PREFERRED PLAN FOR THE REMEDIATION OF

Georgia Pacific Resins, Inc.
1975 Watkins Road
Columbus, Ohio
Franklin County

prepared by

THE OHIO ENVIRONMENTAL PROTECTION AGENCY

January 2006

Solicitation of Comments

Submit Public Comments by March 24, 2006 to:

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Division of Emergency and Remedial Response
Ohio EPA, Central District Office
P.O. Box 1049
Columbus, Ohio 43216
E-Mail: David.O'Toole@epa.state.oh.us

Public Meeting

A public meeting is scheduled for 6:30 P.M. on March 14, 2006,

at the Ohio Department's of Transportation's Auditorium located at

1980 West Broad Street in Columbus, Ohio 43223.

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PREFERRED PLAN

for Georgia Pacific Resins, Inc.
Franklin County, Ohio

1.0 INTRODUCTION

1.1 Executive Summary

The Ohio Environmental Protection Agency (Ohio EPA), Division of Emergency and Remedial Response (DERR) has prepared this Preferred Plan for the remediation of the Georgia Pacific Resins, Inc. (Georgia Pacific) site located in Columbus, Ohio (the Site). This Preferred Plan summarizes information on the evaluated remedial alternatives; identifies Ohio EPA's preferred alternative; explains the reasons for selection of the preferred alternative; solicits public review and comments; and provides information on how the public can be involved in the remedy selection process.

The Preferred Plan, which will form the basis for the Decision Document, is based on a Remedial Investigation (RI) and Feasibility Study (FS) prepared by Georgia Pacific and approved by Ohio EPA in September, 2001 and April, 2002 respectively, pursuant to the Director's Final Findings and Orders issued in December 1994. The Critical Incident Report (November 1997), the Emergency Response (ER) Phase I Interim Summary Report (January 1998), the ER Phase II Interim Summary Report (July 1998), and the ER Report (November 1998) were also used to develop the Preferred Plan.

The health and environmental risks of this Site evaluated by Ohio EPA/DERR resulted from past releases of hazardous wastes and/or hazardous constituents at the facility and the materials released by the September 1997 batch resin explosion into the surrounding atmosphere, soil and ground water. The principal contaminants of concern are acetone, phenol, methanol and formaldehyde. The most significant risk factors arising from these contaminants are due to the possible discharge of methanol and phenol into the ground water from the existing, active on-site two million gallon wastewater biological pretreatment pond and the potential exposure of on-site workers (*e.g.*, facility employees or contractors such as construction workers) to any residual soil contamination. The preferred remedial alternative in this Preferred Plan includes:

- Institutional controls
- Engineering controls
- Bio-pond Decommissioning
- Operation and Maintenance

The Ohio EPA finds that these measures will protect public health and the environment by reducing risk to acceptable levels once the remedial action objectives have been achieved. The Preferred Plan does not address the diesel fuel release reported by Georgia Pacific to Ohio EPA's 24-Hour Spill Hotline on June 13, 2005. Further investigation at the Site has

determined that this fuel release is from a former diesel fuel underground storage tank system which is under the jurisdiction of the Bureau of Underground Storage Tank Regulation (BUSTR). Therefore, BUSTR has taken the lead to address the remediation of this diesel fuel release, and has assigned case number 25010888 to this release.

1.2 How the Preferred Plan Process Works

The Preferred Plan is a preliminary recommendation to address risks to public health and the environment posed by historical contamination at the Site. Any public comments, recommendations, or concerns regarding all of the evaluated remedial alternatives could influence the final decision on the remedy. The decision regarding the remedy will be documented in a Decision Document after Ohio EPA has taken into consideration all public comments on the Preferred Plan.

1.3 Statutory Requirements

Ohio EPA is charged with the responsibility to protect the public health and safety from threats caused by air, water or soil contamination arising from the release(s) of regulated hazardous substances.

1.4 Scope of the Proposed Remedial Action

Ohio EPA's preferred remedial alternative should yield a permanent solution for risks associated with the contaminated media at the Site. The expectations for this preferred alternative include:

- protecting human health and the environment from exposure to contaminants of concern in the ground water, soil and surface water that are above acceptable limits; and

- operating and maintaining existing remedial actions initiated during emergency response activities and monitoring systems.

2.0 COMMUNITY ACCEPTANCE

Community acceptance is an important criteria that Ohio EPA evaluates during the remedy selection process. Ohio EPA has mechanisms to gauge the degree of community acceptance, including 1) open dialogue with citizens concerning the results of the investigation and 2) encouraging citizens to participate in the remedy selection process by commenting on the remedial alternatives. This interaction with the public is important to the remedy selection process and to making sound environmental decisions.

The selection of the remedy will be made after the comments received during the public

comment period have been reviewed and considered. Ohio EPA will consider all public comments on this Preferred Plan in preparing the Decision Document. Depending on comments received, the remedy selected in the Decision Document could be different from the Preferred Plan's remedial alternative.

All written and verbal comments received during the public comment period will be summarized and addressed in the Responsiveness Summary in the Decision Document. The Decision Document for the Site will be issued after its entry into the Ohio EPA's Director's Journal.

2.1 Invitation for Public Comment

Ohio EPA invites comments from the public on whether the preferred remedial alternative(s) identified for the Georgia Pacific Site meets the needs of the local community and is an effective solution to the problem. The comment period includes a public meeting where Ohio EPA will discuss the Remedial Investigation Report, the Feasibility Study Report, and the Preferred Plan; and will answer questions and take oral and written comments based on the schedule found in Section 2.2 of the Preferred Plan. Ohio EPA invites public comments on this Preferred Plan for the Georgia Pacific Site, and all of the remedial alternatives in the Feasibility Study Report.

2.2 Opportunities for Public Involvement

The public is encouraged to review and comment on all of the remedial alternatives presented in this Preferred Plan. The remedial alternatives are explained in detail in Section 7 titled, Summary of Remedial Alternatives. Additional details on the remedial alternatives can be found in the "Feasibility Study Report for the Georgia Pacific Resins, Inc. Facility" submitted on March 6, 2002.

The Critical Incident Report (November 1997), the ER Phase I Interim Summary Report (January 1998), the ER Phase II Interim Summary Report (July 1998), the ER Report (November 1998), the Remedial Investigation Report (September 2001), and the Feasibility Study Report (March 2002) and other documents regarding the Site are available in the public repository for Georgia Pacific located at the:

Columbus Metropolitan Branch Library
3540 South High Street
Columbus, Ohio 43207-4007
and
Ohio EPA, Central District Office
122 South Front Street, 5th Floor
Columbus, Ohio 43216-1049

Ohio EPA will hold a public meeting to present the findings of the RI/FS and the Preferred Plan. Ohio EPA staff will be at the public meeting to respond to questions on the RI/FS

and the Preferred Plan, and to formally receive public comment. The public meeting is scheduled for:

Date:	**March 14, 2006**
Time:	**6:30 PM**
Location:	**Ohio Department of Transportation** **1980 West Broad Street** **Columbus, Ohio 43223**

Public comments may either be presented at the public meeting or submitted by regular mail or e-mail to:

David M. O'Toole
Central District Office
P.O. Box 1049
Columbus, Ohio 43216
E-Mail: David.O'Toole@epa.state.oh.us

The comment period for this Preferred Plan will run until March 24, 2006, and may be extended by Ohio EPA if a specific request for a comment period extension is received within the original comment period.

3.0 SITE BACKGROUND

3.1 Site History

The Georgia Pacific Site is located in Franklin County at 1975 Watkins Road in Columbus, Ohio as shown in attached **Figure 1**[1]. The on-site drainage system flows into a small tributary stream of Obetz Creek. The surrounding land use is a mixture of industrial, agricultural and residential uses. The Site is bordered by industrial properties; to the west is the Norfolk Southern Corp. railroad switch yard and to the east is the Sherwin-Williams paint manufacturing facility. South of the facility is fallow, partially wooded, agricultural land, which is traversed by a railroad spur. Watkins Road borders the Site to the north. The area northeast of Watkins Road, and to the west past the railroad switch yard, are residential; and to the northwest is the L-S II Electro-Galvanizing Company facility.

The Georgia Pacific facility was constructed in 1970, and began operations as Pacific Resins. Georgia Pacific Corporation purchased the site in 1976, and has operated the facility ever since as Georgia Pacific Resins, Inc. The Site encompasses approximately sixteen (16) acres as shown in attached **Figure 2**[2]. The facility manufactures synthetic resins and formaldehyde for sale to customers who then produce building materials, fertilizers, insulation, and various automobile products. Formaldehyde is manufactured at the facility, using methyl alcohol (methanol or MeOH) as its primary raw material. Formaldehyde and phenol are then used to manufacture synthetic resin products. In the past, acetone had also been used in the resin manufacturing process.

Approximately two-thirds of the Site supports manufacturing process operations, including the existing two million gallon wastewater biological pretreatment pond and the closed solid waste landfill (closed landfill). Access to the plant site is restricted by a perimeter chain-link fence, and a key-card entry gate monitored by a security guard or control room personnel 24 hours per day.

Since approximately 1979, Georgia Pacific has operated an unlined, two-million gallon capacity biological pretreatment pond (Bio-pond), south of the main plant area, to serve as a wastewater pretreatment system for the resin process wastewater. The resin process wastewater is a combination of two streams, one from the total distillate and one from the seal pit operations, with reported average concentrations of 27,500 milligrams per liter (mg/L) of formaldehyde, 7,100 mg/L of methanol, and 5,200 mg/L of phenol. The resins process wastewater reported average discharge rate was 1,000 gallons per day for Year 2004. The Bio-pond's effluent is combined with formaldehyde process wastewater, non-contact cooling water and part of the manufacturing area's storm water from rainfall events, before being discharged into the City of Columbus sanitary sewer system as authorized by Georgia Pacific's industrial user discharge permit number 010060-1.

The closed landfill is located in the grassy area to the west of the main plant area and encompasses approximately 35,000 square feet. This landfill was used for the disposal of waste resins, dredgings from settling basins and filter cake waste. Georgia Pacific closed the landfill in December 1979. The landfill was closed by grading the solid waste materials, covering the waste with a layer of high-clay soil, and seeding the area to prevent erosion of this soil cover. Ohio EPA's Division of Solid & Infectious Waste Management inspected and approved the landfill closure in March 1980.

3.2 Releases and Spills

Since 1974, Ohio EPA has documented various releases and spills of formaldehyde, methanol and phenol from the facility to air, soil and surface water. These include a 2,000 pound release of formaldehyde and phenol into the atmosphere in May 1984 and a 10,000 pound release of formaldehyde and phenol into the atmosphere in July 1984. These releases resulted in Ohio EPA obtaining a consent decree against Georgia Pacific for past air and water pollution violations and releases in December 1984. On September 10, 1997, a batch reactor (Kettle #2) exploded and released a "partially polymerized resin" mixture consisting of an estimated 1,100 pounds of phenol, 250 pounds of formaldehyde, and 70 pounds of sulfuric acid. The September 1997 plant explosion and subsequent ER activities are discussed in Section 3.4.

In October 1990, Ohio EPA issued consensual Director's Final Findings and Orders (DFF&Os) to Georgia Pacific for an interim remedial action to address a reported 580 gallon leak from the underground methanol transfer pipeline. Georgia Pacific began this interim remedial action in January 1991 with the installation of ground water recovery wells around the underground methanol transfer pipeline. The collected ground water-methanol mixture was discharged to the sanitary sewer line under the Site's existing industrial user wastewater discharge permit with the City of Columbus. In August 1991, Georgia Pacific

reported to Ohio EPA a second leak from the methanol underground transfer pipeline, stating that 1000 gallons of methanol had been recovered from this second release. Georgia Pacific's interim action ground water recovery operation for the methanol underground transfer pipeline's leakage ceased in December 1991. Ohio EPA terminated the 1990 interim remedial action DFF&Os on February 7, 1992.

On December 22, 1994, Ohio EPA issued DFF&Os to Georgia Pacific for the performance of an RI/FS to complete a remedial investigation of the Site; to determine the nature and extent of contamination caused by the disposal of hazardous, industrial and/or other wastes (the RI); and to develop and evaluate a program of appropriate remedial measures employing sound scientific, engineering practices consistent with all applicable laws (the FS). Georgia Pacific had completed the RI Phase I with the submittal and approval in March 1997 of the Technical Memorandum No. 1, and was finalizing the RI Phase II Work Plan submittal of June 1997 when the reactor explosion occurred in September 1997.

On September 10, 1997, a batch reactor (Kettle #2) used to manufacture thermoset resin in Georgia Pacific's process area exploded. This explosion released a phenol/ formaldehyde resin mixture out onto the plant's structures, over the grounds within the plant, and onto a limited area of the adjacent Sherwin-Williams property to the east. Several above ground storage tanks and water lines adjacent to Kettle #2 were also damaged by the explosion. The mixture of storm water from two subsequent days of rain, water from the damaged water lines, partially polymerized resin chemicals, and the contents of the damaged aboveground storage tanks flooded the resin process area. However, this liquid mixture was contained within the paved and bermed areas of the plant. These liquids were conveyed to the diked methanol tank containment area and the Bio-pond for temporary storage. After being stored on-site for two days, the recovered liquids were pumped through the Bio-pond for initial treatment, and then discharged to the sanitary sewer line.

On June 13, 2005, Georgia Pacific reported to Ohio EPA the discovery of diesel fuel in the excavation of the footer for the extension of the boiler room building. A check of the historical factory layout's detailed plans revealed that a diesel fuel underground storage tank (UST) with a vehicle dispenser was near this area. It has been determined that this fuel release is under the jurisdiction of BUSTR. Therefore, BUSTR has taken the lead for investigation and any corrective action relating to this diesel fuel release, and has assigned case number 25010888 to this release.

3.3 Summary of the Remedial Investigation

The Remedial Investigation (RI) was performed by Georgia Pacific and included a number of tasks to identify the nature and extent of site-related chemical contaminants. The RI was conducted with oversight by Ohio EPA, and the RI Phase I work plan was approved on June 25, 1995. The RI tasks included the collection of 162 soil samples, two surface water samples, seven sediment samples, and 143 ground water samples; the installation of 19 monitoring wells; a geophysical survey of the closed landfill; the excavation and off-site disposal of approximately 1,200 cubic yards of potentially impacted soil and the

construction of two perched water recovery interceptor trenches during the ER activities. The RI was conducted in three main phases between 1995 and 2001: Phase I from November 1995 to September 1997; the ER activities (because of the plant's batch reactor explosion) from September 1997 to November 1998; and the modified Phase II (revised because of the batch reactor explosion) from January 1999 to April 2001. The data obtained from these investigations were used to conduct an exposure assessment and to evaluate remedial alternatives.

The Preferred Plan contains only a brief summary of the findings of the RI, FS, Critical Incident and ER reports. Please refer to the RI, FS, Critical Incident and ER reports for additional information on the Site's contaminant concentrations noted above in Section 2.2. Since BUSTR has jurisdiction over the investigation and remediation of the diesel fuel release reported on June 13, 2005, it is not addressed by Ohio EPA in this Preferred Plan. The nature and extent of contamination at the Site in each environmental medium and the contaminants of concern (COCs) attributable to the Site are described in the following Section 3.3.1 through Section 3.3.5.

3.3.1 Soil Contamination

During the RI Phase I, thirteen (13) soil samples collected from the closed landfill, near the Bio-pond and the eastern drainage ditch were analyzed for metals. A comparison of the metals concentrations detected to the approved background values found only two exceedances, both in the same sample, SB-9. Barium and manganese were present at concentrations of 214 milligrams per kilogram (mg/kg) and 1,480 mg/kg in the duplicate soil sample collected from 2-4 feet below ground surface (bgs) at SB-9 as shown in the attached **Figure 3**[4]. The RI's calculated background value for barium is 185 mg/kg, and for manganese is 1,058 mg/kg. The attached **Table 2**[5] details the site-specific background concentration values and the Preliminary Remediation Goals (PRGs) established for both soil and ground water.

An additional 23 surface soil samples collected from the closed landfill, railroad spur swale, eastern drainage ditch and the former drum storage areas, were analyzed for various metals, VOCs, and SVOCs including acetone, formaldehyde, methanol and phenol during the RI Phase I. Neither VOCs nor SVOCS were detected above the method detection limits in any of the 23 soil samples. Four more soil samples, collected from the former underground methanol transfer pipeline area, were analyzed only for methanol. Methanol was detected at concentrations of 0.950 mg/kg and 0.520 mg/kg, both samples were collected from boring SB-8, one at 6-8 feet bgs and the other from 8-10 feet bgs. However, methanol was not detected in the other two soil samples collected from boring SB-7.

During the RI Phase II, 27 soil samples were collected from seven locations (four of the locations around the methanol tank, Monitoring Wells MW #18 and MW #19, and adjacent to the railroad spur) at various depths. The 20 soil samples, collected from the four different boreholes at various depths around the methanol tank, were analyzed only for methanol. Borehole MT-7 had the maximum concentrations of methanol, ranging from 11,000 mg/kg in the surface sample to 28,000 mg/kg at 10-12 feet bgs.

The six soil samples, collected during the installation of Monitoring Wells MW #18 and MW #19, were analyzed for VOCs, SVOCs and metals. In these six samples, trace amounts of the VOCs methylene chloride and carbon disulfide were detected, no SVOCs (or methanol) were detected, and the metals concentrations did not exceed the approved background concentrations. Sample RS-3, collected from beneath the active railroad spur, detected concentrations of polycyclic aromatic hydrocarbons (PAHs), which were similar to earlier results from samples collected in the eastern ditch and the railroad spur swale, ED-2 and RS-2, during the ER activities.

3.3.2 Ground Water Contamination

The depth to bedrock at Georgia Pacific is approximately 155 feet bgs. Unconsolidated glacial deposits overlie the bedrock, and consist of alternating sequences of sand, gravel and glacial till. Two unconsolidated water bearing zones are present beneath the Site, which are referred to as the shallow and deep aquifers. The shallow aquifer consists of a 20-30 feet thick sand and gravel unit located at an approximate depth 40 to 70 feet bgs. The deep aquifer unit extends from the bottom of the lower till unit at a depth of 90 feet bgs to the top of the bedrock located at a depth of 155 feet bgs.

Ground water in the shallow aquifer system flows to the south at an average rate of 200 feet per year from Georgia Pacific, see attached **Figure 4**[6]. The ground water in the deep aquifer flows to the southeast at an average rate of less than one foot per year. The Village of Obetz and the City of Columbus are both hydraulically downgradient users of the deep aquifer system. There are no known users of the shallow aquifer hydraulically downgradient of the Site. However, residential water wells at 16 private homes are located to the northeast on Watkins Road. These upgradient private wells are believed to be using the shallow aquifer system.

The Village of Obetz's wellfield is located approximately 11,000 feet south of the Site. The Site is outside of Obetz's wellhead protection plan's five-year (5-year) time of travel zone, which is calculated to be within 7,000 feet. The City of Columbus' wellfield is located approximately five miles southwest of the Site. The Site is outside of the 5-year time of travel zone, which is calculated to be at three miles. Both the Obetz and Columbus public wellfields are developed (use as their water source) in the deep aquifer system.

In 1982, Burgess and Niple, Ltd (B&N) performed a ground water investigation at the Site by installing four shallow monitoring wells (MW #1, MW #2, MW #3 and MW #4) around the perimeter of the Bio-pond. These monitoring wells, and the plant production well (plant well) were sampled 18 different times from 1982 to 1991. The ground water samples were analyzed for various parameters including chemical oxygen demand (COD), formaldehyde, nitrate, phenol and total organic carbon (TOC) as shown in the attached **Table 1**[3]. Phenol was detected only in trace amounts or "non-detect" concentrations in the four shallow wells; but it was detected in the plant production well at 0.008 mg/L in May 1982, 0.05 mg/L in October 1984, 4.10 mg/L in January 1985 and 0.96 mg/L in March 1985. However, the remaining samples detected only trace amounts of phenol in the plant production well. Formaldehyde was detected in the four shallow wells and the plant production well during

the various ground water sampling events conducted by B&N as shown in the table below:

Formaldehyde Results (expressed in mg/L)

Date	MW #1	MW #2	MW #3	MW #4	Plant Well
05/26/82	<1.0	1.0	1.60	<1.0	<1.0
07/29/85	1.25	1.40	<1.0	<1.0	<1.0
02/05/86	4.80	1.40	<1.0	<1.0	1.40
04/04/86	1.0	<1.0	<1.0	<1.0	<1.0
07/09/86	5.20	2.50	1.0	<1.0	<1.0
01/30/87	8.0	1.80	<1.0	<1.0	<1.0
07/28/87	11.0	1.10	<1.0	<1.0	<1.0
09/10/87	6.80	<1.0	<1.0	<1.0	<1.0
01/27/88	18.0	2.50	<1.0	1.0	<1.0
08/03/88	14.0	14.0	6.30	<1.0	<1.0
03/03/89	21.0	<1.0	<1.0	<1.0	<1.0
08/16/89	25.0	<1.0	<1.0	<1.0	1.30
03/14/90	8.0	1.10	<1.0	<1.0	<1.0
10/17/90	9.30	<1.0	<1.0	<1.0	<1.0
06/14/91	3.30	1.0	<1.0	<1.0	<1.0

The Columbus Department of Health collected ground water samples in 1984 and 1994 from various residential wells located northeast of Georgia Pacific on Watkins Road, and the plant's production well. Phenol was detected at 0.036 mg/L in one sample collected in 1984 from a residential water well. The health department's 1994 ground water sampling results did not identify elevated levels of any volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) in the residential water wells. Ground water samples were also collected by Ohio EPA from seven residential water wells located along Watkins Road in December 1996. Ohio EPA's sampling results did not detect elevated levels of heavy metals, VOCs or SVOCs.

During the RI Phase I (1995-1997), three rounds of ground water samples were collected from the Site's four monitoring wells shown in attached **Figure 2**[7]. Acetone was not detected above the method detection limit in any of the ground water samples collected for analysis in the RI Phase I. Phenol was detected in ground water samples collected from MW#6, MW#7, and MW#8; however, the maximum concentration detected was 0.030 mg/L, which was below the Maximum Contaminant Levels (MCLs) for drinking water. Methanol was detected during each of the RI Phase I sampling rounds in three of the four

existing ground water monitoring wells as shown in the table below:

Methanol Results (expressed in mg/L)

Monitoring Well	01/17/96	06/21/96	12/21/96
MW #6	0.580	0.130	0.260
MW #7	0.340	ND	0.120
MW #8	1.30	ND	ND

ND = not detected

Ground water quality characterization activities were performed during the ER activities (1997-1998), including the installation of nine monitoring wells to monitor the shallow aquifer system at the Site (MW #10 through MW #14, MW #17, BP-1, BP-2 and BP-3) and two monitoring wells at the Sherwin-Williams property (MW #15 and MW #16). Two additional wells to monitor the deep aquifer were also installed hydraulically down gradient from the rest of the Site (MW #9 and MW #9B). Four rounds of ground water samples were collected in September and October 1997, January 1998, April 1998, and July 1998 from each of these thirteen new wells. Details on the analytical results for the ground water samples collected during the ER activities are in the RI report.

