

ENVIRONMENTAL REVIEW TRIBUNAL

**BAKER et al. v. DIRECTOR
MINISTRY OF THE ENVIRONMENT**

In the matter of appeals by Neil W. Baker, Mark Emery, Gordon Flatt, Glenn E. Hess, Donald K. Jackson, David A. Rattee, Greg A. Schindler, Wayne E. Shaw, Michael J. Tkach, James D. Wallace and Colin D. Watson filed on November 30, 2012 and by Craig A. Yuen filed on December 7, 2012 for a hearing before the Environmental Review Tribunal pursuant to section 140 of the *Environmental Protection Act*, R.S.O. 1990, c. E.19, as amended; with respect to Director's Order No. 5866-8WKU92 issued by the Director, Ministry of the Environment, on November 14, 2012 under sections 17, 18 and 196 of the *Environmental Protection Act*, requiring certain work be undertaken at, and in the vicinity of, a site located at 695 Bishop Street North, Cambridge.

**WITNESS STATEMENTS OF THE
DIRECTOR, MINISTRY OF THE ENVIRONMENT**

September 27, 2013

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ENVIRONMENTAL REVIEW TRIBUNAL

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WITNESS STATEMENT of PHIL SHEWEN

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Background

1. I am a Senior Environmental Officer employed at the Guelph District Office, West Central Region, of the Ministry of the Environment ("MOE"). I have been employed by the MOE since 1998.
2. As Senior Environmental Officer, my duties include dealing with contaminated sites by identifying the responsible parties and requiring them to assess, abate and prevent potential adverse effects related to the contamination.
3. Since October 2004, I have been directly involved with the environmental contamination at and in the vicinity of Northstar Aerospace (Canada) Inc.'s ("Northstar Canada") property at 695 Bishop Street North in Cambridge, Ontario (the "Site").

4. I have no personal interest in the outcome of this appeal. I intend to appear before the Tribunal and be subject to direct and cross examination. My evidence will be both factual and opinion within the limits of my professional experience.

Northstar Aerospace, Inc. and Northstar Canada

5. Northstar Aerospace Inc. was incorporated in Ontario in 1984 under the name Derlan Industries Limited. In 2002, it changed its name to Northstar Aerospace, Inc. ("Northstar Inc."). Its executive office was in Illinois, USA.
6. Northstar Aerospace (Canada) Inc. ("Northstar Canada") was incorporated in Ontario in 1981 under the name Havlik Technologies Inc. In 2002, it changed its name to Northstar Aerospace (Canada) Inc.
7. Northstar Canada was an operating subsidiary of Northstar Inc. Northstar Inc. owned 100% of the voting shares of Northstar Canada.
8. The appellants were directors and/or officers of Northstar Canada and/or Northstar Aerospace at some point since 2004 when the environmental contamination at or in the vicinity of the Site was discovered. The following table summarized which company they were a director and/or officer of and over what period:

Name	Position in Northstar Inc.	Position in Northstar Canada
Glenn E. Hess	Director (2008 – 2012) President & CEO (2008 – 2012)	President & CEO (2008 – 2012)
Craig A. Yuen	Secretary (2005 – 2012) CFO (2007 – 2009 and 2012) VP (2012)	Director (2008 – 2010 & 2012) VP & Secretary (2008 – 2012) CFO (2012)
Greg A. Schindler	CFO (2009 – 2012)	Director (2010 – 2012) CFO (2009 – 2012)
Michael J. Tkach	Director (2007 – 2012) President & CEO (2008)	
Gordon Flatt	Director (2001 – 2012)	
David A. Rattee	Director (1985 – 2012) Chairman (2011 – 2012)	Director (2011 – 2012) Chairman (2011 – 2012)
James D. Wallace	Director (1984 – 2012)	
Neil W. Baker	Director (2009 – 2012)	
Donald K. Jackson	Director (1984 – 2011) Chairman (2003 – 2011)	Director (2008 – 2011) Chairman (2008 – 2011)
Colin D. Watson	Director (2001 – 2011)	
Mark Emery	Director (2003 – 2007) President & CEO (2003 – 2007)	Director (2006 – 2007) President & CEO (2006 – 2007)

Wayne Shaw		Assistant Secretary (2003)
Thomas E. Connerty	Vice President & Secretary (2005 – 2007)	VP & Secretary (2005 – 2007)

The Site

9. Northstar Canada is the current owner of the Site. In 1985, the site was bought by Havlik Technologies Inc., the predecessor to Northstar Canada.
10. Northstar Canada and its predecessor companies operated a manufacturing and processing facility at the Site from about 1985 to about 2009. The operations involved the machining and metal plating of aircraft parts.
11. The operations at the Site used Trichloroethylene ("TCE") in a vapour degreaser to clean cutting oils from metal parts. TCE is a known human carcinogen. It is my understanding that Northstar Canada and its predecessor companies used TCE continuously at the Site from about 1985 until October 2005.
12. The operations at the Site also used chromic acid in the chromium plating line. Chromic acid contains hexavalent chromium, which is also a known human carcinogen.
13. The soil and groundwater on and under the Site as well as beyond the Site are contaminated with TCE, hexavalent chromium and other heavy metal contaminants such as nickel and copper.
14. The land surrounding the Site consists of a mixture of residential and industrial/commercial uses. Residential properties (the "Bishop Street Community") are situated directly adjacent to the Site to the north and approximately 150 metres to the south. The Grand River is located approximately 750 meters southwest of the Site. The area is municipally serviced but the groundwater is considered potable. A municipal drinking water supply well ("Well P6") is located approximately one kilometre from the Site; however, this well has been off-line for approximately two years due to maintenance issues.

Historical Contamination at the Site

15. In 2004, a Phase I and Phase II Environmental Site Assessment ("ESA") conducted at the Site by AMEC Earth & Environmental ("AMEC") for Northstar Canada found levels of TCE above the MOE applicable standards in groundwater samples from five of the six monitoring wells installed at the Site. At one of the monitoring wells (MW-6), the ESA found levels of TCE 300 times greater than the MOE standard and levels of chromium 240 times greater than the MOE standard.

16. As a result, in October 2004, Northstar Inc., through its counsel, Stikeman and Elliot, notified the MOE, via letter, that elevated levels of contaminants (including chromium and TCE) were identified in the groundwater at the southwest corner of the Site, and that contaminated groundwater could be migrating off-site. In the letter, Stikeman and Elliot state that they had been retained by Northstar Aerospace Inc. and had instructed AMEC to perform additional investigations to confirm if any contamination was migrating from the Site.
17. In 2005, Northstar Canada notified the MOE that the contamination had in fact migrated from the Site. Groundwater sampling results from monitoring wells installed in a residential area southwest of the Site showed elevated TCE concentrations of up to 4,000 parts per billion. At that time, the applicable MOE standard for TCE in groundwater was 50 parts per billion. The current MOE standard is 1.6 parts per billion.
18. Given the measured concentration of TCE in groundwater, the MOE was very concerned about TCE evaporating from the groundwater, entering the surrounding soil as vapour and then migrating into the indoor air of the affected residential homes primarily through their basement. The process by which volatile substances move from a subsurface source into the indoor air of overlying buildings is referred to as soil vapour intrusion.
19. AMEC conducted further investigations in order to determine whether TCE soil vapour intrusion was occurring in the affected residential homes. Specifically, in July 2005, AMEC conducted indoor air sampling of about ten homes in the Bishop Street Community. The results from the sampling showed elevated concentrations of TCE in the indoor air of the tested residences. One residence had indoor air levels of TCE that required relocation. Three residences had concentrations that required remediation. Five residences had concentrations that required monitoring.
20. As a result, Northstar Canada expanded the territory of its indoor air sampling program and its groundwater monitoring network.

