HORIZON ENVIRONMENTAL

May 9, 2005

SITE/CO _____
FILE NAME RI/FS
TITLE RIW
DOCUMENT Horizon Env

Ms. Heather Hopkins
Environmental Quality Analyst
Michigan Department of Environmental Quality
Remediation and Redevelopment Division
Grand Rapids District Office
245 Colrain, SW
Grand Rapids, Michigan 49545-1013

**RE: SAPPI FINE PAPER NORTH AMERICA/S.D. WARREN COMPANY, MUSKEGON, MICHIGAN: GREEN LIQUOR CLARIFIER AREA INVESTIGATION RESULTS**

Dear Ms. Hopkins:

The purpose of this letter is to report the results of a supplemental hydrogeologic investigation conducted by Horizon Environmental Corporation ("Horizon") on behalf of Sappi Fine Paper North America/S.D. Warren Company ("Sappi") in the area of the Green Liquor Clarifier at the Sappi site at 2400 Lakeshore Drive in Muskegon, Michigan. This work was conducted in response to your letter of May 14, 2004 to Mr. Evert Vanderberg of Sappi.

## PARTIAL SITE PLAN/RELEASE AREA

Prior to beginning the field investigation in the area of the green liquor clarifier, Horizon met with plant engineering staff from Sappi to verify the location of structures and utilities in the release area. Pursuant to the request in your May 14, 2004 letter, the locations of the following features were field verified: (1) the abandoned six-inch underground sewer line that formerly connected the pulp mill liquor heaters with the waste liquor tank; (2) an underground box drain; (3) the pulp mill liquor heaters; (4) the waste liquor tank; (5) the green liquor clarifier; and (6) the area of impacted soil and the related excavation. The locations of these items, as well as soil and groundwater sampling locations, are illustrated on Figure 1.

In general, as noted on Figure 1, the release area is located within an intensively developed area of the Sappi site. The release area is surfaced with concrete pavement and is underlain by extensive subgrade utilities. In addition, an overhead conveyor and overhead piping associated with Sappi's manufacturing operations are present in the area. These improvements represent significant impediments to both Sappi's excavation activities in response to this release and the investigation activities described here.

## VERTICAL PROFILE GROUNDWATER SAMPLING

In response to the other concerns raised in your May 14 letter, vertical profile groundwater sampling was conducted in the area immediately downgradient (north) of the release area. As noted above and as evident from review of Figure 1, an overhead conveyor system is present in the release area. As a

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result, vertical profile sampling could not be accomplished in the area of soil excavation because of the presence of this overhead obstruction. As you may recall, vertical profile sampling was conducted in this area to assess the extent of elevated sulfate concentrations in groundwater. The results of the previous investigations in this area of the site were reported to the Michigan Department of Environmental Quality, Remediation and Redevelopment Division ("MDEQ", "RRD") in Horizon's letter report dated November 12, 2003.

Vertical profile sampling completed as part of this scope of work included construction of temporary wells using Geoprobe® construction methods and collection of groundwater samples at ten foot vertical intervals throughout the aquifer. Samples were collected from each vertical profile temporary well using a variety of methods including mill-slot samplers and SP-16 screen point samplers. The mill-slot sampler consists of a steel pipe with vertical machine cut slots that is driven directly into the subsurface soils. The SP-16 screen point sampler consists of the continuous wire wrap stainless steel well screen that fits inside a closed and sealed drive casing. To collect a sample with the SP-16 sampler the unit is driven to depth and then pulled back a distance of four feet to expose the screened inlet. Each groundwater sample was collected using a peristaltic pump and polyethylene tubing placed to the base of each sampler.

Each groundwater sample was field screened for pH, conductivity, and total dissolved solids ("TDS"). Field screening was conducted downward until field screening results showed a decrease in conductivity. The groundwater samples were also laboratory analyzed for sodium, sulfate, TDS, and hardness (as $CaCO_3$). The field screening method for TDS analysis involves electrical measurement and mathematical conversion. In contrast, the laboratory analyses were completed using gravimetric methods.

## GROUNDWATER FIELD SCREENING RESULTS

Groundwater flow direction has been determined to be directly to the north in prior investigations at the site, including a hydrogeologic investigation completed near Building #31, which is located approximately 300 feet west/northwest of the green liquor clarifier. Based on this, vertical profile groundwater sampling was conducted at two locations north of the green liquor clarifier release area. The groundwater sampling locations were designated GLC-1 and GLC-2 (see Figure 1). At each location, the aquifer sediments consisted of fine-grained sand to a depth of approximately 18 to 19 feet. Below 18 to 19 feet the aquifer sediments consisted of silt. Copies of the well/boring logs sheets for both boring/temporary well locations are presented as Attachment I to this letter report.

