing would be used to verify the initial 1995 results and to determine if there are any other areas where toxicity to water column and sediment organisms is present in the potentially impacted reaches of the creek. Essentially sediments from four creek sites were tested. Applying a worst case scenario and extrapolating the results that indicate one of the four sites tested showed toxicity would translate into potentially 25% of the area of the bottom sediments in the creek associated with the site being impaired relative to supporting a healthy aquatic population.

The Work Plan states that "the sediments in the creek are fine-grained and mucky, which is not high quality habitat for aquatic insects or other biota". The natural quality of the bottom habitat is not of question. The bottom habitat will support a community of aquatic organisms that are adopted to survive and reproduce in the habitat. This community must be allowed to reach its full potential in terms of species numbers and diversity and not be impaired by introduced contaminants into the system. The full potential and use classification of the stream must be allowed to be met.

The April 11, 1997 NRT Work Plan indicated that further toxicity testing would depend on the results of the chemical testing of the sediments. However, the May 13 Work Plan reached the conclusion that further toxicity testing would not likely provide any more insight as to whether contaminants that are present are causing harm to aquatic biota. Our recommendation is that the option for toxicity testing be left open depending on the results of the chemical testing of the sediments. This addresses the assessment of the sediment quality in a phased or tiered fashion which is an accepted approach to conduct the assessment. All the needed information is in hand before decisions are made on the next logical step, not before the needed information is in hand.

We would agree that the results of the macroinvertebrate studies conducted in the creek in 1995 were inconclusive for reasons believed attributable to the precipitation and high flow conditions in the creek just prior to the sampling event which caused disturbances to the benthic community. However, before we would recommend any additional macroinvertebrate sampling, we would want to consult more with staff who have the necessary expertise to determine if this type of sampling and resulting metrics are applicable to the stream habitat type involved.

4. Sample Collection Methods

The Work Plan indicates that the sediment samples will be taken with a hand corer. The depth of corer penetration achieved is not always reflective of the true depth of the soft sediments. The depth achieved with a hand corer may reach a point of "refusal" that reflects the inability of any more sediment material to move up the core tube rather than reaching underlying more consolidated substrate material that the core cannot penetrate. For example, in some preliminary probing and coring work WDNR did in some sediment deposits of Military Creek in 1996, the relationships in the following table were found. The diameter of the core tube was 3 in. and it was hand pushed into the sediments. The sediments were probed with a 1 3/4 in. aluminum pole, marked in tenths of feet, hand pushed into the sediments.

Site Number	Length of Retrieved Core (feet)	Depth of Pole Penetration (feet)
1	1.7	4.0
2 (1995 MC-3A Site)	2.3	7.0+
3	1.8	7.0

We would be interested in the depth of soft sediments in the creek associated with the site as determined by the use of a similar probe or sounding pole. We would also want to see cores taken into the soft sediments that are representative of at least 50% or more of the soft sediment depth as determined by the sounding pole. More than one core may need to be taken out of the same coring hole. Since we don't fully know the impact of future hydrological conditions in the creek on the stability or disturbance of the existing sediment deposits, it is prudent to characterize the sediments to the above depths.

5. Past sampling results on land at the site have showed significant levels of a number of chlorinated pesticides. Low levels for some of the pesticides were found in concurrent sampling of the creek sediments. There was some past discussions that the detections of the chlorinated pesticides were likely false positive readings based on interferences by chlorodiphenyl ethers during analysis for the pesticides. I don't know if this issue has been dealt with in the past and resolved. In regard to the sediments and the report that will be generated as a result of the current Work Plan, I want to see a discussion of the issues and a chemist or analyst statement in the report that explains the interference problems presented by the ether compounds. Without this, the alternative is to ask for sampling of segmented sediment core samples for the chlorinated pesticides.

If you have any questions or want to discuss the above comments, please call me at 608-266-9268.

cc: Duane Schuettpelz - WT/2
Lee Liebenstein - WT/2
Jim Amrhein - WT/2
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Table 1. Comparisons of TEF Schemes For Calculating 2,3,7,8 TCDD Toxic Equivalencies

Congener	EPA Final Water Quality Guidance for the Great Lakes (March, 1995)[1]		WHO 1997 TEF Scheme		
			Humans/Mammals	Fish	Birds
2,3,7,8-Substituted Dioxins	**TEF**	**BEF**	←BEF value discussed in comments		
2.3.7.8-TCDD	1.0	1.0	1.0	1.0	1.0
1,2,3,7,8-PeCDD	0.5	0.9	1.0	1.0	1.0
1,2,3,4,7,8-HxCDD	0.1	0.3	0.1	0.5	0.05
1,2,3,6,7,8-HxCDD	0.1	0.1	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.1	0.1	0.01	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.05	0.01	0.001	< 0.001
OCDD	0.001	0.01	0.0001	----	----
2,3,7,8-SubstitutedFurans	**TEF**	**BEF**	←BEF value discussed in comments		
2,3,7,8-TCDF	0.1	0.8	0.1	0.05	1
1,2,3,7,8-PeCDF	0.05	0.2	0.05	0.05	0.1
2,3,4,7,8-PeCDF	0.5	1.6	0.5	0.5	1
1,2,3,4,7,8-HxCDF	0.1	0.08	0.1	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.2	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.7	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.6	0.1	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.4	0.01	0.01	0.01
OCDF	0.001	0.02	0.0001	0.0001	0.0001

1. Federal Register. Vol. 60, No.56. Page 15420. Final Water Quality Guidance fo the Great Lakes System; Final Rule.

Table 2. Calculation of the TCDD-Equivalent Concentrations (pg TCDD-EQ / g Sediment) in the Military Creek Sediment Samples Based on the Great Lakes Water Quality Guidance TEF Values and the Proposed 1997 Values from the Stockholm Conference of the World Health Organization (WHO).

Sample Site in Military Creek from Sept. 1993 WDNR Samples	Total TCDD-EQ for 2,3,7,8- Substituted Dioxin and Furan Congeners pg TCDD-EQ / g Sediment			
	Based on TEFs in GLWQG	Based on the 1997 WHO TEF Scheme		
	Humans	Humans/Mammals	Fish	Birds
S-20 (Background)	0.15 - 2.45[1]			
S-21	983	701	333	333
S-22	2,504	1,874	1,083	1,004
S-22(Dup)	1,813	1,266	752	680
S-23	37	21	6.9	6.9
S-24	48	28	12	12

1. Based on background values from statewide sites.

Table 3. Equation for Calculating thePreliminary Exposure Risks to a Child from Ingestion of Contaminated Sediments From Military Creek.

Intake (mg TCDD-EQ-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$ (Source below for equation variables)		
CS	TCDD-EQ concentration in site sediments (mg/kg) as measured in WDNR 1993 1 to 2 ft core samples taken above Co. Hwy. E.	Maximum Probable Concentration (95% UCL) = 0.002167 mg/kg. Ave. = 0.001767 mg/kg. If all congeners in surface 6 in. of sediments and not mixed in two ft. of core = 0.00867 mg/kg
IR	Ingestion Rate (mg sediment/day)	Child - 200
CF	Conversion factor (10^{-6} kg/mg)	0.000001
FI	Fraction ingested from contaminant source (unitless)	1
EF	Exposure frequency (days/year)	Child - 20 and 60
ED	Exposure duration (years)	Child - 6
BW	Body weight (kg)	Child - 15
AT	Averaging time (period over which exposure is averaged - days)	25,550 (70 yrs x 365)
1. EPA. 1989. Risk Assessment Guidance for Superfund. Volume 1. Human Health Evaluation Manual Part A). EPA/540/1-89/002.		

Calculation of Lifetime Cancer Risk to a Child Exposed to the Sediments in Military Creek Considering the Variables in the Above Equation.

Media	Exposure Pathway	Equation Variables		Carcinogenic Intake mg/kg-day	Lifetime Cancer Risk Intake x Oral Slope Factor (SF = 7.5 x 10^{4})
		Exposure Point Concentra-tions (mg/kg)	Exposure Frequency (days/yr)		
Sediment	Ingestion	0.001767 (Ave.)	20	1.11 x 10^{-10}	0.83 x 10-5
			60	3.32 x 10-10	2.49 x 10-5
		0.002167 (MPC)	20	1.36 x 10-10	1.02 x 10-5
			60	4.07 x 10-10	3.05 x 10-5
		0.00867 (All in surface 6 in.)	20	5.43 x 10-10	4.07 x 10-5
			60	1.63 x 10-9	1.22 x 10-4

Slope Factor from EPA 1995. Great Lakes Water Quality Initiative Criteria Documnets for the Protection of Human Health. EPA 820-B-95-006.

Appendix C

Review of Petroleum Fractions and Components and Environmental Weathering of Petroleum

Review of Petroleum Fractions and Components and Environmental Weathering of Petroleum

Composition of Petroleum Oils and Derivatives

Petroleum oils are complex, variable mixtures of many thousands of different organic compounds and their isomers. Crude oils vary in appearance and consistency and in proportions of the various molecular types and sizes of hydrocarbons depending on their source. Major constituents of petroleum are always saturated hydrocarbons (C_nH_{2n+2}) of a wide range of molecular weights ranging from methane (C_4) to heavy oils (C_{50}). Fuel oil and diesel oil, which represent the middle distillates or middle range of distillation boiling points for refined crude oils contain a C_8 to C_{21} carbon range (Bergamini, 1992).

At ambient temperatures, petroleum hydrocarbon compounds with molecules up to 4 carbon atoms vaporize relatively easily; with 5-20 carbon atoms are in a liquid state; and with 20 or more carbon atoms are in a solid state (WHO, 1982).

The molecular configuration of hydrocarbons in crude oils are a complex mixture of straight and branch chain paraffinic (alkanes), cycloparaffinic, aromatic, and polynuclear, aromatic hydrocarbons together with the variable and smaller amounts of heterocyclic sulfur, nitrogen, and oxygen compounds. The latter are referred to as non-hydrocarbon compounds and are differentiated because they do contain S, N, and O in addition to carbon and hydrogen. The sulfur compounds are present as mercaptans, thiophenes, and more complex organic sulfur compounds. Levels of organic nitrogen compounds in most crude oils is less than 1000 mg/Kg, but some have up to 20,000 mg/Kg. Crude oils also contain some naphthenic (cycloalkanes) acids and phenolic compounds (WHO, 1982). Nickel, mercury, and molybdenum are sometimes found in crude oils as high as 10 mg/Kg, and vanadium as high as 50 mg/Kg.

Petroleum hydrocarbons have historically been grouped into the following four generic classes according to their differential solubilities in n-pentane, benzene, pyridine, or carbon disulfide (Pollard and Hrudey, 1992):

1. Saturates – n- and branched chain alkanes, refractory waxes, and cycloparaffins;

2. Aromatics – mono, di, and polynuclear;

3. Resins – e.g. pyridines, quinolines, carbazoles, thiophenes, sulfoxides, and amides; and

4. Asphaltenes – e.g. extended polyaromatics, naphthenic acids, sulfides, polyhydric phenols, fatty acids, and metalloporphyrins.

The relative distribution of these component classes in a natural oil determines the oil's classification as a heavy, intermediate, or paraffinic (waxy) crude.

The total aromatic hydrocarbon compound weight contribution in crude oils analyzed varies from 7.4 to 34% (Neff, 1982). The polycyclic aromatic compounds (tri- to hexacyclic) PAH concentration varies from 0.2 to 7.4% and averaged 2.1%. Typically, the alkylated homologues of PAHs are present at higher concentrations in crude and refined oils than are parent unsubstituted PAH compounds. The aromatic fraction of crude oils can contain many alkyl- and cycloalkyl derivatives of

PAH, a number of parent (unsubstituted) compounds and a large number of their alkyl-substituted homologues (C_1-C_{15}) (Sinkkonen, 1989). As a general rule, acute PAH toxicity is greatest with the lower molecular weight compounds and increases with increasing alkyl substitution (Van Luik, 1984).

Weathering of Petroleum Components When Released to Aquatic Systems

Crude oils and refined products such as fuel and diesel oils, once released to surface waters, undergo transformation through a multitude of biological, chemical, and physical weathering mechanisms (Wolfe, 1984). The various mechanisms that contribute to weathering in the environment include:

1. a. Dissolution into water column
   b. Evaporation/volatilization
   c. Particulate and sediment interactions and settling
   d. Photo-oxidation and biodegradation
   e. Absorption
   f. Emulsification
   g. Agglomeration with particulates and sinking
   h. Formation of surface oil films and dispersion

The fractionation and weathering of the components of oil once released to surface waters depends on the original physical and chemical composition of the oils, the hydrodynamics of the water body, and thermal energy (Owens, 1979). Thermal energy is related to air and water temperatures and as these increase so do rates of most degradation processes. Hydrodynamics determines the mechanical energy which is a function of currents, waves and wind which result in the dispersion, transport and physical breakdown of the oil.

Differentiating between the fractions and fate of oil is of ecological importance. Generally, the original hydrocarbon mixture of released oils may fractionate in water into surface oil films, emulsions, dissolution as water soluble substances; residual oils, semi-solid aggregates of oil and sediment covering the bottom; oil absorbed to particulates that is transported in the currents; and as colloidally-dispersed fractions (Zurcher and Thuer, 1978). The more volatile fractions are subject to volatilization and dissolution. The mono- and dicyclic aromatic hydrocarbons in crude oils will dissolve in water shortly after the spill. Alkylated benzenes and napthalenes are mobile in water. The aqueous phase becomes enriched with aromatics and low molecular weight aliphatics hydrocarbons. Aromatic compounds are generally the immediate interest in an oil spill, because they make up greater than 90% of the soluble hydrocarbon fractions (Korte, 1980) and are acutely toxic to aquatic life. Other water soluble components of oils toxic to aquatic life includes other hydrocarbons, phenols, and sulfides.

Once residual oils and oils entrained in sediment settle out and are deposited on the bottom of surface water bodies where anaerobic conditions exist, microbes cannot degrade the hydrocarbon components effectively. Microbes need oxygen and nutrients to effectively degrade compounds of oil. Anaerobic bacteria degrade petroleum very slowly, at best, compared to aerobic bacteria (API, 1972). Components of petroleum generally most susceptible to biodegradation are the normal (straight chain) paraffinic hydrocarbons. Branched-chain paraffins and cycloparaffins are decomposed more slowly. Many of the aromatic hydrocarbons and non-hydrocarbon compounds, particularly those of high molecular weight, are decomposed very slowly and if at all under anaerobic conditions. Most PAHs,

while readily degraded under aerobic conditions, persist indefinitely in anoxic sediments (Van Luik, 1984). Increases in the asphaltene content of weathered oils suggest that during biotransformations, other hydrocarbon fractions are transformed into polymeric asphaltenes (Pollard et al., 1992).

Persistence of heavy oil constituents in weathered oils, including N-, S-, and methyl-substituted PAHs have indicated that certain heterocyclic components (acridine, carbazole, dibenzothiophene) are sufficiently recalcitrant to be proposed as residual indicators of contamination by heavy oils (Pollard et al., 1992). Enrichment of refractory petroleum residues other than asphaltenes such as the pentacyclic hopanes, the steranes, and diasteranes, and the high molecular weight n-alkanes has also been reported.