Indoor Air Monitoring and Mitigation

21. In 2005, Northstar Canada established an indoor air sampling program in the Bishop Street Community to determine the extent of homes potentially impacted by soil vapour intrusion and to assess which homes may need mitigation equipment installed to maintain TCE levels below the "indoor air no action level" recommended by Public Health - Regional Municipality of Waterloo and MOE while the underlying source of contamination is remediated. The "no action level" for the Bishop Street Community was initially set at a TCE concentration of 2.3 micrograms per cubic metre in indoor air.
22. In 2009, the "no action level" was reduced to 0.5 micrograms per cubic metre as a result of improved understanding of the human toxicity of TCE. The indoor air protocol was revised accordingly.

23. The revised protocol specifies the following action levels:
- No action is required if the TCE indoor air concentration is less than 0.5 micrograms per cubic meter;
 - Annual monitoring is required if the TCE indoor air concentration is between 0.5 and 5 micrograms per cubic meter;
 - Semi-annual monitoring with the option to mitigate if the TCE indoor air mitigation is greater than 5 micrograms per cubic meter and less than 50 micrograms per cubic meter; and
 - Monitoring and high priority to mitigate if the TCE indoor air concentration is greater than 50 micrograms per cubic meter.
24. Northstar Canada was planning to revise the air protocol on an annual basis, as required.
25. In total, the indoor air quality of 652 residences has been tested. As of August 2012 there are 461 residents that are part of the sampling program. The distribution of the results both historically (prior to mitigation) and as of May 2013 (post mitigation) is summarized below:

TCE Levels ($\mu\text{g}/\text{m}^3$)	Number of Properties	
	Historical	May 2013
<0.5	126	302
0.5-5	223	148
5-10	55	1
≥ 10	253	4
Total	657	455

26. Two hundred and twelve (212) of these residences required one or more of the following forms of mitigation:
- Sealing basement foundations, sump and other openings in basement foundations;
 - Installing heat recovery ventilation systems on furnaces, allowing an increase in the number of air changes in the home while recovering most of the heat that would otherwise be lost by simply increasing the ventilation rate;
 - Installing photocatalytic oxidation units on furnaces which utilize ultraviolet light to oxidize the contaminants;
 - Installing portable activated carbon units at homes
 - Installing sub-slab depressurization systems which extract vapours from beneath the basement floor using a blower with extraction ports inside the home; and

- Installing soil vapour extraction systems (“SVES”) which extract vapours from the soil using a system of blowers with extraction wells located outside of the home; and
27. Furthermore, approximately 11 residents were initially relocated on a temporary basis due to TCE concentrations greater than 230 micrograms per cubic meter.

Groundwater Monitoring and Remediation

28. To address groundwater impacts at the Site and in the study area off-site, Northstar Canada submitted its first Interim Remedial Action Plan (“IRAP”) to the MOE in July 2006. The IRAP was a conceptual document that was subsequently revised in August 2006 and in January 2007. The IRAP dated January 31, 2007 was deemed acceptable by MOE. Site remediation, as outlined in the IRAP, commenced in early 2009 after pilot testing (starting in 2005), installation of necessary infrastructure (starting in 2006) and assembly and commissioning of on-site treatment systems.
29. The IRAP was updated again on September 2, 2011 and was deemed acceptable by MOE. This IRAP particularized the remediation activity to be carried out by Northstar Canada during the next eighteen months until March, 2013. Northstar Canada and MOE had an understanding that Northstar would submit a further revised IRAP to MOE in the spring of 2013.
30. The IRAP had three significant objectives:
- (i) to reduce immediate impacts due to subsurface vapour intrusion into residential homes and local businesses
 - (ii) to limit the potential impact of dissolved TCE and its natural breakdown products to the drinking water supply well P6; and
 - (iii) to ensure that the discharge of dissolved TCE and hexavalent chromium into local surface waters, including the Grand River, remains below acceptable levels.
31. The September 2, 2011 IRAP required Northstar Canada's to implement a three-pronged approach to groundwater remediation involving:
- (i) Injecting potassium permanganate into the groundwater to actively destroy TCE: In 2009, Northstar Canada installed an *in-situ* chemical oxidation (“ISCO”) system consisting of five injection wells on the Site and one injection well off-site, south of Bishop Street. A solution of potassium permanganate is injected into the contaminated groundwater in order to destroy the TCE.
 - (ii) Operating a pump and treat remediation system: The system, which was first installed in 2006 and expanded in 2007 and 2009, can extract groundwater from up to six extraction wells located on and off the Site and treats the water to

remove any TCE that is present. The treated water is then discharged into the municipal storm sewer. The treatment system is housed within a building on the Site and consists of a groundwater storage tank, carbon pre-filters, multi-tray air stripper, anion exchange treatment trains, cation exchange treatment trains, granular activated carbon treatment trains and other controls and electrical equipments.

(iii) Operation of the soil vapour extraction systems ("SVES"): Twenty such systems are housed in insulated sheds and treat soil vapour contaminated with chlorinated solvents. While SVES were initially installed to reduce indoor air concentrations by preventing vapours from entering into residences, they have also contributed to reducing TCE concentrations in the groundwater.

32. The September 2, 2011 IRAP also committed Northstar Canada to continue the groundwater monitoring program.
33. Northstar Canada has installed approximately 130 groundwater monitoring wells on the Site and at locations to the south and south-west of the Site. TCE levels at these wells have routinely been sampled on a semi-annual basis. Most recently, the highest TCE groundwater concentration measured between 695 Bishop and 610 Bishop was 200,000 parts per billion. This result was from a sample collected by GE in May 2013. MOE's current groundwater standard is 1.6 parts per billion.

Surface Water Monitoring – Grand River

34. The groundwater monitoring conducted by Northstar Canada showed that groundwater impacted with TCE and hexavalent chromium extended to the Grand River, where there is some groundwater discharging to the River from springs and seeps.
35. As a result, Northstar Canada collected surface water samples three times per year and reported the results to the MOE. Samples were taken from seeps and springs on the eastern shore of the Grand River, from the river locations along the eastern shore and from three transects across the river. Groundwater samples were also taken at nearby monitoring wells.
36. The most recent surface water sampling conducted in April 2012 showed levels of TCE and hexavalent chromium in a spring flowing into the Grand River above the MOE's Provincial Water Quality Objectives. Samples collected from the River were found to be within Provincial Water Quality Objective standards for TCE and hexavalent chromium.

Discovery of Second Source of TCE Contamination

37. In August 2007, the MOE completed a review of hydrogeological reports submitted by Northstar Canada and concluded that there are two contributing sources of TCE

groundwater contamination in the Bishop Street Community. One TCE source originates at the Site and then migrates to the south and partly to the south-west onto the property with the municipal address of 610 Bishop Street North. A second TCE source originates on 610 Bishop Street North and becomes comingled with the source from the Site. Thus, the western portion of the area of groundwater contamination in the Bishop Street Community is a co-mingled plume that originated from both 610 Bishop and the Site.

38. Borg Warner (Canada) Limited ("Borg Warner") operated a facility at 610 Bishop Street North which used TCE. In or about 1980, Borg Warner sold the property. In or about 1988, GE Canada became the corporate successor to Borg Warner. GE never carried on operations at 610 Bishop Street North.
39. GE Canada, as a successor to Borg Warner, has been actively engaged in the groundwater and soil vapour intrusion investigations and remediation activities in and around the Bishop Street Community that is impacted by the co-mingled TCE plume.