The results of the pH, conductivity, and TDS field screening are summarized on Table 1. At both sampling locations, the maximum groundwater conductivity was observed in the sample interval closely associated with the base of the fine sand and top of the silt. The markedly lower hydraulic yield observed in sampling of the deepest intervals strongly suggests that the silt sediments have a significantly lower permeability than the overlying fine sand.

## GROUNDWATER LABORATORY ANALYSIS RESULTS

As noted above, each groundwater sample was also submitted for laboratory analyses. Samples were laboratory analyzed for hardness (as $CaCO_3$), sodium, sulfate, and TDS by Trace Analytical Laboratories, Inc., of Muskegon, Michigan. The results of the laboratory analyses, including

comparison of analytical results to potentially applicable criteria established pursuant to Part 201 of 1994 Michigan P.A. 451, as amended ("Part 201"), are summarized in Table 2. Analytical laboratory reports for these samples are presented as Attachment II to this letter report.

As evident from review of Table 2, all groundwater samples collected during this investigation contained sodium and TDS at concentrations that exceeded the Industrial & Commercial II, III, IV criteria for consumptive use of groundwater. In addition, all groundwater samples collected as part of this investigation contained TDS at concentrations that exceeded the generic Groundwater/Surface Water Interface ("GSI") criterion for TDS. Finally, one groundwater sample, collected from temporary well location GLC-1 at a depth of 17 to 21 feet below ground surface, contained sulfate at a concentration that exceeded its Industrial & Commercial II, III, IV criterion for consumptive use of groundwater.

**ANALYSIS**

Consumptive use of groundwater does not occur on the property, nor is such use contemplated in the future. As a result, the exceedances of Part 201 criteria established based on consumptive use of groundwater do not appear to pose a risk to human health or the environment. Emplacement of an institutional control, likely in the form of a restrictive covenant placed on the deed for the property or a City of Muskegon ordinance restricting construction of potable water wells on the property, will be necessary to eliminate this potential exposure pathway. Emplacement of such an institutional control would be completed as part of a Remedial Action Plan ("RAP") or a plan for an Interim Response Designed to meet Criteria ("IRDC") for the property.

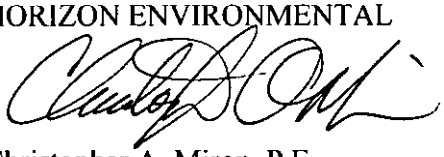
The groundwater sampling locations used during this investigation, GLC-1 and GLC-2, are located approximately 950 feet south of the shoreline of Muskegon Lake. As noted previously, available information suggests that groundwater flow at the site is uniformly to the north, towards Muskegon Lake. As a result, it appears likely that venting of groundwater to Muskegon Lake constitutes a relevant exposure pathway for groundwater at the site. Concentrations of TDS in all groundwater samples collected during this investigation exceed the generic GSI criterion for TDS. Groundwater density is directly related to concentrations of TDS in groundwater. Density-driven flow also appears to be a factor in migration of groundwater containing elevated concentrations of TDS in this area of the site, although this flow appears to be limited by the presence of a lower permeability silt layer at a depth of approximately 18 feet below the ground surface.

Given this, additional investigation is likely necessary to assess the nature and extent of groundwater containing TDS at concentrations in excess of the 500 mg/L generic GSI criterion established in R. 299.5744 of the Part 201 administrative rules. The modest concentrations of sulfate observed in this investigation raise significant ambiguity regarding the source of TDS in groundwater in this area of the site. That is to say, the presence of TDS in groundwater in temporary monitoring wells GLC-1 and GLC-2 may also simply be attributable to historical paper manufacturing and filling activities on the property. As such, a work plan for additional investigation activities in this area of the property, taking into account other groundwater data collected contemporaneously at the site, will be issued to the MDEQ, RRD for review and consideration within three months of the date of this letter. The investigation will focus on assessment of the potential for groundwater more proximate to the GSI to contain elevated concentrations of TDS.

If you have questions or require additional information about anything presented in this letter report, please contact Chris Miron at 616.554.3210 or Evert Vanderberg of Sappi at 231.759.5324.