The greatest changes to oils released to the environment occurs during the first 24-48 hours. In some situations, the volatilization and dissolution of the lower molecular weight aromatics and aliphatics during the early phases of the spill are the primary weathering that occurs if the remaining oils are entrained in particulates and deposited in the bottom sediments. Weathering decreases or stops in deposited, entrained oils (Mayo, et al., 1978). Weathered petroleum-contaminated sediments leaves behind the more resistant (isoprenoids), cycloalkanes, and cycloalkenes in greater relative abundance (Wakeham et al., 1980). Once oil is incorporated into sediments, the oil may be reintroduced into the water column through erosion, resuspension, or dissolution.

Even with aerobic microbial degradation possible, PAHs containing four or more fused benzene rings are known to be particularly resistant to degradation. No microorganisms have been found that can use these compounds as the sole source of carbon and energy (Wild et al., 1990). Complex alicyclic compounds such as tripentacyclic compounds are the most persistent compounds of petroleum spillages (Korte, 1980). Weathered oils can exhibit a class composition heavily weighted toward the more refractory hydrocarbon components, suggesting limited potential treatability in situ of residual oil contamination (Pollard et al., 1992). At one site dibenzothiophene and alkylated dibenzothiophene were found to be the most persistent aromatic oil compounds in sediment. They also accumulated in muscle and fish tissue (Sinkkonen, 1989).

The photo-oxidation process involves ambient sunlight striking petroleum components, yielding several potential products including acids, carbonyl compounds, alcohols, peroxides, sulfoxides, aryl and alkyl ethers, and hydroxy compounds including phenols, naphthols, and phenanthrols (Payne and Phillips, 1985). The photo-oxidation process may have considerable importance in the long-term weathering of spilled oil, both by enhancing dissolution of products, and by increasing the toxicity of water-soluble fractions. Photo-oxidation is responsible for discernable changes in both the composition and physical properties of the exposed parent oil. Changes in viscosity, spreading or contraction rates, and water-in-oil emulsification tendencies also may occur as a function of oil photo-oxidation. Light attenuation at depth may prevent sunlight from reaching oils deposited on the bottom of surface water bodies and causing photo-oxidation reactions.

References

American Petroleum Institute (API), 1972. The migration of petroleum products in soil and ground water. Principles and Countermeasures. Committee on Environmental Affairs. Publication No. 4149

Bergamini, T. 1992. Underground Tank Technology Update. 6(2):1-16. Special issue on Total Petroleum Hydrocarbons.

Korte, N. E. 1980. Literature review and preliminary assessment of biological transformations and biotreatment technology for petroleum hydrocarbons and chlorinated solvents. Prepared by Oak ridge National Laboratory. U. S. Dept. of Energy. Environmental Sciences Div. Publication No. 3513.

Mayo, D. W., D. S. Page, J. Cooley, E. Sorenson, F. Bradley, E. S. Gilfillan, and S. A. Hanson. 1978. Weathering characteristics of petroleum hydrocarbons deposited in fine clay marine sediments, Searsport, Maine. J. Fish. Res. Board Can. 35:552-562.

Neff, J. M. 1979. Polycyclic aromatic hydrocarbons in the aquatic environment. Sources, fates and biological effects. Applied Science Publishers LTD, London.

Owens, E. H. 1979. The Canadian Great Lakes: Coastal Environments and the Cleanup of Oil Spills. Environment Canada. Economic and Technical Review Report EPS-3-EC-79-2.

Payne, J. R. and C. R. Phillips. 1985. Photochemistry of petroleum in water. Environ. Sci. Technol. 19:569-579.

Pollard, S. J., S. E. Hrudey, B. J. Fuhr, R. F. Alex, L. R. Holloway, and F. Tosto. 1992. Hydrocarbon wastes at petroleum - and creosote-contaminated sites: rapid characterization of component classes by thin - layer chromatography with flame ionization detection. 1992. Environ. Sci. Technol. 26:2528-2534.

Sinkkonen, S. 1989. The fate of some crude oil residues in sediments. Chemosphere 18:2093-2100.

Van Luik. 1984. Mined land reclamation using polluted urban navigable waterways sediments. II. Organics. J. Environ. Qual. 13:415-422.

Wakeham, S. G. and J. W. Farrington. 1980. Hydrocarbons in contemporary sediments. In Contaminants and Sediments. Vol. 1. Ed. by R. A. Baker. Ann Arbor Science Publishers, Inc.

WHO (World Health Organization). 1982. Selected Petroleum Products. Environmental Health Criteria 20.

Wild, S. R., K. S. Waterhouse, S. P. McGrath, and K. C. Jones. 1990. Organic contaminants in an agricultural soil with a known history of sewage sludge amendments: polynuclear aromatic hydrocarbons. Environ. Sc. Technol. 24:1706-1711.

Wolfe, D. A. 1984. Interactions of spilled oil with suspended materials and sediments in aquatic systems. In Fate and Effects of Sediment-Bound Chemicals. Ed. by K. L. Dickson, A. W. Maki, and W. A. Brungs. pgs. 299-315.

Zurcher, F. and M. Thuer. 1978. Rapid weathering processes of fuel oil in natural waters: Analyses and Interpretations. Environ Sci Tech. 12:838-843.

Appendix D

Review of Potential Biological Effects from Petroleum Spills to Aquatic Systems and Vegetation and Discussion of Contamination in the Newton Creek System

Review of Potential Biological Effects from Petroleum Spills to Aquatic Systems and Vegetation and Discussion of Contamination in the Newton Creek System

Large volume spills or discharges of petroleum oils to surface water bodies generally have immediate and obvious environmental effects on local water column and benthic communities (Van Vleet and Quinn, 1978). Mass mortality of organisms occurs following acute exposures immediately after oil spill events to surface waters (Chapman et al., 1988). Once petroleum components become incorporated into the sediments below the aerobic surface layer, petroleum oil can remain unchanged, persistent, with retention of toxic properties of the residues over periods of years (DiSalvo et al., 1977). The sedimentary association with oil residues serves to prolong toxic effects of the spilled oil. Complex hydrocarbons once incorporated into sediments are not readily degraded and remain in sediments for significant periods of time. Chronic oil pollution may have serious long-term effects through changes to the structure of the benthic community or cause loss of sensitive important species. Research is needed to characterize the products derived from photo-oxidation of weathered oil and the toxicity of such photochemical products, to define the environmental effects of long term weathering (Payne and Phillips, 1985).

There is great variability in the toxic properties of oil making it difficult to establish a numerical criterion that would be applicable to all combinations of petroleum hydrocarbon and nonhydrocarbon components.

Aquatic site assessments at petroleum spill sites invariably face the problems posed by the complex matrix of contaminants in sediments that have a diverse range of environmental and toxicological properties. The "oil and grease" parameter measured represents a simple gravimetric determination of the organic fraction in water and sediments that are soluble in organic solvents. This parameter measures fats, oils, and waxes of vegetable or animal origin, hydrocarbons of natural origin, petroleum derivatives, organic chemicals, pesticides, detergents and soaps, as well as elemental sulfur (DiSalvo et al., 1977). This parameter provides no information on the relative proportions of toxic and nontoxic components of biological concern which includes certain petroleum hydrocarbons and their sulfur, oxygen, and nitrogen containing analogs. One assumption that can be made is that the oil and grease values reported for the reference sites are due largely to hydrocarbons of biogenic origin (e.g. seasonal growth of algae and plants in or adjacent to the stream). Assuming a comparable input of biogenic hydrocarbons in the Newton Creek system, the amount of petrogenic hydrocarbons would be the difference between the total oil and grease measured at the study sites and the oil and grease measured at the reference sites. Because the CR-2 reference site in Central Park Creek is in the urban area it may have received low inputs of petrogenic hydrocarbons from street and parking lot runoff, etc., as well as biogenic inputs.

The diesel range organic (DRO) parameter measures all chromatographic peaks eluting between n-decane (n-C_{10}) and n-octacosane (n-C_{28}). This measures hydrocarbons with a boiling point range of 170°-430°C that make up diesel and fuel oils. The DRO parameter, as with the oil and grease parameter, represents a somewhat non-specific measurement of different mixtures of compounds based on the methodology of their determination. These parameters can serve as surrogates for the potential problem components of concern that may be present in the mixtures that occur in the study area. For future application at this site, informative and cost-effective techniques should be investigated that can address the complexity of the petroleum components in sediments,

improve site evaluation efforts, and aid in the selection of remedial technologies if needed (Pollard et al., 1992).

Most of the information on ecological consequences of accidental oil spills comes from studies of marine sites. Only in recent years has information on oil in freshwater ecosystems began to be compiled (Mahaney, 1994; Baca et al., 1985). Petroleum oil spills to aquatic systems may be harmful to aquatic life in the following manner (Crump-Wiesner and Jennings; and Hyland and Schneider):

1. Oil accumulates on the gills or organisms and prevents respiration.

2. Oil and emulsions may coat and destroy algae and other plankton, removing a source of fish food.

3. Settled oils may coat the bottom, destroy benthic organisms, and interfere with spawning areas, and change biological habitats.

4. Soluble and emulsified oils, ingested by fish, taint the flavor and may cause intestinal lesions due to laxative properties.

5. The BOD of organic materials may deoxygenate the water column and sediment to kill fish and benthic organisms.

6. Coatings of oil may interfere with natural processes of reaeration and photosynthesis.

7. Water soluble constituents once released may exert a direct toxic action on aquatic organisms.

8. Sublethal disruption of physiological or behavioral activities.

9. Incorporation of hydrocarbons in organisms may cause tainting edible species and/or accumulation of potentially carcinogenic PAHs or their metabolites in food chains.

Once incorporated by sedimentary processes into bottom sediments, oils will continue to have long term, sublethal chronic effects (DiSalvo et al., 1977). Additional effects of oils becoming associated with sediments are:

1. Retention of the oil in the environment over an extended period of time.

2. Weak sediment particle association of sediment with oil, such that oil is available to organisms in the environment over a long period of time.

3. Spread of oil-containing benthic sediments over broad areas extending outward from the original impact area based on normal sedimentary movements.

4. Retardation of biodegradation of oil buried in sediments due to anaerobic conditions. This sedimentary association with oil residues serves to prolong toxic effects of spilled oil, rather than allow for its evaporation, dilution, and/or photochemical oxidation.

Additional studies of the toxicology, biogeochemistry, and geochemistry of aromatic hydrocarbons and other hydrocarbons in deposited sediments on timescales of years are needed to better understand the long-term fate and effects of petroleum compounds on aquatic ecosystems (Wakeham and Farrington, 1980; and Teal et al., 1978). The heavier aromatics in fuel oils, the highly substituted naphthalenes, and phenathenes, are the compounds that could have adverse effects for periods that may well be measured in decades (Teal et al., 1978).

Some of the chronic effects documented that relate to oil contamination in aquatic systems includes (Chapman et al., 1988; and Hyland and Schneider):

1. A delay in cellular division in phytoplankton.

2. Production of abnormal spawn in fish.

3. Reduction of chemotactic responses in snails.

4. Inhibition of burying behavior of clams.

5. Cellular and physiological interferences, usually leading to some form of abnormal behavior, particularly disruption of normal feeding and reproductive patterns.

Chapman et al. (1988) studied the burrowing and crawling behavior of a snail species after exposure to a range of concentrations of diesel oil in sand sediments. Both burrowing and crawling were altered by exposure to petroleum hydrocarbons. The 24-h ED_{50} or effective dose related to an inhibition of the burrowing response in 50% of the organisms, was between 85-108 ug/g of diesel oil in sediments. The 96-h LD_{50}, a concentrations lethal to 50% of the organisms was between 51-107 ug/g (diesel fuels were measured by a gravimetric method).

Gordon et al. (1978) found that in a deposit feeding marine worm that sediment working activity was completely stopped in some worms and substantially reduced in others at sediment fuel oil concentrations on the order of 250 ug/g.

Mayo et al. (1978) in a study of an estuarine cove in Maine contaminated with jet fuel and heating oil found that the loss of Mya arenaria (a soft shelled clam) population was large. Repopulation of the cove by Mya arenaria has correlated closely with sediment hydrocarbon concentrations. The majority of the sample stations where the clam was repopulating have petroleum hydrocarbon concentrations of 49 ug/g or less. Based on the slow loss of oils from the sediment, the sediments will continue to contain oil residues for a substantial period, and the restoration of clam populations to prespill levels will also continue to be suppressed.

Mozley and Butler (1978) in their study of the effects of crude oil on aquatic insects of tundra ponds had situations where no toxicity was detected in laboratory exposures, but there were several apparent effects of oil in treated ponds. They noted that differences between oil-treated and untreated ponds may arise from natural, between-pond year-to-year variations in population sizes of the insects. However, they felt it was necessary to interpret results of field experiments conservatively and to consider the connection of observed effects to oil to be probable until disproven so that potential ecological damage of oil spills is not overlooked. They indicate that system wide effects may be

more extensive than toxicity testing would indicate. Secondary responses of aquatic insects to zooplankton mortality, parasite growth or other effects such as changes in sediment cohesiveness when oil is incorporated into sediments, and interference with mating and oviposition may be quite important. In their review of the literature Mozley and Butler noted that the principle feature in common among petroleum hydrocarbon effects in various bodies of fresh water has been the differential susceptibility of various aquatic macroinvertebrate species. Some chironomid species are resistant to toxic effects of crude oils. At a site where stretches of a stream had oily sediments, predators from the families Agrión (Odonata) and Dugesia (Turbellari) and the omnivore Gammarus (Amphipoda) were eliminated whereas deposit-feeding Tubifex (Oligochaeta), Chironomus, Nematoda and predaceous Hirudinea persisted. They noted that freshwater benthic studies of oil effects are too few and habitats too diverse to make any detailed generalizations.

Payne et al. (1988) evaluated a variety of biological and biochemical indices in a subchronic toxicity study with a species of fish exposed to sediments contaminated with a petroleum source of PAHs. Indices included enzyme induction, muscle and liver levels of energy reserves, organ-weight-body weight relationships, and general condition indices. Biochemical effects such as changes in mixed-function oxygenase (MFO) enzyme levels and fat content of liver were altered at low petroleum hydrocarbon levels (approximately 1 ug/g). The authors state that the fact very low levels of hydrocarbons in sediments, water, or foods may produce biological responses in fish indicates the importance of developing criteria for assessing toxicological significance of sublethal effects from petroleum hydrocarbons. The most distinct change in the fish species study was the induction of the MFO system at the lower level of exposure to petroleum hydrocarbons. The MFO enzyme system plays a role in transforming foreign compounds into derivatives easily eliminated from the fish. Some compounds can be activated to reactive, more toxic species, which may be cytotoxic, mutagenic, or carcinogenic. The metabolites produced may adversely impact such physiological functions as reproduction in the fish or be potentially harmful to consumers of such fish.

Following chronic exposures of sculpin to crude oil contaminated sediments (2,000-3,000 ug/g total hydrocarbon concentration), Khan (1991) found lesions in the gills which probably impaired their function and restricted foraging activities; an increase in melanomacrophage centers in the spleen suggested some erythrocytic destruction via cytotoxicity but not to the extent to cause anemia; and delayed spawning activity and reduced number of egg masses produced. There is evidence that eggs of oil-treated animals are less viable, had a lower rate of hatching success and low survival of offspring. A decrease in lymphocyte levels in oil treated sculpins might be associated with immunosuppression.