Voluntary Approach vs. Orders

40. Between 2004 and 2012, Northstar Canada undertook the investigation, mitigation and remediation programs described above on a voluntary basis without the need for the MOE to issue any orders.
41. Under MOE legislation and the Compliance Policy, a range of tools are available to MOE officials in dealing with environmental contamination. The tools include voluntary approaches, orders and prosecutions. An evaluation is conducted on a case-by-case basis to determine the appropriate abatement response. The voluntary approach was pursued with Northstar Canada for the following reasons:
 - i.) Northstar Canada committed to both the MOE and the public that it would deal with the contamination;
 - ii.) Northstar Canada demonstrated a willingness to work proactively and cooperatively with the MOE; and
 - iii.) It was Northstar Canada's preference that the MOE not issue an Order.
42. However, on a number of occasions, the MOE considered issuing an Order to Northstar Canada and Northstar Inc. For example, in 2007, after a second source of TCE contamination was confirmed, an Order was contemplated due to Northstar's reluctance to continue to complete work in the comingled area of the plume. Ultimately, an Order was not necessary as arrangements were made between Northstar and GE to continue work in the comingled area
43. In 2009, an Order was contemplated when Northstar expressed concerns to the MOE regarding the amount of money being spent on the mitigation and remediation efforts in the Bishop Street Community. However, when Northstar informed the MOE that it had taken steps to significantly reduce costs without impacting the ongoing work and

confirmed their commitment to continuing the work, issuing an Order became unnecessary.

44. In early 2012, the MOE became concerned about Northstar Canada's long-term viability in light of disclosures about its financial condition. As a result, MOE issued two Director's Orders against Northstar Canada and Northstar Aerospace Inc. ("Northstar Inc."). The first Order was issued on March 15, 2012 and ordered the same work detailed in Part 3 of the Order under appeal. The second Order was issued on May 31, 2012 and required financial assurance in the amount of \$10,352.906 be provided to the MOE by June 6, 2012.
45. Northstar Canada and Northstar Aerospace Inc. provided comments on the March 15, 2012 order before it was issued and did not appeal either order.
46. MOE agreed to Northstar Canada's request that the date for compliance with the provision of financial assurance be extended to June 20, 2012. To date, no financial assurance has been provided to the MOE.

Financial Assurance

47. Under the *Environmental Protection Act* (EPA), the MOE has the legislative authority to require Financial Assurance ("FA"). FA can be specified as requirements of orders or conditions of approvals issued under the EPA or the Ontario Water Resources Act (OWRA).
48. Prior to the issuance of an Order to Northstar Inc. and Northstar Canada on May 31, 2012 requiring FA, the MOE contemplated requiring FA from the companies on at least two occasions.
49. In 2006, prior to the issuance of a Certificate of Approval for the soil vapour extraction systems, the District Office asked Approvals Branch if FA could be made a requirement of the Certificate of Approval. Approvals Branch advised that the MOE does not generally require Financial Assurance for Section 9 Approvals so people are not discouraged from installing equipment that is intended to fix problems. As a result, it was deemed inappropriate to add FA to the Certificate of Approval. The only alternative would have been to issue an Order requiring FA. At the time there was no rationale to issue an Order given Northstar's commitment to voluntarily install the necessary equipment and to deal with the contamination from the Site.
50. As noted above, in 2009 the MOE contemplated issuing an Order to Northstar. Had an Order been issued, the MOE would have likely included a provision for FA. In fact, I discussed the issue of FA with Jim Smith, the Corporate Director – Safety, Health & Environmental Affairs for Northstar Aerospace Inc., and provided him with a copy of the MOE's FA Guideline.

Management Involvement in the Site

51. Between 2004 and 2012, senior management from both Northstar Canada and Northstar were heavily involved in dealing with the environmental issues at the Site. The table below summarizes the key senior individuals that I have dealt with or received communications from along with their titles.

Time Period	Activity	Northstar Senior Contacts
October 2004	Notification of elevated levels of contaminants	Larry Cobb – Counsel for Northstar Aerospace Inc.
2004-2006	Initial and expanded air monitoring Identification of indoor air vapour intrusion action levels Initial and expanded groundwater monitoring Testing and installation of indoor air mitigation methods Installation of interim pump and treat system Initial surface water testing Personal meetings with residents Meetings with banking and real estate communities Establishment of Community Information Centre Public information forum Discontinuation of the use of TCE	Ian Taylor – President of Northstar Canada Tom Connerty – Chief Financial Officer – Northstar Aerospace Inc.
March 2007	Announcement by Northstar Aerospace Inc. of increased funding for remediation efforts	Mark Emery – President and CEO of Northstar Aerospace Inc.
2007	Approval of IRAP by MOE Identification of a second source of TCE contamination On-site chemical injection pilot test Revised action levels On-going indoor air monitoring and Groundwater/surface water monitoring	Craig Yuen – acting CFO – Northstar Aerospace Inc. Mark Emery – President and CEO of Northstar Aerospace Inc.
November 25, 2008	Announcement by Northstar Aerospace Inc. of closure of Cambridge plant by March 31, 2009	Glenn Hess – President and CEO of Northstar Aerospace Inc.
May 26, 2009	Announcement by Northstar Aerospace Inc. of settlement of litigation claim	Glenn Hess – President and CEO of Northstar Aerospace Inc.

2008 -2012	Expansion of pump and treat system Completion of installation of indoor air mitigation systems On-going indoor air monitoring and groundwater/surface water monitoring Public information meeting Potassium permanganate injections Revised IRAP Revision of indoor air vapour intrusion target levels and groundwater standards for TCE Expanded indoor air monitoring and revised indoor air protocol Dyck Park pilot study Director's Orders issued to Northstar Canada and Northstar Aerospace Inc.	Jim Smith – Corporate Director – Safety, health & Environmental Affairs – Northstar Aerospace Inc. Craig Yuen – Chief Financial Officer – Northstar Aerospace Inc. Glenn Hess – President and CEO, Northstar Aerospace Inc.
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52. On a regular basis, emails were either copied to or sent to Thomas Connerty and Jim Smith during their tenure. They also attended project meetings either in person or via teleconference. Similarly, Mark Emery and Craig Yuen were copied on emails on a regular basis. Craig Yuen also signed the application for approval of the pump and treat system submitted to the MOE in 2008.
53. It is my understanding that regular reports were provided to the board of directors of Northstar Inc. on the progress of the mitigation and remediation efforts at the Site. This information is confirmed by the minutes of the board meetings disclosed by the appellants.

Review of MOE Historical Files

54. It is my understanding that the appellants have requested MOE records pertaining to environmental issues at the Site in the early 1980's. Purportedly, an inspection conducted by Dan Joyner, Environmental Officer in 1994 suggested that such information exists.
55. I have reviewed the MOE historical files and have spoken with Dan Joyner. I did not find any information related to groundwater or soil contamination prior to the purchase of the Site by Havlik Technologies Inc. in 1985. Nor does Dan Joyner recall that such information exists.
56. Based on my review of the file and the available information, there were environmental issues identified at the site in the late 1980's and early 1990's. The following list is a summary of the issues:

- 1989 violations of the Regional Municipality of Waterloo's sanitary sewer bylaws.
- 1990 notice of violation for transferring unregistered waste
- 1990 unapproved discharge of chromium to sanitary sewer
- 1992 spill of waste black dye to ground
- 1992 unapproved storage of waste and inadequate waste storage areas
- 1994 MOE inspection recommending hydrogeological survey be completed
- 1995 letter signed by David Gee indicating no environmental issues at the site prior to the purchase by Havlik.
- 1995 letter committing to proceed with a Phase I assessment.
- 1997 Phase 1 Assessment Report completed by Beak International Incorporated. (Note: The MOE did not receive a copy this report until recently) This report did not raise concerns regarding groundwater or soil contamination at the Site.