Sincerely,

HORIZON ENVIRONMENTAL



Christopher A. Miron, P.E.
Senior Project Engineer

cc: E. Vanderberg, Sappi

enclosures

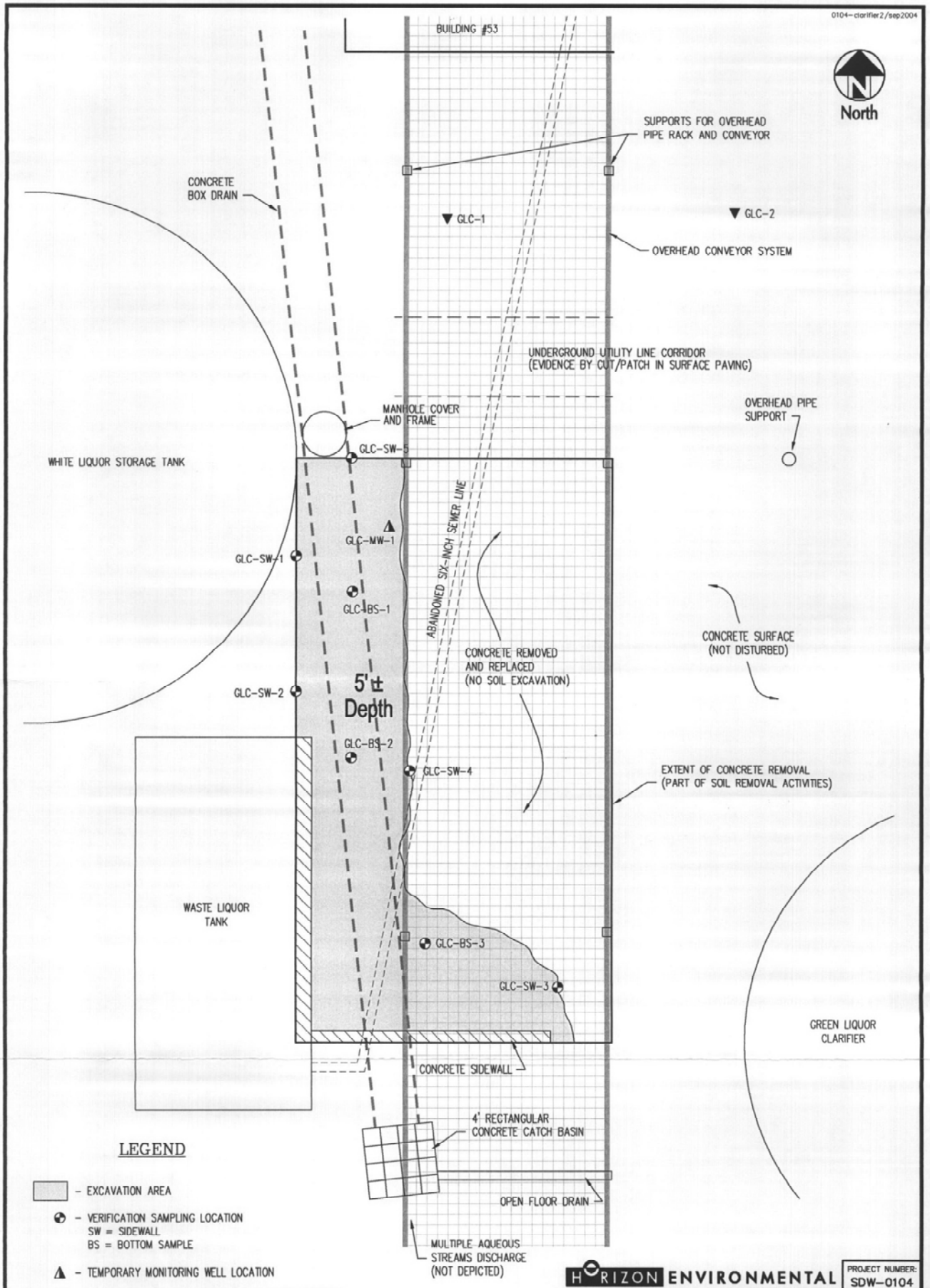

0104-clarifier2/sep2004
BUILDING #53
North
SUPPORTS FOR OVERHEAD PIPE RACK AND CONVEYOR
CONCRETE BOX DRAIN
GLC-1
GLC-2
OVERHEAD CONVEYOR SYSTEM
UNDERGROUND UTILITY LINE CORRIDOR (EVIDENCE BY CUT/PATCH IN SURFACE PAVING)
MANHOLE COVER AND FRAME
OVERHEAD PIPE SUPPORT
GLC-SW-5
WHITE LIQUOR STORAGE TANK
ABANDONED SIX-INCH SEWER LINE
GLC-MW-1
GLC-SW-1
GLC-BS-1
CONCRETE REMOVED AND REPLACED (NO SOIL EXCAVATION)
CONCRETE SURFACE (NOT DISTURBED)
GLC-SW-2
5'± Depth
GLC-BS-2
GLC-SW-4
EXTENT OF CONCRETE REMOVAL (PART OF SOIL REMOVAL ACTIVITIES)
WASTE LIQUOR TANK
GLC-BS-3
GLC-SW-3
GREEN LIQUOR CLARIFIER
CONCRETE SIDEWALL
4' RECTANGULAR CONCRETE CATCH BASIN
OPEN FLOOR DRAIN
MULTIPLE AQUEOUS STREAMS DISCHARGE (NOT DEPICTED)
LEGEND
- EXCAVATION AREA
- VERIFICATION SAMPLING LOCATION
SW = SIDEWALL
BS = BOTTOM SAMPLE
- TEMPORARY MONITORING WELL LOCATION
- VERTICAL PROFILE GROUND WATER SAMPLING LOCATION
0 2.5 5 10
APPROXIMATE SCALE IN FEET
HORIZON ENVIRONMENTAL
PROJECT NUMBER: SDW-0104
SAPPI Fine Paper North America/S.D. Warren
Muskegon, Michigan Plant
FIGURE: 1
GREEN LIQUOR CLARIFIER AREA SAMPLING LOCATIONS
MAY 2005