Rosenberg and Wiens (1976) found that oil substrates supported a macroscopic algae community. The increases in algal biomass were conjectured to due to (1) reduction in numbers or elimination of zoobenthic grazers by toxic fractions of the crude oil allowing algal growth far in excess of normal; or (2) nutrients supplied by the oil stimulating algal growth. Rosenberg and Wiens evaluated Chironomidae (Diptera) species for their potential to indicate oil contamination of the freshwater ecosystem. They found that 10 species of Chironomidae showed a positive response to the presence of oil, 9 species showed a negative response and 10 species were apparently unaffected. Data on responses of species of Chironomidae to the presence of oil never showed that one species occurred exclusively either on oil or unoiled substrates.

Little information exists related to the direct toxicity of petroleum hydrocarbon components to plants. In plants, hydrocarbons have been shown to affect the selective permeability of plant cell membranes (Boyles, 1980). Affected membranes led to electrolyte loss from plant cells. The rate of loss from cells was found to depend on carbon chain length of applied liquid hydrocarbons. There are hydrocarbon susceptible plant species and hydrocarbon resistant species. The relative effects of hydrocarbons containing 10 carbon atoms but of different chemical types is generally in the following order: aromatics > naphthene > olefin > isoalkane approximately equal to n-alkane. Substitution of polar groups (e.g. -COOH) causes significant increases in potency. In the case of No. 2 fuel oil, adverse effects to salt marsh grasses was likely the result of direct chemical toxicity from rapid penetration into the plant from hydrocarbon components (Alexander and Webb, 1985).

Terrestrial plants can tolerate a concentration of hydrocarbons and no more than about 0.7% the equivalent of the uniform distribution of 50 barrels per acre (Schwendinger, 1968 as cited in API, 1972). Some plants, however, can survive in soils that contain up to 3% oil, equivalent to a uniform distribution of about 225 barrels/acre.

There are sample locations in the Newton Creek system where oil and grease levels exceed 0.7%. Assuming that aquatic plants have comparable sensitivity as terrestrial plants to petroleum oils (and assuming the oil and grease analytical method used in the current study is comparable to the method used in the Schwendinger study, sites with sediment contamination (at any depth) that may adversely affect aquatic plants include those in the impoundment and at locations NC-2, FP-1, NC-10, HI-13 and HI-16. A fringe of monotypic cattail (Typha sp.) surrounds the open water in the impoundment and appears to be healthy. Because cattail is tolerant of a number of adverse environmental conditions such as low oxygen levels and high metal contamination, it seems possible that they may also be tolerant of petroleum hydrocarbon enriched wetlands. The cattails growing in the impoundment are growing in a vegetative mat that is loosely anchored to the bottom. The plant debris on the mat and the mat itself have absorbed large amounts of petroleum hydrocarbons. Muskrat and beaver that utilize the system are being exposed to petroleum hydrocarbons in the water column and direct contact with contaminated sediments and the contaminated cattail mat in the impoundment. Muskrats may be additionally exposed to petroleum components from ingestion of cattail and other wetland vegetation that have absorbed and accumulated contaminants in rhizomes, roots, and shoots. The latter serve as the primary food base of muskrats.

Terrestrial plants can absorb PAHs from soils through the roots and translocate them to other plant parts such as developing shoots. Uptake rates are governed by PAH concentration, PAH water solubility, soil type, and PAH physicochemical state. Lower molecular weight PAHs were absorbed by plants more readily than higher molecular weight PAHs (Eisler, 1987). Pollutants with relatively high K_{ow} values such as PAHs (4.07-7.66) are most likely to be accumulated by or in the root and not be translocated out of it (Bell, 1992).

Nesting waterbirds such as mallard (Anas platyrhynchos) and those in the family Rallidae (Rails) may become contaminated externally when they are utilizing the cattail mat of the impoundment or swimming through areas where there are oil sheens on the water surface caused by bottom disturbance, gas ebullition, etc. Studies have shown that nesting birds contaminated externally can transfer oil to their eggs in sufficient amounts to cause embryo toxicity (Couillard and Leighton, 1991; Biderman and Drury, 1980). Ducks or other the waterbirds utilizing the oil contaminated sites in the Newton Creek system may be exposed to low levels of petroleum from ingesting water. Ducks

can accumulate saturated hydrocarbons from petroleum in their tissues (Lawler et al., 1978). Mallards can exhibit sublethal toxic responses from ingestion of petroleum hydrocarbons. Oil-induced retardation of young birds could be responsible for increased mortality (Biderman and Drury, 1980).

Light activation of PAHs is known to occur in the environment. The photomodification or photosensitization of PAH compound can result in the production of more toxic chemical species. Environmental hazard assessments of PAH contaminated systems suggests that a hazard to natural algal communities and duckweed (Lemna sp.) species is present from photo-induced toxicity of PAHs. Because interpretations of the potential impacts of PAHs in the environment are based mostly on measurements of the structurally intact chemicals, severity of PAH hazards is possibly underestimated (Huang et al., 1993; Gala and Giesy, 1992).

Followup monitoring of an oil spill that reached salt marshes near Fallmouth, Massachusetts found that sediment-associated oil continued to have effects on the growth of marsh grasses one year after the spill (Burns et al., 1971 as cited in DiSalvo et al., 1977).

References

Alexander, S.K. and J.W. Webb, Jr. 1985. Seasonal response of Spartina alterniflora to oil. In Proceedings 1985 Oil Spill Conference: Prevention, Behavior, Control, Cleanup.

American Petroleum Institute (API), 1972. The migration of petroleum products in soil and ground water. Principles and Countermeasures. Committee on Environmental Affairs. Publication No. 4149

Baca, B.J., C.D. Getter, and J. Lindstedt-Siva. 1985. Freshwater oil spill considerations: protection and cleanup. In Proceedings 1985 Oil Spill Conference: Prevention, Behavior, Control, Cleanup.

Bell, R. M. 1992. Higher plant accumulation of organic pollutants from soils. Project Summary. U.S. EPA. Risk Reduction Engineering Laboratory, EPA/600/SR-92/138.

Biderman, J.O. and W.H. Drury. 1980. The effects of low levels of oil on aquatic birds. Fish and Wildlife Service. U.S. Department of the Interior. FWS/OBS-80/16. March 1980.

Boyles, D. T. 1980. Toxicity of hydrocarbons and their halogenated derivatives in an aqueous environment. pp. 545-558 In Hydrocarbons and Halogenated Hydrocarbons in the Aquatic Environment. Ed. by B.K. Afghan and D. Mackay. Plenum Press.

Chapman, H. F., R.L. Kitching, and J. M. Hughes. 1988. Behavioral responses of Polinices incei (Gastropoda: Naticidae) to diesel oil contamination in sediments. Aust. J. Mar Freshwater Res. 39:435-440.

Couillard, C. M. and F. A. Leighton. 1991. Critical period of sensitivity to petroleum toxicity in the chicken embryo. Environ. Toxical. Chem. 10:249-253.

Crump-Wiesner, H. J. and A. L. Jennings. Properties and effects of nonpetroleum oils. In Conference on Prevention and Control of Oil Pollution.

DiSalvo, L.H., H. E. Guard, N.D. Hirsch, and J. Ng. 1977. Assessment and significance of sediment-associated oil and grease in aquatic environments. U. S. ACOE. Waterways Experiment Station. Vicksburg, MS. Technical Report D-77-26.

Eisler, R. 1987 Polycyclic aromatic hydrocarbon hazards to fish, wildlife, and invertebrates: A synoptic review. Fish and Wildlife Service. Contaminant Hazards Reviews. Report No. 11.

Gala, W. R. and J. P. Giesy. 1992. Photo-induced toxicity of anthracene to the green alga, Selenastrum capricornutum. Arch. Environ. Contam. Toxical. 23:316-323.

Gordon, D. C. Jr., J. Dale, and P. D. Keizer, 1978. Importance of sediment working by the deposit-feeding polychaete (Arenicola Marina) on the weathering rate of sediment-bound oil. J. Fish Res. Board Car. 35:591-603.

Huang, X., D. G. Dixon, and B. M. Greenberg. 1993. Impacts of UV radiation and photomodification on the toxicity of PAHs to the higher plant Lemna gibba (Duckweed). Environ. Toxicol. Chem. 12:1067-1077.

Hyland, J. L. and E. D. Schneider. Petroleum hydrocarbons and their effects on marine organisms, populations, communities, and ecosystems. E.R.L. Narragansett. U.S. EPA.

Khan, R. A. 1991. Effect of oil-contaminated sediment on the Longhorn Sculpin (Myoxocephalus octodecemspinosus) following chronic exposure. Bull. Environ. Contam. Toxical. 47:63-69.

Lawler, G. C. W. Loong, and J. L. Laster. 1978. Accumulation of saturated hydrocarbons in tissues of petroleum exposed Mallard ducks (Anas platyrhynechos). Environ. Sci. Technol. 12:47-57.

Mahaney, P. A. 1994. Effects of freshwater petroleum contamination on amphibian hatching and metamorphosis. Environ. Toxicol. Chem. 13:259-265.

Mayo, D. W., D. S. Page, J. Cooley, E. Sorenson, F. Bradley, E. S. Gilfillan, and S. A. Hanson. 1978. Weathering characteristics of petroleum hydrocarbons deposited in fine clay marine sediments, Searsport, Maine. J. Fish. Res. Board Can. 35:552-562.

Mozley, S. C. and M. G. Butler. 1978. Effects of crude oil on aquatic insects of tundra ponds. Arctic. 31:229-241.

Payne, J. R. and C. R. Phillips. 1985. Photochemistry of petroleum in water. Environ. Sci. Technol. 19:569-579.

Pollard, S. J., S. E. Hrudey, B. J. Fuhr, R. F. Alex, L. R. Holloway, and F. Tosto. 1992. Hydrocarbon wastes at petroleum - and creosote-contaminated sites: rapid characterization of component classes by thin - layer chromatography with flame ionization detection. 1992. Environ. Sci. Technol. 26:2528-2534.

Rosenberg, D. M. and A. P. Wiens. 1976. Community and species of Chironomidae (Diptera) to contamination of fresh waters by crude oil and petroleum products, with special reference to the Trail River, Northwest Territories. J. Fish Res. Board Can. 33:1955-1963.

Teal, J. M., K. Burns, and J. Farrington. 1978. Analyses of aromatic hydrocarbons in intertidal sediments resulting from two spills of No. 2 fuel oil in Buzzards Bay, Massachusetts. J. Fish Res. Board Can. 35:510-520.

Van Vleet, E. S. and J. G. Quinn. 1978. Contribution of chronic petroleum inputs to Narragansett Bay and Rhode Island Sound sediments. J. Fish. Res. Board Can. 35:536-543.

Wakeham, S. G. and J. W. Farrington. 1980. Hydrocarbons in contemporary sediments. In Contaminants and Sediments. Vol. 1. Ed. by R. A. Baker. Ann Arbor Science Publishers, Inc.

DEPARTMENT OF NATURAL RESOURCES

STATE LAB OF HYGIENE ORGANICS ANALYSIS

Form 3200-95 Rev. 11-94

Location Code 643437 Basin No. 171 Field No. FP-1AD County No. 64 Route WR

Waterbody No. 1623900 Collection Date 10/11/1995 Time 11:00 Sample Matrix SE

Sample Location MILITARY CREEK COUNTY HIGHWAY E UPSTREAM 1300 FT

Sample Desc. OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT

Send Report To:
LINDA TALBOT
DNR GEF II WR/2
MADISON

ENT

Account Number WR283

Collected By JANISCH

Comments:

Parameters:

DIESEL RANGE ORGANICS

Parameters:

TEMP °C 18

ANALYST

R. H. Laessig, PhD, Director
Wisconsin State Laboratory of Hygiene
Madison, Wisconsin 53706

Date Received And Sample No. OCT 13 1995 OG001188

Date Reported DPD

State Laboratory of Hygiene
University of Wisconsin Center for Health Sciences
465 Henry Mall, Madison, WI 53706
R.H. Laessig, Ph.D., Director S.L. Inhorn, M.D., Medical Director

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Environmental Science Section (608) 262-2797 DNR LAB ID 113133790
Organic chemistry

Id: 643437 Point/Well/..: 171 Field #: FP-1AD Route: WR
Collection Date: 10/11/95 Time: 11:00 County: 64 (Vilas)
From: MILITARY CREEK COUNTY HIGHWAY E UPSTREAM 1300 FT
Description: OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT
To: LINDA TALBOT
DNR GEF II WR/2 Source: Sediment
MADISON
Account number: WR283 Collected by: JANISCH
Waterbody/permit/..: 1623900
Enforcement
Date Received: 10/13/95 Labslip #: OG001188 Reported: 11/07/95

---- test: TEMPERATURE - 0950

TEMPERATURE	+	18	

---- test: DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556

DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556		<10.	UG/G, DRY
DRO BY LIQUID EXTRACTION - PREP 1556		C	#1

---- test: PERCENT SOLIDS

SOLIDS	+	21.	%

--- Footnotes ---
+: Positive results are prefixed by a plus sign.
Remark #1: EXTRACTANT WAS NOT ADDED WITHIN 114 HOURS.

DEPARTMENT OF NATURAL RESOURCES

STATE LAB OF HYGIENE ORGANICS ANALYSIS

Form 3200-95 Rev. 11-94

Location Code 643438 Basin No. 171 Field No. FP-2AD County No. 64 Route WR

Waterbody No. 1623900 Collection Date 10/11/1995 Time 11:40 Sample Matrix SE

Sample Location MILITARY CREEK COUNTY HIGHWAY E 850 FT UPSTREAM OF CO HWY E

Sample Desc. OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT

Send Report To:
LINDA TALBOT
DNR GEF II WR/2
MADISON

Comments:

ENF

Account Number WR283

Collected By JANISCH

Parameters:

DIESEL RANGE ORGANICS

Parameters:

TEMP °C 18

ANALYST

TEMP °C [redacted]

ANALYST [redacted]

R. H. Laessig, PhD, Director
Wisconsin State Laboratory of Hygiene
Madison, Wisconsin 53706

Date Received And Sample No. OCT 13 1995

Date Reported

OG001189

State Laboratory of Hygiene
University of Wisconsin Center for Health Sciences
465 Henry Mall, Madison, WI 53706
R.H. Laessig, Ph.D., Director S.L. Inhorn, M.D., Medical Director

---

Environmental Science Section (608) 262-2797 DNR LAB ID 113133790
Organic chemistry

Id: 643438 Point/Well/..: 171 Field #: FP-2AD Route: WR
Collection Date: 10/11/95 Time: 11:40 County: 64 (Vilas)
From: MILITARY CREEK COUNTY HIGHWAY E 850 FT UPSTREAM OF CO HWY E
Description: OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT
To: LINDA TALBOT
DNR GEF II WR/2 Source: Sediment
MADISON
Account number: WR283 Collected by: JANISCH
Waterbody/permit/..: 1623900
Enforcement
Date Received: 10/13/95 Labslip #: OG001189 Reported: 11/07/95

---- test: TEMPERATURE - 0950

TEMPERATURE	+	18	

---- test: DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556

DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556		<10.	UG/G, DRY
DRO BY LIQUID EXTRACTION - PREP 1556		C	#1

---- test: PERCENT SOLIDS

SOLIDS	+	37.	%

--- Footnotes ---
+: Positive results are prefixed by a plus sign.
Remark #1: EXTRACTANT WAS NOT ADDED WITHIN 114 HOURS

DEPARTMENT OF NATURAL RESOURCES

STATE LAB OF HYGIENE ORGANICS ANALYSIS

Form 3200-95 Rev. 11-94

Location Code 643438 Basin No. 171 Field No. FP-2BD County No. 64 Route WR

Waterbody No. 1623900 Collection Date 10/11/1995 Time 11:50 Sample Matrix SE

Sample Location MILITARY CREEK COUNTY HIGHWAY E 850 FT UPSTREAM OF CO HWY E

Sample Desc. OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT

Send Report To:
LINDA TALBOT
DNR GEF II WR/2
MADISON

ENF

Account Number WR283

Collected By JANISCH

Comments:

Parameters:

DIESEL RANGE ORGANICS

TEMP °C 18

ANALYST

R. H. Laessig, PhD, Director
Wisconsin State Laboratory of Hygiene
Madison, Wisconsin 53706

Date Received And Sample No. OCT 13 1995

Date Reported DPD

OG001190

State Laboratory of Hygiene
University of Wisconsin Center for Health Sciences
465 Henry Mall, Madison, WI 53706
R.H. Laessig, Ph.D., Director S.L. Inhorn, M.D., Medical Director

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Environmental Science Section (608) 262-2797 DNR LAB ID 113133790
Organic chemistry

Id: 643438 Point/Well/..: 171 Field #: FP-2BD Route: WR
Collection Date: 10/11/95 Time: 11:50 County: 64 (Vilas)
From: MILITARY CREEK COUNTY HIGHWAY E 850 FT UPSTREAM OF CO HWY E
Description: OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT
To: LINDA TALBOT
DNR GEF II WR/2 Source: Sediment
MADISON
Account number: WR283 Collected by: JANISCH
Waterbody/permit/..: 1623900
Enforcement
Date Received: 10/13/95 Labslip #: OG001190 Reported: 11/07/95

---- test: TEMPERATURE - 0950

TEMPERATURE	+	18	

---- test: DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556

DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556		<10.	UG/G, DRY
DRO BY LIQUID EXTRACTION - PREP 1556		C	#1

---- test: PERCENT SOLIDS

SOLIDS	+	49.	%

--- Footnotes ---
+: Positive results are prefixed by a plus sign.
Remark #1: EXTRACTANT WAS NOT ADDED WITHIN 114 HOURS.