CCAA Proceedings and Sale Transaction

57. On June 14, 2012, Northstar Canada, Northstar Inc. and two related companies sought and obtained protection from their creditors under the *Companies' Creditors Arrangement Act* ("CCAA").
58. On July 24, 2012, the Ontario Superior Court of Justice (Commercial List) approved the sale of substantially all of the operating assets of Northstar Canada and Northstar Inc., with the exception of the Site. Substantially all of the proceeds of the sale were distributed to Northstar's secured lender, leaving no personnel or resources to carry out the remediation program.
59. Effective August 24, 2012, Northstar Canada was deemed bankrupt and the Trustee in Bankruptcy disclaimed its interest in the Site. As a result, the Site was abandoned.
60. Northstar Canada stopped doing the work required in the Order on or about August 23, 2012.
61. On November 14, 2012, the Director issued Order No. 5866-8WKU92 which is the subject of this appeal.


Requirements of the Order

62. The requirements of the Order under appeal are set out under the heading "Part 3: Work Ordered" and are divided into twelve parts.
63. Part 3.0 of the Order requires the Appellants to secure the Site from trespassers.
64. Part 3.1 of the Order requires the Appellants to retain a Competent Person(s), Qualified Person(s), and Laboratory(ies) to prepare and complete, or supervise, the work specified in the Order.

65. Part 3.2 of the Order requires the Appellants to carry out the residential indoor air monitoring protocol which includes monitoring, recording and reporting the level of TCE in the indoor air of 461 residences in the Bishop Street Community.
66. Parts 3.3 and 3.4 of the Order requires the Appellants to operate and maintain the existing Indoor Air Mitigation Systems ("IAMS") and the Soil Vapour Extraction Systems ("SVES") that have been installed in the Bishop Street Community and install any new mitigation systems that may be required. The continued operation and monitoring of these systems is critical to ensuring that the TCE levels are maintained within acceptable limits in the affected residences. The continued operation of these systems requires electricity, periodic replacement of filter media and ongoing maintenance.
67. Part 3.5 of the Order requires the Appellants to operate and maintain the groundwater pump and treat system on and in the vicinity of the Site as set out in the IRAP. This part also sets out the requirement to report upon the effectiveness of the pump and treat system. The operation of the pump and treat system on a continuous basis is critical to preventing further migration of contaminants off-Site. The operation of the pump and treat system requires at a minimum (i) an electrical supply, (ii) that the building containing the pump and treat system be heated in the cold weather, (iii) that the system be monitored and cared for on a daily basis and (iv) that groundwater monitoring wells be monitored and maintained on a regular basis. These systems are critical to prevent the further migration of TCE contamination offsite, which left unattended, could increase the risk to the health and safety of the residents and to the environment.
68. Part 3.6 of the Order requires the Appellants to undertake the Groundwater Remediation Program in the vicinity of the Site as set out in Section 3.3 of the IRAP. It relates specifically to the injection of potassium permanganate into the groundwater as detailed in Section 4.2 of the IRAP.
69. Part 3.7 of the Order requires the Appellants to carry out the monitoring, recording and reporting of groundwater and surface water at the frequency detailed in the Order.
70. Part 3.8 of the Order requires the Appellants to implement the final work plan for the delineation of the groundwater contamination in the bedrock groundwater in the vicinity of the Site, once the work plan has been approved by the MOE. The MOE approved the Work Plan in June 2013.
71. Part 3.9 of the Order sets out the requirement to submit a final report evaluating the effectiveness of the efforts to remediate the offsite groundwater contamination into the Bishop Street Community, and to identify and implement the preferred remedial options approved by the MOE.
72. Part 3.10 of the Order requires the Appellants to submit an updated IRAP to the MOE, the City of Cambridge and Public Health and to hold public information sessions to receive comments. This part also requires implementation of an approved IRAP and

periodic updating of the IRAP. The current IRAP dated September 2, 2011 pertains to the planned remediation efforts to be completed over an 18 month period. As such the current IRAP expired in March 2013. The purpose of updating the IRAP on a routine frequency is to ensure the remedial strategy is based on the most up to date information.

73. Part 3.11 of the Order sets out the requirements for the Appellants to provide copies of all final reports submitted to the MOE to the local public library and nearby property owners, and to provide periodic progress updates to the MOE and other regulators. The purpose of this Part is to ensure current information is available to the public.
74. Part 3.12 of the Order set out various general requirements related to the carrying out and implementation of the work required by the Order.

A handwritten signature in black ink, appearing to read "Phil Shewen", is written over a horizontal line.

Phil Shewen, Senior Environmental Officer

Dated: September 26, 2013

ENVIRONMENTAL REVIEW TRIBUNAL

Baker et al. v. Director, Ministry of the Environment

In the matter of appeals by Neil W. Baker, Mark Emery, Gordon Flatt, Glenn E. Hess, Donald K. Jackson, David A. Rattee, Greg A. Schindler, Wayne E. Shaw, Michael J. Tkach, James D. Wallace and Colin D. Watson filed on November 30, 2012 and by Craig A. Yuen filed on December 7, 2012 for a hearing before the Environmental Review Tribunal pursuant to section 140 of the *Environmental Protection Act*, R.S.O. 1990, c. E.19, as amended; with respect to Director's Order No. 5866-8WKU92 issued by the Director, Ministry of the Environment, on November 14, 2012 under sections 17, 18 and 196 of the *Environmental Protection Act*, requiring certain work be undertaken at, and in the vicinity of, a site located at 695 Bishop Street North, Cambridge.

WITNESS STATEMENT of JANE GLASSCO

Director, s.17 and 18 of the *EPA*
Ministry of the Environment, Guelph District Office
1 Stone Road West
Guelph, ON N1G 4Y2

Tel: 519-826-4258

Background

1. I am currently employed by the Ministry of the Environment (the "MOE") as the District Manager of the Guelph District Office. I have held this position since 2009. As a District Manager, I am responsible for developing, coordinating and managing District Office programs relating to the protection of air, water and soil quality in Ontario.
2. I have been employed at the MOE since 1987. My work experience has been largely in the Hamilton District Office (abatement) as an Environmental Officer for 17 years and Supervisor for 5 years.
3. I am appointed Director under a number of statutes and provisions including sections 17 and 18 of the *Environment Protection Act*.

4. I am the Director who issued Director's Order Number No. 5866-8WKU92 which is the subject of this appeal.
5. I have no personal interest in the outcome of this appeal. I intend to appear before the Tribunal and be subject to direct and cross examination. My evidence will be both factual and my opinion will be within the limits of my professional experience.

Involvement with the Site

6. I have been involved in overseeing the remediation of the environmental contamination at and in the vicinity of Northstar Aerospace (Canada) Inc.'s ("Northstar Canada") property at 695 Bishop Street North in Cambridge, Ontario (the "Site") since 2009.
7. My focus throughout this time period has been first and foremost on ensuring that the health and safety of the residents in the Bishop Street Community are protected.
8. When I became involved with the Site, mitigation and remediation efforts were already underway and Northstar Canada was cooperating fully with the MOE without the need for the MOE to issue any orders.
9. However, in early 2012, the MOE became concerned about Northstar Canada's long term viability in light of disclosures about its financial condition. As a result, I issued two Director's Orders against Northstar Canada and Northstar Aerospace, Inc. ("Northstar Inc."). The first Order was issued on March 15, 2012 and ordered the same work detailed in Part 3 of the Order under appeal. The second Order was issued on May 31, 2012 and required financial assurance in the amount of \$10,352.906 be provided to the MOE by June 6, 2012.
10. Northstar Canada and Northstar Aerospace Inc. did not appeal either order.
11. I agreed to Northstar Canada's request that the date for compliance with the provision of financial assurance be extended to June 20, 2012. To date, no financial assurance has been provided to the MOE.

CCAA Proceedings and Sale Transaction

12. On June 14, 2012, Northstar Canada, Northstar Inc. and two related companies (together, the "CCAA Entities") sought and obtained protection from their creditors under the *Companies' Creditors Arrangement Act* ("CCAA").
13. At that point, I instructed legal counsel to take all necessary legal steps to ensure that the mitigation and remediation efforts at the Site continue to be carried out and funded by Northstar Canada and Northstar Inc.