**Table 1**
**Summary of Field Screening Results for Groundwater Samples**
**Sappi Fine Paper North America/S.D. Warren**
**Muskegon, Michigan Facility**
**Green Liquor Clarifier Release Area**

| Temporary Well/ Sampling Depth | pH (std.units) | Conductivity (mS/cm) | Calculated Total Dissolved Solids ("TDS") (mg/L) |
|---|---|---|---|
| GLC-1 10-12 ft. | 7.23 | 5.06 | 3,000 |
| GLC-1 17-21 ft. | 9.34 | 6.72 | 4,200 |
| GLC-1 27-29 ft. | 9.04 | 6.47 | 4,100 |
| GLC-2 5-8 ft. | 7.20 | 5.47 | 3,500 |
| GLC-2 12-16 ft. | 8.89 | 8.22 | 5,300 |
| GLC-2 21-25 ft. | 9.42 | 7.38 | 4,700 |

# Table 2
## Summary of Analytical Results for Groundwater Samples
## Sappi Fine Paper North America / S.D. Warren
## Muskegon, MI Facility
## Green Liquor Clarifier Release Area

| Sample Location<br>Sample Identification<br>Sampled By<br>Analyzed By<br>Sample Date<br>Sample Depth (ft) | | Industrial & Commercial II, III & IV Drinking Water Criteria | Groundwater Surface Water Interface Criteria | Groundwater Contact Criteria | GLC-1<br>EH058-01<br>Horizon<br>Trace<br>8/3/2004<br>10-12' | GLC-1<br>EH058-03<br>Horizon<br>Trace<br>8/3/2004<br>17-21' | GLC-1<br>EH058-02<br>Horizon<br>Trace<br>8/3/2004<br>27-29' | GLC-2<br>EH058-06<br>Horizon<br>Trace<br>8/3/2004<br>5-8' | GLC-2<br>EH058-05<br>Horizon<br>Trace<br>8/3/2004<br>12-16' | GLC-2<br>EH058-04<br>Horizon<br>Trace<br>8/3/2004<br>21-25' |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Constituent*** | ***Units*** | | | | | | | | | |
| Hardness (as CaCO3) | mg/L | NA | NA | NA | **530** | **290** | **270** | **410** | **150** | **190** |
| Sodium | mg/L | 350 | NA | 1000000 {D} | 1000 | 1700 | 1800 | 1400 | 2400 | 2000 |
| Sulfate (as SO4) | mg/L | 250 {E} | NA | ID | <1.0 | 260 | **70** | **4.3** | **17** | **210** |
| Total dissolved solids (TDS) | mg/L | 500 {E} | 500 {EE} | NA | 3100 | 5500 | 7000 | 4500 | 12000 | 6600 |

Criteria from Part 201 Rule 299-5744
Bolded value denotes parameter detected above detection limit
Shaded values exceed Industrial Drinking Water Criteria.
Boxed values exceed Groundwater Surface Water Interface Criteria.

{D} Calculated criterion exceeds 100% hence is reduced to 100% or 1.0E+9 ppb
{E} Criterion is the aesthetic DW value, as required by section 20120a(5) of the act.
A notice of aesthetic impact may be employed as an institutional control mechanism if groundwater concentrations exceed the aesthetic drinking water criterion, but do not exceed the applicable health-based drinking water value provided in the following table for the Aluminum tertiary Amyl methyl ether, Copper, Diethyl ether, Ethylbenzene, Iron, Manganese, MTBE, Toluene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene and Xylenes.
{EE} The following are applicable generic GSI as allowed for under Sec. 20120a(15) of the act.
Phosphorus, total dissolved solids (TDS) and dssolved Oxygen (DO).
ID = Inadequate data to develop criterion
NA = Criterion or value is not available, or not applicable

*ATTACHMENT I*

*WELL/SOIL BORING LOG SHEET FOR TEMPORARY MONITORING WELLS*

HORIZON ENVIRONMENTAL

Page: 1 of 1
Boring No.: GLC-1
Completed Well No.: N/A
Client : SAPPI
Project No.: SDW-0104
Date: Started: 8/3/04 Finished: 8/3/04
Time: Started: 7:30 Finished: 10:30