DEPARTMENT OF NATURAL RESOURCES

STATE LAB OF HYGIENE ORGANICS ANALYSIS

Form 3200-95 Rev. 11-94

Location Code 643439 Basin No. 171 Field No. FP-3AD County No. 64 Route WR

Waterbody No. 1623900 Collection Date 10/11/1995 Time 12:20 Sample Matrix SE

Sample Location MILITARY CREEK COUNTY HIGHWAY E 400 FT UPSTREAM OF CTY HWY E

Sample Desc. OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT

Send Report To:
LINDA TALBOT
DNR GEF II WR/2
MADISON

ENF

Account Number WR283

Collected By JANISCH

Comments:

Parameters:

DIESEL RANGE ORGANICS

Parameters:

TEMP °C 18

ANALYST

R. H. Laessig, PhD, Director
Wisconsin State Laboratory of Hygiene
Madison, Wisconsin 53706

Date Received And Sample No. OCT 13 1995

Date Reported

OG001191

State Laboratory of Hygiene
University of Wisconsin Center for Health Sciences
465 Henry Mall, Madison, WI 53706
R.H. Laessig, Ph.D., Director S.L. Inhorn, M.D., Medical Director

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Environmental Science Section (608) 262-2797 DNR LAB ID 113133790
Organic chemistry

Id: 643439 Point/Well/..: 171 Field #: FP-3AD Route: WR
Collection Date: 10/11/95 Time: 12:20 County: 64 (Vilas)
From: MILITARY CREEK COUNTY HIGHWAY E 400 FT UPSTREAM OF CTY HWY E
Description: OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT
To: LINDA TALBOT
DNR GEF II WR/2 Source: Sediment
MADISON
Account number: WR283 Collected by: JANISCH
Waterbody/permit/..: 1623900
Enforcement
Date Received: 10/13/95 Labslip #: OG001191 Reported: 11/07/95

---- test: TEMPERATURE - 0950

TEMPERATURE	+	18	

---- test: DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556

DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556		<10.	UG/G, DRY
DRO BY LIQUID EXTRACTION - PREP 1556		C	#1

---- test: PERCENT SOLIDS

SOLIDS	+	49.	%

--- Footnotes ---
+: Positive results are prefixed by a plus sign.
Remark #1: EXTRACTANT WAS NOT ADDED WITHIN 114 HOURS.

DEPARTMENT OF NATURAL RESOURCES

STATE LAB OF HYGIENE ORGANICS ANALYSIS

Form 3200-95 Rev. 11-94

Location Code 643439 Basin No. 171 Field No. FP-3BD County No. 64 Route WR

Waterbody No. 1623900 Collection Date 10/11/1995 Time 12:30 Sample Matrix SE

Sample Location MILITARY CREEK COUNTY HIGHWAY E 400 FT UPSTREAM OF CTY HWY E

Sample Desc. OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT

Send Report To:

LINDA TALBOT
DNR GEF II WR/2
MADISON

Account Number WR283

ENF

Collected By JANISCH

Comments:

Parameters:

DIESEL RANGE ORGANICS

Parameters:

TEMP °C 18

ANALYST

R. H. Laessig, PhD, Director
Wisconsin State Laboratory of Hygiene
Madison, Wisconsin 53706

Date Received And Sample No. OCT 13 1995 OG001192

Date Reported

State Laboratory of Hygiene
University of Wisconsin Center for Health Sciences
465 Henry Mall, Madison, WI 53706
R.H. Laessig, Ph.D., Director S.L. Inhorn, M.D., Medical Director

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Environmental Science Section (608) 262-2797 DNR LAB ID 113133790
Organic chemistry

Id: 643439 Point/Well/..: 171 Field #: FP-3BD Route: WR
Collection Date: 10/11/95 Time: 12:30 County: 64 (Vilas)
From: MILITARY CREEK COUNTY HIGHWAY E 400 FT UPSTREAM OF CTY HWY E
Description: OTHER CORER, FLOODPLAIN SEDIMENT/SOIL ASSESSMENT
To: LINDA TALBOT
DNR GEF II WR/2 Source: Sediment
MADISON
Account number: WR283 Collected by: JANISCH
Waterbody/permit/..: 1623900
Enforcement
Date Received: 10/13/95 Labslip #: OG001192 Reported: 11/07/95

---- test: TEMPERATURE - 0950

TEMPERATURE	+	18	

---- test: DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556

DIESEL RANGE ORGANICS (DRO) IN SOIL - 1556		<10.	UG/G, DRY
DRO BY LIQUID EXTRACTION - PREP 1556		C	#1

---- test: PERCENT SOLIDS

SOLIDS	+	70.	%

--- Footnotes ---
+: Positive results are prefixed by a plus sign.
Remark #1: EXTRACTANT WAS NOT ADDED WITHIN 114 HOURS.

State of Wisconsin
Department of Natural Resources

DRO

CHAIN OF CUSTODY RECORD
Form 4100-145 7-87

Sample Collector(s)	Title/Work Station	Telephone No. (include area code)
Janisch/Amrhein/Kreitlow	Envir. Spec. Madison/Rhinelander	608-266-9268
Property Owner	**Property Address**	**Telephone No. (include area code)**
C.M. Christiansen Co.	Phelps, WI	715-545-2333

Split Samples: Offered? ☐ Yes ☒ No (Check One)
Accepted? ☐ Yes ☐ No (Check One) Accepted By: _____ Signature

Floodplain soils of Military Creek

Field ID No.	Date	Time	Sample Type Comp	Sample Type Grab	Station Location Sample Description	Lab ID Number	No. of Containers	Comments
FP-1AD	10/11/95	11:00	✓		Floodplain reference site Composite of 2 shovel cores	0GØØ1188	3-60ml jars	0-15.2 cm Surface Strata
FP-2AD	10/11/95	11:40	✓		Floodplain 10-15' from Creek Composite of 3 shovel cores	0GØØ1189	3-60ml jars	0-7.6 cm Surface Strata
FP-2BD	10/11/95	11:50	✓		Floodplain 10-15 feet from Creek Composite of 3 shovel cores	0GØØ1190	3-60ml jars	7.6-20.3 cm Lower Strata
FP-3AD	10/11/95	12:20	✓		Floodplain 8 feet from Creek Composite of 3 shovel cores	0GØØ1191	3-60ml jars	0-7.6 cm Surface Strata
FP-3BD	10/11/95	12:30	✓		Floodplain 8 feet from Creek Composite of 3 shovel cores	0GØØ1192	3-60ml jars	7.6-20.3 cm Lower Strata

I hereby certify that I received, properly handled, and disposed of these samples as noted below:

Relinquished By (Signature)	Date/Time	Received by: (Signature)
Thomas Janisch	10/13/95 10:50	
Relinquished By (Signature)	Date/Time	Received by: (Signature)
Relinquished By (Signature)	Date/Time	Received for Laboratory By: (Signature)
	10/13/95 10:50	Paul C Eghan

Disposition of Unused Portion of Sample:

Dispose _____ Retain for 30 days

Return _____ Other _____

COPY

C.M. CHRISTIANSEN CO., INC.

P.O. Box 100
PHELPS, WI 54554
TEL: (715) 545-2333
FAX: (715) 545-2334

ERIC R. CHRISTIANSEN
PRESIDENT
EMAIL: erc@execpc.com

July 31, 1998

Mr. Donald Miller
Wisconsin Department of Natural Resources
Northern Region Headquarters
107 Sutliff Avenue
Rhinelander, WI 54501-0818

Re: C. M. Christiansen Co., Inc. ("CMC") Variance Request

Dear Mr. Miller:

This letter responds to your letter of July 9, 1998. You requested that CMC specify the waste code determination for excavated soils containing elevated levels of pentachlorophenol (PCP). CMC made this determination in 1995, at the time this waste was first generated at the site. As indicated on the enclosed EPA Notification of Regulated Waste Activity, CMC, its legal counsel and its environmental consultant at that time determined that the appropriate waste code for this material is D037. At a meeting I attended in March of 1997, Scott Watson, then the project manager for the site, concurred with this waste determination.

At this time, CMC does not believe it necessary to revisit the issue of the waste code determination. As a practical matter, the waste code determination will not have any impact on how the material is handled during the proposed remediation.

We do not think debating this issue at this time would be in the best interests of any of the parties involved. A debate would only serve to create further delay. Accordingly, if the DNR believes a different waste code is more appropriate, CMC would be willing to defer to the DNR's waste code determination on a conditional basis for the limited purpose of expediting the DNR's review of the variance request. Our willingness in this regard is with the express understanding that CMC reserves all rights to revisit this issue should it become important in the future.

With respect to your comments regarding the need to submit a variance to the LDRs and development of residual contaminant levels for the site upon conclusion of the remediation project, I understand that when you discussed this matter with Laurie Parsons you confirmed that it is not necessary to address this issue at this time; rather, the issue of development of site-specific residual contaminant levels will be addressed at a later date, and then only in the event that contaminated soils are re-deposited on site.

Thank you for your assistance in this matter. Please feel free to contact me should you have any additional questions or information requests.

Very truly yours,

C. M. CHRISTIANSEN CO., INC.

Eric Christiansen,
President

cc: Mr. P.C. Christiansen
Ms. Elizabeth Gamsky Rich
Ms. Laurie Parsons
✓ Mr. Chris Saari

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

Approved. OMB No. 2050-0028. Expires 10-31-91
GSA No. 0246-EPA-OT

Please refer to the *Instructions for Filing Notification* before completing this form. The information requested here is required by law (*Section 3010 of the Resource Conservation and Recovery Act*)

EPA Notification of Regulated Waste Activity

United States Environmental Protection Agency

Date Received (For Official Use Only)

I. Installation's EPA ID Number (Mark 'X' in the appropriate box)

[X] A. First Notification [ ] B. Subsequent Notification (complete item C)

C. Installation's EPA ID Number

II. Name of Installation (Include company and specific site name)

C M Christiansen Co

III. Location of Installation (Physical address not P.O. Box or Route Number)

Street

4700 County Trunk Highway E

Street (continued)

City or Town | State | ZIP Code

Phelps | WI | 54554-0100

County Code | County Name

Vilas

IV. Installation Mailing Address (See instructions)

Street or P.O. Box

PO Box 100

City or Town | State | ZIP Code

Phelps | WI | 54554-0100

V. Installation Contact (Person to be contacted regarding waste activities at site)

Name (last) | (first)

Christiansen | Philip

Job Title | Phone Number (area code and number)

President/CEO | 715-545-2333

VI. Installation Contact Address (See instructions)

A. Contract Address Location [ ] Mailing [X] | B. Street or P.O. Box

City or Town | State | ZIP Code

VII. Ownership (See instructions)

A. Name of Installation's Legal Owner

C M Christiansen Co

Street, P.O. Box, or Route Number

1 Lake Street Cth E

City or Town | State | ZIP Code

Phelps | WI | 54554-0100

Phone Number (area code and number) | B. Land Type | C. Owner Type | D. Change of Owner Indicator | (Date Changed) Month Day Year

715-545-2333 | P | P | Yes [ ] No [X]

Please print or type with ELITE type (12 characters per inch) in the unshaded areas only

Form Approved. OMB No. 2050-0028. Expires 10-31-91
GSA No. 0240-EPA-OT

ID - For Official Use Only

VIII. Type of Regulated Waste Activity (Mark 'X' in the appropriate boxes. Refer to instructions.)

A. Hazardous Waste Activity (Subtitle C)

1. Generator (See Instructions)
   - a. Greater than 1000kg/mo (2,200 lbs.)
   - b. 100 to 1000 kg/mo (220 - 2,200 lbs.)
   - c. Less than 100 kg/mo (220 lbs.)
2. Transporter (Indicate Mode in boxes 1-5 below)
   - a. For own waste only
   - b. For commercial purposes

Mode of Transportation
1. Air
2. Rail
3. Highway
4. Water
5. Other (specify)

3. Treater, Storer, Disposer (at installation) Note: A permit is required for this activity, see instructions.
4. Hazardous Waste Fuel
   - a. Generator Marketing to Burner
   - b. Other Marketers
   - c. Burner - Indicate device(s)

Type of Combustion Device
1. Utility Boiler
2. Industrial Boiler
3. Industrial Furnace

5. Underground Injection Control

B. Used Oil Fuel Activities

1. Off-Specification Used Oil Fuel
   - a. Generator Marketing to Burner
   - b. Other Marketer
   - c. Burner - Indicate device(s)

Type of Combustion Device
1. Utility Boiler
2. Industrial Boiler
3. Industrial Furnace

2. Specification Used Oil Fuel Marketer (for On-site Burner) Who First Claims the Oil Meets the Specification

IX. Description of Regulated Waste Activity (Use additional sheet(s) if necessary)

A. Waste Description (Subtitle C) Mark 'X' in the boxes corresponding to the characteristic(s) identified in 40 CFR Part 261, Subpart C, or the listing(s) identified in 40 CFR Part 261, Subpart D.