14. To that end, the MOE brought a motion before Mr. Justice Morawetz in the Ontario Superior Court of Justice (Commercial List) seeking a declaration that the Director's Order issued to Northstar Canada and Northstar Inc. on March 15, 2012 is a regulatory order that is not subject to the stay issued by the Court on June 14, 2012. The Court dismissed this motion on July 24, 2012. As a result, the Director's Orders issued to Northstar Canada and Northstar Inc. were stayed and the companies were not legally obliged to undertake the work or provide the financial assurance required by the Orders.
15. On June 14, 2012, the CCAA Entities and their direct and indirect subsidiaries in the United States entered into an agreement (the "Heligear Transaction") to sell substantially all of their assets to Heligear Canada Acquisition Corporation and Heligear Acquisition Co. (collectively, "Heligear"). The Site and all environmental liabilities associated with the Site were expressly excluded from the sale.
16. On July 24, 2012, Mr. Justice Morawetz granted motions by the CCAA Entities and Fifth Third Bank (which is the agent for itself and two other banks that provided financing to the CCAA Entities as pre-filing lenders and DIP lenders) for orders approving the Heligear Transaction and directing the Monitor to distribute the sale proceeds.
17. The MOE opposed the sale because there had been no provision made for a reserve to continue funding the remediation activities at the Site after the close of the Heligear Transaction. The MOE was not successful.
18. On August 1, 2012, the MOE brought a motion on an urgent basis before Justice Lang of the Court of Appeal seeking an order granting a partial stay of the distribution of the sale proceeds pending the determination of the MOE's motion for leave to appeal from the order of Mr. Justice Morawetz dated July 24, 2012. The MOE sought an order requiring the Monitor to hold and establish a reserve in the sum of \$14.0 million from the sale proceeds of the Heligear Transaction to satisfy any potential order in the appeal. Justice Lang dismissed the MOE's motion.
19. With the consent of the lenders, Northstar Canada continued to conduct the remediation activities subsequent to the court's approval of the Heligear Transaction on July 24, 2012 until the close of the Heligear Transaction on August 24, 2012.
20. Effective August 24, 2012, Northstar Canada was deemed bankrupt and the Trustee in Bankruptcy disclaimed its interest in the Site. As a result, the Site was abandoned.
21. Northstar Canada stopped doing the work required in the Order on or about August 23, 2012.
22. At that point, the MOE had exhausted its legal recourse in the Commercial court as it relates to Northstar Inc. and Northstar Canada (except for participating in the claims procedure which is discussed later in this witness statement). The MOE has since been granted leave to appeal the order of Mr. Justice Morawetz dated July 24, 2012

to the Court of Appeal. The appeal was heard on June 19, 2013. A decision is still pending.

23. In my view, the only remaining responsible parties that the MOE could order to take over the remediation efforts at the Site were the former directors and officers of Northstar Inc. and Northstar Canada. However, at the time, a stay of proceedings was in effect against the former officers and directors. The stay of proceeding expired on October 31, 2012.

Direction Under s. 146(1) of the EPA

24. In August 2012, the MOE was faced with a situation where there was a stay of the Director's Orders against the corporate entities and a Director's Order could not be issued to the former directors and officers because of the stay of proceeding. There was no responsible person who could be required at that point in time to carry out the mitigation and remediation work necessary to protect the health and safety of the residents in the Bishop Street Community and the natural environment.
25. The MOE had no choice but to undertake the work necessary to protect the health and safety of the residents in the Bishop Street community and the natural environment. In order to do so, the Minister of the Environment issued a direction under section 146 of the EPA on August 15, 2012, requiring that the following work required by the Order be done by the MOE until such time as any other person assumes responsibility for the work:
 - a) Operate and maintain the existing indoor air mitigation systems that have been installed in the Bishop Street Community;
 - b) Operate, monitor and maintain the soil vapour extraction systems;
 - c) Operate, monitor and maintain the groundwater pump and treat system on and in the vicinity of the Site;
 - d) Any other work not mentioned above and deemed necessary to carry out the work required by the Order.
26. The funding for this interim work was obtained from the Environmental Clean-up Fund ("ECF"). The ECF is a funding mechanism of last resort and is only available where a responsible party cannot be identified (or ordered as in this case) or where the responsible party has not complied with an order. Furthermore, ECF funds are to be directed towards the implementation of remedial measures where there is a real or potential risk of harm to public health and safety to the environment.
27. The direction under s.146(1) and the ECF funding was to ensure that the work necessary to protect the health and safety of the residents in the Bishop Street community and the natural environment is undertaken until an order could be issued against the former officers and directors of Northstar Inc. and Northstar Canada.

Remediation Work being performed by GE Canada

28. As set out in the witness statement of Phil Shewen, GE Canada is the corporate successor to Borg Warner (Canada) Limited who formerly operated at the property at 610 Bishop Street ("610 Bishop Street"). The western portion of the area of groundwater contamination in the Bishop Street Community is a co-mingled plume that originated from both Borg Warner Property and the Northstar Site.
29. Prior to the CCAA Entities filing for protection under the CCAA, GE Canada was actively engaged in the groundwater and soil vapour intrusion investigations and remediation activities in and around the Bishop Street Community that is impacted by the co-mingled TCE plume. The MOE expected this engagement to continue.
30. On July 5th, 2012, MOE staff met with legal counsel and staff from General Electric (GE) to discuss strategies for ensuring that the health and safety of residents in the Bishop Street Community are protected in light of the CCAA proceedings.
31. To that end, Bill Bardswick, Director, West Central Region, of the MOE sent a letter dated July 29, 2012 to Dave Leask of GE Canada outlining the remedial work that the MOE expected GE Canada to undertake to manage the environmental impact of the co-mingled plume. GE Canada agreed to undertake the work requested by the MOE on a without prejudice basis following the closing of the Heligear Transaction.

Meetings with the City of Cambridge and the Regional Municipality of Waterloo

32. On August 14, 2013, I along with my director and staff from the Guelph District Office had an emergency meeting with Jim King (CAO of City of Cambridge) to ask for financial assistance to support the interim measures to protect the residents of Bishop Street Community.
33. This meeting was followed up by a letter dated August 14, 2012 from Bill Bardswick (Director of West Central Region of the MOE) to Jim King from the City of Cambridge summarizing the meeting and formally asking for assistance to ensure the Bishop Street Community was protected.
34. On the same date (August 14), Bill Bardswick also wrote a similar letter to Mike Murray (CAO of Regional Municipality of Waterloo) asking for financial assistance to ensure the Bishop Street Community was protected.
35. On August 20, 2012, Jim King responded to Bill Bradswick's letter of August 14 indicating that the City of Cambridge was unable to supply financial assistance as there were priorities given the infrastructure.
36. Similarly, on August 31, 2012, Mike Murray (CAO of Regional Municipality of Waterloo) responded to Bill Bardswick's letter of August 14 indicating that Region of

Waterloo is not in a position to contribute to the costs of remediate action due to financial constraints.

Director's Order Number No. 5866-8WKU92

37. The stay of proceeding against the former directors and officers expired at midnight on October 31, 2012.
38. On October 31, 2012, eleven of the former directors and officers brought a motion before Mr. Justice Morawetz seeking an injunction against the Crown to restrain me from issuing an Order against them. Mr. Justice Morawetz dismissed the motion on November 9, 2012 and declined to grant an injunction.
39. On November 14, 2012, I issued Director's Order No. 5866-8WKU92 (the "Order") against thirteen of the former directors and officers of Northstar Inc. and Northstar Canada pursuant to sections 17, 18 and 196 of the EPA requiring them to continue the monitoring, mitigation, containment and remediation work started by Northstar Canada and Northstar Inc.
40. In the Order at paragraph 2.19, I stated that the MOE intended to cease performing the work at the Site at the end of the transition period specified in the Order for the former directors and officers to take over the work at the Site.
41. I relied on section 18 of the EPA as the main authority to issue the Order. This section allows me to issue an order to anyone who is or was in management and control of an undertaking or property. I understand that directors and officers are presumed to be in management and control of the corporations. Furthermore, based on the MOE's experience with the Site, the mitigation and remediation efforts at the Site were being managed by the senior managers (including the directors and/or officers) from both Northstar Inc. and Northstar Canada and were being overseen by the board of directors. As such, the directors and officers had management and control of the undertaking at the Site.
42. In relying on s.18 of the EPA, I am not alleging any fault on the part of the directors and officers. The directors and officers are being named because of their status as persons in management and control and because of the environmental imperative at the Site and in the Bishop Street Community.
43. I also relied on section 17 of the EPA as authority for issuing the Order. This section allows me to issue an order to any person who causes or permits the discharge of a contaminant. To be clear, I am not alleging that the directors and officers in any way caused the discharge of the TCE and chromium. However, once the magnitude of the contamination and the need for a long-term remediation effort became known, the directors and officers ought to have set aside and secured the funds necessary to complete the remediation. They did not set aside any amount of funds. They thus

failed to take the necessary steps to prevent the discharge of contaminants in the long-term, which I understand falls under the definition of "permit".

MOE Post-Filing Proof of Claims

44. On September 7, 2012, the Monitor gave notice that it had set October 23, 2012 as the Claims Bar Date.
45. As a result, on October 19, 2012, the MOE delivered to the Monitor its Post-Filing Proof of Claim against Northstar Canada and Northstar Inc. and its Post-Filing D&O Claim against seventeen former directors and officers of the corporations.
46. In both the Post-Filing Proof of Claim and the Post-Filing D&O Claim the MOE claimed:
 - i. \$66,240.30 for the costs it had incurred to October 18, 2012 to carry out the Remediation Activities specified in the Minister's Direction;
 - ii. \$15.0 million for the future costs to be incurred by the MOE to carry out the Remediation Activities pursuant to the Director's Order; and
 - iii. an undetermined amount required to conduct additional environmental remediation work to decontaminate the Site and the Bishop Street Community.
47. The MOE's participation in the Claims Procedure process was without prejudice to the MOE's position that neither the Director's Order issued against Northstar Canada and Northstar Inc., nor the Director's Order issued against the former directors and officers are "claims" by the MOE as a creditor, or orders for the "enforcement of a payment" under.
48. On December 10, 2012, the MOE advised the Monitor that the MOE acknowledges that its Post-Filing Proof of Claim is not payable from the Post-Filing Payables Reserve established by the Monitor.
49. On December 3, 2012, Mr. Justice Morawetz heard a motion by the Monitor seeking a determination of whether the MOE's Post-Filing D&O Claim is a valid claim for which the former directors and officers are entitled to be indemnified from the D&O Charge Reserve in the amount of \$1.75 million. In his decision dated April 9, 2013, Mr. Justice Morawetz held that the MOE's Proof of D&O Claim was not a claim for which the former directors and officers are entitled to be indemnified. Accordingly, Mr. Justice Morawetz authorized and directed the Monitor to pay the D&O Charge Reserve to Fifth Third Bank.



Jane Glassco, Director

Dated: September 26, 2013

ENVIRONMENTAL REVIEW TRIBUNAL

Baker et al. v. Director, Ministry of the Environment

In the matter of appeals by Neil W. Baker, Mark Emery, Gordon Flatt, Glenn E. Hess, Donald K. Jackson, David A. Rattee, Greg A. Schindler, Wayne E. Shaw, Michael J. Tkach, James D. Wallace and Colin D. Watson filed on November 30, 2012 and by Craig A. Yuen filed on December 7, 2012 for a hearing before the Environmental Review Tribunal pursuant to section 140 of the *Environmental Protection Act*, R.S.O. 1990, c. E.19, as amended; with respect to Director's Order No. 5866-8WKU92 issued by the Director, Ministry of the Environment, on November 14, 2012 under sections 17, 18 and 196 of the *Environmental Protection Act*, requiring certain work be undertaken at, and in the vicinity of, a site located at 695 Bishop Street North, Cambridge.

WITNESS STATEMENT of CYNTHIA DOUGHTY

Hydrogeologist
Ministry of the Environment
West Central Region
119 King Street W., 12th Floor
Hamilton, Ontario

Tel: 905-521-7866

Background and Qualifications

1. I am currently a Hydrogeologist with the Ministry of the Environment (the "MOE"). I have held this position since 2008. In this capacity, I provide hydrogeological expertise in support of regional groundwater programs, evaluate existing and anticipated impacts, and make recommendations for the protection, conservation, and management of groundwater resources. I am a designated Provincial Officer.
2. I have been employed at the MOE since 2008. Prior to joining the MOE, I was employed as a Hydrogeologist at several private sector environmental consulting companies. I worked in environmental consulting between February 1999 and November 2008. As an environmental consultant, I developed and implemented field programs to identify potential environmental issues at industrial sites, evaluated

existing and anticipated impacts related to contaminated sites, designed and implemented remedial approaches to clean up contaminated sites, trained junior staff, and managed multiple concurrent contaminated site projects.

3. I have a Bachelor of Science, with Honours, specializing in Hydrogeology from the University of Waterloo and a Master of Science in Hydrogeology from the University of Waterloo. I am a licensed Professional Geoscientist in the Province of Ontario. My curriculum vitae is attached.
4. I have no personal interest in the outcome of this appeal. I intend to appear before the Tribunal and be subject to direct and cross examination. My evidence will be both factual and opinion within the limits of my professional experience.

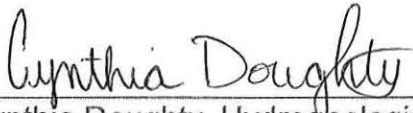
Involvement with the Property at 695 Bishop Street

5. Since November 2009, I have provided hydrogeological technical support in relation to the 695 Bishop Street North property (the "Site"). This has included reviewing and providing comments on groundwater monitoring program, delineation of groundwater contamination, and groundwater and soil remedial activities.

On-going Discharge from the Site

6. Based on information documented in the MOE's groundwater files for this Site, the pump and treat system at the Site is not preventing on-going discharge of contaminants from the Site. The pump and treat system targets only contamination present in the upper aquifer. It does not address contamination in the bedrock or TCE vapours in the soil.
7. The pump and treat system includes extraction from three wells located on the Site and one well installed at 652 Bishop Street North, the property located hydraulically downgradient from the Site. The operation of the pump and treat system limits the discharge of TCE and chromium impacted groundwater in the upper aquifer only.
8. The extent of the capture zone(s) of the pump and treat system as currently operated is unknown since no recent capture zone analysis has been completed. Analyses conducted in the past cannot be extrapolated because of seasonal variations in water levels, leaking underground water and sewer mains, dewatering of the upper aquifer and a change in pumping rates.
9. No bedrock monitoring wells have been installed on the property; thus, the extent of bedrock contamination is not fully understood. However, bedrock monitoring wells installed on Bishop Street North, southwest of the Site, contained very high concentrations of TCE. The TCE concentrations in one of these wells was well in excess of 1% of the TCE solubility, which strongly indicates TCE DNAPL is present in the bedrock hydraulically downgradient of the Site.

10. The pump and treat system is not preventing the discharge of impacted groundwater in the bedrock or providing containment of the suspected DNAPL source zone in the bedrock at the Site.
11. Furthermore, the pump and treat system is not preventing further discharge of TCE soil vapours from the Site. The source of TCE soil vapours is vapours derived from DNAPL sources and off-gassing from the groundwater plume. The lowering of the water table from ongoing groundwater extraction may cause DNAPL trapped in the previously saturated part of the shallow aquifer to now be exposed to air in the vadose zone. This may result in an increase in vapour concentrations.