# Well/Boring Log Sheet

| State | County | Township | Fraction | Section | T | R |
|---|---|---|---|---|---|---|
| MI | Muskegon | Muskegon | | 34 | 10N | 17W |

**Contractor:** Stearns Drilling
Address: Dutton, MI

Equipment: Geoprobe
Crew Chief: Tom
Horizon Supervisor: Dan Greene

| Drilling Method(s) | Depth |
|---|---|
| Hand Auger | 2.0' |
| Geoprobe | 29.0' |
| | |
| | |

Ground Surface Elevation (ft.):
TOC Elevation (ft.)
Datum (ft.):
Static Water Level:

| Grout/Seal Depth/to | Material/Method |
|---|---|
| 0.0-5.0 | Bentonite |
| 5.0-29.0 | Collapse |
| | |

**Notes:** See Table 1 for field screening results

Construction: [ ] Abandonment: [X] Additional Field Notes: Log Books: [ ] Computer File: [ ]

| Thickness (feet) | Depth to Base (feet) | USCS* | Lithologic Description | Sample Depth | Blow Counts Time | 6" | 12" | 18" | 24" | Headspace | Background | Recovery |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.3 | 0.3 | | Concrete | | | | | | | | | |
| 4.7 | 5.0 | | Gravel, sand & wood, black, dry | | | | | | | | | |
| 13.0 | 18.0 | | Sand, fine, wet | | | | | | | | | |
| 11.0 | 29.0 | | Silt, wet | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | EOB @ 29' | | | | | | | | | |

*= The USCS symbol assigned is based on visual and manual observations and not on tests performed in the laboratory.

HORIZON ENVIRONMENTAL

Page: 1 of 1
Boring No.: GLC-2
Completed Well No.: N/A
Client : SAPPI
Project No.: SDW-0104
Date: Started: 8/3/04 Finished: 8/3/04
Time: Started: 11:00 Finished: 1:00

# Well/Boring Log Sheet

| State | County | Township | Fraction | Section | T | R |
|---|---|---|---|---|---|---|
| MI | Muskegon | Muskegon | | 34 | 10N | 17W |

**Contractor:** Stearns Drilling
Address: Dutton, MI

Equipment: Geoprobe
Crew Chief: Tom
Horizon Supervisor: Dan Greene

| Drilling Method(s) | Depth |
|---|---|
| Geoprobe | 25.0' |
| | |
| | |
| | |

Ground Surface Elevation (ft.):
TOC Elevation (ft.)
Datum (ft.):
Static Water Level:

| Grout/Seal Depth/to | Material/Method |
|---|---|
| 0.0-5.0 | Bentonite |
| 5.0-25.0 | Collapse |
| | |

**Notes:** See Table 1 for field screening results

Construction: [ ] Abandonment: [X] Additional Field Notes: Log Books: [ ] Computer File: [ ]

| Thickness (feet) | Depth to Base (feet) | USCS* | Lithologic Description | Sample Depth | Blow Counts Time | 6" | 12" | 18" | 24" | Headspace | Background | Recovery |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.3 | 0.3 | | Concrete | | | | | | | | | |
| 4.7 | 5.0 | | Sand, medium, black, dry | | | | | | | | | |
| 14.0 | 19.0 | | Sand, medium to fine, wet | | | | | | | | | |
| 6.0 | 25.0 | | Silt, wet | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | EOB @ 25' | | | | | | | | | |

*= The USCS symbol assigned is based on visual and manual observations and not on tests performed in the laboratory.

***ATTACHMENT II***

***LABORATORY ANALYTICAL REPORTS AND CHAIN OF CUSTODY DOCUMENTATION***

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

*Trace Analytical Laboratories, Inc.*
2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

TRACE

*the science of compliance*

# ANALYTICAL RESULTS

**Deliver To:** Mr. Chris Miron
Horizon Environmental
4771 50th Street SE
Grand Rapids, MI 49512
(616)554-3210

**TRACE ID:** EH058

**CLIENT PROJECT ID:** SAPPI GLC

**REPORT DATE:** 08/13/04

**PROJECT MANAGER:** 

**Ann Preston**

phone 231.773.5998
toll-free 800.733.5998
fax 231.773.6537

Trace Analytical Laboratories, Inc.
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Muskegon, MI 49444-2673
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## REPORT VALIDATION

All reports were examined through Trace's validation process to ensure that all requirements for quality and completeness were satisfied. All reported analytical results were obtained in accordance with the methods referenced on the reports. Every practical effort was made to meet the reporting limit specifications for this work.

If you have any questions regarding this data, please contact Ann Preston, our client services manager, at (231) 773-5998 Ext 224, apreston@trace-labs.com.

The following definitions and qualification keys are provided to aid in data interpretation.