Ignitable (D001)	Reactive (D003)	Corrosive (D002)	Toxicity Characteristic (D004 - D043)	(List specific EPA hazardous waste number(s) for the Toxicity Characteristic contaminant(s))											
			X	D	0	3	7								

B. Process Codes and Design Capacities (Use additional sheet(s) if you need to list more than twelve codes.)

1. Process Code	2. Process Design Capacity - Amount	3. Unit of Measure	4. Process Code	5. Process Design Capacity - Amount	6. Unit of Measure
7. Process Code	8. Process Design Capacity - Amount	9. Unit of Measure	10. Process Code	11. Process Design Capacity - Amount	12. Unit of Measure

C. Process Codes and Descriptions (Use additional sheet(s) if you need to list more than twelve codes.)

1. Process Code	2. Process Design Capacity - Amount	3. Unit of Measure	4. Process Code	5. Process Design Capacity - Amount	6. Unit of Measure
7. Process Code	8. Process Design Capacity - Amount	9. Unit of Measure	10. Process Code	11. Process Design Capacity - Amount	12. Unit of Measure

X. Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Signature	Name and Official Title (type or print)	Date Signed
By: T.C. Christiansen	President	12/11/95

XI. Comments

This notification of regulated waste activity is for management of materials generated as a result of a site investigation. The investigation wastes may be generated periodically and quarterly.

XII. Transporter Notification

Note: Mail completed form to the appropriate EPA Regional or State Office. (See Section III of the booklet for addresses.)

Saari, Christopher A

From: Miller, Donald L
Sent: Monday, August 03, 1998 11:21 AM
To: Kafura, David J; LeRoy, Gary L
Cc: Mulholland, Timothy S; Flaherty, Peter D; Saari, Christopher A
Subject: CM Christiansen Variance Request - Waste ID response

I received a response to my July 9 letter, stating that the Department would not grant a variance to treat penta contaminated soils at CM Christiansen without their first making a good faith effort to determine the waste code. They have determined through discussion with their legal counsel, environmental consultant and past discussions with the RR project manager (Scott Watson) that they have a D037 waste at the site. They further state that they do not think that it is in the best interests of any of the parties involved to debate this issue. They then say that they would be willing to defer to the Departments waste code determination on a conditional basis for the purpose of our granting the variance. (We have not made a waste code determination to my knowledge, I assume they are referring to the F027 waste code we used at Weisenburger.)

I will be reviewing the variance request this week if I get time. What I think I will do if all the other elements of the variance are in the request is to conditionally approve the variance if Christiansens can agree that they are managing an F027 Waste for the remediation and treatment of the materials on-site. We can argue about this later if it becomes a problem for them when they need to remove it to a disposal site. What do you think? I think Christiansens will agree to this so they can get going on the cleanup. Don

PHONE CONVERSATION RECORD

DATE: 8/4/98
TIME: 0945 hrs

CONVERSED WITH: Don Miller
Hazardous Waste Specialist
Rhinelander
715/365-8980

SUBJECT/PROJECT: C.M. Christiansen

UNIQUE ID#.: 02-64-000068

Miller returned my call from earlier in the day.

Miller said he received a letter from Eric Christiansen regarding the waste code determination. Miller said it sounds like CMC would rather move the cleanup forward than argue this issue. Miller thought he could write the variance approval to include an F027 code, but still leave CMC the flexibility to work this out and allow disposal of the treated soil back onto the site.

Miller said what he needs from me (another effort) is some sort of OK or approval of the proposed performance standard approach to soil remediation. I replied that I could probably write something like that, but that I was more concerned with a lack of a direct contact RCL. I then relayed to Miller some of my comments/discussions with Laurie Parsons, including Parsons' feeling that a direct contact RCL for PCP would be lower than a groundwater pathway RCL.

Miller then described the variance approval process. Miller said it

Signature: Christopher A. Saari
(please write legibly)

-over-

would not take him too long to plug in additional information from NRT to finish a draft approval; he then must forward the draft to Madison and EPA. EPA has a 10 day (2 week) comment period. Miller thought that if everything proceeded smoothly, a final variance approval could be available in mid-September. Miller did say that he could not write the variance approval without more information on the direct contact and groundwater pathways (ROI's, justification of performance standard, etc.). Miller also said that my comment letter should request a written response from Parsons RSKP so that Miller can attach the ROI, etc., to the variance draft.

I told Miller that my comment letter would hopefully go out by the end of the week, and that I would include a request in the letter for justification of why CMC/NRT thinks the arbitrary "cleanup" level chosen for excavation will be protective of groundwater.

PHONE CONVERSATION RECORD

DATE: 8/5/98
TIME: 1405 hrs

CONVERSED WITH: Mike O'Keefe
USACOE
Plover, WI
715/345-7911

SUBJECT/PROJECT: C.M. Christiansen

UNIQUE ID#.: 02-64-000068

I called O'Keefe to discuss the wetland excavation portion of the project.

O'Keefe said the project involved removal of surface organic material, and involved backfilling with granular material. I replied that his assessment was correct. O'Keefe asked about the contaminants in the soil; I said they were PCP and fuel oil.

O'Keefe said the Corps would not want granular backfill placed in the excavation. If granular backfill was used, (apparently) a permit would be needed, and DNR would also have to provide water quality certification (under NR 103?). O'Keefe said NRT would be better off to leave the excavation open, and that the wetland organics should recover in the area in time. In response to a question from me, O'Keefe said no permit would be needed if the excavation is left open. I asked O'Keefe if any notification was needed; O'Keefe replied that (NRT) should notify him prior to beginning the excavation. I then told O'Keefe that I would copy him on the comment letter.

Signature: Christopher Adams
(please write legibly)

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Brule Area Headquarters
6250 South Ranger Road
Brule, WI 54820
TELEPHONE 715-372-4866
TELEFAX 715-372-4836

August 7, 1998

FILE COPY

MR ERIC R CHRISTIANSEN
CM CHRISTIANSEN COMPANY INC
PO BOX 100
PHELPS WI 54554

Re: Comments on *Revised Soil Remedial Action Options Report* and *Design Report and Plan of Operation*, Former C.M. Christiansen Company Pole Treatment Facility (BRRTS #02-64-000068)

Dear Mr. Christiansen:

The Department has received the *Revised Soil Remedial Action Options Report* and the *Design Report and Plan of Operation*. The documents were prepared for the above named site by Natural Resource Technology, Inc. (NRT), and dated May 15, 1998, and June 12, 1998, respectively. These documents were prepared to satisfy Items 1, 3 and 5 of the Spill Response Agreement between your company and the Department, dated April 17, 1998. I am writing to provide you with a status update of the Department's review of these and supporting documents, and to provide you with the following comments and concerns which have arisen in the course of our review of these documents. NRT's *Supplemental Evaluation of Military Creek and Revised Work Plan for Screening Level Assessment*, dated May 13, 1998 and prepared to satisfy Item 2 of the Spill Response Agreement, will be addressed under separate cover.

1. NRT has proposed a performance standard approach per s. NR 720.19(2), Wis. Adm. Code, to address soil contaminants as they relate to the direct contact, contaminant leaching to groundwater, and surface water pathways:

   a. According to NRT, a direct contact pathway residual contaminant level (RCL) would be calculated for pentachlorophenol (PCP) once it had been determined that the soil remedy with respect to groundwater contamination was performing as designed. The Department believes, however, that a direct contact RCL for PCP will need to be calculated prior to initiation of the remedial action. This would appear to be necessary to address potential direct contact hazards posed by unexcavated soil, as PCP-impacted unexcavated soil would remain on site over the course of the biological treatment, possibly posing an unacceptable direct contact risk during that time. You should provide the Department with a direct contact RCL for PCP as soon as possible.

   b. After discussing this issue with NRT, I believe that the performance standard approach has merit in addressing the groundwater pathway at the site. I would request that NRT provide some additional information (e.g. case studies at geologically similar sites) which would further support this approach. You should note, too, that if post-excavation groundwater sampling demonstrates that the soil remedial action has not performed as designed (i.e. the groundwater contaminant plume continues to expand), further soil and/or groundwater remediation may be required.

c. Based on the information provided to the Department, the proposed remedial action appears to be acceptable with respect to the surface water pathway.

In addition, per the requirements of ss. NR 714.07(5) and NR 722.09(2)(a)2, Wis. Adm. Code, you should proceed with the publication of a class 1 public notice in compliance with the requirements of ch. 985, Wis. Stats., for the proposed use of soil performance standards at the site.

2. As I have discussed with NRT, I believe that soil in the area of monitoring well MW-8 needs to be addressed as part of the remedial action. Based on the concentrations of PCP and polynuclear aromatic hydrocarbons (PAH), this soil would appear to pose both direct contact and groundwater leaching threats.

3. The Department has determined that you will not need to perform dioxin/furan analyses during excavation confirmation soil sampling, so long as you can demonstrate through PCP, PAH and volatiles analyses of *in situ* soil that the remedial action will be protective of human health and the environment. It appears that other aspects of the proposed excavation confirmation sampling plan could, and should, be modified. Based on previous sampling, it would be acceptable for you to conduct petroleum volatile organic compound (PVOC) excavation confirmation sampling, rather than analyzing for the full VOC list, in Areas #1, 2, 3 and 4. However, full VOC analyses should be performed on samples collected from the excavation around MW-8, as non-PVOC analytes have been previously detected in soil in this area. The Department also believes that the sampling plan should be modified to include PAH analyses on at least 50% of the total PCP samples, rather than 25% as proposed in Table 2 of the *Design Report and Plan of Operation*, as many PAH compounds are present at concentrations which would appear to pose a threat to human health and the environment.

4. Final closure sampling for the treatment cell should include a representative number of analyses for dioxins/furans prior to disposal of the treated soil on the site, in order to demonstrate that dioxin/furan concentrations in this soil will not pose a threat to human health and the environment.

5. Concurrent with this remedial action, you must define the full degree and extent of groundwater contamination, both horizontally and vertically. NRT has explained to my satisfaction the location of proposed monitoring well PMW-16; I believe that this new monitoring location should be installed as a well nest, complemented with a water table monitoring well. It also appears that additional nested monitoring points should be installed downgradient from proposed excavation Areas 3 and 4 to assess the potential for groundwater contamination in this portion of the site.

6. Initial sampling rounds from newly-installed wells should include analyses for the full VOC list; if these results are similar to results from other wells on site, it will likely be permissible to convert to PVOC analyses in subsequent sampling rounds.

7. In the proposed baseline groundwater monitoring discussed in the *Revised Soil Remedial Action Options Report*, it would be acceptable to modify VOC analyses to PVOC, based on previous analytical results. However, since MW-13 has never been analyzed for volatiles, a sample from this well should be analyzed for VOC in the baseline sampling round.

8. Due to the presence of free product in MW-7, post-excavation groundwater sampling downgradient from Area #1 (either MW-7 replacement or MW-6) should include analyses for PVOC and PAH.

9. Prior to the initiation of the remedial action, the variance to hazardous waste treatment and licensing requirements in chs. NR 600 to NR 685, Wis. Adm. Code, will need to be approved by the Department's Hazardous Waste program. I have been informed that the information you provide for the direct contact RCL for PCP will be included as an attachment to this variance, so you may wish to have NRT prepare this item as soon as possible.

10. Prior to the discharge of any recovered groundwater, the Wisconsin Pollutant Discharge Elimination System permit application will need to be approved by the Department's Wastewater program. Per a recent discussion with the Department permit reviewer, this approval process is nearly complete.

11. The Department's Air Management program has reviewed the Notification to Treat or Dispose of Petroleum Contaminated Soil & Water, and that program has not raised any specific emissions-related concerns with the proposed remedial action.

12. Based on recent discussions with Mr. Mike O'Keefe at the U.S. Army Corps of Engineers, the Corps would not be in favor of your use of granular backfill material in the Military Creek wetland excavation. The use of granular fill would require permitting and Department water quality certification. According to Mr. O'Keefe, you will not be required to obtain a permit for excavation in the wetland so long as you do not backfill the excavation. The Corps believes that, based on the shallow depth of excavation, wetland vegetation should recover in the excavation in time. Mr. O'Keefe did state that you should notify him prior to commencement of excavation activities; Mr. O'Keefe can be reached at telephone 715/345-7911, or in writing at USACOE, 3105 MacArthur Way, Plover, WI 54467. Mr. O'Keefe also said that you could contact him if you have further questions about this project.

You should instruct NRT to prepare a brief addendum to the *Design Report and Plan of Operation* to address the necessary concerns raised above.

I apologize for the length of the review time needed for these documents. This is a complex remedial action, and the Department has to make sure that all of the applicable statutory and administrative code requirements are being met. I am confident, however, that we will be able to come to agreement on these issues and provide you with approval to proceed in the near future. If you have any questions concerning this letter or the project in general, please do not hesitate to write or call me at 715/372-8539, extension 120.

Sincerely,

Christopher A. Saari

Christopher A. Saari
Hydrogeologist

cc: Laurie Parsons - NRT
Don Miller - DNR Rhinelander
Jim Hansen - DNR Park Falls
Robin Capen - DNR Rhinelander
Mike O'Keefe - USACOE
Gary Kulibert - DNR Rhinelander
Michelle DeBrock-Owens - DNR Rhinelander
Linda Meyer - LS/5

PHONE CONVERSATION RECORD

DATE: 8/14/98
TIME: 1450 hrs.

CONVERSED WITH: John Callewaerth (Cworth)
Phelps
315/545-3134

SUBJECT/PROJECT: C. M. Christiansen

UNIQUE ID#.: 07-64-000068

Callewaerth returned my return call.

Callewaerth said he attended a public meeting about the site 2 years ago, and he was wondering why nothing had been done since then.

I explained that I was in the process of reviewing/approving the remedial action plan. I further explained that remediation will involve on site treatment of excavated soil in a biopile. I said that I expect this to occur yet this year.

Callewaerth asked why it had taken until now to reach this point. I explained that problems arose with agreeing upon a schedule that all parties could agree to. I also told Callewaerth that NRT was now the consultant; Callewaerth ~~replied~~ asked why the consultant was changed. I said that Callewaerth would have to ask CM Christiansen that question; I also suggested that NRT had experience with wood treating sites.

Signature: Christopher A Saar
(please write legibly)

-over-

Callenwerth then asked what happened to Scott Watson & I replied that Watson took a new position in ~ May 1997, and I've had the file since then.

Callenwerth wondered if there was a way he could receive copies of correspondence or look at recent reports. I suggested that I call Callenwerth the next time I go to Rhinelander, and bring the file for his review.

PHONE CONVERSATION RECORD

DATE: 9/1/98
TIME: 0945 hrs.

CONVERSED WITH: Laurie Parsons
NRT
414/523-9000

SUBJECT/PROJECT: C M Christiansen

UNIQUE ID#.: 02-64-000068

Parsons called, then connected Don Miller, Rhinelander.

Parsons started out by relaying to Miller the gist of our conversation yesterday regarding a direct contact RCL. Parsons said there are really two issues here: 1) the treated soil from the pile, and 2) the rest of the site. Parsons said what NRT wants to do is review the results of post-excavation samples, and then determine what can be done to restrict access/contact with contaminated soil, whether individual areas or the whole site.

Miller said he didn't necessarily need a direct contact RCL until the LDR variance is submitted. Miller said to complete the treatment variance, he needs the waste code from CMC and my approval of the remedial action proposal. Parsons and I told Miller that NRT will be preparing an addendum to address my concerns; this addendum should be enough for me to write an approval.

Signature: Christopher A Saari
(please write legibly)

-over-

Miller also brought up the issue of dust control during the remediation. Parsons said she thought this had been addressed in the previous submittals. Miller then left the call.

I told Parsons that, in lieu of a calculated RCL, NRT could explain to me how the site won't pose a direct contact risk while the bioremediation is occurring. I also mentioned a memo I had seen in my file between Scott Watson and Chuck Warzecha, DNSS. I told Parsons I'd find the memo, send/fax her a copy.

Saari, Christopher A

From: Saari, Christopher A
Sent: Friday, September 25, 1998 1:31 PM
To: Miller, Donald L
Cc: Kulibert, Gary F; Debrock Owens, Michelle; Meyer, Linda L
Subject: Conversation with Laurie Parsons, NRT re: CM Christiansen

At 1314 hrs. today I called Laurie Parsons of NRT regarding the status of the CM Christiansen project, specifically about the hazardous waste code determination for the treatment variance.

Parsons said she had sent her comments on the waste code determination to CMC and Elizabeth Rich last week, and had spoken with them yesterday. Parsons said that Rich was going to call Pete Flaherty either yesterday or early next week to discuss this issue further.

Parsons also said that a draft addendum to the soil remedial action proposal, incorporating my comments to NRT, is in the hands of CMC and Rich. Parsons said she would like to at least get me that draft some time next week.

I then told Parsons that I would try to get comments on the sediment sampling plan to her next week as well.

We also briefly discussed the time/weather crunch the project will soon face.

PHONE CONVERSATION RECORD

DATE: 9/30/98
TIME: 1557 hrs.

CONVERSED WITH: Laurie Parsons
NRT
414/523-9000

SUBJECT/PROJECT: C-M-Christiansen

UNIQUE ID#.: 02-64-000068

Parsons called to provide me with an update. Parsons said that Elizabeth Rich had tried contacting Pete Flaherty-LSLS, but Flaherty would be unavailable until October 1, so Rich would not be able to discuss the waste code with Flaherty until then.

Parsons also said she hopes to talk to CM Christiansen and company representatives tomorrow regarding the addendum/response to my concerns. Parsons said they are looking at skipping the well nest on the site-side of Military Creek, and installing a nest on the other side. Parsons feels that if the site-side well nest had detects, they would need to monitor across the creek anyway, so why take the intermediate step? Parsons then said that, based on her review of air photos, the other well nest may be 200 ft. from the creek - would that be acceptable?

I told Parsons that I would have to look at this more closely, as I feared that we would then not know what might be discharging to the creek, and the other well nest may be too far away to be useful.

Signature: Christopher A Lauer
(please write legibly)

-over-

Parsons said she would review this issue some more, and get back to me. I suggested possibly using a driven point to sample discharge to the creek, but Parsons was concerned about an inadequate surface seal (cross contamination) and the ability to monitor the correct layer in the aquifer.

PHONE CONVERSATION RECORD

DATE: 8/31/98
TIME: 1012 hrs.

CONVERSED WITH: Laurie Parsons
NRT
414/523-9000

SUBJECT/PROJECT: C.M. Christiansen

UNIQUE ID#.: 02-64-000068

Parsons called to further discuss my 8/7/98 letter.

Parsons began with my request for direct contact RCL for PCP. I said it might be OK to come up with RCL while treatment was occurring, but DNR would still have a concern with unexcavated soil during treatment phase. We then discussed relationship to RCL with treatment and LDR variances. Parsons said her understanding from talking with Don Miller is that the LDR variance could be looked at separately; Parsons suggested we connect Miller after we finished the other issues.

Parsons then brought up Item 3, and my request for 50% PAH analyses. CMC had wondered where I came up with 50%. I replied that it was more in line with other fuel-oil contaminated sites. I also said that some of my thinking had to do with generic (guidance) direct contact RCLs vs. concentrations at the site. Parsons thought this might be similar to PCP RCL argument (e.g. waiting till results are available from excavation, then tailoring restrictions, caps, etc. to specific areas). Parsons said NRT will prepare an addendum

Signature: Christopher A Saar
(please write legibly)

-over-

which will address these points.

Parsons next discussed Item 5. Parsons said they will probably install a well nest downgradient of Area 3, hopefully will be able to cover Area 4 as well. Parsons and I agreed that placement will also depend on topography; location will be shown on map in addendum. Parsons also said CMC questioned putting wells in on the other side of Military Creek; apparently this land is owned by a group slightly different than CMC. Parsons said NRT originally wanted to install one PZ at approximately the location of the reference point on the creek, screened in the first transmissible zone below the water table. Parsons said she will talk to CMC again, see if CMC would rather spend the money on a PZ on the site side of the creek now, or just place a well nest on the south side. I told Parsons that if this will be a complicated issue, I could approve it separately at a later date.

Parsons then said she would include a new proposed groundwater monitoring table in the addendum.

We then tried to connect Miller on the call, but he was unavailable.

PHONE CONVERSATION RECORD

DATE: 8/28/98
TIME: 1014 hrs

CONVERSED WITH: Laurie Parsons
NPT
414/523-9000

SUBJECT/PROJECT: CM Christianson

UNIQUE ID#.: 02-69-000068

I returned a call to Parsons. Parsons said she was in the middle of another project, asked if we could arrange a call on 8/31; I suggested 1000 hrs. Parsons said she would call me.

Parsons said she wanted to discuss calculation of a direct contact number. Parsons will bring up future uses of the property and relation to depth of direct contact zone, as well as exposure durations. Parsons said CM Christianson wants to leave the question open, make a determination after excavation results come back. Parsons said they may use look up numbers, or a combination of capping & restrictions.

Parsons also wants to discuss Item #5 from my 8/7/98 letter. Since it seems I was looking for flow under Military Ck., Parsons may suggest that well nest be placed on other side of creek. Parsons also wondered about nest(s) downgradient from Area 3 & 4.

Signature: Christopher Christianson
(please write legibly)

over

Parsons also wants to discuss Flow 1b - performance standard examples - maybe provide these verbally.

I also mentioned the escrow act which Don Miller had mentioned to me. Parsons insists he would have [illegible] Christiansen check on it.

Natural Resource Technology, Inc.
N R T

October 21, 1998
(1226/3.8)

Mr. Chris Saari
Northern Region
Wisconsin Department of Natural Resources
Highway 2, PO Box 125
Brule, WI 54820

RE: Site Transfer Status and Update
Former Wood Treating Facility, C.M. Christiansen Company, Inc., Phelps, WI
BRRTS #02-64-000068; Ref #WID998639035

Dear Mr. Saari:

On behalf of C.M. Christiansen Company, Inc. (CMC), Natural Resource Technology, Inc. (NRT) has prepared this letter as an Addendum to the June 12, 1998 *Design Report and Plan of Operation.* This letter and attachments address comments made in your letter dated August 7, 1998 and our telephone conversations in August and September 1998, and are numbered accordingly. The attached figure and tables were also revised in response to various comments and are discussed below.

1a. The Department is requesting that a direct contact RCL for PCP be established for the site prior to soil remediation to address potential direct contact hazards posed by un-excavated soil. Section 5.4 of the *Plan of Operation Report* indicates the soils from the treatment cell will be replaced on-site (after suitable treatment) in an approved location with engineering controls or institutional controls, if appropriate. This same plan is intended to apply for unexcavated material.

During excavation and biological treatment, interim measures will be taken to avoid direct contact risks. For example, at the outset of the excavation activities, a fence will be placed along the road near the entrance to the property. If necessary, this fence will be left in place during the course of the biological treatment, except during snowmobiling periods. We understand through our discussions in August 1998 that exposure is not an issue except possibly during the snowmobiling season, according to Health Department officials contacted by WDNR in the early stages of this project.

Other interim measures may be implemented depending on results of shallow excavation sidewall sampling including placement of a 6 inch clean fill cap over select areas indicating concentrations which may pose a direct contact risk. Of note, the U.S. EPA recommends that inhalation and ingestion pathways be evaluated at the 0 to 6 inch depth within a soil profile (*Technical Background Document for Draft Soil Screening Level Guidance, March 1994, EPA-540/R-94/018).*

The exact nature of the final engineering or institutional controls depends largely on the treatment performance within the cell, excavation sidewall sampling (depth and concentrations), and contemplated final use of the property. For example, for non-intrusive uses such as green space or certain recreational development, a 6 inch cover is likely appropriate. For other uses, an asphalt cover or additional fencing may be appropriate. For purpose of this discussion, example direct contact RCLs calculated by others are provided below for various exposure scenarios:

Exposure Scenario	Value (mg/kg)	Reference Source
Construction Worker (ingest.)	520	Illinois EPA Part 742 Tier 1
Industrial/Commercial (ingest.)	24	Illinois EPA Part 742 Tier 1
Residential (ingestion)	3	Illinois EPA Part 742 Tier 1
Industrial Soil	7.9	U.S. EPA-Region IX PRGs
Residential Soil	2.5	U.S. EPA-Region IX PRGs
Residential	5	U.S. EPA-Region III

As you can see, allowable direct contact concentrations vary significantly depending on the exposure scenario corresponding to various property uses and acceptable restrictions.

1b. Reference sites with similar hydrogeological conditions at which a performance standard approach is being used or is in progress.

Location:	Beloit, WI	Location:	Stevens Point, WI
BRRTS #:	03-54-000301	BRRTS #:	02-50-000079
DNR Contact:	Cynde English	WDNR Contact:	Tom Hvisdak

We also suggest you contact Carol McCurry in the Department's central office on this subject.

2. The soil from around MW-8 will be added to the excavation plan as requested. This modification is shown on revised Figure 2 and Table 1. The additional volume is small and should not substantially change the design plan. The MW-8 area was not included originally because groundwater data at MW-8 indicates the concentrations detected in soil at 0 to 2 feet below ground surface have not had a significant impact on groundwater. The most recent concentrations were below the NR 140 Enforcement Standard for PCP.

3.&4. Comments made regarding soil sampling parameters have been incorporated into Table 2.

5. Concurrent with the soil remedial action, the Department requested that CMC define the "full degree and extent of groundwater contamination, both

horizontally and vertically". To this end, potential additional monitoring well locations were discussed in your August 7 letter and were further discussed with you in telephone conversations in August and September. The following table summarizes proposed locations which have been discussed and rationale for placement of each well or well nest. Approximate locations are also shown on attached Figure 2 and the Site Area Map from Volume I of the Site Investigation Report.

Potential Well ID/Location	Depth, ft. (Approx. Elev.)	Rationale
PMW-15: nested with MW-10/PMW-11	60 (1630)	define vertical extent
MW-16: shallow well, adjacent to creek, SE of MW-10 nest approx. 30 ft	15 (1670)	evaluate groundwater quality discharging to stream, omit from current program
MW-17/PMW-17: lower wetland, 200 ft SE of MW-9	15(1670)/30(1655)	evaluate groundwater quality downgradient of Area #3, vertical and horizontal gradient and extent
MW-18/PMW18: 200 to 300 ft across creek, from MW-10	15 (1670)/30 (1655)	define horizontal extent and complement groundwater flow data

MW-16 (originally proposed as PMW-16 in the Remedial Action Options Report) was intended to be a shallow well, recognizing that a "true" water table well in the wetland is not possible at this location in order to obtain an adequate surface seal. Because of the addition of well nests in the lower wetlands (MW-17 and MW-18 nests) we will not be installing MW-16 at this time. Data from proposed MW-16 would be redundant of the information for MW-1, proposed well MW-17, and in particular, MW-10 which is only 30 feet away.

Well nest MW-17/PMW-17 will serve to monitor groundwater quality downgradient of both Areas 3 and 4. The shallow well may be screened slightly below the water table to obtain an adequate surface seal. Well nest MW-18/PMW-18 will be installed across the creek within approximately 300 ft from the site, subject to access conditions (see attached Site Area Map).

6.&7. Table 3 is added and identifies parameters to be analyzed by location for baseline and post-excavation sampling. This schedule replaces that provided in the May 1998 *Soil Remedial Action Options Report.* New wells and existing wells which have not been analyzed for the full VOC list will be analyzed for VOCs (method

8260) and PVOCs thereafter as stated on Table 3. Remaining wells previously analyzed for the full VOC list will be analyzed for PVOCs only.

8. Post excavation groundwater sampling at MW-6 will include analyses for PVOC and PAHs.

9. Through discussion with Mr. Don Miller of the Hazardous Waste Program and yourself, we understand the direct contact RCL for PCP is not necessarily required at this time for the treatment variance approval. Prior to placing treated soils back on the property, CMC recognizes they will need to either submit a supplement to the treatment variance request at this time or file a separate variance request after treatment is complete, if soil concentrations exceed any applicable land disposal restrictions for PCP under NR 600.

10. The WPDES permit application was approved in a letter dated September 1, 1998.

We trust this addendum addresses your comments and encourage you to contact Mr. Eric Christiansen at (715) 545-2333 or NRT at (414) 523-9000 if any questions arise as you complete your review of the project and associated documents.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Laurie J. Parsons, P.E.
Project Manager

Julie A. Zimdars, P.E.
Project Engineer

cc: Mr. Eric Christiansen, C. M. Christiansen Company, Inc.
Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.

Attachments: Figure 1: Site Area Map
Figure 2: Site Plan with Estimated Areas of Excavation (revised)
Table 1: Excavation Soil Volume Estimate (revised)
Table 2: Soil Sampling Plan (revised)
Table 3: Groundwater Monitoring Schedule (new)

[1226wdnr-cs 98-10-21.ltr]

Table 1 - Excavation Soil Volume Estimate (revised)
Design Report and Plan of Operation
C.M. Christiansen Co., Inc. Former Pole Treatment Facility
Phelps, Wisconsin

NRT PROJ. NO.: 1226
BY: JAZ
CHKD BY: LJP
DATE: 10/21/98
FILE: Table 1 ExcSoilVol

Area	Location	Soil Sample	Max PCP Concentration	Estimated Surface Area	Max. Depth	Min. Depth	Average Depth	Estimated Volume[1]	Comments
1	Former AST Area	B-4	1,300 ppm	3,183 ft2	14 ft	6 ft	10 ft	1179 cy	Higher volume corresponds to removal of MW-7 below water table.
2A	Former Boiler Area	HA-2/S-1	1,700 ppm	1450 ft2	5 ft	5 ft	5 ft	269 cy	Max. depth of 5 ft confirmed during sampling at test pit TP-4.
2B	Creek Area	HA-27/28	470 ppm	4296 ft2	1 ft	1 ft	1 ft	159 cy	Excavation of this area depends on approval from WDNR due to wetland
3	Lower Wetland Area	HA-17/19	82,000 ppm	5,093 ft2	5 ft	2 ft	3 ft	566 cy	Max. depth of 5 ft confirmed during sampling at test pit TP-1.
4	Upper Wetland Area	HA-7/MW-13	44,000 ppm	1,793 ft2	6 ft	4 ft	5 ft	332 cy	
5	Western Tree-line	B-12/MW-8	340 ppm	707 ft2	3 ft	1 ft	2 ft	52 cy	

Total Estimated Volume[1] 2,560 cy
Total Estimated Tonnage[2] 3840 tons

[1]Estimated soil volume, based on performance- based standard for pentachlorophenol (PCP)

[2]Tonnage estimated at 1.5 tons per cubic yard of soil

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Table 2 - Soil Sampling Plan (revised)
Design Report and Plan of Operation
C.M. Christiansen Co., Inc. Former Pole Treatment Facilit
Phelps, Wisconsin

NRT PROJ. NO.: 1226
BY: JAZ
CHKD BY: LJP
DATE: 10/21/98
FILE: Table 2 Soil Samp Plan Rev

Sampling Location	*Type*	*Frequency*	*Parameters (Method)*
Excavation Limits	Discreet	30-35 ft-side, 1,000 ft2-base	PCP (8270)
		25% (approx.) of total	PVOC/VOC ** (8260)
		50 % (approx.) of total	PAHs (8270)
		1 per excav. area (approx.)	TOC (St. Meth. 9060)
Surface Soil*	Discreet (0-1 ft)	representative samples before operation and after decommissioning	PCP (8270)
Baseline Treatment Cell	Discreet	one time before cover placement, 1,000 ft2 grid, varying depths	PCP (8270)
		as needed	Biodegradation indicator parameters eg. moisture content, TOC, nutrients, soil gas: oxygen, CO2 and methane
Treatment Cell Performance	Discreet	annually, 2,000 ft2 grid, varying depths	PCP (8270)
		as needed	Biodegradation indicator parameters eg. moisture content, TOC, nutrients, soil gas: oxygen, CO2 and methane
Treatment Cell Closeout	Discreet	1,000 ft2 grid, varying depths representative number of samples	PCP (8270) dioxins/furans

* Surface soil below treatment cell and staging area.
** VOCs to be performed in MW-8 excavation area. PVOCs to be performed in all other excavation areas.

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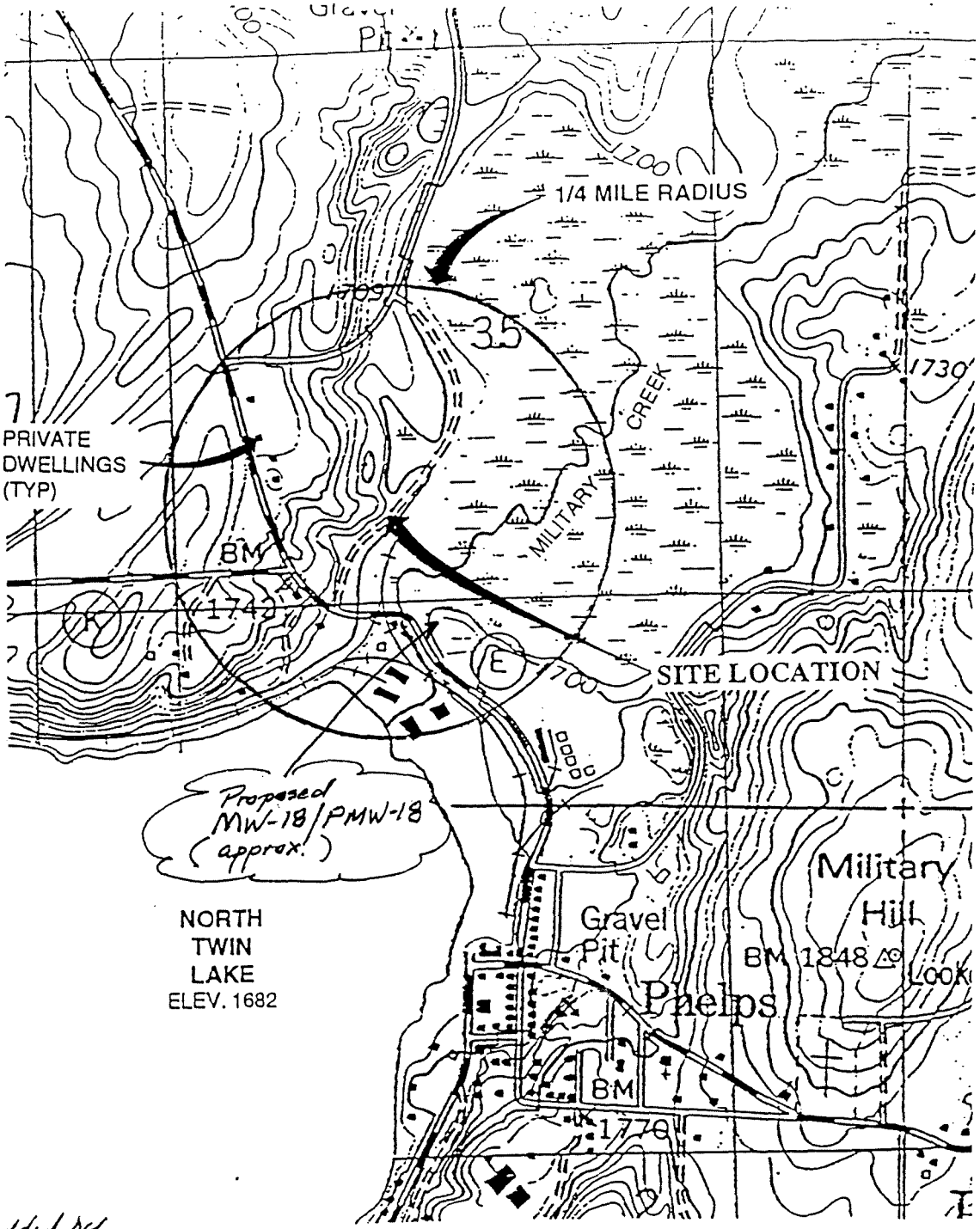
Table 3 - Groundwater Monitoring Schedule
C.M. Christiansen Company, Inc., Phelps, WI

Well	Baseline Sampling	Post-Excavation Sampling
MW-1	PCP, PAHs, PVOCs	PCP
MW-2	PCP, RNA	RNA
MW-3	PCP	--
MW-4	PCP	PCP
MW-5	PCP	--
MW-6	PCP, PAHs, PVOCs, RNA	PCP, PAHs, PVOCs, RNA
MW-8	PCP, RNA	PCP, RNA
MW-9	PCP	--
MW-10	PCP, PAHs, VOCs, RNA	PCP, RNA
PMW-11	PCP, PAHs, VOCs, RNA	PCP, RNA
MW-12	PCP	--
MW-13	PCP, VOCs, RNA	PCP, RNA
PMW-14	PCP	--
PMW-15 (n)	PCP, VOCs	PCP
MW-17 (n)	PCP, PAHs, VOCs	PCP
PMW-17 (n)	PCP, VOCs	PCP
MW-18 (n)	PCP, PAHs, VOCs	PCP
PMW-18 (n)	PCP, VOCs	PCP

Notes:
Baseline sampling to be performed prior to excavation activities.
RNA lab analytical inc.: dissolved iron, nitrate, sulfate, methane, chloride
RNA in field inc.: D.O., ORP, temp., cond., pH
After initial sampling round, new wells will be analyzed for PCP only if results are similar to other wells.
(n) = proposed new well.



Note Added by NRT 10.15.98

SITE AREA
C M CHRISTIANSEN CO.
POLE TREATMENT FACILITY - PHELPS, WISCONSIN

SOURCE: USGS QUAD MAP PHELPS, MICH.-WIS. 1981

Coleman Engineering Company
Iron Mountain, Michigan 49801

JOB NO. E 95042-A7
DATE: FEB 1997

FIGURE 1

WATER DIVERSION SWALE
SLOPE AT 1% MINIMUM IN
DIRECTION OF ARROWS
(SEE FIGURE 8 FOR DETAIL)

APPROXIMATE AREA OF
CONSTRUCTED SEEPAGE CELL
FOR TREATED GROUNDWATER
(SEE FIGURE 8 FOR DETAIL)

TREATMENT CELL
LOCATION
130 FT. x 130 FT.

MATERIAL
PROCESSING AND
SOIL STAGING AREA

AREA #1
6–14' DEPTH

AREA #2A
5' DEPTH

AREA #2B
1' DEPTH

AREA #3
2–5' DEPTH

AREA #4
4–6' DEPTH

AREA #5
1–3' DEPTH

SILT FENCE

FORMER BURN AREA

FORMER 20,000 GAL. WOOD TREATMENT ABOVE GROUND STORAGE TANK

FORMER POLE DIPPING TANK

FORMER PUMP HOUSE

FORMER BOILER HOUSE

UPPER WETLANDS AREA

LOWER WETLANDS AREA

SCATTERED TREES & BRUSH IN CLEARING

SMALL GROWTH

GATE

MILITARY CREEK

MILITARY CREEK
REFERENCE POINT
APPROX. LOCATION

(WELLS LOCATED 200–300 FT
SOUTHEAST OF CREEK)

STREAM FLOW

COUNTY "E"

REL. B.E. +2.5'

REL. B.E. +3'

REL. B.E. +1.5'

REL. B.E. 0'

LEGEND

	ESTIMATED EXCAVATION EXTENT
B-15 (0.14)	BORING WITH PCP RESULTS
MW-12 (0.005)	BORING/MONITORING WELL WITH PCP RESULTS
PMW-14	PIEZOMETER WITH PCP RESULTS
PMW-17	PROPOSED PIEZOMETER
MW-17	PROPOSED MONITORING WELL
HA-34 (0.77)	HAND AUGER BORING WITH PCP RESULTS
S-2 (79)	SURFACE SOIL SAMPLES WITH PCP RESULTS
TP-1	TEST PIT (BY NRT)
PCP	PENTACHLOROPHENOL
REL. B.E.	RELATIVE BASE ELEVATION

N

0 40 80 160

SCALE IN FEET

SOURCE NOTE:
THIS MAP WAS MODIFIED FROM DRAWING BY COLEMAN ENGINEERING COMPANY (CEC), IRON MOUNTAIN, MICHIGAN, DATED FEBRUARY 1997, JOB NO. 95042 A7 .

NOTE:
BASE MAP SURVEY COMPLETED BY CEC WITH ADDITIONAL INFORMATION OBTAINED FROM USDA–ASCS HISTORICAL AERIAL PHOTOGRAPHS, A 7/7/95 SITE VISIT WITH C M CHRISTIANSEN CO., AND A 5/21/96 FIELD INSPECTION.

SITE PLAN WITH ESTIMATED AREAS OF EXCAVATION
DESIGN REPORT AND PLAN OF OPERATION
C.M. CHRISTIANSEN COMPANY, INC.
FORMER POLE TREATMENT FACILITY
PHELPS, WISCONSIN

DRAWN BY: TAS	DATE: 10/21/98
CHECKED BY: JAZ	DATE: 10/21/98
APPROVED BY: JJP	DATE: 10/21/98
AUTOCAD FILE: 1226-B10.DWG	

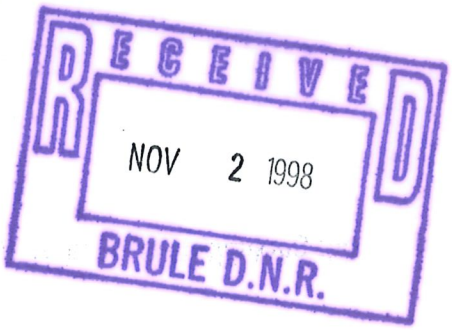
Natural Resource Technology

PROJECT NO. 1226–DR–3.8

DRAWING NO. 1226–B10

FIGURE NO. 2

October 28, 1998



Mr. Chris Saari
Brule office
WDNR
6250 S. Ranger Rd.
Brule, Wi. 54820

Dear Mr. Saari,

We own land in Phelps, WI. near one of the projects where you are project manager over the C. M. Christiansen Co. land. We are told the land you are working on has been contaminated by a type of wood preservative mixed with heating oil. Our concerns are weather our land would also be contaminated. Please give us your professional opinion concerning our land. The location of our land is as follows: The west half of the NW1/4 of the NW1/4 of the SE1/4 of Section 35, Township 42 North, Range 11 East. With right ingress and egress across company property from the Township road. Also known as Sugar Maple road #1837.

This land is vacant and to our knowledge has never had a building on it. We are thinking this would be a good place for someone to build a home.

Thank you for your time.
Sincerely,

Tammy and Gary Lineback

Gary and Tammy Lineback

4781 Ridgewood Creek Dr.
Acworth, Ga. 30102
770-928-3012
Email address- lineback@mindspring.com

Dear Mr. Saari,
Here is the letter you asked me to write per our telephone call.
Thanks again for all your time.

Sammy Linebacks

Linebacks
4781 Ridgewood Circle Dr
Acworth, GA 30102

Mr. Chris Saari
Buford Office
WDNR
6250
Buford,

I then briefly explained the new ch. NR 749 fee rule, and told Lineback that DNR may have to charge for this letter. I suggested that Lineback send me a letter explaining what Lineback wanted (i.e. what she's looking for in terms of a reply), and then I would find out whether a fee was needed, and work on a reply. Lineback said she just wanted a simple letter which could be attached to a statement by Lineback saying that her property didn't have contamination.

Lineback then said that her mother ("who's kinda wierd") once told Lineback that kids who played around the pole yard site would come home with holes in their shoes and pants, and Lineback wondered if this was related to the contamination. I explained that the contaminants at the site were 5% PCP / 95% fuel oil, and it was unlikely that either of these contaminants would dissolve clothing. I then briefly described other aspects of the site (discovery, monitoring etc.), and gave Lineback an update on the current status.

Lineback said she would work on sending me a request letter. Lineback also said it's hard for her to work on selling the property because Lineback has never seen the land. I told Lineback I would work on a reply as soon as I receive the necessary information. I also said my reply may be focused more on where contaminants from the site have (or haven't) gone than what might be on Lineback's property. I said this was due to my lack of actual knowledge of the condition of Lineback's property.

Recd 12/21/98
Brule

C.M. CHRISTIANSEN CO., INC.

P.O. Box 100
PHELPS, WI 54554
TEL: (715) 545-2333
Fax: (715) 545-2334

ERIC R. CHRISTIANSEN
PRESIDENT
EMAIL: erc@execpc.com

SENT VIA FAX & FIRST CLASS MAIL – 5 pages

December 17, 1998

Mr. Donald Miller
Wisconsin Department of Natural Resources
Northern Region Headquarters
107 Sutliff Avenue
Rhinelander, WI 54501-0818

Re: Request for Extension of Investigative Waste Accumulation Time
Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Miller:

Pursuant to your letter of January 26, 1998 (copy enclosed – the "Extension Letter") responding to the request of our consultants (copy also enclosed), we hereby notify you that the investigative waste referred to therein will remain in storage on and after January 1, 1999 pending the undertaking of remediation activities, currently expected to commence in the spring or summer of 1999 (assuming all pending permit applications, reports, plans and other matters before Wisconsin DNR are approved – the "Pending Applications").

We also hereby notify you, as set forth in the Pending Applications, that we currently expect to undertake additional investigative activities this coming winter or spring and that, as a result, additional investigative wastes are likely to be added in 1999 to those currently in storage. We will comply with the provisions of the Extension Letter relating to those additional wastes, if and when added to the existing accumulation.

Based on the foregoing, we hereby respectfully request a one-year Extension of the Investigative Waste Accumulation Time, from the current expiration of December 31, 1998, to and including December 31, 1999, subject to our continuing compliance with the terms of the Extension Letter.

Very truly yours,

C. M. CHRISTIANSEN CO., INC.

Eric Christiansen,
President

cc: Mr. P.C. Christiansen
Ms. Elizabeth Gamsky Rich – Whyte Hirschboeck Dudek S.C.
Ms. Laurie Parsons – Natural Resource Technology, Inc.
Mr. Chris Saari – Wisconsin DNR

State Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Region Headquarters
PO Box 818, 107 Sutliff Ave.
Rhinelander, WI 54501-0818
TELEPHONE 715-365-8900
FAX 715-365-8932
TDD 715-365-8957

January 26, 1998

FID#

Mr. Eric Christiansen
C.M. Christiansen Co.
P.O. Box 100
Phelps, WI 54554

SUBJECT: Extension of Investigative Waste Accumulation Time

Dear Mr. Christiansen:

On January 20, 1998, the Department received a request on your behalf from Natural Resource Technology to extend the time which C.M. Christiansen may retain accumulated investigative hazardous waste on-site. This request was made under the provisions of ch. NR 615.05(4),I,(b), Wis. Adm. Code, and is consistent with Department policy and guidance dated January 14, 1993, (Attachment 3). Earlier, the Department verbally agreed to allow C. M. Christiansen to move the waste from the site to a nearby storage building for safety reasons and protected from the weather. This request for storage of accumulated waste is granted until January 1, 1999 with the following conditions:

The drums must be labelled as hazardous waste, inspected for leaks and defects monthly, with an increase in inspection frequency during the spring months when the water begins to thaw. As required by ch. NR 615.05(4),2.c., an inspection log including the date and time of inspection, name of inspector, and condition of the drums shall be kept for review by the Department for at least three years from the date of the inspection. The Department may revoke this extension at any time, should the facility not fully follow the requirements for accumulated waste, or the drums present an environmental hazard. The Department will allow C. M. Christiansen to add additional investigative wastes to this accumulation as long as records of the additions are kept with the waste, and the Department is notified of additional waste being added.

It is understood that the investigative waste will be treated on-site along with treatment of contaminated water at the facility. Should C. M. Christiansen decide not to treat water on site, the drums must be properly removed as hazardous waste within 90 days of this decision. If the waste will remain on-site after 1998, a request for another extension should be made prior to January 1, 1999. The Department reserves the right to inspect the drums at any time during normal working hours.

If you have any questions regarding this letter, please call me at 715/365-8980.

Sincerely,

Don Miller
Waste Management Specialist

c. Laurie Parsons, Natural Resource Technologies, 23713 W. Paul Rd., Pewaukee, WI 53072
Gary LeRoy, DNR-Spooner
Chris Saari, DNR -Brule

Natural Resource Technology, Inc.

TRANSMITTAL

To:	**Wisconsin Dept. of Natural Resources**	**Date:**	**1/15/98**
	107 Sutliff Avenue	**Project No:**	**1226**
	P.O. Box 818	**From:**	**Laurie Parsons**
	Rhinelander, WI 54501		
Attn:	**Mr. Don Miller**	**Re:**	**C.M. Christiansen Co. Investigative Waste Management**

x For Your Information ☐ As Requested ☐ For Review ☐ Approve and Return

Copies:	Description
1	Nov. 19, 1997 Letter from NRT to Don Miller

Comments: Don -

It came to our attention that you may not have received the attached letter which was issued after our telephone conversations last November. We apologize for this oversight and look forward to your written response.

Laurie P. Parsons

cc: Mr. Eric Christiansen, C.M. Christiansen Co.
Ms. Elizabeth Gamsky Rich - Whyte, Hirschboeck, Dudek, S.C.
Mr. Chris Saari - WDNR - Brule Office

23713 W. Paul Road, Pewaukee, WI 53072 ■ Phone 414/523-9000 ■ Fax 414/523-9001

Natural
Resource
Technology, Inc.
N R T

November 19, 1997
(1226)

Mr. Don Miller
Wisconsin Department of Natural Resources
107 Sutliff Avenue
P.O. Box 818
Rhinelander, WI 54501

RE: Request for Extension of Investigative Waste Accumulation Time
C.M. Christiansen Company, Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Miller:

On behalf of C.M. Christiansen Co. (CMC) we are requesting an extension for continued accumulation of investigative waste at the above referenced site located in Phelps, Wisconsin. This request is made under the provisions of 615.05(4)11(b) and we believe is consistent with Department policy and guidance dated January 14, 1993 (Attachment 3) for long-term on-site accumulation of investigative wastes. CMC asked us to develop a plan to manage and consolidate the investigative waste which was accumulated at the site during previous investigation work. In our telephone conversation during the week of August 4, 1997, you concurred with our proposed plan to move the drums into a covered area for safety reasons and to keep them out of the weather.

During the week of November 3, 17 drums and 4 plastic pails of soil (drill cuttings/treatability samples) and used sampling materials, and 15 drums containing monitoring well purge water from prior investigations were transported a distance of about 900 feet. The drums will be maintained in a covered shed located across from and south of the site. The drums with water are half full or less, are in good condition, and will have secondary containment. Consistent with the intent of the Department's guidance on these matters, the containers will be labeled and inspected on a monthly basis. Records of inspections will be kept in a log and the frequency of inspections will be increased during freeze/thaw periods. Adequate head space will be maintained on the drums which contain water to allow for freezing.

Also by your verbal approval, approximately 10 gallons of a oil/water mixture from monitoring well MW-7 was also taken off-site and disposed through the Vilas County small quantity hazardous waste disposal program in August 1997.

Based on our follow-up conversation on November 13 and 17, we trust this approach to managing the investigative wastes will suffice until remedial actions are implemented. Your assistance and written approval of this request is greatly appreciated. Please do not hesitate to call should you have any questions.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Spiros L. Fafalios, E.I.T.
Project Engineer

Laurie J. Parsons, P.E.
Senior Environmental Engineer

cc Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.
Mr. Eric Christiansen, C. M. Christiansen Company

[1226dmiller.ltr2]

C.M. CHRISTIANSEN CO., INC.

P.O. Box 100
PHELPS, WI 54554
TEL: (715) 545-2333
Fax: (715) 545-2334

ERIC R. CHRISTIANSEN
PRESIDENT
EMAIL: erc@execpc.com

SENT VIA FAX & FIRST CLASS MAIL – 5 pages

December 17, 1998

Mr. Donald Miller
Wisconsin Department of Natural Resources
Northern Region Headquarters
107 Sutliff Avenue
Rhinelander, WI 54501-0818

Re: Request for Extension of Investigative Waste Accumulation Time
Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Miller:

Pursuant to your letter of January 26, 1998 (copy enclosed – the "Extension Letter") responding to the request of our consultants (copy also enclosed), we hereby notify you that the investigative waste referred to therein will remain in storage on and after January 1, 1999 pending the undertaking of remediation activities, currently expected to commence in the spring or summer of 1999 (assuming all pending permit applications, reports, plans and other matters before Wisconsin DNR are approved – the "Pending Applications").

We also hereby notify you, as set forth in the Pending Applications, that we currently expect to undertake additional investigative activities this coming winter or spring and that, as a result, additional investigative wastes are likely to be added in 1999 to those currently in storage. We will comply with the provisions of the Extension Letter relating to those additional wastes, if and when added to the existing accumulation.

Based on the foregoing, we hereby respectfully request a one-year Extension of the Investigative Waste Accumulation Time, from the current expiration of December 31, 1998, to and including December 31, 1999, subject to our continuing compliance with the terms of the Extension Letter.

Very truly yours,
C.M. CHRISTIANSEN CO., INC.

Eric Christiansen,
President

cc: Mr. P.C. Christiansen
Ms. Elizabeth Gamsky Rich – Whyte Hirschboeck Dudek S.C.
Ms. Laurie Parsons – Natural Resource Technology, Inc.
Mr. Chris Saari – Wisconsin DNR

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Region Headquarters
PO Box 818, 107 Sutliff Ave.
Rhinelander, WI 54501-0818
TELEPHONE 715-365-8900
FAX 715-365-8932
TDD 715-365-8957

January 26, 1998

FID#

Mr. Eric Christiansen
C.M. Christiansen Co.
P.O. Box 100
Phelps, WI 54554

SUBJECT: Extension of Investigative Waste Accumulation Time

Dear Mr. Christiansen:

On January 20, 1998, the Department received a request on your behalf from Natural Resource Technology to extend the time which C.M. Christiansen may retain accumulated investigative hazardous waste on-site. This request was made under the provisions of ch. NR 615.05(4),l,(b), Wis. Adm. Code, and is consistent with Department policy and guidance dated January 14, 1993, (Attachment 3). Earlier, the Department verbally agreed to allow C. M. Christiansen to move the waste from the site to a nearby storage building for safety reasons and protected from the weather. This request for storage of accumulated waste is granted until January 1, 1999 with the following conditions:

The drums must be labelled as hazardous waste, inspected for leaks and defects monthly, with an increase in inspection frequency during the spring months when the water begins to thaw. As required by ch. NR 615.05(4),2.c., an inspection log including the date and time of inspection, name of inspector, and condition of the drums shall be kept for review by the Department for at least three years from the date of the inspection. The Department may revoke this extension at any time, should the facility not fully follow the requirements for accumulated waste, or the drums present an environmental hazard. The Department will allow C. M. Christiansen to add additional investigative wastes to this accumulation as long as records of the additions are kept with the waste, and the Department is notified of additional waste being added.

It is understood that the investigative waste will be treated on-site along with treatment of contaminated water at the facility. Should C. M. Christiansen decide not to treat water on site, the drums must be properly removed as hazardous waste within 90 days of this decision. If the waste will remain on-site after 1998, a request for another extension should be made prior to January 1, 1999. The Department reserves the right to inspect the drums at any time during normal working hours.

If you have any questions regarding this letter, please call me at 715/365-8980.

Sincerely,

Don Miller
Waste Management Specialist

c. Laurie Parsons, Natural Resource Technologies, 23713 W. Paul Rd., Pewaukee, WI 53072
Gary LeRoy, DNR-Spooner
Chris Saari, DNR -Brule

Natural Resource Technology, Inc.

TRANSMITTAL

To: Wisconsin Dept. of Natural Resources
107 Sutliff Avenue
P.O. Box 818
Rhinelander, WI 54501

Date: 1/15/98
Project No: 1226
From: Laurie Parsons

Attn: Mr. Don Miller

Re: C.M. Christiansen Co. Investigative Waste Management

x For Your Information ☐ As Requested ☐ For Review ☐ Approve and Return

Copies:	Description
1	Nov. 19, 1997 Letter from NRT to Don Miller

Comments: Don -
It came to our attention that you may not have received the attached letter which was issued after our telephone conversations last November. We apologize for this oversight and look forward to your written response.

Laurie Parsons

cc: Mr. Eric Christiansen, C.M. Christiansen Co.
Ms. Elizabeth Gamsky Rich - Whyte, Hirschboeck, Dudek, S.C.
Mr. Chris Saari - WDNR - Brule Office

23713 W. Paul Road, Pewaukee, WI 53072 ■ Phone 414/523-9000 ■ Fax 414/523-9001

Natural
Resource
Technology, Inc.
N R T

November 19, 1997
(1226)

Mr. Don Miller
Wisconsin Department of Natural Resources
107 Sutliff Avenue
P.O. Box 818
Rhinelander, WI 54501

RE: Request for Extension of Investigative Waste Accumulation Time
C.M. Christiansen Company, Former Wood Treatment Site, Phelps, Wisconsin
Ref: WID998639035

Dear Mr. Miller:

On behalf of C.M. Christiansen Co. (CMC) we are requesting an extension for continued accumulation of investigative waste at the above referenced site located in Phelps, Wisconsin. This request is made under the provisions of 615.05(4)11(b) and we believe is consistent with Department policy and guidance dated January 14, 1993 (Attachment 3) for long-term on-site accumulation of investigative wastes. CMC asked us to develop a plan to manage and consolidate the investigative waste which was accumulated at the site during previous investigation work. In our telephone conversation during the week of August 4, 1997, you concurred with our proposed plan to move the drums into a covered area for safety reasons and to keep them out of the weather.

During the week of November 3, 17 drums and 4 plastic pails of soil (drill cuttings/treatability samples) and used sampling materials, and 15 drums containing monitoring well purge water from prior investigations were transported a distance of about 900 feet. The drums will be maintained in a covered shed located across from and south of the site. The drums with water are half full or less, are in good condition, and will have secondary containment. Consistent with the intent of the Department's guidance on these matters, the containers will be labeled and inspected on a monthly basis. Records of inspections will be kept in a log and the frequency of inspections will be increased during freeze/thaw periods. Adequate head space will be maintained on the drums which contain water to allow for freezing.

Also by your verbal approval, approximately 10 gallons of a oil/water mixture from monitoring well MW-7 was also taken off-site and disposed through the Vilas County small quantity hazardous waste disposal program in August 1997.

Based on our follow-up conversation on November 13 and 17, we trust this approach to managing the investigative wastes will suffice until remedial actions are implemented. Your assistance and written approval of this request is greatly appreciated. Please do not hesitate to call should you have any questions.

Sincerely,

NATURAL RESOURCE TECHNOLOGY, INC.

Spiros L. Fafalios, E.I.T.
Project Engineer

Laurie J. Parsons, P.E.
Senior Environmental Engineer

cc Ms. Elizabeth Gamsky Rich, Whyte Hirschboeck Dudek, S.C.
Mr. Eric Christiansen, C. M. Christiansen Company

[1226dmiller.ltr2]

Recd 1/4/99
Brule

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
William H. Smith, Regional Director

Northern Region Headquarters
107 Sutliff Ave.
Rhinelander, Wisconsin 54501-0818
Telephone 715-365-8900
FAX 715-365-8932
TDD 715-365-8957

December 29, 1998

Mr. Eric Christiansen
P.O. Box 100
Phelps, WI 54554

Subject: Extension for Investigative Waste Accumulation Time

Dear Mr. Christiansen:

On December 17, 1998, the Department received a request from you to extend the time which C.M. Christiansen may retain accumulated investigative hazardous waste on site. The request was made under the provisions of ch. NR 615.05 (4),1,(b), Wis. Adm. code, and is consistent with Department policy and guidance dated January 14, 1993. Earlier, the Department had granted you an extension for one year ending January 1, 1999. The request for storage of accumulated investigative wastes is granted until July 1, 1999 for the drums of soil drill cuttings, treatability samples and used sampling materials. Purge water wastes generated from well sampling may remain on site until October 1, 1999, or until you begin groundwater treatment, whichever comes first.

The Department is granting this extension based on the assumption that remedial activities will begin in the spring of 1999. Do not anticipate that the Department will grant further extensions allowing these wastes to remain on site. As required in the past, all drums must be properly labeled and inspected for leaks monthly. An inspection log including the date and time of inspection, name of inspector, and condition of the drums shall be kept for review by the Department for at least three years from the date of the inspection. The Department will allow C.M. Christiansen to add investigative wastes to this accumulation as long as records are kept and the Department is notified of additional waste.

Should Christiansen's decide to not treat groundwater on site, the purge water wastes shall be properly removed as hazardous waste within 90 days of this decision. If soil treatment has not begun by July 1, 1999, the treatability samples, drill cuttings and sampling materials must be removed by that date. The Department reserves the right to inspect the drums at any time during normal working hours.

If you have any questions regarding this letter, please call me at 715/365-8980

Sincerely,

Don Miller
Waste Management Specialist

c. Dave Kafura, Spooner
Chris Saari, Brule
Gary LeRoy Spooner
Laurie Parsons, Natural Resource Technologies, 23713 w. Paul Rd. Pewaukee, WI 53072