Cynthia Doughty, Hydrogeologist

Dated: September 26, 2013

Cynthia A. Doughty, M.Sc., P.Geo.

Personal Data

Ministry of the Environment
Hamilton Regional Office
12th floor
119 King St. W.
Hamilton, ON L8P 4Y7
Tel: 905-521-7866

Education

M.Sc., Hydrogeology, University of Waterloo, 2006.

Thesis Title: NAPL Recovery Using CO₂-Supersaturated Water Injection: Distribution of the CO₂ Gas Phase

Courses: Environmental Biogeochemistry, Physical Processes in Groundwater Systems, Organic Contaminants in the Subsurface, Contaminant Hydrogeology, Quaternary Geology, and Field Methods in Hydrogeology

B.Sc., Honours, Minor in Earth Sciences with a Specialization in Hydrogeology, University of Waterloo, 1998.

Key Courses: Chemical Hydrogeology, Physical Hydrogeology, Groundwater Modelling, Environmental Geology, Hydrology, Stratigraphy, Geophysics, Geochemistry, Flow Through Porous Media, Microbiology, and GIS.

Professional Affiliations

Association of Professional Geoscientists of Ontario (Practising Member)

Designations

Provincial Officer

Relevant Work Experience

Regional Hydrogeologist, Ministry of the Environment, West Central and Southwestern Regions. November 2008 – present.

- Responsible for reviewing technical reports and evaluating hydrogeological impacts of proposed and existing activities on regional groundwater resources.

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- Analyze and synthesis all relevant information, including results of groundwater field investigations completed by external sources, file material, technical studies, research papers, or data and information from own field investigations.
- Provide technical reports based on analysis of data and information using environmental standards and guidelines and make appropriate recommendations.
- Evaluate hydrogeological studies in support of Permit to Take Water Applications and Renewable Energy Applications.
- Technical hydrogeological lead reviewer for a number of contaminated sites, including Bishop St (Northstar and GE), TCE contaminated sites in the Northwest Quadrant of Guelph (Cowie, AOC, GE, FRP, Guelph Tool and Die, and Comtran), Atlas Steels Landfill, 152-153 Shanley St., Bridge St. Landfill, and Former Hubbard Dry Cleaners St.
- Present technical opinion at meetings with multiple stakeholders including Municipalities, other Governmental Agencies, responsible parties, and technical consultants.
- Performed a focused review of the Draft Assessment Report for the City of Guelph and Regional Municipality of Waterloo.
- Providing a high-level hydrogeological review of Tier 3 Water Budgets prepared within West Central Region.
- Reviewed available scientific information to assess whether a GUDI study was necessary for municipal wells classified as good groundwater wells.
- Investigated residential well interference complaint for a permitted taking at an adjacent golf course.

Hydrogeologist, Water Management Consultants/Schlumberger, Waterloo, Ontario.
January 2008 – November 2008.

- **Project Hydrogeologist.** *Active Gold Mine Sites, Northwestern Ontario*
 - Developed and calibrated two numerical groundwater flow models to multiple data sets using MODFLOW2000 for two active gold mine sites.
 - Authored a modelling report to evaluate a range of preliminary interception alternatives for tailings-derived constituents.
 - Designed, implemented, and analyzed a pumping test.
 - Performed a groundwater profiling investigation to characterize groundwater quality with depth downgradient of a tailings pond.
 - Managerial responsibilities included providing assistance with subcontractor procurement, scheduling, budgeting, and communications with subcontractors and client.
 - Provided training to staff on Groundwater Vistas software.

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- **Project Hydrogeologist.** *Pebble Mine Project, Southwest Alaska.*
 - Contributed to the development of a large-scale numerical model for a mineral exploration and development site by creating and calibrating telescopic mesh refinements of transient models.

Project Hydrogeologist, Geosyntec Consultants, Lawrenceville, New Jersey. March 2006 – December 2007.

- **Project Manager.** *Former Railroad Yard, Morrisville, Pennsylvania.*
 - Provided technical advice for LNAPL recovery system at a former railroad yard.
- **Assistant Project Manager.** *American Standard, Trenton, New Jersey.*
 - Provided assistance with the management of an *in situ* remediation pilot-scale test at an active industrial facility. Responsibilities included subcontractor procurement, scheduling, budget development, leading field staff in field evaluation, guidance and training to junior field staff on field sampling procedures, and communications with subcontractors.
 - Implemented a pilot-scale test using nanoscale zero valent iron (nZVI) for treatment of elevated levels of chlorinated VOCs.
 - Assisted with the development of the sampling program to assess mobility of nZVI and VOC reduction subsequent to the injection of nZVI. Performed post pilot-scale soil and groundwater sampling.
- **Project Hydrogeologist.** *Merck, Elkton, Virginia.*
 - Developed approach and implemented field program to select the optimal locations for biosparging and monitoring wells in a karst environment.
 - Integrated multiple lines of evidence (fracture trace analysis, geochemical data, surface geophysics, and hydraulic data) to locate fractures and voids to aid in the placement of biosparging and monitoring wells.
 - Authored work plan and summary report for characterization of site geology and hydrogeology, and installation of biosparging wells in a karst environment.
 - Developed sampling plans for overburden bioventing and biosparging systems.
 - Provided assistance with subcontractor procurement, scheduling, budget development, and communications with subcontractors and client.
- **Project Hydrogeologist.** *Municipal Landfill, Dover, New Hampshire.*
 - Analyzed groundwater quality and geochemical data from previous investigations at an inactive municipal landfill to identify data gaps for a pre-design investigation (PDI). The analysis included spatial and temporal analysis of data to select locations for further delineation of the groundwater plume.
 - Authored the PDI work plan to further delineate groundwater contamination prior to implementing an enhanced *in situ* bioremediation remedy for the site.

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- **Project Hydrogeologist.** *Due Diligence, Various Clients, New Jersey.*
 - Assisted with the development of sampling programs for several due diligence programs in New Jersey.
 - Implemented soil and groundwater sampling programs.
 - Provided guidance and training to junior staff on field sampling procedures and soil classification.
- **Project Hydrogeologist.** *ISP-Belleville, Belleville, New Jersey.*
 - Evaluated a proposed sampling program for delineation of soil contamination developed by a former consultant and provided recommendations for modifications to the program.
 - Determined preliminary limits of excavations both laterally and vertically and estimated volumes based on the results of historical site investigations.

Hydrogeologist III/Assistant Project Manager (January 2002 – February 2006), Associate Hydrogeologist (January 2001 – December 2001), Assistant Hydrogeologist (February 1999 – December 2000), Brown and Caldwell, Allendale, New Jersey.

- **Project Manager.** *Browning-Ferris Industries, Pedricktown, New Jersey.*
 - Managed *in situ* remediation project at a former truck washing facility. Responsibilities included subcontractor procurement, scheduling, budgeting, communications with subcontractors, planning and organizing field program, and leading field staff in field evaluation.
 - Evaluated effectiveness of initial injections of Hydrogen Release Compound (HRC™) and Oxygen Release Compound (ORC™) on chlorinated ethene and chlorinated benzene groundwater plumes.
 - Designed and implemented a remediation field program for the second round of HRC™ and ORC™ injections to further support enhanced natural attenuation.
- **Assistant Project Manager.** *LCP Chemicals, Inc. Superfund Site, Linden, New Jersey.*
 - Provided assistance with the management of a Phase I Remedial Investigation (RI) at a former mercury-cell chlor-alkali production plant. Responsibilities included subcontractor procurement, scheduling, budgeting, leading field staff in field evaluation, planning and organizing field program, and communications with subcontractors and client.
 - Analyzed soil and groundwater quality data and performed hydrogeologic interpretation.
 - Authored investigation summary report presenting findings and identifying data gaps for an additional phase of investigation.
 - Developed a Phase II RI field investigation and prepared a work plan to address data gaps identified during the review of the Phase I RI data.