QC DEFINITIONS:

| | |
|---|---|
| LCS | Laboratory Control Sample |
| LCSD | Laboratory Control Sample Duplicate |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| RPD | Relative Percent Difference |
| DUP | Matrix Duplicate |

QUALIFIER KEYS: These descriptors will be associated with individual results for a specific sample and a specific analyte and will help qualify the data:

| | |
|---|---|
| <,ND, or U | Indicates the compound was analyzed for but not detected |
| J | Indicates an estimated value |
| B | Indicates the analyte is found in the blank associated with the sample |
| E | Indicates the analyte exceeded the range of calibration |
| * | Indicates QC exceedance |

**TRACE IS VALIDATED BY THE U.S. ARMY CORPS OF ENGINEERS**

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# Certificate of Analysis

## Workorder Sample Summary

| *Client* | *Trace ID* | *Client Project ID* |
|---|---|---|
| Horizon Environmental | EH058 | SAPPI GLC |

| *Trace ID* | *Sample ID* | *Matrix* | *Collected By* | *Collect Date/Time* | *Receive Date* |
|---|---|---|---|---|---|
| EH058-01 | GLC-1 10-12' | Water | Client | 08/03/04 8:15 | 08/05/04 |
| EH058-02 | GLC-1 27-29' | Water | Client | 08/03/04 9:30 | 08/05/04 |
| EH058-03 | GLC-1 17-21' | Water | Client | 08/03/04 10:00 | 08/05/04 |
| EH058-04 | GLC-2 21-25' | Water | Client | 08/03/04 11:00 | 08/05/04 |
| EH058-05 | GLC-2 12-16' | Water | Client | 08/03/04 11:15 | 08/05/04 |
| EH058-06 | GLC-2 5-8' | Water | Client | 08/03/04 12:30 | 08/05/04 |

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Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

# Certificate of Analysis

| Trace ID | Sample ID | Collected | Matrix |
|---|---|---|---|
| EH058-01 | GLC-1 10-12' | 08/03/04 08:15 | Water |

## Wet Chemistry - EPA 160.1, Total Dissolved Solids

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/05/04 | at | WETC / 2531 [19935] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Total Dissolved Solids | 3100 | 20 | | mg/L |

## Wet Chemistry - EPA 300.0, Anions

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/12/04 | at | WETC / 2604 [20191] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sulfate (as SO4) | <1.0 | 1.0 | | mg/L |

## Inorganics - SM2340B, Hardness

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | sd | META / 2563 [20148] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Hardness (as CaCO3) | 530 | 6.6 | | mg/L |

## Inorganics - SW846 6010B Analysis, Total Waters

(Results reported on a wet weight basis)

| Prep Date | Prep Batch | Prep Method | Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|---|---|---|
| 08/10/2004 | DIG / 1701 [20061] | SW846 3015 | 1 | 08/12/04 | sd | META / 2562 [20147] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sodium | 1000 | 1.6 | | mg/L |

phone 231 773-5998
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fax 231 773-6537

Trace Analytical Laboratories, Inc.
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# Certificate of Analysis

| Trace ID | Sample ID | Collected | Matrix |
|---|---|---|---|
| EH058-02 | GLC-1 27-29' | 08/03/04 09:30 | Water |

## Wet Chemistry - EPA 160.1, Total Dissolved Solids

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/05/04 | at | WETC / 2531 [19935] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Total Dissolved Solids | 7000 | 200 | | mg/L |

## Wet Chemistry - EPA 300.0, Anions

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 5 | 08/12/04 | at | WETC / 2604 [20191] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sulfate (as SO4) | 70 | 2.0 | | mg/L |

## Inorganics - SM2340B, Hardness

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | sd | META / 2563 [20148] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Hardness (as CaCO3) | 270 | 6.6 | | mg/L |

## Inorganics - SW846 6010B Analysis, Total Waters

(Results reported on a wet weight basis)

| Prep Date | Prep Batch | Prep Method | Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|---|---|---|
| 08/10/2004 | DIG / 1701 [20061] | SW846 3015 | 1 | 08/12/04 | sd | META / 2562 [20147] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sodium | 1800 | 1.6 | | mg/L |

phone 231-773-5998
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www.trace-labs.com

# Certificate of Analysis

| Trace ID | Sample ID | Collected | Matrix |
|---|---|---|---|
| EH058-03 | GLC-1 17-21' | 08/03/04 10:00 | Water |

## Wet Chemistry - EPA 160.1, Total Dissolved Solids

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/05/04 | at | WETC / 2531 [19935] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Total Dissolved Solids | 5500 | 100 | | mg/L |

## Wet Chemistry - EPA 300.0, Anions

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | at | WETC / 2604 [20191] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sulfate (as SO4) | 260 | 4.0 | | mg/L |