Methanol was detected in April 1998 in the ground water samples collected from MW#10 at 2.0 mg/L, MW#13 at 1.4 mg/L, and BP-1 at 1.8 mg/L. Various heavy metals were also detected at low levels in the various ground water samples, including arsenic, barium, lead, and mercury. However, these on-site concentrations were consistent with the metals concentrations found in the residential water wells located northeast of the Site. The VOCs benzene, 2-butanone and methylene chloride were detected intermittently at low concentrations. One SVOC, bis(2-ethylhexyl)phthalate, was detected in the ground water samples collected in April 1998 from MW#8, MW#12, MW#13, and MW#16 at low concentrations.

During the RI Phase II (1999-2001), two rounds of ground water samples were collected from the Site's entire monitoring system, including the two adjacent wells at the Sherwin Williams property (except for MW #4), in April 2000 and July 2000. Two additional rounds of ground water samples were collected in October 2000 and January 2001 from these two new monitoring wells, MW #18 and MW #19, completed in March 2000, installed downgradient of the Bio-pond. No VOCs or SVOCs (including acetone, methanol and phenol) were detected in any of the RI Phase II ground water samples collected in 2000 and 2001, see attached **Table 3**[8], and the metals concentrations detected were generally uniform between the upgradient and downgradient monitoring wells across the Site. The detected metals concentrations were consistent with the naturally occurring metals concentrations found in the seven residential drinking water wells located upgradient of the Site, to the northeast along Watkins Road. In addition, methanol was not detected in the ground water samples collected from any of the monitoring wells during the RI Phase II.

During October 28-31, 2002, Georgia Pacific abandoned and sealed thirteen ground water monitoring wells following the procedures in Ohio Administrative Code (OAC) rules 3745-9-07 and 3745-9-10, and the "State of Ohio Technical Guidance for Sealing Unused Wells (1996)". Eleven on-site monitoring wells; BP-3, MW#4, MW#5, MW#6, MW#7, MW#8, MW#9, MW#10, MW#11, MW#13, and MW#14, were abandoned and sealed. Two off-site monitoring wells (on Sherwin Williams property); MW#15 and MW#16, were also abandoned and sealed. However, six monitoring wells; BP-1, BP-2, MW#9B, MW#12, MW#18, and MW#19, still remain at the Site to use for periodic ground water sampling.

3.3.3 Surface Water Contamination

Storm water runoff from Georgia Pacific's resin process areas is directed to the Bio-pond for initial treatment. The Bio-pond discharges to the City of Columbus sanitary sewer system. This storm water runoff is included as part of the Site's industrial water discharge of 35,000 gallons per day allowed under Georgia Pacific's industrial user discharge permit number 010060-1 with the City of Columbus Department of Sewerage and Drainage.

The former storm water retention pond (used for fire protection purposes) no longer receives storm water runoff from any part of the Site after earthen berms were built around it to deflect any storm water runoff into the on-site drainage ditch system. The former storm water retention pond receives only water from direct precipitation events; and there is no off-site surface water discharge from it. One surface water sample was collected from the approximate center of the former storm water retention pond during the RI Phase. The surface water sample was analyzed for acetone, phenol and methanol but not metals. The water sample results did not detect VOCs (acetone and phenol), SVOCs or methanol.

Bottom sediment samples were collected at three locations in the former storm water retention pond (SED-1 through SED-3) during the RI Phase I, see the attached **Figure 3**[9]. The sediment samples were analyzed for acetone, phenol and methanol but not heavy metals. Acetone was detected in SED-1 and SED-2 at concentrations of 0.170 mg/L and 0.130 mg/L; and in the duplicate sample collected from SED-1 at a concentration of 0.170 mg/L. However, phenol was not detected in the former storm water retention pond's sediment samples. The laboratory analysis for SVOCs and methanol was not performed for these sediment samples.

The eastern drainage ditch located along the eastern and northeastern perimeter of the Site collects surface water runoff from Watkins Road, areas north of the road, the Sherwin-Williams property, and the Georgia Pacific facility. The storm water runoff in this ditch flows intermittently offsite to the south of the Site, and ultimately discharges (via several streams such as Obetz Creek) to Big Walnut Creek located approximately 2.5 miles south-southeast of Georgia Pacific. Because no visible water was flowing in the ditch during the RI Phase I sampling event, no surface water was collected for analysis from the eastern drainage ditch. However, there have been earlier spills/ releases of contaminants from the Site to the eastern drainage ditch.

The drainage ditch on the Site's west side that was used to discharge the non-contact cooling water to the south has been eliminated. This cooling water is now included in the Site's wastewater discharge to the Columbus Sewerage System. The drainage ditch along the road on the Site's north side that receives the office area parking lot runoff did not receive any process or spill impacted runoff; and therefore this ditch was not a part of the RI Phase I, RI Phase II, and the ER evaluations. Runoff that was formerly collected between the former storm water retention pond and the west ditch was blocked off by Georgia Pacific and no longer discharges off-site.

3.3.4 Air Releases

Georgia Pacific had an estimated 2,000 pound release of phenol and formaldehyde into the atmosphere in May 1984. In July 1984, Georgia Pacific had a 10,000 pound release of phenol and formaldehyde mixture into the atmosphere, but process safety devices directed this discharge into a secondary containment system at the Site. The batch reactor explosion in September 1997 released a "partially polymerized resin" mixture, consisting of an estimated 1,100 pounds of phenol, 250 pounds of formaldehyde and 70 pounds of sulfuric acid. The September 1997 batch reactor explosion, the resulting ER actions, investigation and cleanup are discussed in more detail in Section 3.4.

3.3.5 Impacts to Biological Resources

Based on the results of the Ecological Risk Assessment (ERA) in the RI report, Georgia Pacific concluded that there is no significant risk to ecological receptors, including all surface water bodies, from the COCs at the Site. The facility contains habitat representative of an industrial and urban setting, with approximately two-thirds of the Site involved with the manufacturing process operations, and the remaining one-third of the Site vegetated with grass. There are no sensitive species, habitats, or features on or adjacent to the Site.

3.4 Interim or Removal Actions Taken to Date

On September 10, 1997, a batch reactor used to manufacture thermoset resin in Georgia Pacific's process area exploded. As a result of the batch reactor explosion, additional areas of concern were investigated that were not part of the initial RI. The areas of concern created by this explosion were the resin process area, the resin process truck bay, the northern and southern railroad spurs, the methanol storage tank containment area, part of the Sherwin-Williams property, and the former storm water retention pond. Many of the RI Phase II activities initially proposed by Georgia Pacific were completed during the subsequent ER activities to stabilize conditions at the Site.

These ER activities included collecting 35 on-site soil samples and thirteen soil samples from the Sherwin-Williams property; installing nine shallow and two deep on-site ground water monitoring wells; installing two shallow ground water monitoring wells at the Sherwin-Williams property; controlling and remediating the on-site perched water; demolishing and removing damaged facility structures and tanks; excavating 135 cubic yards from the

Sherwin-Williams property and 1,100 cubic yards of potentially impacted on-site soil. The ER activities were completed by Georgia Pacific in November 1998 with the reconstruction of the resin process area.

3.4.1 Soil Investigation

Surface and subsurface soil samples were collected at various locations on the Site, on the Sherwin-Williams property, and at different residential properties located on Watkins Road north and to the east of the Site. The soil samples were submitted for laboratory analysis of selected chemical parameters.

Phenol, formaldehyde and methanol were detected in subsurface soil samples collected from the areas of the Site that were proximate to the location of the explosion as shown by Areas A, B and C on attached **Figure 3**[10], but none of the concentrations exceeded the soil PRGs. A total of 1,100 cubic yards of on-site soil and 135 cubic yards of soil from the Sherwin-Williams property were excavated. Phenol was not detected in the final confirmatory surface soil samples, SW-10 and SW-11, collected from the Sherwin-Williams property, nor in the subsurface soil samples collected during the installation of ground water monitoring wells MW#15 and MW#16.

3.4.2 Surface Water Investigation

During the ER activities, surface water samples were collected from the former storm water retention pond and its associated drainage swale and tested in the field for phenol. Phenol was not detected in these samples, nor in a confirmatory sample, SW-1, collected later from the pond itself for laboratory analysis. Metals concentrations detected in sample SW-1 were consistent with naturally occurring background concentrations, and further evaluation of the swale and storm water pond was not performed during the ER activities.

After the batch reactor explosion, discolored water with a red tint indicating the presence of phenol, was observed in the eastern drainage ditch and railroad spur swale. Stabilization measures were implemented in both areas to limit potential offsite migration of any contaminants (see Section 3.4.3).

3.4.3 Emergency Response (ER) Site Stabilization Activities

Site stabilization measures were performed at the Site after the initial ER activities were completed to address the immediate problems caused by the September 10, 1997 batch reactor explosion. The site stabilization measures were performed to prevent the migration of the released materials from the batch reactor explosion and to reduce the potential for the exposure of off-site human and ecological receptors. The locations of these measures are shown in the attached **Figure 3**[11]. All of the summary information provided in this section of the Preferred Plan (Section 3.4.3) is described in further detail in the November 1998 Ohio EPA Emergency Response Spill Report.

Discolored water (with a red tint) was observed in the railroad spur swale several days after the explosion. Field testing of the discolored water by Georgia Pacific confirmed that the water contained phenol. Its source was determined to be perched water that had seeped under the asphalt, and was present within the fill material underneath the pavement and the railroad spur ballast. The perched water had migrated laterally on top of the clayey soil layer beneath the soil's surface to exit at the railroad spur swale.

Georgia Pacific installed three passive recovery trenches (TR-1, TR-2 and TR-3, in Area C shown in attached **Figure 3**[12]) perpendicular to the railroad spur swale, which directed the phenol-contaminated water into the spur's swale to prevent it from entering the adjacent eastern drainage ditch. The affected railroad spur ballast and fill material area were then flushed with clean water for several days. The water collected in the railroad spur swale was pumped to the Bio-pond. The contaminated soil in the swale was excavated and disposed at a licensed solid waste landfill. Verification samples were collected from the excavated area soil to confirm that the soil removal was complete. A passive recovery trench and water collection sump (Sump #2) was then installed in the swale to collect and pump the water from TR-1, TR-2, and TR-3 into the Bio-pond.

Trench 1 was excavated within the concrete floor of the resin process area truck bay (Area B shown in attached **Figure 3**[13]) to evaluate the presence and quality of any perched water and affected soil beneath the floor. Methanol (12.0 to 22.0 mg/L), phenol (1.60 to 13.0 mg/L), and p-cresol (0.18 to 0.92 mg/L) were detected in the perched water samples collected from Trench 1. Formaldehyde (2.10 to 8.20 mg/kg), phenol (0.45 to 2.90 mg/kg), and p-cresol (0.83 to 1.10 mg/kg) were detected in the soil samples collected from Trench 1. These soil and water concentrations were below the PRGs. Because no contaminant migration pathway was identified, and only a limited volume of perched water was observed, Trench 1 was backfilled by Georgia Pacific.

Trench 2 was excavated between the northern railroad spur and the resin process area (Area B shown in attached **Figure 3**[14]). Formaldehyde (0.97 to 3.40 mg/kg), phenol (up to 6.20 mg/kg), and p-cresol (up to 3.30 mg/kg) were detected in the soil samples collected from Trench 2, and a large volume of discolored, perched water had gathered in the trench. Trench 2 was then converted to a passive recovery trench and a collection sump (Sump #3) was installed. The water collected in the recovery trench is pumped to the Bio-pond. Also, two water collection sumps (Sump #4 and Sump #5) were installed south of the resin process area to assist in the capture of the perched water. The water recovered in these collection sumps is pumped to the Bio-pond.

Several days after the batch reactor explosion, field testing of surface water samples from the eastern drainage ditch detected phenol. The source of the phenol appeared to be surface water runoff, and the migration of perched water within the railroad spur ballast (before the installation of the railroad spur passive recovery system). Georgia Pacific built two earthen dams in the eastern drainage ditch, and the water that pooled in the drainage ditch was pumped to the Bio-pond. When phenol was not detected in the pooled water, the earthen dams were removed by Georgia Pacific, and recovery of the water in the eastern drainage ditch ceased.

A week after the batch reactor explosion, field testing of pooled water in several of the deep tire ruts in the grassy area west of the parking lot (West Area shown in attached **Figure 3**[15]) detected phenol. Exploratory Trench 3 was excavated through this rutted area, and the water collected in this trench was pumped to the Bio-pond. When phenol was no longer detected in the accumulated water in the trench, it was backfilled.

During the initial ER activities, the water collected throughout the Site was pumped into the methanol storage tank containment area for temporary storage. This water was subsequently pumped to the Bio-pond. A shallow soil boring was advanced between the plastic soil liners and the methanol storage tank's concrete floor. Field testing of the perched water detected the phenol. A sump was installed beneath the concrete floor, and water was used to flush the area between the concrete floor and plastic liners. After several days, field testing of samples collected from the water in this sump did not detect phenol. The water flushing operation in the Methanol storage tank area ceased, and the sump was removed.

In addition, approximately 135 cubic yards of soil were removed from the Sherwin-Williams property because of the presence of partially polymerized resin and debris on the ground surface. The materials (released from the batch reactor explosion) and surface soils were removed by Georgia Pacific, and disposed at a licensed solid waste landfill. Analytical data for the final two subsurface soil samples collected within the excavated area at the Sherwin-Williams property did not detect the presence of phenol.

3.4.4 Post-Emergency Response Activities

The sample results from three sediment samples, collected from the eastern drainage ditch (ED-1 through ED-3), showed that no phenol was present in the ditch, but several PAHs were detected in the ED-2 sediment sample. The source of these PAHs was believed to be the commonly used wood preservatives from the adjacent railroad spur ballast and railroad ties. Two additional samples of soil were collected from the rail spur (RS-1 and RS-2) to verify this conclusion, and the PAHs found in the RS-2 sample were similar to levels found in the ED-2 sample.

In September and October 1998, Georgia Pacific removed the concrete floor in Area A and the western part of Area B (shown in the attached **Figure 3**[16]). Trench 4 was excavated in Area A to collect subsurface soil samples to evaluate the presence of phenol because the earlier shallow soil samples had detected phenol. The laboratory analysis results for these subsurface soil samples from Trench 4 are summarized in the RI Report's Table 9. No acetone, phenol or p-cresol were detected in samples T4N and T4C at depths of 4-5 feet bgs and 5-6 feet bgs. However, acetone, phenol and p-cresol were present in T4N and T4S at the following concentrations listed in the table on page 16.

Trench 4 (expressed in mg/kg)

Sample ID	acetone	p-cresol	phenol
T4N at 0-2 feet bgs	0.125	1.55	43.60
T4N at 4-5 feet bgs	0.120	ND	ND
T4S at 4-5 feet bgs	0.162	1.22	8.28
T4S at 5-6 feet bgs	0.214	0.492	4.71

Georgia Pacific excavated the soil underlying Area A to a depth of approximately 4 feet. Soil samples were collected throughout this excavation along both the floor (EXC-1 to EXC-8) and the sidewalls (EXC-9 to EXC-12). These sample results are summarized in the RI Report's Table 9. Acetone, phenol and p-cresol were detected at the following concentrations in the table below.

Area A's Excavation (expressed in mg/kg)

Sample ID	acetone	p-cresol	phenol
EXC-1 at 4 feet bgs	ND	0.530	1.010
EXC-2 at 4 feet bgs	ND	ND	0.590
EXC-3 at 4 feet bgs	ND	1.190	20.60
EXC-4 at 4 feet bgs	ND	ND	1.040
EXC-5 at 4 feet bgs	0.142	ND	7.40
EXC-6 at 4 feet bgs	ND	0.457	11.80
EXC-12 at 3 feet bgs	ND	0.773	22.50

Georgia Pacific placed clean soil as fill material in the Area A excavation, which was then compacted by heavy machinery as part of the reconstruction of the resin process area. Crushed stone base material was placed on top of the compacted soil (the initial layer of fill material), and the resin process area's concrete floor was then poured and installed over the crushed stone base.

4.0 SUMMARY OF SITE RISKS

Normally, a baseline risk assessment is conducted to evaluate current and potential future risks to human health. However, no baseline risk assessment was performed for the Site by Georgia-Pacific because of the occurrence of the batch reactor explosion and subsequent ER activities before the completion of the Phase II of the RI. An exposure assessment using the U.S. EPA Region 9 generic residential PRGs was conducted as part of the ER activities for the Site.

In addition to the exposure assessment conducted by Georgia Pacific, Ohio EPA generated a limited human health risk assessment for the Site using two hypothetical ("what-if") scenarios. The first scenario assumes that after the batch reactor explosion, no ER cleanup activities were performed to estimate the risk to a hypothetical on-site resident. The second scenario estimates the residual risk to a hypothetical resident following the completion of the ER cleanup activities. Both of these scenarios are summarized in Section 4.2.2. Georgia Pacific's baseline exposure assessment is part of the RI Report, and the limited human health risk assessment completed by Ohio EPA is attached as **Appendix A**.

An ERA was conducted by Georgia-Pacific to evaluate current and potential future risks to ecological receptors associated with the contaminants present at the Site. The ERA's results are summarized in Section 4.3.

4.1 Contaminants of Concern

The five chemical compounds listed in this section are the primary materials used in the Site's manufacturing operation and were involved in the earlier releases and spills.

4.1.1 Acetone

Acetone was detected during the RI phase I in a sediment sample from the storm water retention pond, and during post-ER activities in a soil sample from the floor of the resin process area's excavation.

Acetone is used as a chemical intermediate in the manufacture of other chemicals; and it is used as a solvent. If acetone is released on soil, it will both volatilize rapidly, and leach into the ground where it biodegrades readily. If released into surface water, acetone will biodegrade fairly rapidly, while also decreasing due to volatilization, with an estimated half-life of twenty hours, and its adsorption to sediments should not be significant. If released to the atmosphere, acetone will be destroyed by photolysis, and its reaction with photo-chemically produced hydroxyl radicals, with a half-life estimated average of 22 days[17].

4.1.2 Formaldehyde

Formaldehyde was detected in ground water samples collected from 1982 through 1991. It was also detected in soil samples during the ER activities in the areas proximate to the location of the batch reactor explosion; the site stabilization activities; the exploratory trenches excavations in and near the resin process area; and the post-ER soil excavation in the resin process area's reconstruction (Area A in attached **Figure 3**[18]).

Formaldehyde is used primarily for the manufacture of various thermoset resins, and as a chemical intermediate in the manufacture of other chemicals. If it is released on soil, aqueous solutions containing formaldehyde will leach into the soil. While it biodegrades under both aerobic and anaerobic conditions, formaldehyde's fate in soil is unknown. If formaldehyde is released into surface water, it will biodegrade to low levels within a few

days, and its adsorption to sediment probably will not be significant. If formaldehyde is released to the atmosphere, it will be destroyed by photolysis and its reaction with photochemically-produced hydroxyl radicals, with an approximate half-life of 19-50 hours[19].

4.1.3 Methanol (MeOH)

Methanol was detected during the 1991 interim action performed at the underground methanol transfer pipeline in soil samples; the RI Phase I at the underground methanol transfer pipeline; the RI Phase II at the Methanol storage tank and the underground methanol transfer pipeline; the ER activities in areas proximate to the location of the batch reactor explosion; the site stabilization activities; the exploratory trench excavations in and near the resin process area; and the post-ER soil excavation in the resin process area's reconstruction (Area A in the attached **Figure 3**[20]). Methanol was also detected in the shallow ground water samples during the RI Phase I in Wells MW #6, MW #7 and MW #8; and during the April 1998 ER activities in BP-1, MW #10, and MW #13. Methanol was not detected in the ground water samples collected during the RI Phase II.

Methanol is used primarily as a solvent in various manufacturing processes. If methanol is released on soil, it will both rapidly volatilize and leach into the ground where it will rapidly biodegrade. If methanol is released into surface water, it will fairly rapidly biodegrade (also decreasing due to volatilization) with an estimated half-life of 5.3 hours, and its adsorption to sediment will probably not be significant. If methanol is released to the atmosphere, it will degrade via its reaction with photochemically-produced hydroxyl radicals, with an approximate half-life of 17.8 days. Physical removal of the methanol from the air can also occur via rainfall[21].

4.1.4 Phenol

Phenol was detected in soil samples collected during the reconstruction of the resin process area. Georgia Pacific excavated the soil in this area (Area A on the attached **Figure 3**[22]) down to a depth of 4 feet. Compacted fill (soil), crushed stone base material, and a concrete floor slab were then installed over the location of the elevated phenol soil samples. Phenol was only detected in one ground water sample collected during the RI Phase I, and it was not detected in the subsequent ground water samples collected during both the ER activities and the RI Phase II.

Phenol is used in the manufacturing of thermoset resins and plastics. If phenol is released to the environment, its primary removal mechanism is biodegradation, which is generally rapid. If phenol is released on soil, it will rapidly biodegrade (while also decreasing due to volatilization) within 2 to 5 days. Phenol's biodegradation in sub-surface soils is sufficiently rapid that most ground water generally remains free of this pollutant. If phenol is released into surface water, it will rapidly biodegrade in the water within hours. If phenol is released to the atmosphere, it will degrade via its reaction with photochemically-produced hydroxyl radicals, with an approximate half-life of 0.61 days. Physical removal of the phenol from the air can also occur via rainfall[23].

4.1.5 Polycylic Aromatic Hydrocarbons (PAHs)

Several PAHs were detected in sediment samples from the eastern drainage ditch. The PAH concentrations are similar to levels found in the railroad spur samples, and they are believed to be associated with the creosote-preserved railroad ties and ballast in the adjacent railroad spur. Georgia Pacific does not use any raw materials that would be similar in composition to the PAHs detected in the ditch. The recent diesel fuel release discovered at the west side of the Site will be addressed by BUSTR; their case site number assigned to this release is 2501088.

4.2 Risks to Human Health

A limited, "what-if" human health risk assessment was completed for the Site by Ohio EPA to evaluate potentially completed exposure pathways, and the potential adverse health effects due to Site related contaminants. Georgia Pacific performed a limited risk assessment based on post-ER activity cleanup levels. The Ohio EPA's risk assessment included an exposure scenario that presented results based on the conditions after the batch reactor explosion release, prior to the ER cleanup activities.

4.2.1 Exposure Assessment

After the completion of the ER activities, the risk to human health from COCs detected at the Site was evaluated by Georgia Pacific using the U.S. EPA Region 9 PRGs for soil, and the drinking water MCLs for ground water are listed in attached **Table 2**[24]. Region 9 PRGs combine U.S. EPA toxicity values with "standard" exposure factors to estimate contaminant concentrations in environmental media (soil, air, water) that the U.S. EPA considers protective of humans (including sensitive groups) over a lifetime.

Region 9 PRGs are based on direct contact pathways for which generally accepted methods, assumptions and models have been developed (*i.e.*, ingestion, dermal contact and inhalation) for specific land-use conditions and do not consider impact to ecological receptors. These PRGs are chemical concentrations that correspond to fixed levels of risk for carcinogenic (cancer) compounds or hazards for non-carcinogenic compounds in the soil, air and water. Carcinogenic risks are the probability of an individual developing cancer over a lifetime from exposures to chemical compounds that are considered cancer causing. The U.S.EPA Region 9 PRGs are developed using an excess lifetime cancer risk goal of 1E-6. However, the PRGs for non-carcinogenic hazards are developed using a Hazard Quotient (HQ) for each compound, which is the expected safe concentration one can be exposed to over a lifetime without any adverse effects.

The risk exposure assessment found that the concentrations of the site-related COCs detected in the environmental media following the ER activities were below the residential soil PRGs, and the drinking water MCLs for lifetime consumption of ground water. Therefore, the risk exposure assessment concluded that the COCs found in the environmental media at the Site do not pose risks to humans at levels sufficient to require

further active remedial actions. However, the closed (Dec. 1979) landfill and the operating Bio-pond were not included in the exposure assessment of the RI report.

4.2.1.1 Exposure Pathways

Exposure pathways that are considered "complete" represent a potential for exposure to the COCs. Pathways that are determined to be "incomplete" represent situations where exposure is unlikely to occur. Without exposure, there is no contact with any contaminants; and, therefore, no risk of associated adverse health effects. The specific exposure pathway scenarios evaluated by the U.S.EPA Region 9 PRGs are shown in the table below:

Exposure Pathways for PRGs

Medium	Residential Land Use	Industrial Land Use
Ground Water	Ingestion from drinking	
	Inhalation of volatiles	
Surface Water	Ingestion from drinking	
	Inhalation of volatiles	
Soils	Ingestion	Ingestion
	Inhalation of particulates	Inhalation of particulates
	Inhalation of volatiles	Inhalation of volatiles
	Dermal adsorption	Dermal adsorption

A review of the potential exposure pathways shows the air, ground water, and surface water pathways are incomplete (*e.g.*, exposure to residual contamination is unlikely to occur) because of the following:

- Site-related COCs are not detected in the air, ground water, or surface water above the U.S.EPA Region 9 residential soil PRGs or drinking water MCLs.
- There are no nearby downgradient receptors for surface water and the ground water's shallow and deep aquifer systems.
- The Site is outside the wellhead protection zones for the City of Columbus and the Village of Obetz drinking water wellfields.

A review of the potential pathways shows that the soil pathway is complete for only the on-site workers (*e.g.*, facility employees and outside contractors such as construction workers) because of the following:

- The Site has been used as an industrial property for the last 30 years, and is expected to remain so for the foreseeable future.
- The security fence, security personnel and the 24-hour facility operations also make it unlikely that individuals can trespass on the property.

4.2.1.2 Soil Pathway

Site-related COCs were detected in the soil samples collected at Georgia Pacific and on the Sherwin-Williams property. However, these impacted soils were either excavated and removed during the ER activities, or the concentrations of the COCs detected in the soil were below the direct contact residential soil PRGs. Acetone, formaldehyde, methanol and phenol were not detected at concentrations that exceeded the residential soil PRGs.

Currently, the remaining site-related COCs residing in the soil are situated below grade or below surface barriers (building or concrete slab); and, therefore, soil exposure cannot easily occur. The location of the elevated phenol in the soil is currently covered by the concrete floor of the resin process area, and the location of the elevated methanol is 10-12 feet bgs underneath the Methanol storage tank containment area. The soil exposure pathway is potentially complete only for the on-site worker during future on-site O&M and construction activities that may disturb the current surface barriers. However, the detected concentrations of the COCs are below the residential soil PRGs, and the residential soil PRGs are more conservative than the industrial soil PRGs. Therefore, the soil exposure pathway is determined to be insignificant and was not evaluated further.

The closed landfill, Bio-pond areas and the areas beneath the main factory building were not evaluated in the soil exposure pathway assessment.

4.2.1.3 Air Pathway

The operating Bio-pond currently has a synthetic cover, and the Ohio EPA's Division of Air Pollution Control (DAPC) has evaluated its air emission exposure risks. The closed landfill has been covered with a layer of soil and vegetation. Both of these covers are maintained by Georgia Pacific as a part of their current manufacturing operations. Therefore, these areas were not considered during the evaluation of the air pathway; the focus of the air pathway evaluation was in the areas affected by the batch reactor explosion.

Air monitoring at the Site has not detected the site-related COCs in ambient air since the day following the September 10, 1997 batch reactor explosion. The direct contact residential soil PRGs incorporate the potential soil-to-air transfer rate for the chemical compounds, and these residential soil PRGs for the site-related COCs were not exceeded. As a result, there appears to be minimal potential for exposure to the COCs in the air, and the air exposure pathway was not evaluated further for the Site.

4.2.1.4 Ground Water Pathway

Potable water for Georgia Pacific is provided exclusively by the City of Columbus. The Village of Obetz withdraws water from the deep aquifer approximately 11,000 feet south-southeast of the Site, and the City of Columbus withdraws water from the deep aquifer approximately five miles southwest of the Site. The wellhead protection plans for the Village of Obetz and the City of Columbus wellfields indicate that the Site is outside of the hydraulic zone of influence of both wellfields. Modeling performed by Georgia Pacific using

the wellfields' extreme withdrawal assumptions show that these two wellfields do not hydraulically affect the deep aquifer at the Site. Residential water wells are located northeast of the Site. The predominant direction of flow in the shallow (see attached **Figure 4**[25]) and deep aquifers is to the south; therefore, the residential wells are located hydraulically upgradient of the Site.

Before the RI, Georgia Pacific performed a ground water investigation from 1982 through 1991, collecting samples 18 different times from the four on-site monitoring wells. Formaldehyde was detected at values from 230 to 1,400 micrograms per liter, (ug/L), but these values were below the drinking water MCL value of 5,500 ug/L. Phenol was detected at trace concentrations, except for the four values ranging from 8 to 4,100 ug/L, which were below the drinking water MCL value of 11,000 ug/L. Methanol was detected numerous times in the four on-site monitoring wells, with the values of 18,000, 21,000 and 25,000 ug/L detected in 1988 and 1989, at or above the drinking water MCL value of 18,000 ug/L.

During the RI Phase I (Nov. 1995- Sept. 1997) when ground water samples were collected from the four on-site monitoring wells, acetone was not detected while phenol was detected at trace concentrations. However, methanol was detected in each of the sampling rounds in three of the four monitoring wells, but the maximum value detected was 1,300 ug/L.

As part of the ER activities (Sept. 1997 - Nov. 1998), thirteen new monitoring wells were installed, and then four rounds of ground water samples were collected from each well. Phenol and formaldehyde were not detected above trace concentrations in all of the ER ground water samples. Only methanol was detected in several of the April 1998 samples, but the maximum value detected was 2,000 ug/L.

During the RI Phase II (Jan. 1999 - April 2001), two additional monitoring wells were installed, and the entire ground water monitoring well system had four rounds of samples collected. Acetone, formaldehyde, methanol and phenol were not detected above trace concentrations in any of the ground water samples collected in the RI Phase II.

As long as the closed landfill's cover is maintained and monitored, then the potential for releases to the ground water exposure pathway should be minimal. Also, the active Bio-pond ongoing O&M, along with periodic ground water monitoring for releases into the ground water, should minimize the potential impact to the ground water exposure pathway. Therefore, the ground water exposure pathway was determined to be insignificant, and was not evaluated further. However, potential releases from the closed landfill or active Bio-pond could increase the significance of the ground water exposure pathway.

4.2.1.5 Surface Water and Sediment Pathway

Site-related COCs were not detected in the surface water samples collected from the storm water retention pond, retention pond swale (formerly the western drainage ditch), and the eastern drainage ditch. The storm water retention pond, retention pond swale, and the eastern drainage ditch are not located near any residences and are unlikely to be used for any type of recreational activities. The Bio-pond discharges to the City of Columbus

sanitary sewer system. Furthermore, Georgia Pacific has blocked off storm water drainage from leaving the Site from the storm water retention pond, the retention pond swale, while the Bio-pond discharges to the City of Columbus sanitary sewer system. These storm water drainage elements do not discharge to any off-site surface waters and were not evaluated as part of the surface water and sediment pathways. Therefore, the surface water exposure pathway was considered insignificant, and was not evaluated further.

Acetone was detected in a sediment sample from the storm water retention pond. However, acetone was not detected at a concentration that exceeded the residential risk PRG in the sediment. PAHs were detected in the eastern drainage ditch's sediment samples at locations south of the railroad spur. The PAHs are believed to be associated with the creosote-preserved railroad ties and ballast from the adjacent rail spur. Currently, the Site is fenced to restrict Site access and prevents exposure to the PAHs in the sediment of the eastern ditch. The on-site workers do not come into direct contact with the eastern ditch's sediment during their normal manufacturing operations. Therefore, the sediment exposure pathway was considered insignificant and was not evaluated further.

4.2.2 Limited Human Health Risk Assessment

Ohio EPA reassessed the potential human health hazards and cancer risk from the Site using the COCs, formaldehyde, methanol and phenol, detected in the soil and ground water to the most sensitive human receptors; hypothetical on-site residents. These human health risk assessments were calculated for two "what if" scenarios using limited sampling data results, and do not address any type of real-life situation. The two limited risk assessments are detailed in the Ohio EPA February 10, 2004 memo, attached as **Appendix A**. These risk assessments' assumptions and calculations are detailed in **Appendix B**. The Abbreviated Template used for the additive risk calculations is attached as **Appendix C** in a Microsoft Excel (*.XLS) spreadsheet format. The first scenario assumes that immediately after the batch reactor explosion, no ER cleanup activities were performed and the Site was open to residential development. The risk assessment used the sampling results below (from Table 1 in Appendix A):

First Risk Assessment Scenario

Chemical	Soil in mg/kg	Ground Water in mg/L
Formaldehyde	8.30	ND
Methanol	250	22.0
Phenol	7,800	13.0

Using the modeling methods detailed in Appendix A, the hazard Indices (HI), the sum of the hazard quotients (HQs), in this case the exposure to soil plus ground water were calculated for formaldehyde = 6E-4, methanol = 1E0, and phenol = 2E0.

The second scenario assumes that immediately after the plant explosion, the ER cleanup activities were performed and completed, and then the Site was opened to residential

development. This risk assessment used the sampling results below (from Table 2 in Appendix A):

Second Risk Assessment Scenario

Chemical	Soil in mg/kg	Ground Water in mg/L
Formaldehyde	2.10	ND
Methanol	ND	ND
Phenol	22.5	ND

HQ values were then again calculated, with the HI based on exposure to soil and ground water for formaldehyde = 1E-4, methanol = N/A (not applicable because of non-detection in the sampling results), and phenol = 1E-3.

The excess cancer risk of 6E-7 based on the hypothetical exposure to formaldehyde before remediation and 1E-7 after the ER cleanup operations, were both below the *de minimis* level (1E-6). Before the Site's remediation activities, the HQs for both methanol and phenol each exceeded a value of 1. After the completion of the ER activities and plant reconstruction, all the HQs were below the desired goal of 1.

4.3 Risks to Ecological Receptors

An ERA was completed by Georgia-Pacific to evaluate potential ecological risks to on-site terrestrial receptors from exposure to residual levels of COCs in surface soil, and to aquatic biota in drainage ditches and a storm water retention pond from exposure to residual levels of COCs in surface water and sediment. As described in the U.S. EPA 1998 Guidelines for ERA, a screening of the contaminants of potential concern was performed to evaluate the potential risk to ecological receptors at the Site. If this screening process indicates that there are no significant risks to exposed ecological receptors, then no further assessment activity is warranted. However, if the screening indicates otherwise, then the ERA continues with an analysis plan to conduct a more comprehensive site study to better define the potential risk to ecological receptors.

The Site contains habitats representative of an industrial and urban setting, with no sensitive species, habitats or features on or adjacent to the Site. The ERA evaluated two ecological areas: the surface soils in the areas of the Site that have been affected by the ER activities and the surface water and sediments in the eastern drainage ditch and the storm water retention pond.

Surface soils are classified as the top twelve inches of soil for use in the ERA. The COCs in the soil samples were compared to the site-specific background metals concentrations (see attached Table 1) and to risk-based ecological benchmarks to determine if additional analysis was warranted in the ERA. The hazard quotient (HQ) methodology was used in the ERA's screening process. The potential risks are estimated by comparing the

exposure point concentration (EPC) to an ecological benchmark (EB) value as shown by equation: HQ = EPC / EB.

The resulting HQ must be less than or equal to one for the risks to be considered acceptable. If the HQ is greater than one, the exposure may potentially cause an adverse ecological effect. The EPCs used in the screening process were the sample results for each of the COCs. The risk-based EBs used in this ERA were the 1997 Ecological Data Quality Levels (EDQLs) from U.S. EPA Region 5.

4.3.1 Surface Soils

The detected metals concentrations in five soil samples from the RI Phase I data set were less than the site-specific background values so a comparison to the EDQLs was not required. Therefore, the metals at these locations were not evaluated further in the ERA for soil. VOCs and SVOCs were not detected in these five soil samples collected during the RI Phase I.

The detected metals concentrations in five soil samples from the ER Report data set were all below the Site's background values except for lead and mercury. At MW #12, lead was detected at 38 mg/kg, but using the U.S. EPA guidance for risk-based screening levels for lead (25 to 100 mg/kg), the HQ would be less than one, and was not considered further in the ERA for soil. At MW #14, mercury was detected at 0.39 mg/kg, producing a HQ of 5. Because this sample location is within the plant production area and covered by asphalt, there is minimal potential for exposure to ecological receptors; and it was not considered further in the ERA for soil.

The detected VOC concentrations (carbon disulfide in MW #14, and methylene chloride in MW #13 and MW #14) in the nine soil samples from the ER Report data set all had HQs of less than one, and these COCs were not considered further in the ERA for soil. The other VOCs were not detected in these selected nine soil samples and were not considered further in the ERA for soil.

The detected concentrations of phenol, ranging from 0.38 mg/kg to 14.0 mg/kg, in the 23 soil samples screened from the ER Report's data sets produced HQs of less than 1, and were not considered further in the ERA for soil. The other SVOCs were not detected in these selected 23 soil samples, and they were not considered further in the ERA for soil.

The detected SVOC concentrations (fluorene at 0.852 mg/kg and pyrene at 0.479 mg/kg in RS 2) in two soil samples from the ER Report data set produced HQs of less than 1, and these COCs were not considered further in the ERA for soil. The other SVOCs were not detected, and VOCs (including acetone) were not considered (analyzed for), in these two soil samples.

4.3.2 Surface Water

VOCs and SVOCs were not detected in the one surface water sample screened from the RI Phase I data set for the ERA. However, heavy metals were not evaluated in this

sample's analysis. The detected metals concentrations for arsenic and zinc in the one surface water sample screened from the ER Report data set produced HQs of less than one for each metal. Therefore, metals, VOCs and SVOCs were not evaluated further in the ERA for surface water. However, only the eastern drainage ditch was evaluated since the western ditch, storm water retention pond and Bio-pond do not discharge to any off-site surface waters.

4.3.3 Sediments

The detected VOC concentrations (acetone at 0.170 mg/kg in SED 1, and 0.130 mg/kg in SED 2) in three sediment samples screened from the RI Phase I data set gave a HQ of less than 1. Other VOCs and SVOCs were not detected in these sediment samples. Heavy metals were not evaluated in these sediment samples.

Three sediment samples from the eastern drainage ditch adjacent to the railroad spur, ED 1, ED 2 and ED 3 from the ER Report data set, were screened for the ERA. Twelve different PAHs were detected at concentrations exceeding their EDQLs at ED 2, with a range of HQs from 8 to 238. However, using the PRGs for sediments developed from a review of other sediment ecological benchmarks (see reference Efroymson 1997 in the RI Report), the recomputed HQs decreased to less than 1 to a maximum of 18. The recomputed HQs for ED 2 indicate a moderate risk only slightly greater than the low risk range (with a HQ of 1 to 10). However, only the eastern drainage ditch was evaluated since the western ditch, storm water retention pond and Bio-pond do not discharge to any off-site surface waters.

4.3.4 Ecological Significance

The ERA concluded that there are no significant risks to ecological receptors from contaminants of potential concern associated with the Site. This is based on both the low HQs calculated for the environmental media evaluated, and the nature of the environmental setting at the Site. The Site contains habitat representative of an industrial and urban setting, with a general absence of long grass and herbaceous species of old field and riparian habitants to provide foraging for many species. There are no reported rare or endangered species at the Site or within a one-half mile radius. In addition, there are no unique habitats or geologic features, animal concentrations or wildlife areas on, or within a one-half mile radius of the Site.

5.0 FEASIBILITY STUDY

A Feasibility Study was conducted by Georgia Pacific to define and analyze appropriate remedial alternatives. That study was conducted with Ohio EPA oversight, and was approved on April 10, 2002. The Remedial Investigation, Feasibility Study, Critical Incident Report and Emergency Response Report are the basis for the selection of Ohio EPA's preferred remedial alternative(s).

6.0 REMEDIAL ACTION OBJECTIVES

As part of the remedial investigation/feasibility study (RI/FS) process, remedial action objectives (RAOs) were developed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), codified at 40 CFR Part 300 (1990), as amended, which was promulgated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. §9601 et. seq., as amended, and U.S. EPA guidance. The RAOs are goals that a remedy should achieve in order to ensure the protection of human health and the environment. The goals are designed specifically to mitigate the potential adverse effects of site contaminants present in the environmental media.

PRGs for the protection of human health were established using the acceptable excess lifetime cancer risk and non-cancer hazard goals identified in the DERR Technical Decision Compendium (TDC) document "Human Health Cumulative Carcinogenic Risk and Non-carcinogenic Hazard Goals for DERR Remedial Response and Federal Facility Oversight", dated April 26, 2004. These goals were stated as 1E-5 excess lifetime cancer risk and a hazard index of 1, and were established using the default exposure parameters provided by U.S. EPA. This TDC document can be found at the Ohio EPA's webpage: http://www.epa.state.oh.us/derr/policies/riskgoal.pdf

The carcinogenic risk levels refer to the increased likelihood that someone exposed to the chemical releases from the Site would develop cancer during his or her lifetime as compared with a person not exposed to the Site. For example, a 1 in 100,000 (equal to 1/100,000 or 1E-5) risk level means that if 100,000 people were chronically exposed to a carcinogen at the specified concentration, then there is a probability of one additional case of cancer in this population. Note that the risks refer only to the incremental risks created by exposure to the chemicals at the Site. They do not include the risks of cancer from other non-site related factors to which people could be exposed to in their lifetime. Non-carcinogenic hazards are generally expressed in terms of a hazard quotient (HQ) or index (HI), which combines the concentration of chemical exposures with the toxicity of the chemicals (quotient refers to the effects of an individual chemical whereas index refers to the combined effects of all chemicals). A hazard index of 1 represents the exposure at which no harmful effects are expected.

The RAOs developed for the Site are detailed below:

1. Reduce or eliminate direct exposure to contaminated ground water, sediment, and soil to ensure the beneficial use of the site for commercial/industrial and/or potential future residential use.

2. Prevent the leaching of COCs from the soil or other sources into ground water underneath the Site in excess of the MCLs for public drinking water or PRGs.

3. Prevent contaminant migration into unaffected areas at the Site or off of the Site.

7.0 SUMMARY OF REMEDIAL ALTERNATIVES

Because the earlier ER activities remediated, contained or removed the Site related COCs to below PRGs, the remedial alternatives selected for the Site now focus on the operation and maintenance of the existing remedial alternatives. Therefore, Ohio EPA modified the FS's remedial alternatives so that a total of five remedial alternatives are incorporated in the Preferred Plan. A brief description of the major features for each remedial alternative is listed below.

7.1 **No Action** (FS Alternative 3.1.1) (Alternative 1: No Action)

The no action alternative is a baseline against which the other alternatives are compared, and it retained in accordance with the NCP. This alternative assumes that no further actions will be implemented to operate and maintain the existing remedial actions.

7.2 **Institutional Controls** (FS Alternative 3.1.2, modified by Ohio EPA) (Alternative 2: Institutional Controls)

Deed restrictions at the Site were stated to be unnecessary in the FS due to the commercial zoning restrictions that are already in place at the Site and the surrounding properties. However, Ohio EPA has added to this alternative (not a FS Alternative originally proposed) for activity and use limitations, in a recorded environmental covenant in accordance with Ohio Revised Code (ORC) §5301.80 et. seq., to prohibit excavation in the closed landfill, and the construction of permanent or temporary buildings on the closed landfill.

7.3 **Engineering Controls** (FS Alternative 3.1.2, modified by Ohio EPA) (Alternative 3: Engineering Controls)

The Ohio EPA's DAPC and Division of Surface Water (DSW) currently monitor the operation of the active Bio-pond. The Bio-pond has an artificial cap to control emissions to the air; it also has demonstrated a degree of impermeability due to the accumulated resin materials that have lined its walls. During routine dredging operations to maintain the Bio-pond's capacity, Georgia Pacific should minimize disturbing this layer of materials. During the remainder of the Bio-pond's operation under this Preferred Plan, these engineering controls must be maintained.

Georgia Pacific also maintains a soil and vegetative cover over the closed landfill located on the west side of the Site. The closed landfill was capped with soil and closed in 1979 following the solid waste regulations in effect at that time. Under this Preferred Plan, the closed landfill's soil and vegetative cover must be maintained in good condition.

Several other remedial alternatives were completed by Georgia Pacific during the ER activities to stabilize conditions at the Site, and during the reconstruction of the resin process area and truck bay after the September 10, 1997 Kettle #2 explosion. Vertical barriers, in the form of passive recovery trenches and water collection sumps, were

installed to control the horizontal migration of the shallow perched water (containing phenol) beneath the soil's surface. Two of these recovery trenches and collection sumps remain in operation at the Site.

A perimeter chain link fence now surrounds the entire Site and provides security against unauthorized public access to the Site. In addition, public access to the Site is limited by a key-card entry entrance gate at the front of the plant, monitored on a 24-hour basis by a security guard or plant control room personnel. Equivalent security measures will be maintained by Georgia Pacific as long as the manufacturing plant is in operation.

7.4 **Bio-pond Decommissioning** (not a FS Alternative, added by Ohio EPA) (Alternative 4: Bio-pond Decommissioning)

The active Bio-pond will be decommissioned when its operation is no longer needed for the plant's manufacturing activities. Georgia Pacific will submit a decommissioning plan to Ohio EPA's DERR for approval, which will provide details on the Bio-pond's decommissioning, such as the dewatering operation, removal and disposal of sludge, disposal of any contaminated soils, sampling results, and future plans for the Bio-pond area. Georgia Pacific will also obtain a permit-to-install (PTI) from Ohio EPA's DSW prior to decommissioning the Bio-pond. Georgia Pacific will notify Ohio EPA's DERR ninety (90) days in advance of the startup of the Bio-pond decommissioning. Once the Bio-pond decommissioning activities are completed, Georgia Pacific will submit a final closure report to Ohio EPA's DERR for approval.

After the Bio-pond's decommissioning, two consecutive ground water sampling events will be performed by Georgia Pacific at six month intervals. If no COCs are detected during these two sampling events, then Georgia Pacific can request a release from continued periodic ground water monitoring. When periodic ground water sampling ceases at the Site, the six monitoring wells shall be abandoned in accordance with OAC rules 3745-9-07 and 3745-9-10, and the "State of Ohio Technical Guidance for Sealing Unused Wells (1996)." A copy of the monitoring wells' abandonment reports will be submitted to the Ohio Department of Natural Resources, and a copy of these reports sent to Ohio EPA.

7.5 **Operation and Maintenance (O&M)** (FS Alternatives 3.1.2 and 3.1.3, modified by Ohio EPA) (Alternative 5: O&M)

The active Bio-pond will be operated and maintained in good condition by Georgia Pacific prior to its decommissioning by following the standard conditions and requirements stated in "City of Columbus, Division of Sewerage and Drainage, Wastewater Discharge Permit #010060-1, effective March 29, 2004"; and in the "GP Bio-pond Operation and Maintenance Plan, Columbus, Ohio" dated August 30, 2004 which was also submitted to the City of Columbus, Division of Sewerage and Drainage.

Georgia Pacific will inform Ohio EPA of any maintenance activities that may impact the integrity of the Bio-pond, such as dredging or enlarging or decreasing its size, 30 days before starting such activities. Georgia Pacific will submit a report to Ohio EPA after the

maintenance activity is complete, which will provide details on the maintenance activity, such as the amount of sludge removed, the disposal of the sludge, the depth of the Bio-pond before and after dredging and sampling results. These requirements were added by Ohio EPA (not a FS Alternative originally proposed).

Six ground water monitoring wells (BP-1, BP-2, MW#9B, MW#12, MW#18 and MW#19) will continue to be sampled by Georgia Pacific on a periodic basis to ensure that no COCs are migrating from the operating Bio-pond and the resin process area into the shallow and deep aquifer systems, see the attached **Figure 3**[26]. Well MW#12, located at the Site's northeast corner, will be used to monitor the shallow aquifer system closest to the residential houses on Watkins Road. Wells BP-1 and BP-2, located at the north side of the Bio-pond, will be used to monitor the shallow aquifer system. Wells MW#18 and MW#19, located in the fallow field south of the Bio-pond, will be used to monitor the shallow aquifer system. Well MW#9B, located at the Site's southwest corner, will be used to monitor the deep aquifer system. The periodic sampling of these six ground water monitoring wells was listed in the FS as Alternative 3.1.2.

A ground water monitoring plan will be developed and implemented by Georgia Pacific as part of the O&M plan. The ground water monitoring plan will include the sampling schedule and testing parameters. A ground water contingency monitoring plan will also be developed by Georgia Pacific as part of the O&M plan, and implemented by Georgia Pacific if increased COC concentrations are detected in the ground water sampling results. In addition to the routine sampling of monitoring wells, Georgia-Pacific will also sample Monitoring Wells BP-1, BP-2, MW#18 and MW#19 four to six months after undertaking any maintenance activities that may impact the integrity of the Bio-pond. Georgia Pacific will submit a summary report to Ohio EPA, which will provide details and results of the ground water sampling event. The requirement for a ground water monitoring plan to be developed and implemented by Georgia Pacific was added by Ohio EPA (not a FS Alternative).

In addition, the closed landfill's soil and vegetative cover, the two recovery trenches and collection sumps, and the current security measures will be maintained in good condition at the Site. Georgia Pacific will develop and implement, for Ohio EPA approval, an O&M Plan that will detail the periodic inspection and routine maintenance of the closed landfill's cover, the two recovery trenches and collection sumps, and the current security measures. In addition, the O&M Plan will provide for the reporting of Bio-pond maintenance activities to Ohio EPA. This requirement for an O&M Plan from Georgia Pacific was added by Ohio EPA (not originally a FS Alternative).

8.0 COMPARISON AND EVALUATION OF ALTERNATIVES

8.1 Evaluation Criteria

In selecting a remedy for a contaminated site, Ohio EPA considers the following eight evaluation criteria as outlined in U.S. EPA's NCP promulgated under CERCLA (40 CFR 300.430):

1. Overall protection of human health and the environment - Remedial alternatives shall be evaluated to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from any unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site.

2. Compliance with all applicable or relevant and appropriate requirements (ARARs) - Remedial alternatives shall be evaluated to determine whether a remedy will meet all of the applicable or relevant and appropriate requirements of state and federal environmental laws.

3. Long-term effectiveness and permanence - Remedial alternatives shall be evaluated to determine the ability of a remedy to maintain reliable protection of human health and the environment over time once pollution has been abated and RAOs have been met. This includes assessment of the residual risks remaining from untreated wastes, and the adequacy and reliability of controls such as containment systems and institutional controls.

4. Reduction of toxicity, mobility, or volume through treatment - Remedial alternatives shall be evaluated to determine the degree to which recycling or treatment are employed to reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the Site.

5. Short-term effectiveness - Remedial alternatives shall be evaluated to determine the following: (1) Short-term risks that might be posed to the community during implementation of an alternative; (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and (4) Time until protection is achieved.

6. Implementability - Remedial alternatives shall be evaluated to determine the ease or difficulty of implementation and shall include the following factors as appropriate: (1) Technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy; (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); (3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

7. Cost - Remedial alternatives shall evaluate costs and shall include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operation and

maintenance (O&M) costs; and (3) Net present value of capital and O&M costs; the cost estimates include only the direct costs of implementing an alternative at the Site and do not include other costs, such as damage to human health or the environment associated with an alternative. The cost estimates are based on figures provided by the Feasibility Study.

8. Community acceptance - Remedial alternatives shall be evaluated to determine which of their components interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the Preferred Plan are considered.

Evaluation Criteria 1 and 2 are threshold criteria required for acceptance of an alternative that has accomplished the goal of protecting human health and the environment and has complied with the law. Any acceptable remedy must comply with both of these criteria. Evaluation Criteria 3 through 7 are the balancing criteria used to select the best remedial alternative(s) identified in the Preferred Plan. Evaluation Criteria 8, community acceptance, is a modifying criterion that will be evaluated by consideration of public comments on the alternatives received during this comment period (see Section 2.0).

8.2 Analysis of Evaluation Criteria

This section examines how each of the evaluation criteria is applied to each of the remedial alternatives detailed in Section 7.0 of the Preferred Plan, and compares how these alternatives achieve the criteria.

8.2.1 Overall Protection of Human Health and the Environment

The assessment of cancer risks and non-cancer hazards to human receptors requires that pathways for exposure be identified and the risks and hazards of each pathway be numerically estimated. An exposure assessment using the U.S. EPA Region 9 PRGs was conducted as part of the ER activities at the Site. In addition to the exposure assessment conducted by Georgia Pacific, Ohio EPA generated a limited human health risk assessment for the Site. The normal criteria for acceptability of risk represent an upper bound excess lifetime cancer risk to an individual to between 1 in 10,000 and 1 in 1,000,000. The total non-carcinogenic adverse health effects should result in a HI of less than one.

Adverse impacts to ecological receptors are identified as a HQ and, when appropriate, a HI value greater than one. Thus, RAOs for ecological receptors in the Feasibility Study were based on either a HQ or HI of 1. Full attainment of the appropriate water quality criteria were also evaluated in the Feasibility Study for sites with contaminated surface water bodies.

- Alternative 1: No Action. This alternative will not be protective of human health and the environment since RAOs 1, 2, and 3 will not be met for each of the affected media at the Georgia Pacific facility.

- Alternative 2: Institutional Controls. The activity and use limitations, which would prohibit excavation in the closed landfill and prohibit construction of permanent or temporary buildings on the closed landfill, should prevent future possible exposures to on-site workers (*i.e.*, facility employees and outside contractors such as construction workers). This alternative meets RAO 1, but does not meet RAOs 2 and 3.

- Alternative 3: Engineering Controls. The active Bio-pond's artificial cap and accumulated resin materials minimize air releases and ground water migration of COCs. The closed landfill soil and vegetative cover prevent direct contact to any waste materials. The two recovery trenches and collection sumps control the horizontal migration of shallow water beneath the soil. The current security measures prevent unauthorized public access to Georgia Pacific's facility and possible exposure to the Bio-pond. This alternative meets RAO 1, but does not meet RAOs 2 and 3.

- Alternative 4: Bio-pond Decommissioning. The on-site, active Bio-pond will be decommissioned by Georgia Pacific when it is no longer necessary for the plant's production operation. This alternative meets RAOs 1, 2, and 3.

- Alternative 5: Operation and Maintenance (O&M). The active Bio-pond, the closed landfill's soil and vegetative cover, the two recovery trenches and collection sumps, and the current security measures will be maintained in good condition by Georgia Pacific. Periodic sampling of six ground water monitoring wells will be performed by Georgia Pacific to detect the potential migration of COCs. This alternative meets RAOs 1, 2, and 3.

8.2.2 Compliance with ARARs

- Alternative 1: No Action. This alternative does not restrict access to potentially contaminated ground water, soil or waste within the landfill; therefore, it would not comply with the ARARs.

- Alternative 2: Institutional Controls. This alternative complies with all identified ARARs as long as the activity and use limitations are recorded in an environmental covenant in accordance with ORC §5301.80 et. seq.

- Alternative 3: Engineering Controls. This alternative complies with the identified ARARs as long as the controls are properly operated and maintained by Georgia Pacific, its successors, or any future owners of the Site.

- Alternative 4: Bio-pond Decommissioning. This alternative complies with all identified ARARs for the decommissioning of a surface water impoundment. Georgia Pacific will submit a decommissioning plan to Ohio EPA for approval. A PTI application from Ohio EPA's DSW will be required prior to decommissioning the Bio-pond. After the Bio-pond's decommissioning, the six monitoring wells can be abandoned in accordance with OAC rules 3745-9-07 and 3745-9-10, and the "State

of Ohio Technical Guidance for Sealing Unused Wells (1996)".

- Alternative 5: O & M. This alternative complies with the identified ARARs as long as the O&M activities continue to be performed by Georgia Pacific, its successors, or any future owners of the Site.

8.2.3 Long-Term Effectiveness and Permanence

- Alternative 1: No Action. This alternative does not provide long-term effectiveness or permanence because it does not include O&M for the existing remedial actions or monitoring of the remedial alternatives to prevent future potential exposure risks.

- Alternative 2: Institutional Controls. This alternative provides some long-term effectiveness and permanence because the excavation and building limitations are adequate methods to control potential exposure risks from future construction activities at the closed landfill. The long-term effectiveness and permanence of this alternative will require a reliable mechanism to enforce the maintenance of these activity and use limitations, such as periodic compliance checks by Ohio EPA.

- Alternative 3: Engineering Controls. This alternative provides some long-term effectiveness and permanence because the Bio-pond's artificial cap limits air emissions while the accumulated resin material minimizes ground water migration, the closed landfill's soil and vegetative cover prevents direct contact, the two recovery trenches and collection sumps control the horizontal migration of shallow water, and the current security measures restrict unauthorized public access; and should be effective in reducing potential future exposure risks if they are properly maintained by Georgia Pacific, its successors, or any future owners of the Site.

- Alternative 4: Bio-pond Decommissioning. This alternative should provide long-term effectiveness and permanence because the decommissioning of the Bio-pond is a permanent method to control the migration of COCs, and to prevent the possible contamination of ground water. However, the decommissioning activities may create limited short-term exposure risks to the on-site workers involved in these decommissioning activities.

- Alternative 5: O & M. This alternative provides some long-term effectiveness and permanence because the Bio-pond's artificial cap and accumulated resin materials, the closed landfill's soil and vegetative cover, the two recovery trenches and collection sumps, are adequate methods to control the migration of COCs when properly operated and maintained in good condition. In addition, the current security measures limit potential exposure to COCs. Periodic sampling of the six ground water monitoring wells provides a reliable method of detecting any potential migration of COCs. Following the terms of the discharge permit and the maintenance plan with Columbus will provide a reliable means to ensure the proper operation of the Bio-pond. After any maintenance activities that may impact the integrity of the Bio-pond, additional sampling of the monitoring wells is an effective

method to detect any potential migration of COCs. Long-term operation and maintenance issues at the Site will be addressed in Georgia Pacific's O&M Plan submittal to Ohio EPA.

8.2.4 Reduction of Toxicity, Mobility or Volume through Treatment

- Alternative 1: No Action. This alternative does not reduce the toxicity, mobility or volume by treatment of the potential COCs including acetone, formaldehyde, methanol and phenol.

- Alternative 2: Institutional Controls. This alternative does not reduce the toxicity, mobility or volume by treatment of potential COCs.

- Alternative 3: Engineering Controls. This alternative does not reduce the toxicity, or volume by treatment of potential COCs. However, the mobility of the COCs will be reduced by proper operation and maintenance of the in-place engineering controls.

- Alternative 4: Bio-pond Decommissioning. Once the decommissioning of the Bio-pond occurs, it will likely reduce the toxicity, mobility and volume of the COCs at the Site by removing a potential source area.

- Alternative 5: O & M. The O&M activities for the active Bio-pond, the closed landfill's soil and vegetative cover, and the two recovery trenches and collection sumps, should reduce the mobility of potential COCs at the Site. The pumping of the perched water from the two recovery trenches and collection sumps may reduce the volume of potential COCs at the Site, and it should prevent ground water and any perched water from mobilizing potential COCs in the on-site soils.

8.2.5 Short-Term Effectiveness

- Alternative 1: No Action. This alternative would not provide short-term effectiveness because it would not prevent potential exposure risks from the COCs existing at the Site to the on-site workers or to the community.

- Alternative 2: Institutional Controls. This alternative would provide short-term effectiveness because contact with the closed landfill contents should be limited by recording an environmental covenant on the property deed.

- Alternative 3: Engineering Controls. This alternative has already been implemented at the Site and provides short-term effectiveness because: the Bio-pond's artificial cap and accumulated resin materials limit COC releases to the air and ground water, the closed landfill's soil and vegetative cover limits direct contact, the two recovery trenches and collection sumps restrict the migration of perched ground water, and the existing security measures restrict unauthorized public access to the Site.

- Alternative 4: Bio-pond Decommissioning. This alternative does not provide short-term effectiveness because the decommissioning of the Bio-pond will not be performed by Georgia Pacific until the Bio-pond is no longer needed for production.

- Alternative 5: O & M. This alternative provides short-term effectiveness because these O&M activities are currently in place, they limit exposure to on-site workers, and they monitor the potential migration of contaminants.

8.2.6 Implementability

- Alternative 1: No Action. This alternative is readily implementable because no actions are required and no approvals are necessary.

- Alternative 2: Institutional Controls. This alternative should be readily implementable once Georgia Pacific prepares the legal documents to establish the Site's institutional controls for the closed landfill. Georgia Pacific would be required to file the environmental covenant with the Franklin County Recorder.

- Alternative 3: Engineering Controls. This alternative has already been completed by Georgia Pacific.

- Alternative 4: Bio-pond Decommissioning. This alternative will be readily implementable once Georgia Pacific prepares and submits the Bio-pond's decommissioning plan for Ohio EPA approval.

- Alternative 5: O & M. This alternative will be readily implementable once Georgia Pacific prepares and submits an O&M Plan for Ohio EPA approval. The closed landfill's soil and vegetative cover, and the two recovery trenches and collection sumps will require regular visual inspections to confirm their proper operation. The monitoring wells will need to be periodically sampled, and the ground water samples analyzed, as long as the Bio-pond continues to be operated. The discharge permit, and the maintenance plan with the City of Columbus for the Bio-pond has already been approved and issued to Georgia Pacific.

8.2.7 Cost

- Alternative 1: No Action. This alternative has no additional costs.

- Alternative 2: Institutional Controls. This alternative has an estimated cost of $17,500 to record and monitor the property restrictions.

- Alternative 3: Engineering Controls. This alternative has an estimated cost of $50,000 per year to maintain the current security measures at the Site.

- Alternative 4: Bio-pond Decommissioning. This alternative has an estimated cost of $500,000 to complete the final decommissioning of the Bio-pond.

- Alternative 5: O & M. The periodic sampling of the remaining six monitoring wells is estimated to cost $20,000 per year. The estimated cost for the continued operation of the recovery trenches and collection sumps is $5,000 per year including the employee monitoring, and the repair and/or replacement as needed of the pumping equipment. The estimated cost for the preventative maintenance of the closed landfill soil and vegetative cover is $1,000 per year.

9.0 OHIO EPA'S PREFERRED ALTERNATIVES

The preferred remedial alternative is a combination of Alternative 2. Institutional Controls, Alternative 3. Engineering Controls, Alternative 4, Bio-pond Decommissioning and Alternative 5, Operation and Maintenance. The elements of Alternatives 2, 3, 4 and 5 are as follows:

9.1 Institutional Controls

Activity and use limitations will be established in an environmental covenant to be recorded with the Franklin County Recorder that prohibit excavation in the closed landfill, and prohibit construction of any permanent or temporary structure on the closed landfill.

Performance Standards. Institutional controls are necessary to achieve RAO 1 by preventing potential exposure to contamination. The performance standard will be achieved when the environmental covenant is recorded with the Franklin County Recorder, and Ohio EPA is notified by Georgia Pacific that the environmental covenant has been recorded in accordance with ORC §5301.80 et. seq.

9.2 Engineering Controls

The active Bio-pond's artificial cap and accumulated resins materials will be maintained by Georgia Pacific during the remainder of its operation. The closed landfill's soil and vegetative cover will also be maintained by Georgia Pacific to prevent any exposure to the existing waste materials. The two recovery trenches and collection sumps will also be maintained by Georgia Pacific until such time that the sampling results demonstrate that the recovery trenches and collection sumps no longer need to be operated and be maintained. Security measures equivalent to the existing security measures will be maintained as long as the Bio-pond, closed landfill, and the recovery trenches and collection sumps remain at the Site, to restrict unauthorized public access.

Performance Standards. Engineering controls are necessary to meet RAOs 1, 2 and 3. The performance standard is achieved as long as engineering controls are operated and maintained in a manner that prevents exposure to contamination, to prevent leaching of contaminants into ground water and prevent migration of contaminants to other areas.

9.3 Bio-pond Decommissioning

The Bio-pond will be decommissioned when it is no longer needed for the plant's manufacturing operations.

Performance standards. Bio-pond decommissioning is necessary to achieve RAOs 1, 2 and 3. The performance standard will be achieved when the Bio-pond is decommissioned according to a plan submitted to and approved by Ohio EPA.

9.4 Operation and Maintenance

An O&M Plan will be submitted to Ohio EPA for approval and will include the following:

Closed landfill cover

During the closure of the on-site landfill in December 1979, Georgia Pacific constructed a soil and vegetative cover over the landfill's entire area as a horizontal barrier to minimize surface water infiltration into the soil, reduce the potential impact to the aquifer systems, and prevent any contact with any impacted media. The closed landfill's soil and vegetative cover will be periodically inspected, mowed, repaired and revegetated as needed, and maintained in good condition.

Performance standards: The operation and maintenance of the landfill cover is necessary to meet RAOs 1 and 2 by preventing exposure to contaminants and to prevent surface water from leaching contaminants to ground water. The performance standard is achieved as long as the landfill cover is maintained.

Recovery trenches and water collection sumps

As part of the ER activities, vertical barriers consisting of passive recovery trenches and water collection sumps were constructed to collect the shallow perched water beneath the soil's surface and to prevent the potential off-site migration of this perched water. Currently, two recovery trenches and collection sumps discharge the shallow perched water to the Bio-pond, which discharges to the City of Columbus sanitary sewers. The recovery trenches and collection sumps will be periodically inspected and maintained in good operating condition. The recovery trenches and collection sumps will continue to operate as needed. The pumping equipment in the recovery trenches and collection sumps will be monitored, and the equipment repaired and/or replaced as needed. The perched water will continue to be periodically monitored for phenol.

Performance standards. The operation and maintenance of the recovery trenches and collection sumps is necessary to meet RAO 3 by preventing the migration of contaminants. The performance standard will be achieved when four consecutive quarters (every 3 months) of ground water samples gathered from the two collection sumps demonstrate that remediation levels in the table listed below (on Page 39) are met.

Ground Water Remediation Levels (expressed in ug/L)

COC	Remediation Level
Acetone	5.5E3
Formaldehyde	5.5E3
Methanol	1.8E4
Phenol	1.1E4

Bio-pond Maintenance

The Bio-pond will be maintained in good condition prior to its decommissioning. Ohio EPA will be notified of any maintenance activities by Georgia Pacific that may impact the integrity of the Bio-pond, such as dredging or enlarging or decreasing its size, 30 days prior to starting such activities. After the maintenance activities are completed, a summary report will be submitted to Ohio EPA which will provide details on these maintenance activities; such as the amount of sludge removed, the disposal methods used for the sludge, the depth of the Bio-pond before and after dredging, and sludge sampling results.

Performance standards. Bio-pond maintenance is necessary to continue to achieve RAOs 1, 2, and 3 by preventing potential exposure to contaminated to ground water and the migration of contaminants to other areas. The performance standard will be achieved when operation and maintenance is conducted in a manner that prevents exposure, leaching to ground water and migration of contaminants.

Ground Water Monitoring Wells

As part of the O&M plan, a ground water monitoring plan for the periodic sampling of the six existing ground water monitoring wells (BP-1, BP-2, MW#9B, MW#12, MW#18 and MW#19) will be developed and implemented to ensure that no COCs are migrating from the operating Bio-pond and the resin process area into the shallow and deep aquifer systems at the Site.

Performance standards. Ground water monitoring is necessary to achieve RAOs 1, 2, and 3 by ensuring that COCs on ground water do not exceed remediation levels, and contaminants are migrating to other areas. The performance standard will be achieved when the ground water is periodically monitored according to the plan submitted to and approved by Ohio EPA. After the Bio-pond's decommissioning, when two consecutive semi-annual sampling events of ground water monitoring demonstrate that remediation levels for the COCs listed in the table above are met, then the six ground water monitoring wells are properly abandoned and sealed.

10.0 GLOSSARY

Acetone -	A chemical compound that is a common industrial solvent.
Aquifer -	An underground geological formation capable of storing and yielding water.
ARARs -	Applicable or relevant and appropriate requirements. Those rules, including state and federal laws, which strictly apply to remedial activities at the site, or whose requirements would help achieve the remedial goals for the site.
Baseline Risk Assessment -	An evaluation of the risks to humans and the environment posed by a site.
BGS -	Below Ground Surface.
BUSTR -	Bureau of Underground Storage Tank Regulation is a part of the Division of the State Fire Marshal under the Ohio Department of Commerce, that regulates underground storage tanks used to dispense motor fuels.
Carcinogen -	A chemical compound that causes cancer in humans.
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended. A federal law that regulates cleanup of hazardous substance sites under the U.S. EPA Superfund Program.
CDO -	Central District Office of the Ohio Environmental Protection Agency located in Columbus, Ohio.
COC -	Contaminant of Concern.
Decision Document -	A statement issued by the Ohio Environmental Protection Agency giving the Director's selected remedy for a site and the reasons for its selection.
DFF&Os -	Director's Final Findings and Orders.
EB -	Ecological Benchmark.
Ecological Receptor -	Animals/plant life exposed to the chemicals released at a site.
EDQL -	Ecological Data Quality Levels.

ERA -	Ecological Risk Assessment.
Exposure Pathway -	Route by which a chemical is transported from the site to a human or ecological receptor.
EPC -	Exposure Point Concentration.
Feasibility Study (FS) -	A study conducted to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected for the site.
Formaldehyde -	A common industrial chemical that is commonly used in the manufacture of resins or other chemicals; and as a preservative, fumigant and disinfectant.
HI -	Hazard Index, the sum of more than one hazardous quotient for multiple chemicals and/or multiple exposure pathways. A hazard index of 1 represents an exposure at which no harmful effects are expected.
HQ -	Hazard Quotient, the ratio of a single substance exposure level to a toxicity value (*e.g.,* reference dose) for that substance.
Human Receptor -	A person exposed to chemicals released from a site.
MCL -	Maximum Contaminant Levels; established drinking water standards in OAC 3745-81-12.
Methanol -	Also known as Methyl Alcohol. A common industrial chemical compound used as a solvent.
MeOH -	Common abbreviation spelling for methanol.
mg/kg -	Milligrams per Kilogram. An expression for soil concentration of a chemical compound; equal to one part per million.
mg/L -	Milligrams per Liter. An expression of water concentration of a dissolved material; equal to one part per million.
NCP -	National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 CFR Part 300 (1990), as amended. A framework for the remediation of hazardous substance sites specified in CERCLA.

OAC -	Ohio Administrative Code.
Ohio EPA -	Ohio Environmental Protection Agency.
O&M -	Operation and Maintenance. Those long-term measures taken at a site, after the initial remedial actions, to assure that a remedy remains protective of human health and the environment.
ORC -	Ohio Revised Code.
PAHs -	Polycyclic Aromatic Hydrocarbons. A broad class of chemicals including multiple six-carbon rings. Often found as residue from coal-based chemical processes.
Preferred Plan -	The plan that evaluates the preferred remedial alternative chosen by Ohio EPA to remediate the site in a manner that best satisfies the evaluation criteria.
Phenol -	A chemical that is a common disinfectant and anesthetic.
PRG -	Preliminary Remediation Goals.
Remedial Action Objectives (RAOs) -	Specific goals of the remedy for reducing the exposure risks posed by the site.
Remedial Investigation -	A study conducted to collect information necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.
Responsiveness Summary -	A summary of all comments received concerning the Preferred Plan, and Ohio EPA's response to all issues raised in those comments.
SVOCs -	Semi-Volatile Organic Compounds.
ug/L -	Micrograms per Liter. An expression of water concentration of a dissolved material; equal to one part per billion.
U.S. EPA -	United States Environmental Protection Agency.
UST -	Underground Storage Tank.
VOCs -	Volatile Organic Compounds.

11.0 FOOTNOTES

1. Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001. Figure 1, Site Location.

2. Technical Memorandum No. 1, Phase I Investigation, Interim Data Evaluation, Georgia-Pacific Resins, Inc. Manufacturing Plant, Columbus, Ohio; December 1996, Figure 2.2, Site Plan Layout - Manufacturing Operations.

3. Technical Memorandum No. 1, Phase I Investigation, Interim Data Evaluation, Georgia-Pacific Resins, Inc. Manufacturing Plant, Columbus, Ohio; December 1996. Table A.1, Summary of Historical Results, Existing Site Shallow Monitoring Wells and Plant Production Well.

4. Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001. Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

5. Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001. Table 1, Background Concentrations and Preliminary Remediation Goals (PRGs).

6. Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001. Figure 6, Potentiometric Surface Map, Shallow Aquifer.

7. Technical Memorandum No. 1, Phase I Investigation, Interim Data Evaluation, Georgia-Pacific Resins, Inc. Manufacturing Plant, Columbus, Ohio; December 1996. Figure 2.2, Site Plan Layout - Manufacturing Operations.

8. Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001. Table 11, Phase II Remedial Investigation Ground Water Data.

9. Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001. Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

10. Ibid.

11. Ibid.

12. Ibid.

13. Ibid.

14. Ibid.

Footnotes continued:

15. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

16. **Ibid.**

17. Philip H. Howard, Handbook of Environmental Fate and Exposure for Organic Chemicals, Volume II, Solvents (Lewis Publishers, Inc.,1991), pp. 9-11.

18. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

19. Philip H. Howard, Handbook of Environmental Fate and Exposure for Organic Chemicals, Volume I, Large Production and Priority Pollutants (Lewis Publishers, Inc.,1990), pp. 343-345.

20. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

21. Philip H. Howard, Handbook of Environmental Fate and Exposure for Organic Chemicals, Volume II, Solvents (Lewis Publishers, Inc.,1991), pp. 310-312.

22. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

23. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume I, Large Production and Priority Pollutants, (Lewis Publishers, Inc.,1990), pp. 468-471.

24. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Table 1, Background Concentrations and Preliminary Remediation Goals (PRGs).

25. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Figure 6, Potentiometric Surface Map, Shallow Aquifer.

26. **Remedial Investigation Report, Georgia-Pacific Resins, Inc. Facility, Columbus, Ohio; September 2001.** Figure 5, Remedial Investigation Areas of Interest and Site Stabilization Locations.

TABLES

TABLE 1

SUMMARY OF HISTORICAL ANALYTICAL RESULTS
EXISTING SITE SHALLOW MONITORING WELLS AND PLANT PRODUCTION WELL
GEORGIA-PACIFIC RESINS, INC.
COLUMBUS, OHIO

MONITOR WELL 1

Date	*COD mg/L*	*Formald. mg/L*	*Organic N mg/L*	*Nitrate mg/L*	*Phenols mg/L*	*TOC mg/L*	*pH Lab S.U.*	*pH Field S.U.*	*S.C. Lab umhos/cm*	*S.C. Field umhos/cm*
14-May-82	110	<0.200	5.0	NR	<0.005	NR	7.4	NR	NR	NR
26-May-82	140	0.400	10.0	NR	0.006	NR	6.9	NR	NR	NR
8-Oct-84	45	<0.006	1.8	NR	0.07	NR	7.0	NR	NR	NR
24-Jan-85	160	<0.006	3.5	NR	<0.05	102.0	6.9	NR	1330	NR
30-Apr-85	55	<0.006	3.1	NR	<0.05	18.0	6.9	NR	1640	NR
29-Jul-85	100	1.25	4.0	5.33	<0.05	16.2	6.9	7.1	1415	1430
5-Feb-86	240	4.80	4.2	1.10	<0.05	18.0	6.9	6.5	1600	1600
14-Apr-86	34	1.00	5.2	0.73	<0.05	22.3	7.2	6.7	1500	1500
9-Jul-86	85	5.20	1.9	1.00	<0.05	19.0	6.8	NR	1400	NR
30-Jan-87	98	8.00	2.9	0.72	<0.05	18.0	7.0	6.6	1500	1850
28-Jul-87	48	11.00	5.3	1.80	<0.05	22.0	6.9	5.9	1800	1800
10-Sep-87	NR	6.80	NR	NR	NR	NR	NR	NR	NR	NR
27-Jan-88	54	18.00	0.5	0.15	0.05	4.1	7.3	6.97	1600	2000
3-Aug-88	71	14.00	6.5	12.00	<0.05	25.0	6.8	7.3	2200	2250
3-Mar-89	93	21.00	9.6	0.44	<0.05	34.0	6.4	NR	2410	NR
16-Aug-89	110	25.00	6.8	1.70	0.05	43.0	7.1	6.7	2320	2200
14-Mar-90	11	8.00	<1.0	2.00	<0.05	26.0	7.1	6.8	1988	2600
17-Oct-90	<5	9.30	2.0	1.20	<0.05	18.0	6.8	6.7	1700	2000
14-Jun-91	25	3.30	1.1	12.00	<0.05	24.0	6.5	6.8	1700	1990

Note:

(1) Formaldehyde concentrations anaylzed during May 1982 to April 1985 are expressed in percentages
(2) NR - not reported

TABLE 1

SUMMARY OF HISTORICAL ANALYTICAL RESULTS
EXISTING SITE SHALLOW MONITORING WELLS AND PLANT PRODUCTION WELL
GEORGIA-PACIFIC RESINS, INC.
COLUMBUS, OHIO

MONITOR WELL 2

Date	*COD mg/L*	*Formald. mg/L*	*Organic N mg/L*	*Nitrate mg/L*	*Phenols mg/L*	*TOC mg/L*	*pH Lab S.U.*	*pH Field S.U.*	*S.C. Lab umhos/cm*	*S.C. Field umhos/cm*
14-May-82	240	<0.20	3.6	NR	<0.005	NR	7.5	NR	NR	NR
26-May-82	180	1.000	6	NR	0.007	NR	7.1	NR	NR	NR
8-Oct-84	66	<0.006	2	NR	<0.05	NR	7.2	NR	NR	NR
24-Jan-85	98	<0.006	2.8	NR	<0.05	622.0	6.9	NR	2310	NR
30-Apr-85	110	<0.006	5	NR	<0.05	35.0	6.9	NR	2800	NR
29-Jul-85	190	1.40	14	6.15	<0.05	31.8	7.2	6.8	2350	2030
5-Feb-86	170	1.40	8.5	28.00	<0.05	14.0	6.5	6.8	1300	1300
9-Jul-86	160	2.50	0.4	4.60	<0.05	19.0	7.1	NR	1500	NR
30-Jan-87	40	1.80	2.4	20.00	<0.05	16.0	7.1	6.8	1500	1840
28-Jul-87	130	1.10	0.56	0.80	<0.05	14.0	7.2	6.1	1200	1390
27-Jan-88	26	2.50	<0.10	57.00	<0.05	4.0	7.3	6.7	2100	2000
3-Aug-88	75	14.00	2.9	0.76	<0.05	29.0	7.0	6.9	2000	2100
3-Mar-89	17	0.45	0.1	21.00	<0.05	5.3	6.6	7.3	1310	1600
16-Aug-89	66	0.27	8.7	10.00	<0.05	14.0	7.2	7.0	870	895
14-Mar-90	<10	1.10	<1.0	12.00	0.06	12.0	7.5	7.2	955	800
17-Oct-90	<5	0.58	2.6	14.00	<0.05	12.0	7.0	7.2	970	1000
14-Jun-91	96	1.00	1.7	1.80	<0.05	22.0	6.8	8.9	1000	1270

Note:

(1) Formaldehyde concentrations anaylzed during May 1982 to April 1985 are expressed in percentages
(2) NR - not reported

TABLE 1

SUMMARY OF HISTORICAL ANALYTICAL RESULTS
EXISTING SITE SHALLOW MONITORING WELLS AND PLANT PRODUCTION WELL
GEORGIA-PACIFIC RESINS, INC.
COLUMBUS, OHIO

MONITOR WELL 3

Date	*COD mg/L*	*Formald. mg/L*	*Organic N mg/L*	*Nitrate mg/L*	*Phenols mg/L*	*TOC mg/L*	*pH Lab S.U.*	*pH Field S.U.*	*S.C. Lab umhos/cm*	*S.C. Field umhos/cm*
14-May-82	270	<0.20	2.5	NR	<0.005	NR	7.8	NR	NR	NR
26-May-82	110	1.600	3.5	NR	0.012	NR	7.5	NR	NR	NR
8-Oct-84	7	<0.006	1.1	NR	0.06	NR	7.3	NR	NR	NR
24-Jan-85	27	<0.006	0.3	NR	<0.05	519.0	7.2	NR	1310	NR
30-Apr-85	120	<0.006	2.8	NR	<0.05	8.0	7.1	NR	1660	NR
29-Jul-85	330	0.21	0.8	35.1	<0.05	7.0	7.1	7.5	1480	1250
9-Aug-85	160	0.34	0.3	26.8	<0.05	6.4	7.1	NR	1530	NR
5-Feb-86	190	0.22	7.4	36.0	<0.05	8.8	7.4	7	1600	1700
9-Jul-86	190	1.00	0.4	27.0	<0.05	10.0	7.1	NR	1500	NR
30-Jan-87	100	<0.10	0.4	33.0	<0.05	7.1	7.3	6.6	1400	1700
28-Jul-87	200	<0.10	<0.1	34.0	<0.05	11.0	7.2	6.1	1500	1600
27-Jan-88	23	0.33	<0.1	8.9	<0.05	2.4	7.3	7.6	1400	1475
3-Aug-88	18	6.30	1.5	42.0	<0.05	6.8	7.3	7.5	1300	1560
3-Mar-89	36	0.70	0.3	22.0	<0.05	7.5	6.7	7.0	1350	1500
16-Aug-89	28	0.86	0.2	28.0	<0.05	5.4	7.2	7.0	1286	1200
14-Mar-90	<10	<0.10	<1.0	26.0	<0.05	7.8	7.6	7.1	1294	1500
17-Oct-90	<5	0.22	<1.0	18.0	<0.05	8.0	7.0	7.3	1200	1100
14-Jun-91	56	<0.50	<1.0	18.0	<0.05	9.0	6.8	7.1	1200	1430

Note:

(1) Formaldehyde concentrations anaylzed during May 1982 to April 1985 are expressed in percentages
(2) NR - not reported

TABLE 1

SUMMARY OF HISTORICAL ANALYTICAL RESULTS
EXISTING SITE SHALLOW MONITORING WELLS AND PLANT PRODUCTION WELL
GEORGIA-PACIFIC RESINS, INC.
COLUMBUS, OHIO

MONITOR WELL 4

Date	*COD mg/L*	*Formald. mg/L*	*Organic N mg/L*	*Nitrate mg/L*	*Phenols mg/L*	*TOC mg/L*	*pH Lab S.U.*	*pH Field S.U.*	*S.C. Lab umhos/cm*	*S.C. Field umhos/cm*
14-May-82	310	<0.20	3.6	NR	<0.005	NR	7.3	NR	NR	NR
26-May-82	90	<0.600	3.5	NR	0.009	NR	7.2	NR	NR	NR
8-Oct-84	69	<0.006	1.5	NR	<0.05	NR	7.3	NR	NR	NR
24-Jan-85	15	<0.006	1.1	NR	<0.05	8.0	7.0	NR	1180	NR
30-Apr-85	160	<0.006	2.2	NR	<0.05	9.0	6.9	NR	570	NR
29-Jul-85	180	0.17	0.6	20.4	<0.05	8.4	6.9	7.3	1180	1320
9-Aug-85	110	0.17	0.6	14.0	<0.05	8.1	6.7	NR	1420	NR
5-Feb-86	120	0.55	1.1	16.0	<0.05	7.6	7.1	6.5	1400	1300
9-Jul-86	52	<0.10	0.6	17.0	<0.05	10.0	6.9	NR	1200	NR
30-Jan-87	82	0.10	0.3	20.0	<0.05	7.6	7.0	6.8	1200	1500
28-Jul-87	13	0.50	<0.1	22.0	<0.05	11.0	7.0	6.5	1300	1400
27-Jan-88	14	1.00	<0.1	8.9	<0.05	2.2	7.3	7.6	1300	1510
3-Aug-88	37	0.27	0.3	39.0	<0.05	7.4	7.0	7.1	1400	1700
3-Mar-89	13	0.32	2.1	15.0	<0.05	2.7	6.7	7.0	1250	1500
16-Aug-89	42	0.51	1.4	28.0	<0.05	7.5	7.0	7.0	1259	1200
14-Mar-90	<10	0.69	<1.0	24.0	<0.05	6.4	7.3	7.0	1145	1300
17-Oct-90	16	0.53	<1.0	29.0	<0.05	6.9	6.9	7.0	1300	1200
14-Jun-91	120	0.85	<1.0	30.0	<0.05	11.0	6.7	6.7	1300	1480

Note:

(1) Formaldehyde concentrations anaylzed during May 1982 to April 1985 are expressed in percentages
(2) NR - not reported

TABLE 1

SUMMARY OF HISTORICAL ANALYTICAL RESULTS
EXISTING SITE SHALLOW MONITORING WELLS AND PLANT PRODUCTION WELL
GEORGIA-PACIFIC RESINS, INC.
COLUMBUS, OHIO

PLANT PRODUCTION WELL

Date	*COD mg/L*	*Formald. mg/L*	*Organic N mg/L*	*Nitrate mg/L*	*Phenols mg/L*	*TOC mg/L*	*pH Lab S.U.*	*pH Field S.U.*	*S.C. Lab umhos/cm*	*S.C. Field umhos/cm*
14-May-82	92	<0.20	6.0	NR	<0.005	NR	7.6	NR	NR	NR
26-May-82	100	0.400	10.7	NR	0.008	NR	7.7	NR	NR	NR
8-Oct-84	74	<0.006	2.4	NR	0.05	NR	7.4	NR	NR	NR
24-Jan-85	71	<0.006	5.7	NR	4.10	28.0	7.4	NR	650	NR
5-Mar-85	92	NR	NR	NR	0.96	NR	NR	NR	NR	NR
30-Apr-85	150	<0.006	0.6	NR	<0.05	8.0	7.3	NR	860	NR
29-Jul-85	90	0.23	0.3	0.26	<0.05	7.0	7.2	7.7	790	750
5-Feb-86	70	1.40	1.1	0.60	<0.05	6.3	7.4	7.1	870	880
14-Apr-86	48	<0.20	0.6	0.13	<0.05	7.4	7.4	7.1	900	890
9-Jul-86	55	<0.10	0.4	0.16	<0.05	6.5	7.1	NR	720	NR
30-Jan-87	15	<0.10	0.6	0.04	<0.05	6.0	7.3	6.8	730	970
28-Jul-87	10	0.30	0.1	0.11	<0.05	9.8	7.3	6.1	700	840
27-Jan-88	23	0.63	<0.1	0.04	<0.05	4.7	7.6	7.4	670	845
3-Aug-88	15	0.32	0.3	<0.10	<0.05	5.5	7.2	7.2	750	840
3-Mar-89	6.7	0.76	0.4	0.13	<0.05	3.8	6.8	7.2	650	820
16-Aug-89	32	1.30	0.3	0.17	0.05	15.0	7.8	7.4	586	580
16-Mar-90	<10	0.79	<1.0	<0.02	<0.05	6.8	7.7	7.2	635	NR
17-Oct-90	<5	0.40	<1.0	<0.02	<0.05	4.3	7.1	7.3	690	700

Note:

(1) Formaldehyde concentrations anaylzed during May 1982 to April 1985 are expressed in percentages
(2) NR - not reported

TABLE 2
Background Concentrations and Preliminary Remediatiou Goals (PRGs)
Remedial Investigation Report
Georgia-Pacific Resins, Inc. Facility
Columbus, Ohio (a)

	Background Concentration (mg/Kg)	U.S. EPA SSL (mg/Kg)	Soil Contact PRGs (mg/Kg) Region 9 SSL	Region 9 PRG	Site Criterion	Water PRGs (mg/L) Federal MCL	Region 9 PRG	Site Criterion
Organics								
Volatile Organic Compounds								
Acetone	NA	16.0	7,800	1,600	1,600	NA	0.610	0.610
Benzene	NA	0.030	0.800	0.670	0.670	0.005	0.00041	0.005
2-Butanone (MEK)	NA	NA	NA	7,300	7,300	NA	1.90	1.90
Carbon disulfide	NA	32.0	720	360	360	NA	1.00	1.00
Chloroform	NA	0.60	0.300	0.240	0.240	0.100	0.00016	0.100
p-Cresol	NA	9.0	1,600	310	310	NA	0.180	0.180
Formaldehyde	NA	NA	NA	9,200	9,200	NA	5.50	5.50
Methanol	NA	NA	NA	31,000	31,000	NA	18.0	18.0
Methylene chloride	NA	0.020	13.0	8.90	8.90	0.005	0.0043	0.005
Phenol	NA	100.0	47,000	37,000	37,000	NA	22.0	22.0
Toluene	NA	12.0	16,000	520	520	1.00	0.720	1.00
Xylenes	NA	200	160,000	320	320	10.0	1.40	10.0
Polynuclear Aromatic Hydrocarbons								
Acenaphthene	NA	570	4,700	3,700	3,700	NA	0.370	0.370
Anthracene	NA	12,000	23,000	22,000	22,000	NA	1.80	1.80
Benzo(a)anthracene	NA	2.00	0.900	0.620	0.620	NA	0.00009	0.00009
Benzo(b)flouranthene	NA	5.00	0.900	0.620	0.620	NA	0.00009	0.00009
Benzo(k)fluoranthene	NA	49.0	9.00	6.20	6.20	NA	0.0009	0.0009
Benzo(g,h,i)perylne	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	8.0	0.090	0.060	0.060	0.0002	0.000009	0.0002
Carbazole	NA	0.600	32.0	0.240	0.240	NA	0.0034	0.0034
Chrysene	NA	160	88.0	62.0	62.0	NA	0.0092	0.0092
Fluoranthene	NA	4,300	3,100	2,300	2,300	NA	1.50	1.50
Fluorene	NA	560	3,100	2,600	2,600	NA	0.240	0.240
Indeno(1,2,3-cd)pyrene	NA	14.0	0.900	0.620	0.620	NA	0.00009	0.00009
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	4,200	2,300	2,300	2,300	NA	0.180	0.180

TABLE 2 (continued)
Background Concentrations and Preliminary Remediation Goals (PRGs)
Remedial Investigation Report
Georgia-Pacific Resins, Inc. Facility
Columbus, Ohio (a)

	Background Concentration (mg/Kg)	U.S. EPA SSL (mg/Kg)	Soil Contact PRGs (mg/Kg)			Water PRGs (mg/L)		
			Region 9		Site	Federal	Region 9	Site
			SSL	PRG	Criterion	MCL	PRG	Criterion
Inorganics								
Aluminum	23,630	NA	NA	76,000	76,000	NA	36	36
Antimony	18.6	5	31	31	31	0.006	0.015	0.006
Arsenic	31.1	29	0.4	0.39	0.39	0.05	0.000045	0.05
Barium	185	1,600	5,500	5,400	5,400	2	2.6	2
Beryllium	1.23	63	0.1	150	150	0.004	0.073	0.004
Cadmium	4.7	8	78	37	37	0.005	0.018	0.005
Calcium	172,169	NA	NA	NA	NA	NA	NA	NA
Chromium	32.5	38	390	210	210	0.1	NA	0.1
Cobalt	30.5	NA	NA	4,700	4,700	NA	2.2	2.2
Copper	47.1	NA	NA	2,900	2,900	1.3	1.4	1.3
Iron	50,266	NA	NA	23,000	23,000	NA	11	11
Lead	23.3	NA	400	400	400	0.015	NA	0.015
Magnesium	45,876	NA	NA	NA	NA	NA	NA	NA
Manganese	1,058	NA	NA	1,800	1,800	NA	0.88	0.88
Mercury	0.14	NA	NA	23	23	0.002	0.011	0.002
Nickel	74.9	130	1,600	1,600	1,600	NA	0.73	0.73
Potassium	2,733	NA	NA	NA	NA	NA	NA	NA
Selenium	1.4	5	390	390	390	0.05	0.18	0.05
Silver	1.4	34	390	390	390	NA	0.18	0.18
Sodium	703	NA	NA	NA	NA	NA	NA	NA
Thallium	2.9	0.7	NA	6.3	6.3	0.002	0.003	0.002
Vanadium	57.8	6,000	550	550	550	NA	0.26	0.26
Zinc	173.8	12,000	23,000	23,000	23,000	NA	11	11

a/ SSLs = U.S. EPA Soil Screening Levelsa
Region 9 PRG = U.S. EPA Region 9 Preliminary Remediation Goals for Residential Exposure Risks
MCL = maximum contaminant levels promulgated under the Safe Drinking Water Act
PAHs = polynuclear aromatic hydrocarbons
NA = not available
mg/kg = milligrams per kilogram = ppm
mg/l = milligrams per liter = ppm
ppm = parts per million

DO/pan
Georgia Pacific Tables
April 15, 2004

TABLE 3

Phase II RI Groundwater Data
Remedial Investigation Report
Georgia-Pacific Resins, Inc. Facility
Columbus, Ohio

Sample Location: / Sample ID:	GPRI-GW-MW5-400	GPRI-GW-MW5-400	GPRI-GW-MW5-400	GPRI-GW-MW6	GPRI-GW-MW6	GPRI-GW-MW7	GPRI-GW-MW7	GPRI-GW-MW8	GPRI-GW-MW8	GPRI-GW-MW9	GPRI-GW-MW9	GPRI-GW-MW9B	GPRI-GW-MW9B
Other:			(D)										
Sample Date:	04/12/2000	07/19/2000	04/12/2000	04/12/2000	07/20/2000	04/12/2000	07/20/2000	04/11/2000	07/19/2000	04/12/2000	07/19/2000	04/12/2000	07/19/2000
Parameters													
TCL VOCs (ug/L) (a)	ND (b)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL SVOCs (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methanol (mg/L)	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
pH	7.51	7.66	7.57	7.22	7.20	7.21	7.15	7.21	7.13	7.22	7.16	7.35	7.29
Specific Conductance @ 25C	853	839	846	915	901	914	892	804	801	989	1020	922	908
TAL Total Metals (mg/L)													
Aluminum	< 0.050	< 0.050	< 0.050	0.21	0.12	< 0.050	<0.05	< 0.05	<0.05	< 0.050	< 0.050	< 0.050	< 0.050
Antimony	<0.005	< 0.0050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	<0.005	0.008
Arsenic	0.017	0.005	0.012	0.019	0.021	0.007	<0.002	0.019	0.016	0.021	0.022	0.002	0.01
Barium	0.21	0.18	0.21	0.074	0.062	0.5	0.045	0.16	0.13	0.52	0.3	0.4	0.29
Beryllium	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.001	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Cadmium	< 0.002	< 0.0010	< 0.0010	0.001	< 0.001	0.002	<0.001	< 0.0010	<0.001	0.002	< 0.0010	0.002	< 0.0010
Calcium	71	61	71	110	100	110	110	99	95	140	130	110	100
Chromium	0.004	0.004	0.003	0.014	0.002	0.003	<0.001	0.002	<0.001	0.005	0.001	0.003	< 0.0010
Cobalt	< 0.0050	< 0.0050	< 0.0050	0.008	< 0.005	< 0.0050	<0.005	< 0.0050	<0.005	< 0.0050	0.005	<0.005	< 0.0050
Copper	0.027	0.006	0.025	0.028	< 0.005	0,03	<0.005	0.3	<0.005	0.03	< 0.0050	0.036	< 0.0050
Iron	3	0.92	3	3.4	2.7	6.3	0.98	3.6	2.6	4	2.7	5	3.6
Lead	0.008	0.003	< 0.0020	< 0.0020	< 0.002	0.003	<0.002	0.003	<0.002	0.005	0.006	0.007	0.002
Magnesium	41	36	41	41	37	60	36	35	33	47	32	41	33
Manganese	0.043	0.64	0.043	0.058	0.048	0.78	0.083	0.045	0.035	0.28	0.19	0.12	0.1
Mercury	<0.0002	< 0.0002	<0.0002	<0.0002	< 0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	< 0.00020	<0.0002	< 0.00020
Nickel	< 0.010	< 0.010	< 0.010	0.013	< 0.001	0.015	<0.01	< 0.010	<0.010	< 0.010	< 0.010	< 0.01	< 0.010
Potassium	2.9	2.9	3.1	2.9	1.8	3.9	4.3	1.5	0.07	2.8	1.2	3.2	1.7
Selenium	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.002	0.01	<0.002	< 0.002	<0.002	0.016	0.016	< 0.0020	< 0.0020
Silver	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.001	< 0.0010	<0.001	< 0.0010	<0.001	0.001	0.007	< 0.0010	< 0.0010
Sodium	39	36	39	10	10	17	9.2	6.2	6	14	15	13	12
Thallium	< 0.0020	0.005	< 0.0020	< 0.0020	0.013	< 0.0020	<0.002	< 0.002	0.005	0.008	< 0.0020	< 0.0020	< 0.0020
Vanadium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc	0.043	0.017	0.04	0.033	0.014	0.065	<0.005	< 0.005	0.006	0.03	0.019	0.043	0.009
TAL Dissolved Metals (mg/L)													
Aluminum	< 0.050	< 0.050	< 0.050	< 0.050	< 0.05	< 0.050	<0.005	< 0.050	<0.05	< 0.050	< 0.050	< 0.050	< 0.050
Antimony	< 0.0050	< 0.005	< 0.0050	< 0.0050	< 0.005	< 0.0050	<0.005	< 0.0050	<0.005	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Arsenic	0.009	0.011	0.004	0.022	0.014	0.011	0.009	0.015	<0.002	0.019	0.011	0.003	< 0.0020
Barium	0.22	0.2	0.22	0.63	0.06	0.65	0.048	0.77	<0.010	0.88	0.29	0.9	0.29
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cadmium	0.002	< 0.001	0.001	0.002	< 0.001	0.002	<0.001	< 0.0010	<0.001	0.001	< 0.0010	0.003	< 0.0010
Calcium	70	65	69	110	100	110	100	100	<1.0	120	110	110	100
Chromium	0.001	< 0.001	0.001	0.001	< 0.001	0.003	<0.001	< 0.0010	<0.001	0.002	< 0.0010	0.004	< 0.0010
Cobalt	< 0.0050	< 0.005	< 0.0050	< 0.0050	< 0.005	< 0.005	<0.005	< 0.0050	<0.005	< 0.0050	< 0.0050	< 0.005	< 0.0050
Copper	0.025	< 0.005	0.026	0.024	< 0.005	0.018	<0.005	< 0.0050	<0.005	0.027	< 0.0050	0.092	< 0.0050
Iron	1.9	0.53	1.9	2.2	1.4	3.8	2.9	2.6	<0.03	3.3	2.5	4.8	3.6
Lead	< 0.0050	0.006	< 0.0050	0.01	0.03	0.008	<0.002	< 0.0020	<0.002	0.004	< 0.0020	0.008	0.004
Magnesium	41	39	41	41	37	38	25	36	<0.70	41	33	41	32
Manganese	0.046	0.049	0.046	0.051	0.043	0.098	0.083	0.038	<0.005	0.26	0.2	0.12	0.099
Mercury	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Nickel	< 0.010	< 0.010	< 0.010	< 0.010	< 0.01	< 0.010	<0.010	< 0.010	<0.010	< 0.010	< 0.010	0.031	< 0.010
Potassium	3	2.4	3	1.9	1.9	3.6	4.3	0.88	0.61	1.8	< 0.00020	2.5	< 0.00020
Selenium	< 0.0020	< 0.002	< 0.0020	0.015	< 0.002	0.005	<0.002	< 0.0020	<0.002	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Silver	< 0.0010	< 0.001	< 0.0010	0.001	< 0.001	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	< 0.0010	0.002	< 0.0010
Sodium	39	39	39	15	11	13	10	11	<1.0	16	14	18	13
Thallium	< 0.0020	< 0.002	< 0.0020	< 0.0020	< 0.002	< 0.0020	<0.002	< 0.0020	0.002	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Vanadium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc	0.049	0.043	0.043	0.19	0.007	0.23	0.011	0.18	<0.005	0.19	0.01	0.36	0.016

Sample Location: / Sample ID:	GPRI-GW-MW10	GPRI-GW-MW10	GPRI-GW-MW10	GPRI-GW-MW11	GPRI-GW-MW11	GPRI-GW-MW12	GPRI-GW-MW12	GPRI-GW-MW13	GPRI-GW-MW13	GPRI-GW-MW14	GPRI-GW-MW14	GPRI-GW-MW15	GPRI-GW-MW15
Other:			(D)										
Sample Date:	04/12/2000	07/19/2000	07/19/2000	04/12/2000	07/19/2000	04/11/2000	07/19/2000	04/11/2000	07/20/2000	04/11/2000	07/19/2000	04/11/2000	07/18/2000
Parameters													
TCL VOCs (ug/L) (a)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL SVOCs (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methanol (mg/L)	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
pH	7.02	6.98	6.94	7.08	7.13	7.07	7.11	7.06	7.09	7.00	7.21	7.12	7.26
Specific Conductance @ 25C	1310	1260	1270	1030	1030	972	938	1330	1340	1230	1150	910	914
TAL Total Metals (mg/L)													
Aluminum	1.1	< 0.050	< 0.050	1	< 0.050	0.097	0.27	0.097	1.7	< 0.05	<0.05	0.18	0.24
Antimony	<0.005	< 0.0050	< 0.0050	<0.005	< 0.0050	<0.0050	0.006	<0.005	0.024	<0.0050	<0.005	<0.005	0.012
Arsenic	0.015	0.02	0.011	0.024	0.015	0.023	0.01	0.033	0.036	0.022	0.011	0.003	< 0.0020
Barium	0.043	0.016	0.016	0.056	0.039	0.037	0.041	0.035	0.05	0.62	0.027	0.053	0.14
Beryllium	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.001	<0.001	< 0.001	<0.001	< 0.001	<0.001	< 0.0010	0.001
Cadmium	0.002	< 0.0010	< 0.0010	0.003	< 0.0010	< 0.001	<0.001	< 0.001	0.003	< 0.001	0.002	< 0.0010	0.003
Calcium	200	160	160	140	120	130	120	180	240	180	150	120	280
Chromium	0.013	0.002	< 0.0010	0.012	< 0.0010	0.007	0.002	0.001	0.017	< 0.001	<0.001	0.013	0.003
Cobalt	< 0.0050	0.008	0.008	0.006	< 0.0050	0.015	<0.005	< 0.005	0.036	0.025	<0.005	0.014	0.018
Copper	0.03	< 0.0050	< 0.0050	0.029	< 0.0050	< 0.005	<0.005	< 0.005	0.022	0.018	<0.005	0.015	< 0.0050
Iron	4	2.5	2.5	5.2	0.27	2.3	2.8	4.8	26	3.7	0.25	2	3.2
Lead	0.005	< 0.0020	< 0.0020	0.015	0.004	< 0.002	0.011	< 0.002	0.029	0.005	<0.002	0.005	0.003
Magnesium	47	40	41	42	36	39	35	57	70	53	42	42	54
Manganese	0.28	0.58	0.56	0.27	0.2	0.28	0.25	0.13	0.54	0.24	0.23	0.31	2.3
Mercury	<0.0002	< 0.00020	< 0.00020	<0.0002	< 0.00020	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.006
Nickel	< 0.010	< 0.010	< 0.010	0.015	< 0.010	< 0.01	<0.01	< 0.01	0.024	< 0.01	<0.01	0.013	0.012
Potassium	2.8	1.5	1.4	2.2	0.82	2.1	1.7	1.8	1.9	1.1	0.78	1.7	1.3
Selenium	0.016	< 0.0020	< 0.0020	< 0.0020	0.004	< 0.002	0.026	< 0.002	<0.002	< 0.002	<0.002	0.016	< 0.0020
Silver	0.001	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.001	<0.001	< 0.001	<0.001	< 0.0010	<0.001	< 0.001	< 0.0010
Sodium	14	12	12	8.6	10	7	6.5	6.2	6.6	15	8.6	6.4	9.1
Thallium	0.008	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.002	<0.002	< 0.002	<0.002	< 0.002	<0.002	< 0.002	< 0.0020
Vanadium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc	0.03	0.048	0.006	0.062	0.012	< 0.005	0.015	< 0.005	0.12	0.27	0.038	< 0.005	0.048
TAL Dissolved Metals (mg/L)													
Aluminum	<0.05	< 0.050	< 0.050	0.061	<0.050	< 0.050	<0.05	< 0.050	<0.05	0.071	<0.05	< 0.050	0.06
Antimony	0.006	0.014	< 0.0050	0.011	0.012	< 0.0050	<0.005	<0.005	0.02	< 0.0050	<0.005	< 0.0050	< 0.0050
Arsenic	0.017	0.013	0.013	0.022	0.021	0.017	0.015	0.025	0.027	0.015	<0.011	< 0.0020	0.003
Barium	0.59	0.019	0.016	0.6	0.043	0.65	0.031	0.39	0.025	0.025	0.03	0.69	0.045
Beryllium	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002
Cadmium	0.002	< 0.0010	< 0.0010	0.002	<0.001	< 0.0010	<0.001	0.001	<0.001	< 0.0010	<0.001	< 0.0010	< 0.0010
Calcium	170	170	150	140	130	130	120	190	180	170	150	120	110
Chromium	0.002	< 0.0010	< 0.0010	0.002	<0.001	< 0.0010	<0.001	< 0.0010	<0.001	0.019	<0.001	0.001	< 0.0010
Cobalt	<0.005	0.006	0.007	< 0.0050	<0.005	0.008	<0.005	< 0.0050	0.022	0.041	<0.005	0.011	< 0.0050
Copper	0.025	< 0.0050	< 0.0050	0.031	<0.005	< 0.0050	<0.005	< 0.0050	<0.005	0.015	<0.005	< 0.0050	< 0.0050
Iron	3.3	3.4	2.3	2.7	0.074	1.9	0.96	4.3	31	4.4	0.25	1.4	0.057
Lead	0.007	< 0.0020	< 0.0020	< 0.0020	<0.002	< 0.0020	0.007	< 0.0020	0.011	< 0.0020	0.008	0.003	0.004
Magnesium	48	44	37	39	38	37	35	57	52	51	44	40	44
Manganese	0.6	0.62	0.52	0.22	0.21	0.27	0.25	0.12	0.12	0.24	0.23	0.29	0.29
Mercury	<0.00020	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Nickel	<0.010	< 0.010	< 0.010	< 0.010	<0.010	< 0.010	<0.010	< 0.010	0.027	0.017	<0.01	< 0.010	< 0.010
Potassium	<0.0002	0.0002	1.3	1.3	0.94	1	1.7	1.1	1.8	1.9	0.93	0.92	0.79
Selenium	<0.002	< 0.0020	0.009	< 0.0020	0.006	< 0.0020	0.008	< 0.0020	<0.002	< 0.0020	0.005	< 0.0020	0.021
Silver	<0.001	< 0.0010	< 0.0010	< 0.0010	<0.0010	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	< 0.0010
Sodium	19	13	11	13	11	11	8.4	9.9	8.3	9.4	9.3	11	6
Thallium	0.011	< 0.0020	< 0.0020	< 0.0020	0.003	< 0.0020	<0.002	< 0.0020	<0.002	< 0.0020	<0.002	< 0.0020	< 0.0020
Vanadium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc	0.26	0.033	0.029	0.26	0.031	0.23	0.012	0.19	0.015	< 0.0050	0.025	0.21	0.016

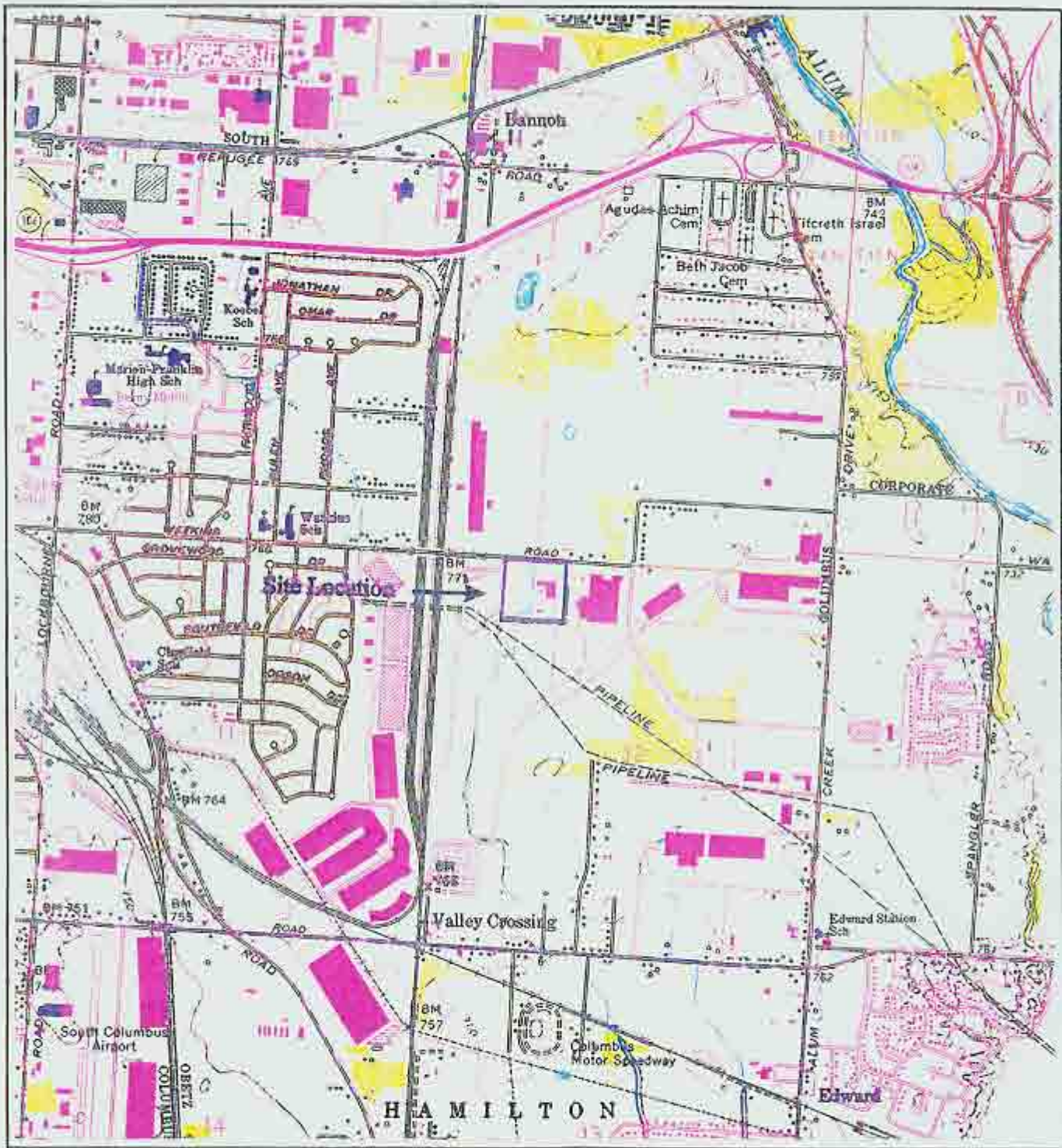
TABLE 3

Phase II RI Groundwater Data
Remedial Investigation Report
Georgia-Pacific Resins, Inc. Facility
Columbus, Ohio

Sample Location:	GPRI-GW-MW16		GPRI-GW-MW18				GPRI-GW-MW19				GPRI-GW-BP1		GPRI-GW-BP2		GPRI-GW-BP3		GPRI-EB-0412
Other:																	(Equipment Blank)
Sample Date:	07/18/2000	10/18/2000	04/11/2000	07/18/2000	10/19/2000	01/29/2001	04/11/2000	07/18/2000	10/19/2000	01/29/2001	04/11/2000	07/20/2000	04/11/2000	07/20/2000	04/11/2000	07/20/2000	4/12/00
Parameters																	
TCL VOCs (ug/L) (a)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL SVOCs (ug/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methanol (mg/L)	< 0.50	<2.0	< 0.50	< 0.50	<2.0	<1.0	< 0.50	< 0.50	<2.0	<1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.59
pH	7.15	7.35	7.08	7.08	6.92	6.90	7.02	7.06	6.96	7.14	6.99	7.12	7.24	7.09	7.24	7.10	4.20
Specific Conductance @ 25C	935	956	1190	1190	1330	1400	1100	1070	1140	1100	1150	1290	978	988	1050	1080	48.7
TAL Total Metals (mg/L)																	
Aluminum	0.82	2.7	1.4	0.36	1	4.5	0.39	0.28	0.66	1.8	0.25	0.21	0.19	0.79	0.86	0.22	< 0.50
Antimony	0.012	<0.0050	<0.005	0.018	<0.0050	<0.0050	<0.005	0.007	<0.005	0.0050	<0.005	<0.005	<0.005	0.009	<0.005	0.009	0.005
Arsenic	0.012	0.078	0.011	0.017	0.019	0.020	0.016	0.021	0.0037	0.044	0.017	<0.002	0.023	0.02	0.034	<0.002	0.011
Barium	0.081	0.13	0.058	0.068	0.05	0.12	0.054	0.063	0.088	0.10	0.039	0.084	0.048	0.049	0.08	0.086	< 0.010
Beryllium	0.001	<0.0010	< 0.0010	0.001	<0.0010	0.0030	< 0.0010	0.001	<0.0010	0.0040	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010
Cadmium	0.003	0.0021	0.002	0.003	<0.0010	0.0090	0.001	0.005	<0.0010	0.014	< 0.0010	<0.001	< 0.0010	<0.001	0.001	<0.001	0.002
Calcium	280	290	240	360	210	610	150	330	440	400	160	700	130	150	150	450	< 1.0
Chromium	0.003	0.022	0.045	0.002	0.0062	0.017	0.005	0.001	<0.0010	0.0030	0.004	0.001	0.002	0.006	0.011	0.001	0.003
Cobalt	0.018	0.017	0.027	0.007	<0.0050	<0.0050	0.007	0.008	0.005	<0.0050	0.005	0.014	< 0.0050	0.019	0.009	0.006	< 0.0050
Copper	<0.0050	0.018	0.019	< 0.0050	0.0083	<0.0050	0.043	< 0.0050	<0.0050	<0.0050	< 0.0050	<0.005	< 0.0050	0.007	0.03	<0.005	0.022
Iron	5.5	1.2	11	8.2	9.3	38	5.7	5.4	2.6	58	3.5	0.77	3.6	8.4	8.9	1.8	0.098
Lead	0.004	0.048	< 0.0020	0.003	0.0036	0.024	< 0.0020	0.01	<0.0020	0.047	< 0.0020	0.008	0.004	0.01	0.008	0.007	0.008
Magnesium	82	77	83	92	68	170	48	66	54	110	44	57	41	45	46	49	< 0.20
Manganese	1.3	1.2	0.68	1.5	0.5	2.4	0.18	1.4	1.6	2.1	0.38	2.8	0.1	0.22	0.2	1.3	< 0.0050
Mercury	< 0.0002	0.00032	<0.0002	< 0.00020	0.0003	<0.0002	<0.0002	< 0.00020	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020
Nickel	0.024	0.069	0.06	0.031	<0.010	0.017	< 0.010	0.028	0.018	<0.010	< 0.010	0.038	< 0.010	<0.01	0.012	0.026	< 0.010
Potassium	1.5	4.4	5.4	4.8	4.5	9.6	1.9	0.91	3.5	3.6	2.3	4.6	1.8-	1.5	2.1	2.9	<0.50
Selenium	0.018	<0.0020	< 0.0020	0.015	<0.0020	<0.0020	< 0.0020	0.008	<0.0020	< 0.0020	< 0.0020	0.01	< 0.0020	<0.002	< 0.0020	0.007	0.006
Silver	< 0.0010	<0.0010	< 0.0010	< 0.0010	<0.0010	<0.0010	< 0.0010	< 0.0010	<0.0010	<0.0010	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010
Sodium	9.4	13	9.2	11	11	12	5.7	9.1	6.9	6.4	8	10	5.9	5.5	6.2	6.4	< 1.0
Thallium	< 0.0020	<0.0020	< 0.0020	< 0.0020	<0.0020	<0.0020	< 0.0020	< 0.0020	<0.0020	0.0060	< 0.0020	<0.005	< 0.0020	<0.002	< 0.0020	0.01	0.009
Vanadium	<0.0050	0.0055	<0.0050	<0.0050	<0.0050	0.0060	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc	0.073	0.073	0.023	0.054	0.013	0.022	0.029	0.2	0.044	0.065	0.022	0.039	< 0.0050	0.035	0.06	0.081	0.04
TAL Dissolved Metals (mg/L)																	
Aluminum	< 0.050	<0.050	< 0.050	< 0.050	<0.050	<0.050	< 0.050	< 0.050	<0	< 0.050	< 0.050	<0.05	< 0.050	<0.05	< 0.050	<0.05	< 0.050
Antimony	0.01	<0.0050	< 0.0050	< 0.0050	<0.0050	<0.0050	< 0.0050	0.023	<0.050	0.0090	< 0.0050	0.027	< 0.0050	<0.005	< 0.0050	0.007	< 0.0050
Arsenic	0.008	0.045	0.006	0.009	0.018	0.011	0.024	0.019	0.035	0.011	0.019	0.046	0.028	0.022	0.021	0.022	< 0.0020
Barium	0.036	0.14	0.48	0.035	0.72	0.043	0.64	0.032	0.4	0.041	0.65	0.033	0.65	0.039	0.65	0.039	0.17
Beryllium	0.001	<0.0010	<0.0010	0.001	<0.0010	0.0030	<0.0010	0.001	<0.0010	0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Cadmium	< 0.0010	<0.0010	< 0.0010	< 0.0010	<0.0010	<0.0010	0.001	< 0.0010	<0.0010	< 0.0010	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010
Calcium	110	130	160	140	180	190	150	130	150	140	160	180	130	120	140	130	< 1.0
Chromium	< 0.0010	<0.0010	< 0.0010	< 0.0010	<0.0010	<0.0010	< 0.0010	< 0.0010	0.031	< 0.0010	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	<0.001	0.001
Cobalt	< 0.0050	<0.0050	0.007	< 0.0050	<0.0050	<0.0050	< 0.0050	< 0.0050	<0.0050	< 0.0050	< 0.0050	<0.005	< 0.0050	0.014	< 0.0050	<0.005	< 0.0050
Copper	< 0.0050	<0.0050	< 0.0050	< 0.0050	<0.0050	<0.0050	< 0.0050	< 0.0050	<0.0050	< 0.0050	< 0.0050	<0.005	< 0.0050	<0.005	< 0.0050	<0.005	0.023
Iron	0.18	1.2	2.9	0.051	4.9	0.061	3.5	0.11	1.3	<0.030	2.7	0.083	2.9	1.3	2.9	0.34	0.07
Lead	0.008	<0.0010	< 0.0020	0.005	<0.0010	<0.0050	< 0.0020	< 0.0020	<0.0010	< 0.0010	< 0.0020	0.007	< 0.0020	0.01	< 0.0020	0.01	0.007
Magnesium	40	37	47	53	54	56	46	48	47	46	43	45	41	38	44	41	< 0.20
Manganese	0.33	0.33	0.32	0.29	0.37	0.43	0.13	0.13	0.13	0.17	0.34	0.37	0.09	0.087	0.096	0.095	0.065
Mercury	<0.00020	0.0003	<0.00020	<0.00020	0.0003	0.00026	<0.00020	<0.00020	0.0002	0.00080	<0.00020	0.0003	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Nickel	< 0.010	0.014	< 0.010	0.011	<0.010	0.012	< 0.010	< 0.010	0.013	< 0.010	< 0.010	<0.010	< 0.010	<0.01	< 0.010	<0.010	< 0.010
Potassium	1	1.6	2.7	4.8	2.6	6.6	0.88	< 0.50	0.95	2.8	1.1	3.2	1.2	1.4	0.98	2	0.65
Selenium	0.009	<0.0020	< 0.0020	0.006	<0.0020	<0.0020	< 0.0020	< 0.0020	<0.0020	0.0030	< 0.0020	0.018	< 0.0020	<0.002	< 0.0020	0.006	0.017
Silver	< 0.0010	<0.0010	< 0.0010	< 0.0010	<0.0010	<0.0010	< 0.0010	0.002	<0.0010	< 0.0010	< 0.0010	<0.001	< 0.0010	<0.001	< 0.0010	0.001	< 0.0010
Sodium	6.5	13	14	8.4	17	14	10	4.8	12	10	12	11	10	6.3	10	7.2	5.8
Thallium	< 0.0020	<0.0020	< 0.0020	< 0.0020	<0.0020	<0.0020	< 0.0020	> 0.0020	<0.0020	< 0.0020	< 0.0020	<0.002	< 0.0020	<0.002	< 0.0020	0.005	0.008
Vanadium	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Zinc	0.016	0.17	0.23	0.008	0.27	0.036	0.23	0.011	0.28	0.0056	0.22	0.01	0.18	0.009	0.23	0.012	0.13

a/ ug/L = micrograms per liter; mg/L = milligrams per liter.
b/ NA = Sample not analyzed for identified parameter
ND = Chemical parameters of interest not detected above the method detection limits
D = Duplicate.

FIGURES



Reference

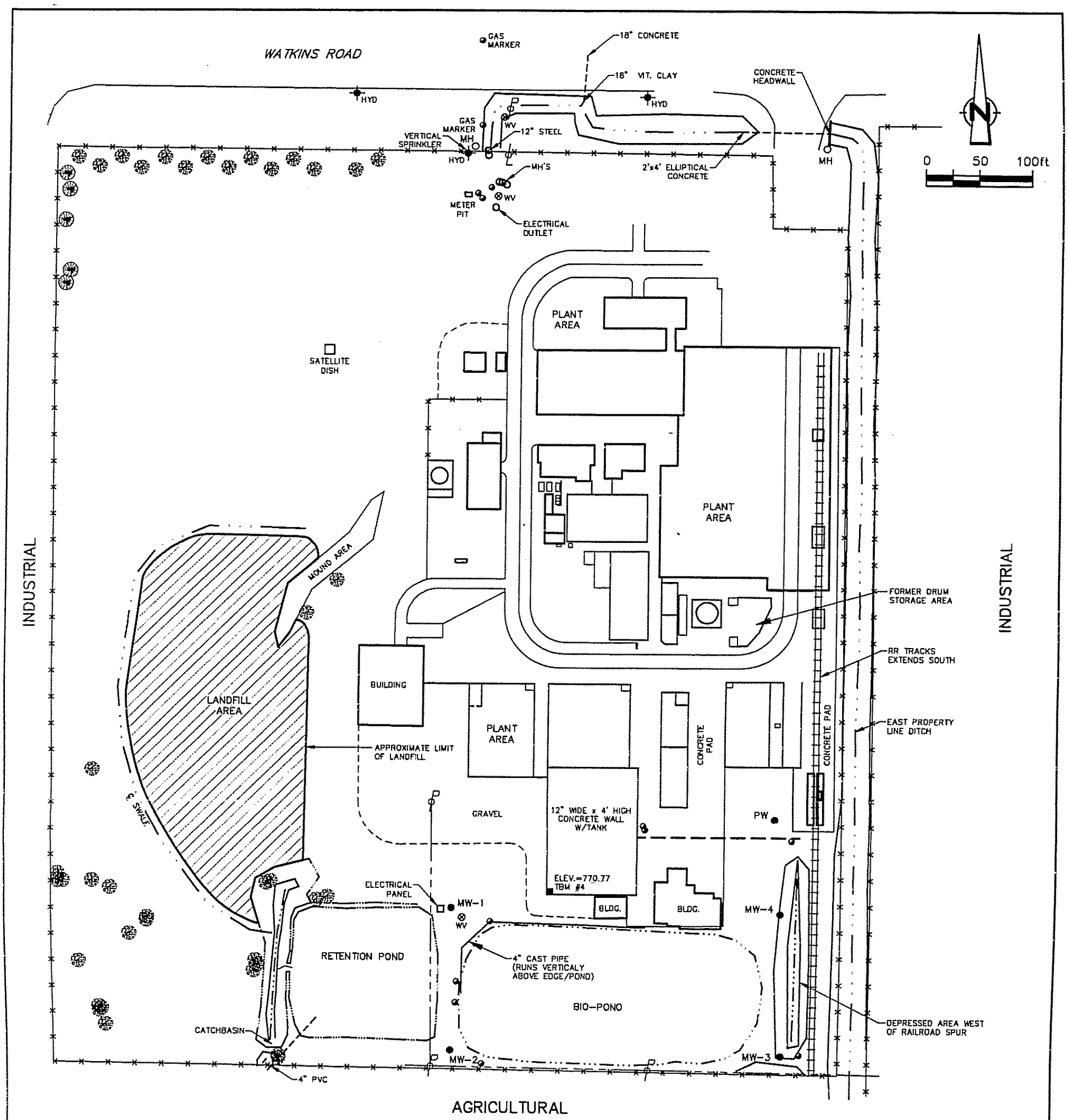
USGS 7.5 Minute Topographic Quadrangle, Southeast Columbus, Ohio, Dated 1964, Revised 1994. Scale 1:24,000

Quadrangle Location

0 2000 4000
Scale in Feet

ENVIRONMENTAL STRATEGIES CORPORATION
4 Penn Center West, Suite 315
Pittsburgh, Pennsylvania 15276
412-787-5100

Figure 1
Site Location
Georgia-Pacific Resins, Inc. Facility
Columbus, Ohio



LEGEND

- CHAIN LINK FENCE
- CENTERLINE OF WATER FLOW
- POWER LINE
- APPROX. FORMER LOCATION OF TANK B5 PIPELINE
- LIGHT POLE
- POWER POLE
- ELEV. = 770.77 TBM #4 — BENCHMARK
- HYD — FIRE HYDRANT
- WV — WATER VALVE
- STEEL POST
- DECIDUOUS TREE
- CONIFEROUS TREE
- MH — SANITARY MANHOLE
- MW-1 — SHALLOW MONITORING WELL
- PW — PLANT WELL

SURVEY NOTES:

A FIELD SURVEY OF THE PREMISES WAS PERFORMED BY WOOLPERT, COLUMBUS, OHIO, IN JANUARY, 1995.

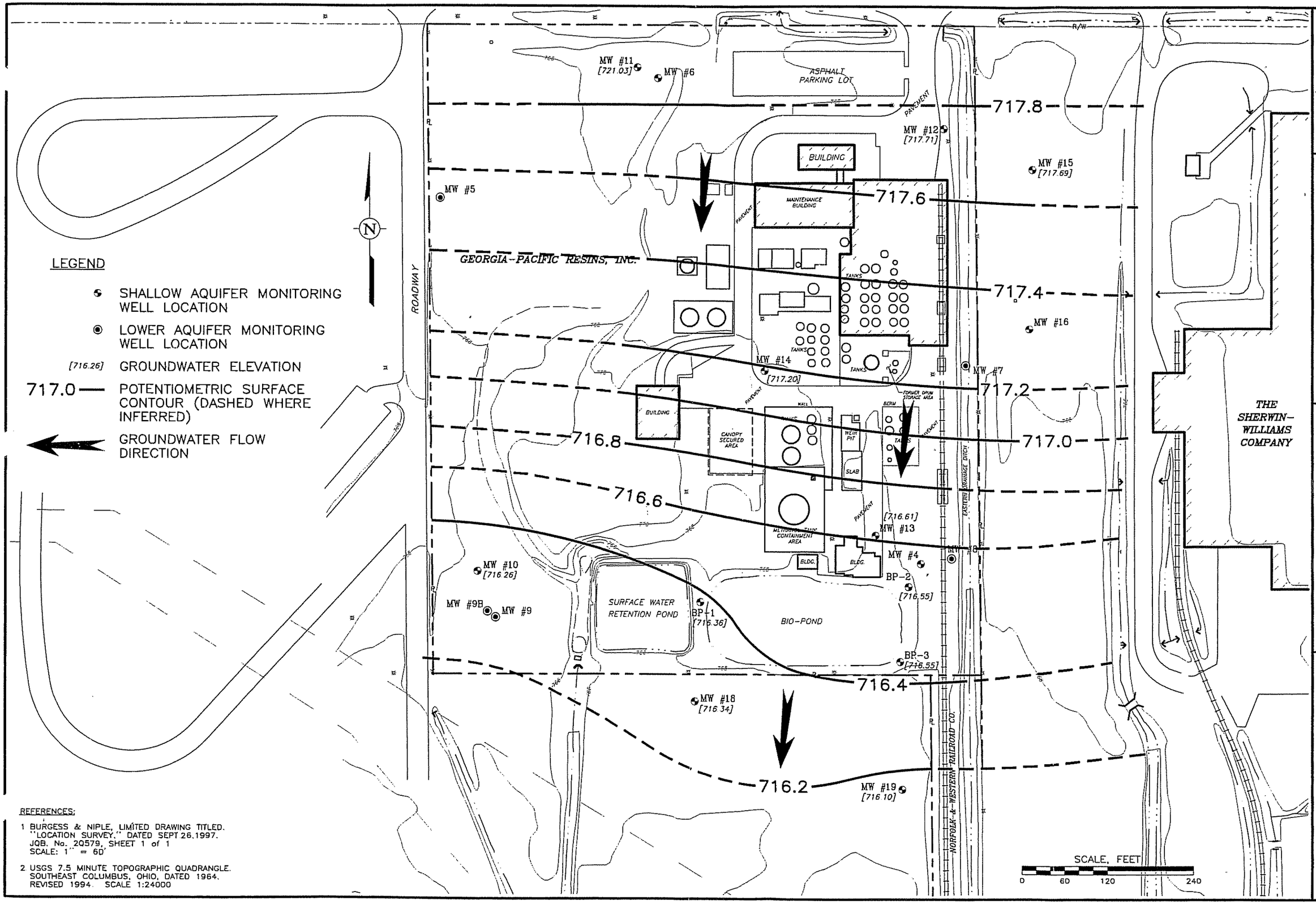
PLANT AREA NOT TO SCALE.

FIGURE 2

SITE PLAN LAYOUT - MANUFACTURING OPERATIONS
GEORGIA-PACIFIC RESINS, INC.
Columbus, Ohio

CRA

6127 (6) NOV 28/96(W) REV.0 (P-13)



REFERENCES:

1 BURGESS & NIPLE, LIMITED DRAWING TITLED. "LOCATION SURVEY," DATED SEPT 26,1997. JOB. No. 2Q579, SHEET 1 of 1 SCALE: 1" = 60'

2 USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE. SOUTHEAST COLUMBUS, OHIO, DATED 1964. REVISED 1994. SCALE 1:24000

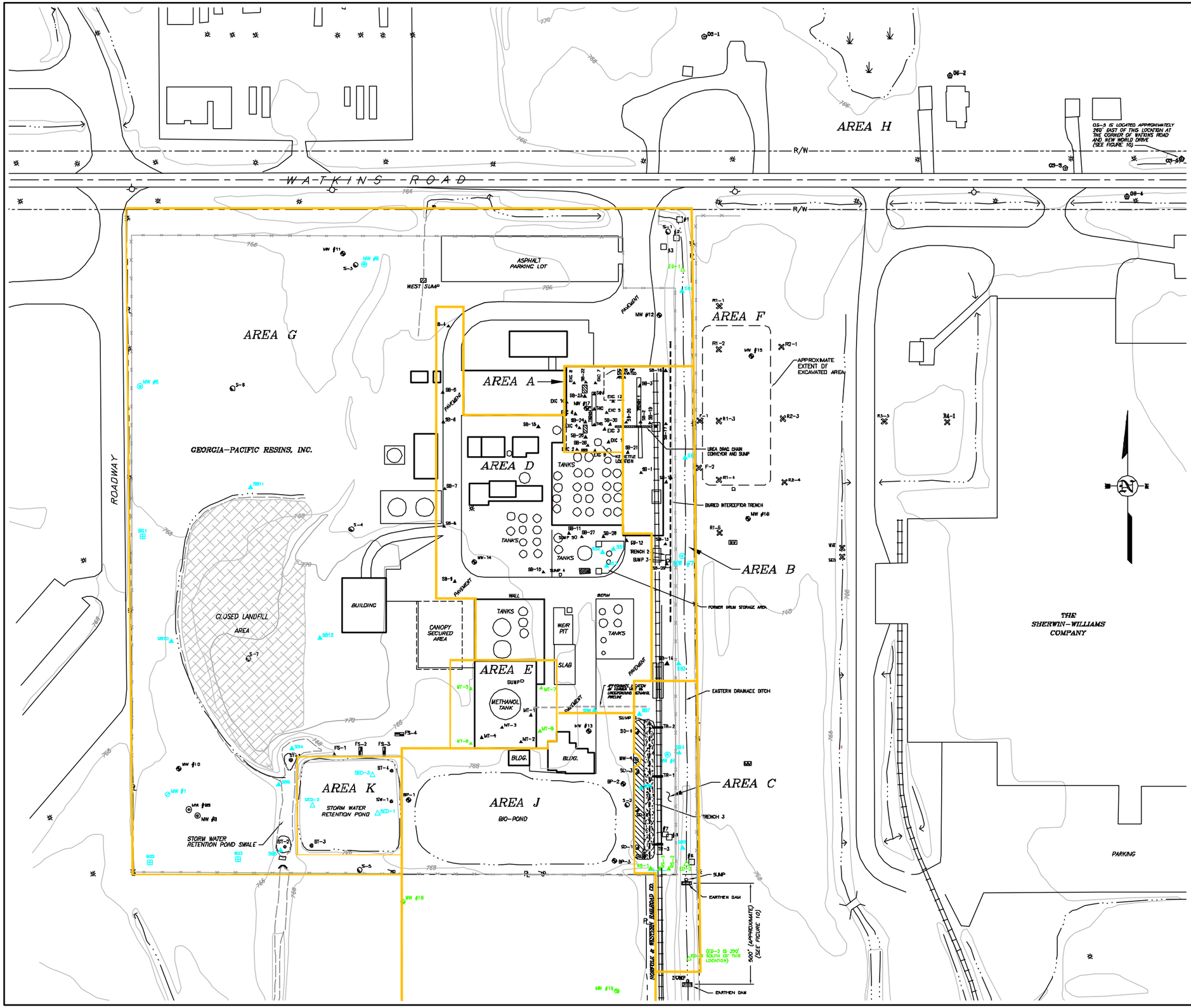
Drawn By: RZ 091800
Checked:
Approved:
DWG Name: 466135-B01

GEORGIA-PACIFIC RESINS, INC. FACILITY
COLUMBUS, OHIO
PREPARED FOR
GEORGIA-PACIFIC CORPORATION
ATLANTA, GEORGIA

FIGURE 3
POTENTIOMETRIC SURFACE MAP
SHALLOW AQUIFER (APRIL 10, 2000)

ENVIRONMENTAL STRATEGIES CORPORATION
Four Penn Center West, Suite 315
Pittsburgh, Pennsylvania 15276
(412) 787-5100
ESC

TMT X:\PROJ\96 466135\466135B01.dwg 11:26, 2000 10:04a



LEGEND

- MW #1D — SHALLOW AQUIFER MONITORING WELL LOCATION
- MW #5 — LOWER AQUIFER MONITORING WELL LOCATION
- MW-4 — DETECTION MONITORING WELL LOCATION
- NW — EXISTING SHERWIN-WILLIAMS MONITORING WELL LOCATION
- PRE-EXISTING SUMP
- SUMP — EMERGENCY RESPONSE SUMP
- TR-1 — TEMPORARY RECOVERY TRENCH LOCATION
- TRENCH 1 — EXPLORATORY OR COLLECTION TRENCH
- SOIL BORING SAMPLE LOCATION
- #5 — GPRI SURFACE WATER AND SOIL SAMPLE LOCATION
- TP-3 — TEST PIT LOCATION
- SW-2 — SURFACE WATER SAMPLE LOCATION
- ED-1 — CONFIRMATORY SOIL SAMPLE LOCATION
- F-1 — SHERWIN-WILLIAMS SOIL, SEDIMENT, AND SURFACE WATER SAMPLE LOCATIONS
- OS-1 — OFFSITE SURFACE SOIL SAMPLE LOCATION
- ED-1 — SEDIMENT SAMPLE LOCATION
- S-1 — SURFACE SOIL SAMPLE LOCATION
- SWALE

AREAS OF INVESTIGATION:

AREA A– RESIN PROCESS KETTLE AREA
AREA B– RESIN PROCESS TRUCK BAY/ NORTHERN RAILROAD SPUR AREA
AREA C– SOUTHERN RAILROAD SPUR AREA
AREA D– GPRI PLANT AREA (OUTSIDE OF RESIN PROCESS KETTLE AREA)
AREA E– METHANOL TANK CONTAINMENT AREA
AREA F– SHERWIN-WILLIAMS AREA
AREA G– GPRI ANCILLARY AREAS
AREA H– NORTHERN OFFSITE AREA
AREA I– GROUNDWATER (NOT SHOWN ON MAP)
AREA J– BIO-POND
AREA K– STORM WATER RETENTION POND

NOTES:

1. THE LOCATIONS EVALUATED DURING THE PHASE I RI ARE PRESENTED IN BLUE.
2. THE LOCATIONS EVALUATED DURING THE EMERGENCY RESPONSE ACTIVITIES ARE PRESENTED IN BLACK.
3. THE LOCATIONS EVALUATED DURING THE PHASE II RI ARE PRESENTED IN GREEN.
4. MONITORING WELLS ARE PRESENTED IN THE COLOR WHICH CORRESPONDS TO THE PHASE OF WORK DURING WHICH THE WELLS WERE COMPLETED.

REFERENCE:
BURGESS & NIPLE, LIMITED DRAWING TITLED, "LOCATION SURVEY," DATED SEPT.26,1997, JOB. No. 20579, SHEET 1 of 1, SCALE 1" = 60'

SCALE, FEET
60 30 0 60 120

REVISIONS

REV.	DATE	DESCRIPTION	BY
–	–	–	

SEAL

DRAWN BY: AC 111500
CHECKED
APPROVED

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REMEDIAL INVESTIGATION AREAS OF INTEREST AND SITE STABILIZATION LOCATIONS

GEORGIA-PACIFIC RESINS, INC. FACILITY
COLUMBUS, OHIO

PREPARED FOR
GEORGIA-PACIFIC CORPORATION
ATLANTA, GEORGIA

ENVIRONMENTAL STRATEGIES CORPORATION
Four Penn Center West
Suite 315
Pittsburgh, PA 15276
(412) 787-5100
ESC

Figure 5

Drawing Number
466135-D02

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APPENDIX A

Human Health Risk Memo for Georgia Pacific Resins

State of Ohio Environmental Protection Agency

Interoffice Memorandum

To: David O'Toole, CDO-DERR Date: 10 February 2004

From: Janusz Z. Byczkowski, DERR, CO

Subject: Human Health Risk Assessments for the Georgia Pacific Resins, Inc.

According to your additional request of 2/05/2003, I re-assessed the human health hazards and cancer risk for the Georgia Pacific Resins, Inc. (*Columbus, OH, Franklin County, Ohio EPA #125-0332*). This evaluation includes the new information that you have provided:

The COCs -

Formaldehyde
Methanol
Phenol

The affected media -

Soil
Ground water

The most sensitive human receptors -

Hypothetical and future on-Site Residents

This risk assessment includes two "what-if" scenarios. The first assumes that after the accident, no emergency clean-up had been performed and the site has been open to residential settlement (Table 1). The second risk assessment (Table 2) estimates, under current conditions, the residual risk to a hypothetical future resident following the cleanup and the Site reconstruction.

Please note, that from the previous review of the "Remedial Investigation Report" it seems that if the Site would be redeveloped in the future, it is possible that the current ground cover would be removed. If this were to happen, direct exposure of the future on-Site construction workers to contaminated soil (surficial and deeper, depending on the type of construction) and perched ground water may occur. The potential routes of exposure may include: incidental ingestion, dermal contact, and inhalation of particles and vapors. In such cases, additional risk assessment may be needed in the future, to assist in decisions regarding management of the Site.

Human Health Risk Assessment:

A conceptual Site model is presented in the Figure 1 (attached as Abbreviated Template.XLS). The adult on-Site resident was selected as the most sensitive receptor to oral, dermal, and inhalation exposures and a child resident as the receptor with the

highest rate of soil ingestion. Using this model, the following hazard quotients (HQ) were estimated for soil, ground water and aggregate exposures to chemicals of concern in these media (HI):

COC	Soil (HQ)	G.Water (HQ)	HI (Soil + GW)
If no remediation was performed (status before emergency cleanup):			
FORMALDEHYDE	5.7E-4	ND	5.7E-4
METHANOL	6.5E-3	1.2E+0	1.2E+0
PHENOL	3.5E-1	1.2E+0	1.6E+0
Residual risk (status after emergency cleanup):			
FORMALDEHYDE	1.4E-4	ND	1.4E-4
METHANOL	ND	ND	N/A
PHENOL	1.0E-3	ND	1.0E-3

N/A - not applicable; ND - not detected.

The excess cancer risk (ECR = 5.5E-7 before remediation and 1.4E-7 after emergency cleanup), quantifiable for hypothetical exposure to formaldehyde in soil, was below the *de minimis* level (1E-6).

The detailed list of human health risk assessment assumptions and calculations is included in the Appendix. The Abbreviated Template used for additive risk calculation is attached as a spreadsheet in MS Excel (*.XLS) format.

The hazard quotients for methanol and phenol before remediation, each exceeded the hazard goal value of 1. The contribution of formaldehyde to cumulative health hazards and risk of cancer was negligible. Since phenol and methanol affect different target tissues causing different "critical effects", there was no need to calculate a cumulative hazard index (HI) for this Site. After remediation, all hazard quotients were below unity.

The possible, potential adverse human health effects that may be caused by adequately elevated and relevant intakes of methanol and phenol include, but are not limited to hepato- and neuro-toxicity (for methanol) and digestive tract disturbance (such as diarrhea and mouth sores), maternal- and/or feto-toxicity (for phenol).

Uncertainty:

a) These estimates have been calculated for two hypothetical "what if" cases and do not address any real-life situation.

b) Since the reported concentration of phenol in soil before emergency cleanup was measured in a sample of excavated and removed soil, this risk assessment does not address elevated health hazards from possible hot spots that might have been present before remediation.

c) It is not clear if lack of information on concentration of methanol in soil after remediation is because methanol concentration was below detectable limit or because it was not measured in this area of concern (or simply not reported).

d) Since hazard indices calculated for this Site before emergency cleanup were driven by contaminants in ground water, while those calculated after cleanup depended only on residues in soil, any quantitative comparison of the status before and after remediation may be problematic.

APPENDIX B

Human Health Risk Assessment Assumptions and Calculations for Appendix A

Two sets of data for soil and ground water were used as provided by David O'Toole Georgia Pacific Resins Sampling Results Memo dated 12/08/03, and then, updated on 02/05/04 to focus the assessment in the plant explosion area. As a health-protective measure, the maximum detected COC concentrations were used in the risk calculation:

1) Before emergency cleanup; and
2) After plant cleanup and reconstruction.

Human health hazard and carcinogenic risk were calculated as described in U.S. EPA Risk Assessment Guidance for Superfund (RAGS, Volume 1, Human Health Evaluation Manual (Part A), Appendix A, EPA/540/1-89/002. Available on-line: http://www.epa.gov/superfund/programs/risk/ragsa/index.htm), using defaults for residential exposure scenario, provided by Risk Assessment Information System (Available on-line: http://risk.lsd.ornl.gov/CRE/tutorial.shtml).

The adult on-Site resident was selected as the most sensitive receptor with the resident child considered to be the most exposed receptor, because of the highest ingestion rate of soil. The complete exposure pathways included desorption of COCs from the contaminated soil and direct contact (ingestion, inhalation, and dermal exposures), as well as, infiltration and percolation to ground water followed by ingestion and dermal exposures (Figure 1).

The following COCs toxicity values were used in human health risk assessment:
The Inhalation Slope Factor was calculated from inhalation unit risk as described in Supplemental Guidance for RAGS: Region 4 Bulletins, Human Health Risk Assessment (Interim Guidance) (Nov. 1995).

The Data are current as of January 2004

Toxicity Values and Chemical-Specific Factors You Selected:

NOTE: If this page is too wide to print, try selecting a smaller font or printing in landscape mode.

Chemical	CAS #	Dermal RfD - Chronic (mg/kg-day)	Dermal SF $(mg/kg\text{-}day)^{-1}$	Inhalation RfD - Chronic (mg/kg-day)	Oral RfD - Chronic (mg/kg-day)	Inhalation SF $(mg/kg\text{-}day)^{-1}$	Oral SF $(mg/kg\text{-}day)^{-1}$
Formaldehyde	50000	1.60E-01			2.00E-01	4.55E-02 u	
Methanol	67561	4.00E-01			5.00E-01		
Phenol	108952	2.70E-01			3.00E-01		

Table 1: Concentrations of COCs after explosion but before cleanup.

	Soil (mg/kg)	Ground Water (mg/L)
Formaldehyde	8.3	ND
Methanol	250.0	22.0
Phenol	7800.0	13.0

Enter a Concentration:

CAS Number/Analyte	Units - Media - Anatype	Concentration
50000 - Formaldehyde - Organic	mg/L -- Water	
	mg/kg -- Soil	8.3
	mg/kg -- Food	
67561 - Methanol - Organic	mg/L -- Water	22
	mg/kg -- Soil	250
	mg/kg -- Food	
108952 - Phenol - Organic	mg/L -- Water	13
	mg/kg -- Soil	7800
	mg/kg -- Food	

Residential/SOIL/Dermal

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Body Weight = 70 kgs
- Surface Area = 0.53 m^2
- Adherence Factor = 1 unitless

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Formaldehyde	50000	8.3E+00	.	3.8E-05	2.6E-06	6.0E-06
Methanol	67561	2.5E+02	.	4.5E-04	7.8E-05	1.8E-04
Phenol	108952	7.8E+03	.	2.1E-02	2.4E-03	5.7E-03

Residential/SOIL/Ingestion - Adult

Your results were calculated using the following variables:

- Exposure Frequency = 350 events/year
- Exposure Time = 24 (hours/day)
- Adult Body Weight = 70 kgs
- Child Body Weight = 15 kgs
- Adult Ingestion Rate = 0.0001 kg/day
- Child Ingestion Rate = 0.0002 kg/day
- Adult Exposure Duration = 24 years
- Child Exposure Duration = 6 years

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Formaldehyde	50000	8.3E+00	.	5.7E-05	1.3E-05	1.1E-05
Methanol	67561	2.5E+02	.	6.8E-04	3.9E-04	3.4E-04
Phenol	108952	7.8E+03	.	3.6E-02	1.2E-02	1.1E-02

Residential/SOIL/Ingestion - Child

Your results were calculated using the following variables:

- Exposure Frequency = 350 events/year
- Exposure Time = 24 (hours/day)
- Adult Body Weight = 70 kgs
- Child Body Weight = 15 kgs
- Adult Ingestion Rate = 0.0001 kg/day
- Child Ingestion Rate = 0.0002 kg/day
- Adult Exposure Duration = 24 years
- Child Exposure Duration = 6 years

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Formaldehyde	50000	8.3E+00	.	5.3E-04	1.3E-05	1.1E-04
Methanol	67561	2.5E+02	.	6.4E-03	3.9E-04	3.2E-03
Phenol	108952	7.8E+03	.	3.3E-01	1.2E-02	1.0E-01

Residential/SOIL/Inhalation

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Exposure Time = 24 (hours/day)
- Body Weight = 70 kgs
- Inhalation Rate = 20 m^3/day

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Formaldehyde	50000	8.3E+00	5.5E-07	.	4.2E-05	9.9E-05
Methanol	67561	2.5E+02	.	.	3.2E-03	7.4E-03
Phenol	108952	7.8E+03	.	.	6.7E-03	1.6E-02

Residential/WATER/Dermal

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Exposure Time = 0.25 (hours/day)
- Body Weight = 70 kgs
- Surface Area = 1.94 m^2

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Methanol	67561	2.2E+01	.	1.3E-03	2.2E-04	5.0E-04
Phenol	108952	1.3E+01	.	1.8E-02	2.0E-03	4.8E-03

Residential/WATER/Ingestion

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Body Weight = 70 kgs
- Ingestion Rate = 2 kg/d

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Methanol	67561	2.2E+01	.	1.2E+00	2.6E-01	6.0E-01
Phenol	108952	1.3E+01	.	1.2E+00	1.5E-01	3.6E-01

Residential/WATER/Inhalation

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Body Weight = 70 kgs
- Inhalation Rate = 20 m^3/day

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Methanol	67561	2.2E+01	.	.	1.3E+00	3.0E+00
Phenol	108952	1.3E+01	.	.	.	.

Table 2: Concentrations of COCs after plant cleanup and reconstruction.

	Soil (mg/kg)	Ground Water (mg/L)
Formaldehyde	2.1	ND
Methanol	ND	ND
Phenol	22.5	ND

Enter a Concentration:

CAS Number/Analyte	Units - Media - Anatype	Concentration
50000 - Formaldehyde - Organic	mg/L -- Water	
	mg/kg -- Soil	2.1
	mg/kg -- Food	
67561 - Methanol - Organic	mg/L -- Water	
	mg/kg -- Soil	
	mg/kg -- Food	
108952 - Phenol - Organic	mg/L -- Water	
	mg/kg -- Soil	22.5
	mg/kg -- Food	

Residential/SOIL/Dermal

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Body Weight = 70 kgs
- Surface Area = 0.53 m^2
- Adherence Factor = 1 unitless

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Formaldehyde	50000	2.1E+00	.	9.5E-06	6.5E-07	1.5E-06
Phenol	108952	2.3E+01	.	6.1E-05	7.0E-06	1.6E-05

Residential/SOIL/Inhalation

Your results were calculated using the following variables:

- Exposure Duration = 30 years
- Exposure Frequency = 350 events/year
- Exposure Time = 24 (hours/day)
- Body Weight = 70 kgs
- Inhalation Rate = 20 m^3/day

Your results are:

Nonradionuclides

Parameter	CAS Number	Concentration	Risk	Hazard	Carcinogenic CDI	Noncarcinogenic CDI
Formaldehyde	50000	2.1E+00	1.4E-07	.	1.1E-05	2.5E-05
Phenol	108952	2.3E+01	.	.	1.9E-05	4.5E-05

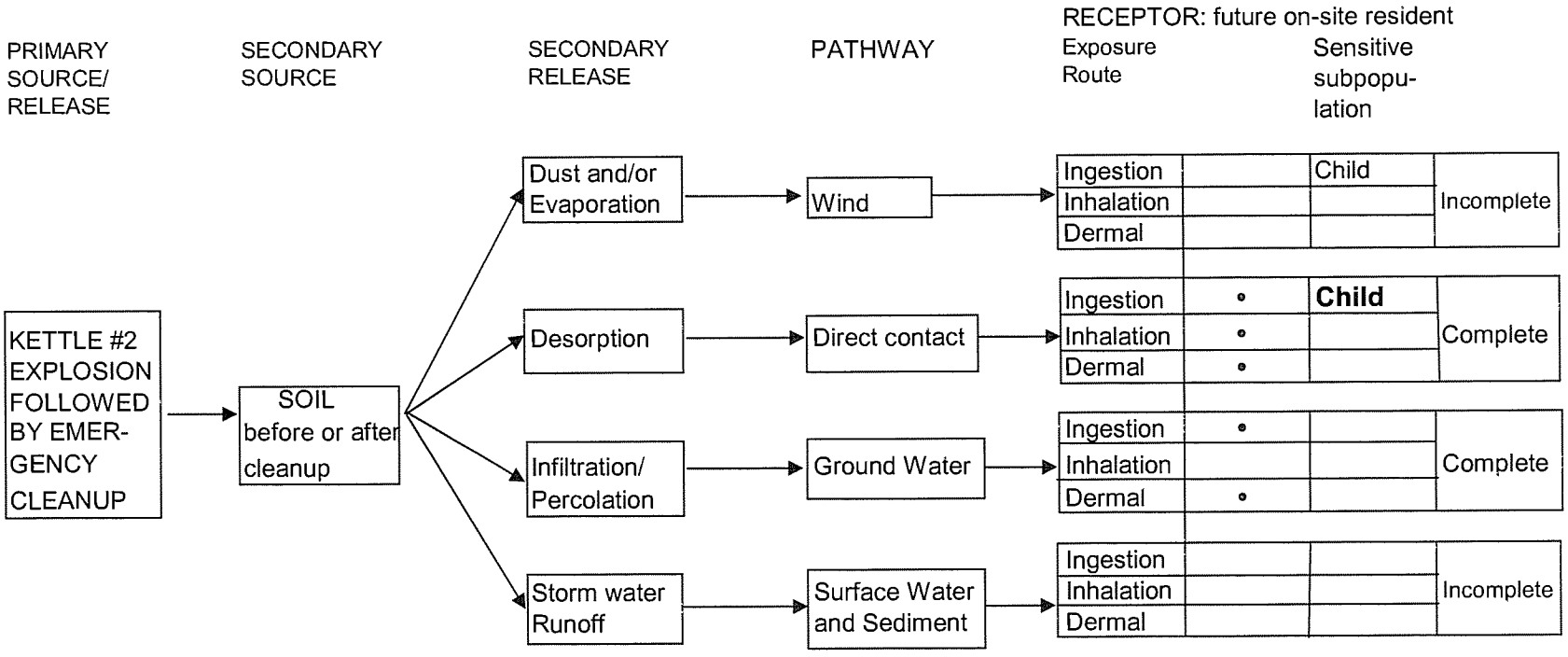
Table 3: COCs toxicity characteristics and estimates of cumulative and aggregate human health risks.

Chemical	CAS #	EPA Cancer Class	Inhalation Study Reference	Inhalation Target Organ	Inhalation Tumor	RfD Basis	RfD Critical Effect	RfD Study Reference	RfD Target Organ
Formaldehyde	50000	B1	Kerns et al.	nasal cavity	squamous cell carcinoma	NOALE/LOAEL	reduced weight gain, histopathology	Til et al.	
Methanol	67561					NOEL/LOAEL	increased SAP and SGPT, decreased brain weight	U.S. EPA	
Phenol	108952	D				BMDL	decreased maternal weight gain	Argus Research Laboratories	

APPENDIX C

Spreadsheet of Risk Assessment Assumptions and Calculations

Figure 1. Georgia - Pacific Resins, Inc. **Conceptual Site Model**



COCs:
FORMALDEHYDE
METHANOL
PHENOL

ADDITIVE RISK CALCULATION ABBREVIATED SPREADSHEET: Georgia - Pacific Resins, Inc.

Before emergency cleanup

		SOIL			Soil	GROUND WATER		GW	Soil + GW	
		Ingestion*	Inhalation	Dermal	Aggregate	Ingestion	Dermal	Aggregate	Aggregate	
FORMALDEHYDE	HQ	5.30E-04		3.80E-05	5.68E-04				5.68E-04	Formaldehyde
	CA Risk		5.50E-07						**5.50E-07**	CA**
METHANOL	HQ	6.40E-03		4.50E-05	6.45E-03	1.20E+00	1.30E-03	1.20E+00	1.21E+00	Methanol
PHENOL	HQ	3.30E-01		2.10E-02	3.51E-01	1.20E+00	1.80E-02	1.22E+00	**1.57E+00**	Phenol
					Cumulative			Cumulative	**1.21E+00**	
					7.01E-03			N/A		

* Resident child

** Cancer endpoint by inhalation only

After emergency cleanup

		SOIL			Soil	GROUND WATER		GW	Soil + GW	
		Ingestion*	Inhalation	Dermal	Aggregate	Ingestion	Dermal	Aggregate	Aggregate	
FORMALDEHYDE	HQ	1.30E-04		9.50E-06	1.40E-04				1.40E-04	Formaldehyde
	CA Risk		1.40E-07						**1.40E-07**	CA**
METHANOL	HQ									
PHENOL	HQ	9.60E-04		6.10E-05	1.02E-03				**1.02E-03**	Phenol
					Cumulative			Cumulative	**1.40E-04**	
					N/A			N/A		

* Resident child

** Cancer endpoint by inhalation only