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- Generated chemical constituent distribution maps using ArcView.
- Interpreted patterns of groundwater flow and surface drainage between the site, an adjacent industrial facility, and a creek immediately bordering the neighboring property. The assessment included an analysis of historical aerial photographs to demonstrate that the two sites were not hydraulically connected through a network of drainage ditches to a nearby creek and that the site did not discharge site-related contaminants into the creek.
- **Assistant Project Manager.** *GenCorp Inc., Lawrence, Massachusetts.*
 - Provided assistance with managing the preparation of a Groundwater Comprehensive Site Assessment Report for a former industrial site contaminated with PCBs and VOCs. Responsibilities included coordinating contributions to this report from multiple collaborators and successfully delivering the report on time.
 - Served as the editor and primary author of this major document.
 - Assisted with hydrogeologic and groundwater quality data evaluation.
 - Performed statistical analyses on groundwater and surface water quality data.
 - Provided training to staff on ArcView and Microsoft Access software.
 - Provided database management for numerous media using Microsoft Access.
 - Generated potentiometric and chemical constituent distribution maps using ArcView.
 - Performed field work on earlier phases of the CSA including drilling oversight, visual identification of soils, field screening (UV light, headspace analysis, and hydrophobic dyes), and groundwater sampling.
- **Project Hydrogeologist.** *Arrow Group Industries, Haskell, New Jersey.*
 - Implemented and analyzed an aquifer test to supplement hydrogeologic information and evaluate the proposed groundwater pump and treat (P&T) system's ability to achieve capture of the zinc and chlorinated VOCs groundwater plumes.
 - Primary author of the Remedial Action Work Plan proposing enhanced *in situ* bioremediation as the remedial approach for the site rather than the P&T proposed by the previous consultant.
 - Provided assistance with the implementation and evaluation of a pilot-scale test utilizing Metals Remediation Compound (MRC™). The pilot-scale test was one of the first field programs using MRC™ for the remediation of both zinc and VOCs impacted groundwater.
- **Project Hydrogeologist.** *Former MGP Site, Troy, New York.*
 - Identified technical requirements for a pre-design investigation (PDI) and former gas holder supplemental investigation through the development of

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detailed work plans.

- Provided technical support for field personnel during investigation.
 - Developed a Microsoft Access database for historical site data collected by previous consultants.
 - Assessed soil and groundwater quality data collected during the PDI. Generated chemical constituent distribution maps using ArcView.
 - Evaluated natural attenuation using groundwater quality data, geochemical data, and BIOSCREEN to support the potential use of monitored natural attenuation (MNA) as part of the remedy if In Situ Chemical Oxidation (ISCO) was unable to reduce BTEX concentrations to groundwater quality standards.
 - Prepared a number of reports, including Field Sampling Plan, Quality Assurance Project Plan, and Evaluation of Natural Attenuation Report.
- **Project Hydrogeologist.** *Former Manufactured Gas Plant (MGP) Site, North Adams, Massachusetts.*
 - Implemented a field investigation for a Comprehensive Site Assessment, including drilling oversight, classification of soils, visual identification of soils impacted with MGP waste, collection of soil samples for laboratory analysis, and installation of groundwater monitoring wells.
- **Project Hydrogeologist.** *Former MGP Site, Malden, Massachusetts.*
 - Assisted with modelling a soil vapour extraction (SVE) system to support the selection of the number and spacing of horizontal SVE wells beneath the onsite building. This was accomplished using Visual MODFLOW with the appropriate conversion factors to simulate air flow.
 - Collaborated on technical memorandum presenting the results from the gas flow modelling.
- **Project Hydrogeologist.** *D'Imperio Property Superfund Site, Hamilton Township, Atlantic County, New Jersey.*
 - Evaluated natural attenuation using groundwater quality data, geochemical data, and BIOSCREEN to provide an understanding of the persistence and fate of selected site-related constituents within the sand aquifer.
 - Assisted with updating a 3-D groundwater flow model from legacy software to Visual MODFLOW Version 2.82 for a former unauthorized disposal area. The objectives of the updated model were to capture and establish hydraulic contaminant of groundwater plumes, reduce travel time of contaminants to enhance cleanup, and minimize the total flow required to achieve objectives.

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- **Project Hydrogeologist.** *Ciba Geigy-Hercules Plant Site, Queensbury, New York.*
 - Assisted with the implementation of a field program for a bedrock groundwater pump and treat system at a former pigment production plant. Responsibilities included oversight of monitoring and extraction well installations and downhole geophysical logging to identify the correct horizon for well installations.
- **Project Hydrogeologist.** *Light Manufacturing Sites, Montreal, Quebec.*
 - Performed Phase I Environmental Site Assessments for two light manufacturing sites in Montreal, Quebec.
- **Project Hydrogeologist.** *Confidential Client, Carver, Massachusetts.*
 - Performed a 3-D transient groundwater flow model analysis of the proposed storm-water infiltration basin at a landfill facility using Visual MODFLOW.
 - Prepared a technical memorandum with the results of the groundwater model.

Research

Masters of Science, University of Waterloo, Waterloo, Ontario.

- Evaluated CO₂-gas distribution in a field setting for a novel remedial technology that dissolves CO₂ into water at elevated pressures for NAPL recovery. Groundwater monitoring of CO₂ partial pressures above the hydrostatic pressure and geophysical surveys (neutron measurements, surface ground penetrating radar (GPR), and cross-borehole GPR) to find zones of induced gas content were supported by hydraulic monitoring and physical observations of gas bubbles at the water table to determine the distribution of the CO₂-gas phase. Results were compared to a similar field experiment conducted at Borden to assess the air distribution from a single in situ air sparging injection point.

Conference Presentations

Doughty, C. "Dominican Republic Safe Water and Sanitation Program". 39th Annual WEAO Technical Symposium & OPCEA Exhibition, London, Ontario, 2010.

Doughty, C, T. Endres, S. Piggott, J. Barker, N. Thomson, T. Li, and J. Archibald, "CO₂ Gas-Phase Distribution at Borden using CO₂-Supersaturated Water Injection". Battelle Conference: Remediation of Chlorinated and Recalcitrant Compounds. Monterey, California, 2006.

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Doughty, C. A., A. L. Endres, S. D. Piggott, J. F. Barker, N. R. Thomson, T. M. W. Li, and J. Archibald, "NAPL recovery using CO₂-supersaturated water injection: distribution of the CO₂ gas phase". API-NGWA Conference: Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Assessment, and Remediation Conference. Costa Mesa, California, 2005.

Conference Proceedings

Doughty, C. A., S. A. Kessel, R. D. Norris, and R. Burt, "Enhanced MNA of Metals and Chlorinated VOCs Using MRC" published in the Battelle Conference: In Situ and On-Site Bioremediation Symposium proceedings. Baltimore, Maryland, 2005.



Environment and Land Tribunals Ontario

- ☐ Environmental Review Tribunal
☐ Niagara Escarpment Hearing Office
☐ Office of Consolidated Hearings

Acknowledgement of Expert's Duty

Case Name
and No.:

1. My name is Cynthia Doughty (name). I live at Guelph (city) in the Province (province/state) of Ontario (name of province/state).
2. I have been engaged by or on behalf of Director, MOE (name of party/parties) to provide evidence in relation to the above-noted proceeding.
3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:
 - (a) to provide opinion evidence that is fair, objective and non-partisan;
 - (b) to provide opinion evidence that is related only to matters that are within my area of expertise;
 - (c) to provide opinion evidence in accordance with the Environmental Review Tribunal's Practice Direction for Technical and Opinion Evidence; and
 - (d) to provide such additional assistance as the tribunal may reasonably require, to determine a matter in issue.
4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date Sept 26/13

Cynthia Doughty
Signature