## Inorganics - SM2340B, Hardness

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | sd | META / 2563 [20148] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Hardness (as CaCO3) | 290 | 6.6 | | mg/L |

## Inorganics - SW846 6010B Analysis, Total Waters

(Results reported on a wet weight basis)

| Prep Date | Prep Batch | Prep Method | Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|---|---|---|
| 08/10/2004 | DIG / 1701 [20061] | SW846 3015 | 1 | 08/12/04 | sd | META / 2562 [20147] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sodium | 1700 | 1.6 | | mg/L |

phone 231.773.5998
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fax 231.773.6537

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2241 Black Creek Road
Muskegon, MI 49444-2673
info@trace-labs.com
www.trace-labs.com

# Certificate of Analysis

| Trace ID | Sample ID | Collected | Matrix |
|---|---|---|---|
| EH058-04 | GLC-2 21-25' | 08/03/04 11:00 | Water |

## Wet Chemistry - EPA 160.1, Total Dissolved Solids

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/05/04 | at | WETC / 2531 [19935] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Total Dissolved Solids | 6600 | 200 | | mg/L |

## Wet Chemistry - EPA 300.0, Anions

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 50 | 08/12/04 | at | WETC / 2604 [20191] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sulfate (as SO4) | 210 | 20 | | mg/L |

## Inorganics - SM2340B, Hardness

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | sd | META / 2563 [20148] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Hardness (as CaCO3) | 190 | 6.6 | | mg/L |

## Inorganics - SW846 6010B Analysis, Total Waters

(Results reported on a wet weight basis)

| Prep Date | Prep Batch | Prep Method | Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|---|---|---|
| 08/10/2004 | DIG / 1701 [20061] | SW846 3015 | 1 | 08/12/04 | sd | META / 2562 [20147] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sodium | 2000 | 1.6 | | mg/L |

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# Certificate of Analysis

| Trace ID | Sample ID | Collected | Matrix |
|---|---|---|---|
| EH058-05 | GLC-2 12-16' | 08/03/04 11:15 | Water |

## Wet Chemistry - EPA 160.1, Total Dissolved Solids

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/05/04 | at | WETC / 2531 [19935] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Total Dissolved Solids | 12000 | 200 | | mg/L |

## Wet Chemistry - EPA 300.0, Anions

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 5 | 08/12/04 | at | WETC / 2604 [20191] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sulfate (as SO4) | 17 | 2.0 | | mg/L |

## Inorganics - SM2340B, Hardness

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | sd | META / 2563 [20148] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Hardness (as CaCO3) | 150 | 6.6 | | mg/L |

## Inorganics - SW846 6010B Analysis, Total Waters

(Results reported on a wet weight basis)

| Prep Date | Prep Batch | Prep Method | Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|---|---|---|
| 08/10/2004 | DIG / 1701 [20061] | SW846 3015 | 1 | 08/12/04 | sd | META / 2562 [20147] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sodium | 2400 | 1.6 | | mg/L |

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# Certificate of Analysis

| Trace ID | Sample ID | Collected | Matrix |
|---|---|---|---|
| EH058-06 | GLC-2 5-8' | 08/03/04 12:30 | Water |

## Wet Chemistry - EPA 160.1, Total Dissolved Solids

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/05/04 | at | WETC / 2531 [19935] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Total Dissolved Solids | 4500 | 200 | | mg/L |

## Wet Chemistry - EPA 300.0, Anions

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 1 | 08/12/04 | at | WETC / 2605 [20192] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sulfate (as SO4) | 4.3 | 1.0 | | mg/L |

## Inorganics - SM2340B, Hardness

(Results reported on a wet weight basis)

| Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|
| 10 | 08/12/04 | sd | META / 2563 [20148] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Hardness (as CaCO3) | 410 | 6.6 | | mg/L |

## Inorganics - SW846 6010B Analysis, Total Waters

(Results reported on a wet weight basis)

| Prep Date | Prep Batch | Prep Method | Dilution | Analyzed | By | Analytical Batch |
|---|---|---|---|---|---|---|
| 08/10/2004 | DIG / 1701 [20061] | SW846 3015 | 1 | 08/12/04 | sd | META / 2562 [20147] |

| Parameter | Result | RDL | MCL | Units |
|---|---|---|---|---|
| Sodium | 1400 | 1.6 | | mg/L |

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# CHAIN-OF-CUSTODY RECORD AND WORK AUTHORIZATION

8/12/10

TRACE ID NO. E#058

Page 1 of 1

Client Name: Horizon

Contact Person: Chris Mann

Mailing Address: 4771 South Division St SE

City, State, Zip Code: Grand Rapids, MI 49512

Phone: 616 554-3210 Fax: 616-554-3211

Email Address:

Project Name: SWMSF - GLC PO #: Trace Quote #:

Project #: SDW-0104 Sampled by:

For Use by TRACE Personnel Only

Logged By: T. Huck Checked By: DV

Received on ice: (Yes) No

Preservative Checked: (Yes) No N/A

Soil Volatiles Preserved: MeOH En Core Low Level Lab

Report results to:

Sample identification / request for analytical services:

**Regulatory Requirements**
- MERA TMDL's ☐
- RCRA ☐
- NPDES ☐
- USACE ☐
- Special ☐

**Turnaround Requirements**
- Standard (2 wk) ☒
- * 5 Day ☐
- * 2-4 Day (RUSH) ☐
- * 24 Hour (RUSH) ☐
- * Requires prior approval

**Matrix Key**
- S = Soil
- W = Water
- SE = Sediment
- OI = Oil
- SO = Solid Waste
- WI = Wipes
- LW = Liquid Waste
- A = Air
- D = Drinking Water
- SL = Sludge

ANALYSIS REQUESTED

| TRACE NO | DATE TAKEN | TIME TAKEN | METALS FIELD FILTERED | CLIENT SAMPLE ID | MATRIX | NUMBER OF CONTAINERS | Sediment | Soil Intake | Hardness | TDS | NONE | HNO3 | #4 | REMARKS | Possible Health Hazard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 8/4/04 | 8:15 | | GLC-1 10-12' | W | 2 | X | X | X | X | | | | | |
| 02 | " | 9:30 | | GLC-1 27-25' | W | 2 | X | X | X | X | | | | | |
| 03 | " | 10:00 | | GLC-1 17-21 | W | 2 | X | X | X | X | | | | | |
| 04 | " | 11:00 | | GLC-2 21-25 | W | 2 | X | X | X | X | | | | | |
| 05 | " | 11:15 | | GLC-2 12-16 | W | 2 | X | X | X | X | | | | | |
| 06 | " | 12:30 | | GLC-2 5-8 | W | 2 | X | X | X | X | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

| Item # | RELEASED BY | RECEIVED BY | DATE | TIME | Item # | RELEASED BY | RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|---|---|---|---|
| | 1) | T. Huck | 8/4/04 | 3:15 | | 3) | | | |
| | 2) | 8/5/04 | | | | 4) | | | |

By executing this agreement the client acknowledges acceptance of the terms of the agreement listed on the reverse side.

# SAMPLE LOG IN CHECKLIST

Date: 8-5-04 | Client Name: Horizon | # of Coolers: 2&9

HPN #: NA | Project Name: SAPPI | Cooler #s:

Project #: EH058 | Logged in by: T. Hueck | Cooler #s:

## Cooler Receipt

Cooler/samples delivered by: Trace courier [ ] / Hand delivered [✓] / Commercial courier [ ] — Name of delivery person: ; Name of courier service:

Did cooler come with a bill of lading? No [✓] / Yes [ ] — Way Bill or Tracking #:

COC Seals present and intact on cooler? No [✓] / Yes [ ] — Custody seals signed by:

Client COC number:

Type of packing in cooler:

## Coolant and Temperature

### Type of Coolant Used

| | Yes | No |
|---|---|---|
| Slurry w/ crushed, cubed, or chip ice? | [ ] | [ ] |
| Multiple bags of ice around samples? | [✓] | [ ] |
| Ice Packs/ Blue Ice : | [ ] | [ ] |
| No Coolant Present: | | [ ] |

### Cooler Temperature

Correction Factor -0.2 °C

Date: 8-5-04 Time: 8:30

Temperature Blank: 1.5 °C

Range of 3 samples: 0-2 °C

Melt Water: NA °C

Ice still present upon receipt: [✓] Yes [ ] No

## General

| | Yes | No | NA |
|---|---|---|---|
| COC taped to inside of cooler lid? | [ ] | [✓] | [ ] |
| All bottles arrived unbroken with labels in good condition? | [✓] | [ ] | [ ] |
| Each sample is in a sealed plastic bag? | [ ] | [✓] | [ ] |
| Labels filled out completely? | [✓] | [ ] | [ ] |
| All bottle labels agree with Chain of Custody (COC)? | [✓] | [ ] | [ ] |
| Sufficient sample to run tests requested? | [✓] | [ ] | [ ] |
| pH checked and samples at correct pH? | [ ] | [ ] | [ ] |
| Correct preservative added to samples? | [ ] | [ ] | [ ] |
| DRO/GRO samples received and appropriate check in form completed? | [ ] | [ ] | [ ] |
| Air bubbles absent from VOAs? | [ ] | [ ] | [ ] |
| COC filled out properly and signed by client? | [ ] | [ ] | [ ] |
| COC signed in by TRACE sample custodian? | [ ] | [ ] | [ ] |
| Was project manager called and samples discussed? | [ ] | [ ] | [ ] |

Contact: Date:

Notes: