BRITISH COLUMBIA

Environmental Appeal Board

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APPEAL NOS. 2001-WAS-011(b) & 2001-WAS-012(b)

In the matter of an appeal to the Environmental Appeal Board under section 44 of the *Waste Management Act*, R.S.B.C., 1996, c. 482.

BETWEEN:	Alfred and Norma Penner Petro-Canada Limited	**APPELLANTS**
AND:	Regional Waste Manager	**RESPONDENT**
AND:	Linda Geddes Husky Oil Operations Limited and Mohawk Oil Company Limited Race Trac Fuels Ltd. Wildwood Swifty's Foods Ltd.	**THIRD PARTIES**
BEFORE:	A Panel of the Environmental Appeal Board Alan Andison, Chair Dr. Robert Cameron, Member Joanne Dunaway, Member	
DATES:	August 12-16, 19-23, and September 18-19, 2002	
PLACE:	Vancouver, B.C.	

APPEARING:

For the Appellants:	
Alfred and Norma Penner	Alfred Penner
Petro-Canada Limited	R.R.E. DeFilippi, Counsel Robin Wishart, Counsel
For the Respondent:	Dennis Doyle, Counsel
For the Third Parties	
Linda Geddes	Brenda McLuhan, Counsel
Husky Oil Operations Limited & Mohawk Oil Company Limited:	Paul Cassidy, Counsel Janice Walton, Counsel
Race Trac Fuels Ltd.	James Beckett, Counsel Gordon Marshall, Counsel

APPEALS

Alfred and Norma Penner (the "Penners") and Petro-Canada Limited ("Petro-Canada") filed separate appeals against the May 22, 2001 decision of the Regional

Waste Manager (the "Regional Manager"), Cariboo Region, Ministry of Water, Land and Air Protection (the "Ministry"), to issue Remediation Order ON-16880 (the "Order"). The Penners, Petro-Canada, and Wildwood Swifty's Foods Ltd. ("Swifty's") are named in the Order as persons responsible for remediation of contamination at and adjacent to the Wildwood Gas Bar, located approximately 10 kilometres north of Williams Lake.

The Environmental Appeal Board has the authority to hear these appeals under section 11 of the *Environment Management Act* and section 44 of the *Waste Management Act* (the "*Act*"). Section 47 of the *Act* gives the Board the power to confirm, reverse, or vary the decision being appealed, send the matter back to the person who made the decision, with directions, or to make any decision that the original decision-maker could have made and that the Board considers appropriate.

The Penners request that the Board vary the Order by removing them as persons responsible for remediation. Alternatively, they request that they be named as minor contributors to the contamination, that Husky Oil Operations Limited ("Husky") and Mohawk Oil Company Limited ("Mohawk") be named in the Order, and that Petro-Canada, Husky and Mohawk be deemed to have contributed most substantially to the contamination.

Petro-Canada requests that the Board reverse or vary the Order, and remove Petro-Canada from the Order as a person responsible for remediation. Alternatively, Petro-Canada requests that Mohawk and Race Trac Fuels Ltd., now known as Parkland Industries Ltd., ("Race Trac") be included in the Order as persons responsible for remediation.

The appeals were heard together.

BACKGROUND

The Penners own the Wildwood Gas Bar, which consists of a service station and associated convenience store, and is located at 115 Hickory Road on land legally described as Lot 11, Block C, District Lots 9834 and 12093, Cariboo District Plan 11353, except Plans 20762 and 30986 (the "Penner Lands"). The 2 residential properties adjacent to the Penner Lands that are discussed in these appeals are legally described, respectively, as Lot A and Lot B, District Lot 12093, Cariboo District, Plan 30986. Marjorie McCombe and Norman Spooner own (since July 1994) and reside on Lot A (the "McCombe Lands"), and Linda Geddes owns (since March 1995) and resides on Lot B (the "Geddes Lands").

The Geddes Lands and the McCombe Lands both abut the east side of the Penner Lands, and the McCombe Lands abut the north side of the Geddes Lands. Highway No. 97 runs along the west side of the Gas Bar, and an unnamed lake is located to the west of the highway. The south side of the Gas Bar and Lot B are bounded by Hickory Road. To the south of Hickory Road is the Wildwood Trailer Park, which contains about 47 residences.

The Wildwood Trailer Park is served by 3 water wells, one of which (the "Highway Well") is located in the northwest corner of the Trailer Park, just south of the Penner Lands. Ms. Geddes and Ms. McCombe each have domestic water wells located in the northwest portions of their properties (the "Geddes Well" and the "McCombe Well", respectively). Until 2001, the Penners relied on a 60-foot deep domestic water well located in the northeast corner of the Penner Lands (the "Former Penner Well"). They now use a 105-foot deep well located in the north central part of the property.

The Penner Lands have been operated as a service station supplying gasoline since sometime in the 1960's. After the Penners purchased the property in January 1980, they continued to operate the Gas Bar and resided in a mobile home located behind the Gas Bar. When the Penners purchased the property, the Gas Bar was obtaining bulk loads of gasoline from Petro-Canada without a formal agreement in place, an arrangement that continued. At that time, the Gas Bar equipment included two - 1000 gallon (4550 litre) underground gasoline storage tanks (USTs). In 1982, the Penners installed an additional 22,730 litre steel UST in a new tank basin overlain by a storage tank pad. The new tank was used for regular gasoline and the two existing 4550 litre UST lines were connected together and used for premium gasoline.

Petro-Canada, on behalf of the Penners, arranged in the fall of 1988 to have the old 4550 USTs and piping removed, and Western Oil Services Ltd. was retained to install a steel 36,370 litre UST to the east of the existing 22,730 litre steel UST. The steel fuel lines were replaced with fibreglass lines, and a cathodic protection system was installed along with UST nest monitoring wells and new fuel dispensers (commonly referred to as "gas pumps"). The UST installation was reviewed and approved by the Fire Commissioner, and the entire fuel storage and dispensing system lines passed a pressure integrity test.

In 1994, the Penners incorporated Swifty's and transferred the Penner Lands to Swifty's. The Penners were the sole shareholders, officers and directors of Swifty's.

At the end of July 1996, Petro-Canada ceased supplying gas to the Gas Bar. On behalf of Swifty's, the Penners approached Mohawk (which changed its name to Husky in August 2000 following an amalgamation) about a new fuel supply arrangement. Before entering into a supply contract with Swifty's, Mohawk retained EBA Engineering Consultants Ltd. ("EBA") to conduct a limited Phase II Environmental Site Assessment of the Penner Lands to determine if past or current fuel storage and dispensing activities had adversely affected soil or groundwater quality. In August 1996, EBA drilled four boreholes on the Penner Lands, one of which was constructed as a monitoring well (BH4-M) immediately south of the convenience store. Borehole locations were based on the location of the former USTs, the pump island and distribution pipes, and the existing USTs. The EBA assessment revealed the presence of dissolved BETX[1] concentrations exceeding drinking water standards in BH4-M. However, BETX concentrations in the Former

[1] Benzene, ethylbenzene, toluene, and xylenes are components of gasoline and are used as indicators of the presence of gasoline contamination.

Penner Well and in soil samples taken from the Penner Lands were below detection levels.

In a September 1996 report (the "EBA Report"), EBA concluded that the presence of dissolved BETX concentrations in groundwater near BH4-M was "most likely due to leakage or past spillage associated with the former UST installation." EBA also reported that "the absence of significant hydrocarbon concentrations in the shallow soils and bedrock suggests that recent hydrocarbon leaks associated with the existing tanks and distribution lines is unlikely."

In addition, Mohawk retained Sure Test Canada Ltd. to conduct a pressure integrity test on the USTs and fuel lines. Tests were conducted on August 26, 1996, and no leaks were found in the USTs and fuel lines.

In September 1996, Mohawk concluded that the Gas Bar site was appropriate for fuel delivery, and entered into a gasoline supply agreement with Swifty's.

In November 1996, the Penners sold their shares in Swifty's to Felix Groot and Sally Kerr, accepted a mortgage from Swifty's against the Penner Lands, and retired to a location in the Scotch Creek area north-east of Chase, B.C.

In December 1999, Gordon Johnson, a creditor of Swifty's, seized the convenience store inventory and equipment. About the same time, Mohawk ceased supplying gasoline to the Gas Bar due to non-payment. In March 2000, Mohawk contracted with T.C. Electrical Petroleum Installations to remove the two gasoline dispensers, electrical signs, and other equipment from the Gas Bar.

By early 2000, monthly mortgage payments to the Penners had ceased, and the Penners commenced mortgage foreclosure proceedings. On or about April 1, 2000, Mr. Penner attended at the Gas Bar and found that the store was closed, the dispensers and signage had been removed, the fuel lines had been cut off below ground level, and there was a gasoline odour around the holes in the concrete pump island upon which the dispensers had been mounted.

On April 3, 2000, the Supreme Court of British Columbia granted the Penners an Order Absolute of Foreclosure in respect of the Penner Lands. Shortly, thereafter, the Penners obtained possession of the property, and contacted Race Trac about entering into a contract to supply and deliver fuel to the Gas Bar. In June 2000, Race Trac retained Leak Test Technologies Solutions Ltd. ("Leak Tech") to test the tank and lines, install new dispensers, and repair the fuel lines. On June 24, 2000, Leak Tech reported that the USTs and fuel supply lines tested tight (the "Precision Leak Test Report"). In July 2000, Race Trac entered into an agreement to supply and deliver fuel to the Gas Bar. At this time, the smaller UST was converted to a diesel fuel tank and the larger UST was used for regular grade gasoline. Race Trac continues to supply gasoline and diesel fuel to the Gas Bar.

In January 2001, Ms. Geddes noticed an odour in her well water and stopped drinking the water. In early February 2001, she had her tap water tested and was told that it contained benzene, a component of gasoline, in excess of the provincial

drinking water standard of 5 micrograms per litre (µg/L). She then complained to the Ministry, which collected and tested a water sample from her tap. This again exceeded the drinking water standard. The Ministry subsequently advised her not to use the water for drinking, food preparation, or bathing. In March 2001, she had her well disconnected, and an above ground water tank and pump were installed using a grant provided by the Provincial Emergency Program. Currently, her domestic water is supplied by tanker truck and stored in the above ground tank. Since August 2001, Petro-Canada has been paying for her water deliveries and tank rental on a "without prejudice" basis.

Meanwhile, in mid-February 2001, the Ministry obtained water samples from a tap in the line from the Former Penner Well and from the Highway Well that serves the Wildwood Trailer Park. Those samples revealed benzene concentrations less than the drinking water standard.

In a letter dated February 20, 2001, the Regional Manager informed the Penners that, based on a review of the EBA Report and the contamination found in the Geddes Well, there was reason to believe that the Gas Bar operations had contaminated the groundwater underlying the site. The Regional Manager advised the Penners that they would be required to conduct a detailed site investigation.

On February 23, 2001, the Regional Manager met with Mr. Penner, who provided the Regional Manager with a copy of the Precision Leak Test Report. Mr. Penner indicated that he lacked the funds to conduct a detailed site investigation.

In a letter dated March 1, 2001, the Ministry notified the Penners, Mohawk, Husky, Swifty's, Petro-Canada, and Race Trac of the Regional Manager's intention to issue a remediation order in order to "address the adverse affects on human health and pollution of the environment at the Site" and "to require safe water supplies or alternate accommodation for the impacted family." Referring to the two samples collected from the Geddes water supply and the two samples collected from the Former Penner Well and the Highway Well, the letter stated that the "Wildwood Gas Bar is the only identified source of this contamination identified to date."

During the remainder of 2001, the Ministry continued to test wells in the area around the Penner Lands. In March 2001, a benzene level in excess of the provincial drinking water standard was detected in water from a tap at the McCombe property, and the Ministry advised Ms. McCombe not to use the well water for drinking. In June 2001, a benzene level in excess of the drinking water standard was detected in a sample taken from the Former Penner Well. In July 2001, the Penners had a new well drilled on their property. In December 2001, water samples were collected from residences located to the north (the Lee property), northeast (the McCallum property), and southeast (the Steeple property) of the Penner Lands, and petroleum hydrocarbons were not detected in any of those samples.

On April 5, 2001, the Regional Manager sent a draft remediation order to the Penners, Mohawk, Husky, Swifty's, Petro-Canada, and Race Trac.

On May 22, 2001, the Regional Manager issued the Order. The Order names the Penners, Petro-Canada, and Swifty's as persons responsible for remediation. The Order is directed at groundwater contamination located at the Penner Lands, Geddes Lands, and McCombe Lands. These properties are described as being "characterized by petroleum related hydrocarbon contamination such as benzene, toluene and xylenes in groundwater exceeding the Drinking Water standard as described in the *Contaminated Sites Regulation* (B.C. Reg. 375/96)." The Order also states that benzene concentrations in excess of the drinking water standard are evident on the Geddes Lands and the McCombe Lands. However, the Order states that the contaminated site boundaries "will be determined once the full extent of contamination has been identified." The Order requires the Penners, Petro-Canada, and Swifty's to submit a work plan for, and undertake, a detailed site investigation of the Penner Lands. "The results of the detailed site investigation shall be used to determine the boundaries of the contaminated site and any remediation requirements."

On June 19, 2001, Petro-Canada filed a Notice of Appeal of the Order. In summary, Petro-Canada appeals on the grounds that: (1) Race Trac should be named in the Order; (2) Mohawk and/or Husky should be named in the Order; and (3) it is premature to name Petro-Canada in the Order because of the lack of technical information about the migratory pattern and pathway of the contamination which would link it to any activities that may have been conducted by Petro-Canada on the Penner Lands.

On June 21, 2001, the Penners filed a Notice of Appeal with the Board. In summary, they appeal on the grounds that: (1) it was premature to issue the Order because of the absence of technical information about the migratory pattern and pathway of the contamination which would link it to any activities on the Penner Lands; (2) there is no evidence to indicate that the site was contaminated during the Penners' ownership; and (3) Mohawk and Husky should be named in the Order.

On June 26, 2001, the Board invited Husky, Mohawk, Race Trac, and Swifty's to participate as full parties in the appeals. Husky, Mohawk, and Race Trac accepted full party status. Swifty's did not reply.

On November 8, 2001, Ms. Geddes applied for party status in the appeals. The Board granted her application for party status on January 10, 2002 (*Linda Geddes, Applicant, and Alfred and Norma Penner et al.* v. *Regional Waste Manager*, Appeal Nos. 2001-WAS-011(a) & 2001-WAS-012(a), [2002] B.C.E.A. No. 4 (Q.L.)).

On October 29, 2002, the Board was advised that Swifty's had been struck from the register of companies and dissolved by the Registrar of Companies on September 27, 2002.

The Regional Manager submits that the appeals should be dismissed, and the Order should be varied by adding Husky and Mohawk as responsible persons.

Ms. Geddes submits that the appeals should be dismissed, and the Order should be amended by adding Husky and Mohawk and Race Trac as responsible persons and

requiring the responsible persons to remediate groundwater contamination below the Penner Lands, Geddes Lands, and McCombe Lands.

Husky and Mohawk request that the Board cancel the Order, or alternatively, decline to amend the Order by adding Husky or Mohawk as responsible persons.

Race Trac submits that it is not a responsible person under the *Act*, and there is no evidence of any contamination on the Penner Lands.

Finally, a number of the parties requested that the Board make certain orders with respect to costs in the appeal.

ISSUES

The Panel has addressed the following issues:

1. Whether the Order should be reversed or varied on the basis that the Penner Lands are not the source of the contamination found on the Geddes Lands and the McCombe Lands.

2. Whether the Order should be varied on the basis that the existing contamination under the Penner Lands arose from adjacent properties or arose from activities on the gas bar site.

3. Whether the Board should order any of the parties to pay the costs of any of the other parties in relation to these appeals.

RELEVANT LEGISLATION

The following sections of the *Act* are relevant to this appeal:

Part 4 — Contaminated Site Remediation

Definitions and interpretation

26 (1) In this Part:

...

"contaminated site" means an area of land in which the soil or any groundwater lying beneath it, or the water or the underlying sediment, contains

(a) a special waste, or

(b) another prescribed substance in quantities or concentrations exceeding prescribed criteria, standards or conditions;

"contamination" means the presence, in soil, sediment or groundwater, of special waste or another substance in quantities or concentrations exceeding prescribed criteria, standards or conditions;

Site investigations

26.2 (1) A manager may order an owner or operator of a site, at the owner's or operator's own expense, to undertake a preliminary site investigation or a detailed site investigation and to prepare a report of the investigation in accordance with the regulations if the manager reasonably suspects on the basis of a site profile, or any other information, that the site

(a) may be a contaminated site, or

(b) contains substances that may cause or threaten to cause adverse effects on human health or the environment.

...

Persons not responsible for remediation

26.6 (1) The following persons are not responsible for remediation at a contaminated site:

...

(i) a person who owns or operates a contaminated site that was contaminated only by the migration of a substance from other real property not owned or operated by the person;

...

Remediation orders

27.1 (1) A manager may issue a remediation order to any responsible person.

(2) A remediation order may require a person referred to in subsection (1) to do all or any of the following:

(a) undertake remediation;

(b) contribute, in cash or in kind, towards another person who has reasonably incurred costs of remediation;

...

(10) A manager may amend or cancel a remediation order.

There is no dispute that the applicable *Contaminated Sites Regulation* shows the standards for groundwater used as drinking water are as follows:

Benzene: 5 µ/L

Ethyl-benzene: 2.4 µ/L

Toluene: 24 µ/L

Xylene: 300 µ/L.

DISCUSSION AND ANALYSIS

1. Whether the Order should be reversed or varied on the basis that the Penner Lands are not the source of the contamination found on the Geddes Lands and the McCombe Lands.

Petro-Canada submits that the Order should be set aside or abandoned. Petro-Canada submits that there is evidence that, on a balance of probabilities, the Penner Lands are not the source of the benzene contamination found in the Geddes Well, McCombe Well, and Former Penner Well in 2001. Specifically, Petro-Canada disputes the Regional Manager's assumption that the BETX concentrations found on the Penner Lands in 1996 migrated over a 5-year period and caused the benzene contamination in the Geddes Well, the McCombe Well, and the Former Penner Well. Petro-Canada argues that the BETX found in 1996 would have attenuated long ago, or if still present it would be in such minute quantities that it could not have caused the contamination of the drinking water wells.

Petro-Canada maintains that the source of the contamination was a small, isolated release of a relatively small volume of gasoline somewhere to the east or northeast of the Penner Lands within months or weeks prior to the discovery of benzene in the Geddes Well in February 2001. Petro-Canada notes that a gasoline leak from a parked truck was confirmed at the McCombe Lands in Fall 2001. Ms. McCombe put a tray under the truck to collect the gasoline after she noticed the leak, and advised that the leak was subsequently fixed. However, Petro-Canada notes that the truck had been parked sporadically at the McCombe property for 2 years, excluding summer months, before the leak was noticed.

Further, Petro-Canada argues that remediation is not warranted because data from the drinking water wells and monitoring wells indicate that the contaminant plume has passed, or is in the process of passing, from the northeast to the southwest.

In support of those submissions, Petro-Canada refers to several reports prepared by Morrow Environmental Consultants Inc. ("Morrow") for Petro-Canada. John Elliott and Michelle Tittley, Professional Engineers with Morrow, provided expert evidence for Petro-Canada and provided support for the conclusions in the reports prepared by Morrow.

Morrow's Stage 1 Preliminary Site Investigation Report, completed in January 2002, identified a number of areas of potential environmental concern associated with current and historical land use. On December 13, 2001, Morrow was told by Ms. McCombe that a red truck parked at her home that day had a fuel tank leak but

only a litre or two had leaked to her knowledge and she had placed a pan under it to collect the leakage. A later conversation between Morrow and Ms. McCombe revealed that there had been numerous small spills on the property while fueling small equipment such as lawn mowers and chain saws. Out-of-use vehicles were observed parked on the Geddes Lands and at the McCallum residence to the northeast of the Penner Lands. The report noted that the Penners had told the Ministry that they had observed evidence of a spill on a gravel shoulder along Hickory Road that was used as a parking spot by trucks involved in road paving during the summer of 2001.

In early February 2002, Morrow completed 2 more reports: a Fuel Storage and Dispensing System Review and a Summary of Results - Soil and Groundwater Quality and Hydrogeological Investigation. These two reports were supplemented with groundwater investigations carried out by Morrow in April and May 2002, which were included in the Stage 2 Preliminary Site Investigation Report issued in June 2002.

The Fuel Storage and Dispensing System Review at the gas station found that there was no evidence of spills or leakage and the tanks and lines had tested tight in June 2000. In a subsequent pressure integrity test conducted by Cantest Solutions Inc. ("Cantest") in September 2001, the tanks still tested tight but a leak was found in the diesel dispenser line and the tightfill caps were not sealing properly on the 2 USTs. (It should be noted that there is no evidence of contamination by diesel in this case). Cantest also noted that the USTs had no overfill protection. Morrow concluded that there was a potential for historical fuel spills if the USTs were overfilled during deliveries, due to the absence of overfill protection, which may have contributed to the contamination identified in 1996 as well as the existing contamination.

The Summary of Results - Soil and Groundwater Quality and Hydrogeological Investigation was concerned with the absence of soil contamination found around the station and an investigation into the groundwater gradient, direction and quality. For this investigation, Morrow sampled the drinking water at several local residences, drilled 9 boreholes across the Penner Lands and 4 on surrounding properties, and installed monitoring wells in 9 of the boreholes. Groundwater samples were taken from the monitoring wells and nearby domestic water wells. Hydrogeological characterization of the aquifer was achieved through well response testing and "long-term" groundwater level monitoring. This analysis was assisted by interviews with the Wildwood Trailer Park manager regarding the operation of the Park's water supply system to determine its influence on the hydrogeology of the area.

Soil and rock conditions in each borehole were logged with respect to soil type, colour, density, moisture content, and contamination, if present. Morrow observed that the geology at the Penner Lands and surrounding properties consists of surficial sand and silty sand ranging in thickness from 0.7 metres to 2.4 metres overlying fractured and clay-altered rhyolite bedrock. No concentrations of BETX, volatile petroleum hydrocarbons and extractable petroleum hydrocarbons greater

than the detection limit and *Contaminated Sites Regulation* residential land use standards were identified in the soil samples analyzed during the drilling investigation.

Morrow concluded in the Summary of Results – Soil and Groundwater Quality and Hydrogeological Investigation that the natural groundwater flow appears to have been toward the lake to the west of the Penner Lands, but that the natural groundwater flow has been altered by pumping of the wells in the Wildwood Trailer Park. Morrow stated that the groundwater now flows toward the southwest, based on conditions observed in November 2001. Morrow calculated the hydraulic gradient (slope of the groundwater table) to be approximately 0.1 m/m (or 10 percent), and the groundwater flow velocity to be 100 m/year to 1000 m/year. Based on Morrow's observations in 2001 and EBA's observations in 1996, Morrow concluded that the Former Penner Well, the Geddes Well, and the McCombe Well are all upgradient from the fueling facilities on the Penner Lands, and therefore, it is "unlikely" that they would be affected by activities at the fueling facilities.

In the summary report and in the June 2002 subsequent report, Morrow found that benzene concentrations exceeded the drinking water standard in water samples from the Penner Lands and wells on the adjacent properties. According to Morrow, the benzene concentrations observed in those wells indicated a benzene concentration higher in the northeast and decreasing toward the southeast. Based on that, and the rapid rate of increase in benzene concentrations in 2001 and the direction of groundwater flow, Morrow's opinion was that the source of the contamination was located to the east or northeast of the Penner Lands, and probably occurred within a year of when the contamination was first observed.

Petro-Canada also referred to a June 27, 2002 report (the "Golder Report"), prepared by Guy Patrick, a Professional Engineer with Golder Associates. Mr. Patrick testified before the Panel, and was qualified as an expert in hydrogeology with respect to the movement and assessment of hydrocarbon contamination.

In the Golder Report, Mr. Patrick states that several issues are central to understanding the origins and timing of the release(s) that led to the contamination. Those issues include the local bedrock conditions, direction of groundwater flow, and BETX and groundwater chemistry. He explains that both EBA and Morrow encountered the water table within the bedrock, and most, if not all, local water wells, including the Geddes Well, McCombe Well, Former Penner Well, and Wildwood Trailer Park Wells, are completed in bedrock. He states that water is primarily transmitted through the bedrock along open, interconnected fractures that comprise a fracture network. In such systems, groundwater flow velocities are typically in the order of metres per day under hydraulic gradients of a few percent. However, Mr. Patrick notes that fracture infilling by clays may reduce the hydraulic conductivity, and that Morrow's boreholes revealed both clay-altered, highly fractured zones as well as more competent, less fractured zones. Given the lack of hydraulic testing of these individual zones, Mr. Patrick states that he is uncertain whether the more competent bedrock is any more or less permeable than the overlaying clay-altered rock. He states:

> …it is not possible to draw conclusions respecting the difference in hydraulic conductivity between the clay-altered zones and more competent zones in the bedrock. As a consequence, the significance of the bedrock lithology as a factor governing the transport of petroleum-related contamination at the WGB Site [Penner Lands] is uncertain.

However, Mr. Patrick states that, based on groundwater elevation data, which indicates that the slope of the water table is about 10 percent, and estimated groundwater extraction rates at the Wildwood Trailer Park since the 1980's:

> …groundwater flow direction has been from the McCombe and Geddes residences towards the WGB Site [Penner Lands] at least since 1996, and probably since at least the late 1980's. Consequently, groundwater could not have transported petroleum hydrocarbons from the UST basin area towards these wells over that time period.

Based on the water samples taken in 1996 and 2001, and the changes in benzene concentrations observed in 2001, Mr. Patrick further states that:

> …**the presence of contamination first observed in the Geddes well, and in higher concentration than at the McCombe well, is consistent with a source of contamination northeast of the WGB Site.**
>
> With the exception of MW01-2D[2] [a deep monitoring well drilled by Morrow close to the gas bar USTs in 2001], the groundwater chemistry data for all wells where hydrocarbons have been detected since contamination was discovered in 2001 have been dominated by benzene. At MW01-2D, the concentrations of xylenes exceed benzene concentrations and are consistent with historic contamination observed in 1996 at BH4-M. MW01-2D is completed several metres below the water table, and below the benzene-dominant groundwater found in adjacent shallow well MW01-2S [a shallow monitoring well drilled by Morrow in 2001]. **Based on the available chemistry data, and the measured downward hydraulic gradients between MW01-2S and MW01-2D, I conclude that the contamination observed at MW01-2S is not related to underlying contamination observed at MW01-2D, and is indicative of a separate source.**
>
> …
>
> Given that the 1996 contamination indicated no preferential degradation of toluene, ethylbenzene or xylenes over benzene in shallow groundwater, preferential degradation in the shallow groundwater is an unlikely process of significance at [the Penner Lands]. However, biodegradation in the vadose zone (*i.e.* the bedrock and soil zone above the water table), where oxygen may readily enter the soil through diffusion and infiltration, may

[2] In this decision, references to "MW" mean 'monitoring well', "D" mean 'deep' and "S" mean 'shallow.'

> be very active, and would act to reduce BETX concentrations in vapours and porewater prior to entry into the groundwater system…
>
> As a consequence, where the source is largely confined to the vadose zone, benzene-dominant groundwater in concentrations well below the expected benzene concentrations derived from a large gasoline source at the water table (*i.e.* several thousand µg/L), would be expected. Thus, the benzene-dominant groundwater detected at several wells at and in the vicinity of the WGB Site is consistent with a localized, relatively small source of gasoline contamination.
>
> …
>
> **From the data and observations, I conclude that the benzene contamination in groundwater resulted from relatively small-volume releases of gasoline or gasoline-like product since 1996, and probably from a release or releases that occurred only a few months prior to first discovery in February 2001 in the Geddes well.** [Emphasis in original]

In conclusion, Mr. Patrick states that the contamination in the Geddes Well, the McCombe Well, and the Former Penner Well has resulted from:

> …either a) a release or releases of gasoline or gasoline-like hydrocarbons from a source at or northeast of these wells; or b) a release or releases of gasoline to the subsurface of the WGB Site [Penner Lands] sometime after 1996. Further, it is my opinion that, of these two possibilities, the former (*i.e.* hydrocarbon release or releases at or northeast of the residential wells) is the more likely.

To conclude, Petro-Canada submits that the Order should be abandoned or set aside.

The Penners submit that there is insufficient information to link the benzene contamination to any activities that the Penners may have conducted on the Penner Lands. The Penners submit that their property was contaminated only by the migration of a substance from a neighbouring property not owned by them. The Penners submit, therefore, that they are not responsible persons in respect of the benzene contamination, in accordance with section 26.6(1)(i) of the *Act*.

Specifically, the Penners submit that the groundwater flows in a southwesterly direction towards the Penner Lands. The Penners maintain that since the Geddes Lands and McCombe Lands are located east or northeast of the Penner Lands, those properties are upgradient from the Penner Lands with respect to the flow of groundwater. The Penners argue that the groundwater elevations at the Geddes Well, McCombe Well, and Former Penner Well were higher than at monitoring wells installed near the fueling facilities on the Penner Lands in 2001. In addition, they argue that the contamination in the Geddes and McCombe wells is not associated with the release of BETX on the Penner Lands noted in 1996, because those wells

only show benzene concentrations, and not ethylbenzene, toluene and xylenes concentrations.

Further, the Penners submit that benzene concentrations were highest in the Geddes and McCombe Wells, and that groundwater data from the shallow monitoring well near the fueling facilities indicates the presence of the leading edge of a contaminant plume from upgradient. The Penners submit that the presence of only benzene indicates the leading edge of a plume that has resulted from a recent spill. The Penners note that no soil contamination was found by EBA in 1996, or by Morrow in 2001. The Penners argue that the rate of increase in benzene concentrations in the drinking water wells between February and November 2001 indicated the presence of a benzene plume that had not reached a steady state and was still moving through the subsurface. They note that benzene concentrations had started to decrease in the Geddes and McCombe Wells by May 2002, while benzene concentrations in the monitoring wells on the Penner Lands had started to increase. Additionally, they note that benzene was not detected in the Former Penner Well in 1996, while benzene concentrations in that well were below the drinking water standard in February 2001, exceeded the drinking water standard from June to November 2001, and then decreased in May 2002.

The Penners suggest that the source of the benzene contamination may be the McCombe Lands, the Geddes Lands, or a landfill or sewage lagoon located to the east of the Penner Lands. The Penners maintain that, for several years, the occupants of the Geddes Lands and McCombe Lands have regularly stored, dismantled, reassembled, and disposed of automobiles on their properties. The Penners argue that this conduct could have caused or contributed to any contamination at the relevant properties. Further, the Penners note that at least one spill of gasoline from a leaking vehicle has been reported on the McCombe Lands. Alternatively, the Penners suggest that the contamination could have been caused by a spill on the Penner Lands in March 2000, when the fuel dispensers were removed and fuel lines were cut by Mohawk's contractor.

In conclusion, the Penners submit that they should be removed from the Order as responsible persons.

The Regional Manager submits that the Appellants have failed to establish that the benzene contamination resulted only from the migration of substances from other properties not owned or operated by them. He submits that the evidence still weighs in favour of finding that the Penner Lands are the source of the contamination.

In particular, the Regional Manager submits that there is clear evidence that the Penner Lands are at least one source of the contamination found in the drinking water wells. He notes that EBA found elevated BETX concentrations in the groundwater at the Penner Lands in 1996, and he maintains that there is evidence of subsequent fuel leaks or spills at the Penner Lands. The Regional Manager notes that Mr. Penner noticed a strong gasoline smell near the pump island after the

dispensers were removed in 2000, and there was evidence of leaking supply lines and tightfill caps when they were tested by Cantest in September 2001.

The Regional Manager also considers that the high vapour concentrations measured, particularly in the monitoring wells near the gas bar and near the Geddes Well, support a finding that gasoline contamination is migrating or has migrated from the gas bar towards the Geddes Well. These measurements were taken on April 16, 2002, May 7, 2002 and July 31, 2002.

In reference to these vapour concentrations, the "Stage 2 Preliminary Site Investigation – Wildwood Gas Bar" report by Morrow stated that:

> Hydrocarbon vapour concentrations were consistent with dissolved hydrocarbon concentrations measured in groundwater samples collected from the WGB site and surrounding property monitoring wells.

In regard to these vapour concentrations, Mr. Patrick wrote:

> These data are consistent with the presence of volatile products such as gasoline **near each of these wells.** Where such **localized releases** of gasoline hydrocarbons have occurred, the gasoline will have potentially penetrated the fractured rock toward the water table, and have evolved vapours that can be detected. Vertical migration of gasoline along the fractures towards the water table following a release would be expected to occur relatively quickly (i.e. on the order of days to weeks). (Emphasis added).

Mr. Patrick went on to write:

> It is not possible to conclude whether there are single or multiple sources of gasoline in the vadose zone at the WGB site.

In his oral testimony, Mr. Patrick stated that the high vapour concentrations in the wells are an issue above the water table and not in the groundwater system.

The Regional Manager submits that evidence focusing on groundwater as the medium for contaminant transport is misplaced. He argues that the evidence in this case is consistent with the spread of contamination from the Penner Lands to the Geddes Well through an unsaturated zone. Specifically, the Regional Manager submits that there is evidence of a 15 to 18 metre unsaturated (vadose) zone above the water table, where contaminant transport would be dictated by gravity and the orientation and interconnectivity of bedrock fractures. In this zone, the spread of contaminants would be independent of the groundwater flow, and contaminants could spread as pure phase gasoline or as dissolved gasoline components in infiltrating water.

Peggy Evans, a Professional Engineer and Soil and Hydrology Specialist with the Contaminated Sites Unit of the Ministry, testified as an expert for the Regional Manager. Ms. Evans stated that the borehole logs indicate that competent bedrock

is found in bands at increasing depths as one moves eastward from the Penner Lands towards the Geddes and McCombe Lands. Ms. Evans noted that there is evidence of a confining layer in one borehole at a depth of 21 to 24.5 metres. She stated that this pattern is consistent with a sloping bedrock unit tilted towards the east, which could form a pathway for contaminants on the Penner Lands to migrate in unsaturated conditions towards the Geddes and McCombe Lands. While she acknowledged that there is no evidence that the zones of competent bedrock are continuous from one borehole to the next, she maintained that there is no evidence to show that this is not so.

Ms. Evans further stated that there is insufficient data to support a conclusion regarding the historic direction of groundwater flow, because there is considerable uncertainty around the effects of water pumping by wells in the area. She agreed that the Former Penner Well, Geddes Well, and McCombe Well were upgradient of the fueling facility under the groundwater flow regime in effect during Morrow's 2001 investigations. However, she stated that Morrow's calculations apply only at the time of measurement in 2001. Additionally, she stated that if the contamination was migrating through the groundwater from a source to the northeast, the plume would be so narrow, given the steepness of the hydraulic gradient, that it would only be captured by the Geddes Well, and not the McCombe Well or the Former Penner Well.

In addition, the Regional Manager noted that there is a sewer line running through the Penner Lands and along the north side of the Geddes Lands near the Geddes Well, at a depth of approximately 0.6 metres (2 feet) underground near the convenience store, and sloping towards the east to a depth of approximately 2.4 metres (8 feet) where it connects to another sewer line. The Regional Manager submits that the sand fill along the base of this sewer line creates a potential preferential pathway for contaminants to flow by gravity towards the east, independent of the groundwater flow.

The Regional Manager further argues that there is evidence of a confining layer in the bedrock or other subsurface materials that would facilitate lateral movement of contaminants. In particular, he notes that the results of one borehole drilled by Morrow in 2001 (BH01-8D) to the east of the Penner Lands shows a dry zone at a depth of approximately 21 to 24.5 metres underlying a wet zone, which indicates a possible confining layer that could have facilitated the spread of contaminants in an easterly direction from the Penner Lands.

With respect to the evidence of changes in BETX concentrations documented since 1996, the Regional Manager argues that there are too many variables to predict the breakdown time for gasoline in the subsurface of the Penner Lands. He submits that there is evidence of iron staining in exposed bedrock fractures along the highway south of the Penner Lands, which is indicative of anaerobic conditions that could delay the breakdown of gasoline contaminants.

In this regard, Ms. Evans agreed that the BETX measured in 1996 may have attenuated, but the absence of data precludes a definitive determination of

dissolved gasoline distribution and degradation during that period. She stated that the water table in the area has dropped since 1996, and the gasoline that caused the BETX concentrations in 1996 would have dropped with it, such that the gasoline could have eventually come into contact with the competent bedrock unit and migrated along it by gravity flow. Ms. Evans opined that once the water table dropped below the surface of the competent bedrock unit after 1996, the contaminants would have been free to migrate by gravity along the bedrock unit which she says tilts to the east towards the McCombe and Geddes wells. Therefore, she concludes that it is possible that the contamination found in 2001 could have originated from gasoline that was released to the ground before 1996.

The Regional Manager also disputes the Appellants' claims that the contamination may have originated from a source to the northeast of the Penner Lands. With respect to the leaking truck observed on the McCombe Lands, the Regional Manager submits that this was a minor leak of about ½ cup of gasoline, which occurred on December 13, 2001, almost a year after Ms. Geddes reported the contamination in her well. The Regional Manager notes that Ms. McCombe testified before the Panel that she would have noticed if the truck had leaked on other days. As for the Appellants' suggestion that vehicles and fuel containers stored on the Geddes Lands and the McCallum Lands may have leaked, the Regional Manager states that Ministry staff investigated those properties and observed no evidence of gasoline spills.

Ms. Geddes submits that the Penner Lands are the source of the benzene contamination identified in the Order. She argues that there is evidence of fuel spills on the Penner Lands. For example, she notes that Mr. Penner observed a strong fuel smell near the pump island in April 2001, and Morrow did not take soil samples near the dispensers when it investigated the site in 2001.

Similar to the Regional Manager's statements, Ms. Geddes submits that the primary mode of benzene transport is through the fractured bedrock and not through the groundwater. Ms. Geddes submits that if the contaminant plume was migrating through groundwater, it would be too narrow to reach all of the affected wells given the steepness of the hydraulic gradient, and it would have reached the Wildwood Trailer Park Wells given the groundwater velocity. She argues that the conclusions in the Morrow reports and the Golder Report appear to be based on the assumption that the contaminant would flow downward into the water table and then move with the groundwater through the fractured bedrock. She submits that the bedrock described in Morrow's borehole logs and shown in Mr. Patrick's photos of the outcropping beside Highway 97 is unreliable as an indicator of the level of bedrock fracturing. She submits, therefore, that it is erroneous to assume that contaminants would travel down to the water table and then move laterally through bedrock fractures. She argues that the exposed bedrock beside Highway 97 would have been subject to further fracturing as a result of upheaval and weathering. She argues that the benzene contamination is itself indicative of travel through an unsaturated (vadose) bedrock zone, because biodegradation, which requires the presence of oxygen, is evidenced by the predominance of benzene rather than ethylbenzene, toluene and xylenes.

William Gaherty, a Professional Engineer with Pottinger-Gaherty Environmental Consultants Ltd., provided expert evidence for Ms. Geddes. He described the Penner Lands as a "9 out of 10" for hydrogeological complexity. He stated that fewer than 20 of the 1000 site investigations he has conducted involved fractured bedrock environments such as this. He stated that it would be "surprising" to see benzene contamination in the Former Penner Well if the contamination had travelled in the groundwater from a source to the northeast of the McCombe and Geddes wells, because a steep hydraulic gradient would cause the plume to be too narrow to reach that well. He also commented on the lack of reliability of the exposed bedrock along Highway 97 as an indicator of the degree of fracturing in the bedrock underlying the area, noting that the cracks in buried rock will change once it is uncovered and under less stress.

Ms. Geddes maintains that there are 3 ways in which the contamination could have travelled through the vadose zone. These are through the sewer corridor; along a competent bedrock unit dipping towards the east; and/or through interconnected cracks in the bedrock. Ms. Geddes refers to Ms. Evans' testimony that there is evidence of a confining layer in one borehole (the dryness of the rhyolite reported on the drill log). She notes that the expert witnesses disagree on whether any drying caused by a drilling method that uses compressed air would give the impression that there appears to be a confining layer. Although Ms. Geddes argues that the "majority" of experts agree that the borehole results show that there "could be" a confining layer, she acknowledges that the extent of any confining layer is unknown due to the limited number of boreholes. Ms. Geddes argues that, although Mr. Patrick and the experts from Morrow do not agree with the dipping bedrock theory, they did not present additional evidence to corroborate their assessment that other flow directions are more likely.

Ms. Geddes submits that, in any event, the Panel need not accept the dipping bedrock theory in order to accept that the contamination flowed through the unsaturated zone as opposed to the groundwater, because the third possibility is that it may have moved through fractures in the bedrock. In this regard, Mr. Gaherty testified that the contamination could have migrated through bedrock fractures as a result of both gravity and capillary action. He stated that he had never seen this level of contamination in a site except where the contamination was due to the bulk storage of gasoline. However, he concluded that there was insufficient information to show whether the Penner Lands are the source of contamination in the Geddes Well.

In summary, Ms. Geddes submits that there is more evidence to suggest that the primary mode of benzene travel is through the unsaturated zone than to suggest that it travels through or along with groundwater. She maintains, therefore, that the fact that the groundwater flows from the northeast to the southwest is "completely irrelevant" in assessing where the contamination originated. She argues that given the preponderance of evidence that the Penner Lands are contaminated, it is reasonable to conclude that the Penner Lands are the source of the benzene contamination on the Geddes and McCombe Lands. Given the hydrogeological complexity of this site, and the associated uncertainty, Ms. Geddes

submits that the Board should be reluctant to accept that the benzene originates from a source east or northeast of the McCombe and Geddes Lands, in the absence of information establishing that such a source exists.

Husky and Mohawk made a joint submission. They submit that the Order should be cancelled because the evidence indicates that the contamination is not coming from the Penner Lands; rather, the contamination is from a source to the northeast of the Penner Lands. Further, Husky and Mohawk submit that a remediation order should be issued to the parties responsible for the contamination once the source has been determined by the Regional Manager. In this respect, Husky and Mohawk rely on section 26.6(1)(i) of the *Act*.

Specifically, Husky and Mohawk submit that the evidence indicates that the groundwater flows from northeast to southwest, i.e. from the Geddes and McCombe Lands towards the Penner Lands, as a result of both natural forces and the removal of water from the water table at the Highway Well. They submit that water pumping at the Highway Well causes a "drawdown effect" which draws groundwater further south than would naturally occur. They further submit that the benzene in the drinking water wells resulted from a small gasoline spill, and the contaminant plume is generally flowing in a southwesterly direction while spreading laterally to the contaminated wells.

Husky and Mohawk submit that the Regional Manager's theory that the contamination migrated along an unsaturated bedrock zone dipping towards the Geddes and McCombe Lands lacks merit and fails to take into account the relative benzene concentrations under the Penner Lands and in the Geddes Well, McCombe Well, Former Penner Well, and Highway Well. Further, Husky and Mohawk maintain that the Regional Manager's expert witness, Ms. Evans, was only prepared to say that this scenario is a "possibility," and all of the other experts agree that it is unlikely.

In particular, Husky and Mohawk rely on the testimony of John Balfour, a Professional Engineer with EBA. Mr. Balfour testified as an expert witness for Husky and Mohawk. Mr. Balfour reviewed all of the possible sources of contamination, including the McCombe Lands and the fueling facilities on the Penner Lands. He stated that one possible explanation for the contamination is that gasoline deposited on the Penner Lands moved in a northeasterly direction through unsaturated fractured bedrock, eventually meeting the water table and contaminating the wells, as suggested by Ms. Evans. For this to occur, Mr. Balfour stated that there would need to be fractures in the rock that dip preferentially to the northeast. Although he agreed that there could be fractures that dip in that direction, he testified that the evidence demonstrates that there are also fractures in vertical directions. Consequently, Mr. Balfour opined that, for this scenario to occur, "quite a large" quantity of gasoline would need to have been released as most of this release would have preferentially migrated vertically downward and a lesser portion would migrate to the northeast. He stated that if this had occurred, he would expect to see the following:

- high concentrations of benzene in the groundwater beneath the Penner Lands;
- some detectable contamination in the soil samples or rock cores;
- contamination in the Highway Well; and
- higher concentrations of benzene in the groundwater under the fueling facilities, diminishing towards the northeast.

Mr. Balfour stated that none of these factors have been observed. Consequently, he concluded that the probability of gasoline migrating from the Penner Lands to the drinking water wells was "low."

With respect to the theory that the gasoline migrated from the Penner Lands in a vertical direction down to the groundwater and then flowed northeast to the drinking water wells, Mr. Balfour opined that this would require both the gradient and flow direction of the groundwater to reverse from what was observed in 2001. Mr. Balfour indicated that the data collected by Morrow in 2001 revealed that the water table at the Geddes Well was approximately 4 metres higher than the water table at the east edge of the USTs on the Penner Lands. Thus, the water table at the Geddes Well would have to be lowered by 4 metres to make the gradient flat, and 8 metres to achieve a reverse gradient of 10 percent. Mr. Balfour reviewed the effects of drawdown by local wells, and concluded that pumping by the McCombe and Geddes Wells for residential use is insufficient to cause a drawdown of more than 4 metres, which would be needed to reverse the hydraulic gradient and cause the migration of benzene from the Penner Lands to the Geddes and McCombe Wells. In addition, Mr. Balfour testified that he would expect to see higher benzene concentrations at the Penner Lands and the Highway Well, but this has not occurred.

The third theory, which Mr. Balfour subscribes to, is that there was a small spill of gasoline somewhere to the northeast of the Geddes and McCombe Lands, which then migrated down to the aquifer and into the drinking water wells. Mr. Balfour testified that if a contaminant from a point source begins to move with groundwater flow, it will spread laterally by chemical and physical processes, including mechanical dispersion through fractures and diffusion from areas of high concentration to areas of lower concentration. He testified that those two processes are not likely to show a high degree of spreading. Mr. Balfour stated that another process could cause lateral spreading of the contaminants; namely, pumping from wells causes a drawdown around the wells, which will "drag" contaminants in the groundwater towards the wells that are drawing water. Mr. Balfour opined that the history of benzene concentration recordings obtained by Morrow between February 2001 and May 2002 from the Geddes, McCombe, and the Former Penner Wells, relative to the Highway Well and the monitoring well on the Penner Lands, are consistent with this process. In conclusion, Mr. Balfour stated that, based on the available information, this theory is "by far the most likely" on a balance of probabilities.

Race Trac submits that the contamination in the Geddes and McCombe Wells did not originate at the Penner Lands. Race Trac submits that the preponderance of evidence indicates that it is most probable that the contaminants were introduced into the aquifer at a location to the northeast of the McCombe and Geddes Lands. In support of these submissions, Race Trac referred to the evidence in the Morrow reports and the testimony of Mr. Patrick and Mr. Balfour.

Race Trac also relied on the testimony of Gary Chan, a Professional Geologist and Senior Consultant/Hydrologist with Jacques Whitford Environmental Limited. Mr. Chan testified as an expert witness for Race Trac. Mr. Chan testified that he reviewed the available information concerning the contamination, including the EBA Report, the Morrow reports, the Golder Report, and Ms. Evans' letter dated March 19, 2002. He stated that the groundwater flow data collected by Morrow in November 2001 and May 2002 indicate a southwesterly flow between the wells on the Geddes and McCombe Lands and the area of the USTs on the Penner Lands. Based on the information, he concluded that there was no migration of gasoline contamination from the area of the USTs to the Geddes and McCombe Wells between July 2000 and May 2002.

The Panel notes that these appeals have been conducted as a new hearing of the matter, in accordance with section 46(2) of the *Act*. Therefore, the question for the Panel in addressing this issue is not, as suggested by some of the parties, whether the Regional Manager's decision to issue the Order was reasonable in light of the information that was available to him. The Panel has been provided with, and has considered, a great deal of expert evidence that was not before the Regional Manager when the Order was issued. Accordingly, the Panel must determine whether, on a balance of probabilities, the weight of evidence indicates that the benzene contamination found in the drinking water wells originated from the Penner Lands. If the Panel finds that that is not so, then the Panel may, under sections 47(c) and 27.1(10) of the *Act*, exercise the authority of the Regional Manager to cancel the Order. Further, if the Panel finds that the Penner Lands are contaminated with benzene "only by the migration of" the benzene "from other real property not owned or operated by" the persons who owned or operated the Penner Lands, then those persons who owned or operated the Penner Lands are not persons responsible for remediation of the benzene, pursuant to section 26.6(1)(i) of the *Act*.

The Panel finds that the weight of expert evidence cannot support a finding that, on a balance of probabilities, the source of the benzene contamination in the Geddes, McCombe and Former Penner Wells is the Penner Lands. The Panel notes that the reports by Morrow and the testimony of Mr. Patrick, Mr. Chan, and Mr. Balfour all indicate that it is "unlikely" or a "low probability" that the Penner Lands are the source of the benzene contamination.

Further, the Panel finds that the evidence indicates, on a balance of probabilities, that the Penner Lands are contaminated with benzene "only by the migration of" the benzene "from other real property not owned or operated by" the persons named in the Order. The Panel notes that all of the experts, except Ms. Evans and

Mr. Gaherty, subscribe to the theory that there was a small spill of gasoline somewhere to the northeast of the Geddes and McCombe Lands, which then migrated downwards to the aquifer and appeared in the Geddes and McCombe Wells, and later the Former Penner Well.

Specifically, the Panel notes that the benzene contamination followed a time pattern. In February 2001, two high concentrations were measured a week apart at the Geddes Well and a very low concentration was measured at the Former Penner Well. In March 2001, a relatively low concentration was measured at the McCombe Well. In June 2001, a high concentration was measured at the McCombe Well and again, a very low concentration at the Former Penner Well. In November 2001, a high concentration was measured at the Former Penner Well. From November 2001 to May 2002, the benzene concentrations at each of these wells decreased substantially (the McCombe Well by about 66%, the Geddes Well by about 56% and the Former Penner Well by about 95%). During this November 2001 to May 2002 period, the benzene concentration at the gas bar (MW01-2S) increased by nearly 19%. These data support the above concept of a gasoline spill towards the northeast with subsequent migration towards the Penner Lands. The Panel notes that, regardless of the direction of migration of the gasoline contaminants, significant lateral spreading must have occurred because increasing contamination was measured in the McCombe and Former Penner Wells. This spreading is consistent with the plume dimensions in Mr. Patrick's reference #9 "Characteristics of Dissolved Petroleum Hydrocarbon Plumes, Results from Four Studies" by the American Petroleum Institute, API Soil/Groundwater Task Force, December 1998 (Texas and California Studies).

The Panel has reviewed all of the expert evidence and has concluded that the benzene could not have moved from the Penner Lands to the Geddes and McCombe Lands through the aquifer. The Panel accepts that the groundwater gradient slopes downward from the east to the west at approximately 10 percent. The Panel further accepts that the comparatively high demand (about 47 residences) of the Trailer Park wells, compared with the low demand from the Penner, McCombe and Geddes wells would alter the groundwater flow from a westerly to a south-westerly direction. Accordingly, the Panel finds that any contamination found in the Geddes and McCombe Wells did not move through the aquifer from the Penner Lands.

However, the aquifer may well have allowed transport of the contamination to the Geddes and McCombe Wells if the contamination originated to the east or north east of those wells.

In addition, the Panel has reviewed the evidence respecting the subsurface above the aquifer. The evidence included core samples, rock samples, driller's logs and photographs of the rocks and soils in that zone. The rock in the area underlying the Penner Lands is highly fractured. It is, therefore, unlikely that a solid impermeable layer of bedrock, which tilts from west to east, exists. This precludes the concept that contamination could have travelled down to this impermeable layer from the gas bar and then moved along the impermeable layer to the Geddes and McCombe Wells. The ground is simply too fractured for this to have occurred.

In support of this, the Panel notes that, in November 2001, the following concentrations were observed in MW01-2D. Benzene was 1.6 µg/L, ethylbenzene was 1.4 µg/L, toluene was 6.0 µg/L, and xylenes were 10 µg/L. This indicates the presence of petroleum hydrocarbons. This monitoring well is located immediately in front of the Wildwood store. It is 34.4 metres deep and is the second deepest of all the monitoring wells. According to the driller's log, this well passes through five layers of "competent" rhyolite and penetrates a sixth layer. If any one of these layers were impermeable, it seems highly unlikely that petroleum hydrocarbons could have migrated vertically downward to the water table at this location.

It has been suggested that the contamination has moved through a series of fractures from the west to the east allowing the contamination to travel from the gas bar to the Geddes and McCombe Wells.

The Panel accepts the expert evidence of Mr. Balfour on this point. Mr. Balfour explained that in order for this to happen quite a large spill would have to occur. Some of this could have travelled to the east, and some vertically downward to the aquifer. If this large spill were the case, Mr. Balfour would expect odours or hydrocarbons to have been detected in the soil as well as high concentrations of hydrocarbons in the groundwater below the gas bar. In his opinion, this would have also resulted in significant concentrations of hydrocarbons in the Highway Well. He would also expect higher concentrations in the groundwater under the gas bar than those in the McCombe and Geddes Wells. This description does not fit the evidence presented.

In addition, the Panel rejects the argument that the sewer line leading from the gas bar past the Geddes and McCombe properties could have served as a pathway for the contamination. The sewer line is too isolated from any source of gasoline and is located at a higher level than the USTs. Further, soil tests in the area of the sewer line did not indicate high levels of contamination along the length of that corridor.

For all the above reasons, the Panel finds on a balance of probabilities that the gas bar is not the source of contamination in the Geddes and McCombe Wells.

2. Whether the Order should be varied on the basis that the existing contamination under the Penner Lands arose from adjacent properties or arose from activities on the gas bar site.

The Panel has also considered the question of contamination on the Penner lands themselves. As noted above the Panel has concluded that the contamination found at the Former Penner Well has migrated there from a source to the east or north east of the Penner Lands. Accordingly, that contamination is subject to the exemption set out in 26.6(1)(i) of the *Act*.

Further contamination found on the Penner Lands is set out in the September 1996 EBA Report. That report indicated that there were BETX concentrations found in bore hole BH4-M all of which exceeded drinking water standards. That borehole is in the immediate vicinity of the USTs at the gas bar. EBA attributed these concentrations to historical spills and leakage associated with the former UST

installation. The Regional Manager relied on the EBA findings in issuing both the April 5, 2001 Draft Remediation Order and the May 5, 2001 Remediation Order to conclude that the ground water below the Penner Lands was contaminated.

The Panel has had the benefit of monitoring results in the vicinity of borehole BH4-M taken in 2001 and 2002 at MW01-2S and MW01-2D (both of which are adjacent to the USTs). In November 2001, benzene was 62 µg/L and toluene 0.8 µg/L at MW01-2S. In May 2002, benzene was 73.9 µg/L and toluene was 0.7 µg/L at the same location. Both ethylbenzene and xylenes were less than their detection limits on both occasions. According to Mr. Patrick's reference #7 "Patterns of Chemical Changes During Environmental Alteration of Hydrocarbon Fuels" in Groundwater Monitoring Review, Fall 1996, based on average concentrations, unleaded gasoline has the approximate ratios of 0.8:1 for ethylbenzene to benzene, 2.8:1 for toluene to benzene and 3.9:1 for xylenes to benzene. Neither of the November and May analyses are remotely close to these ratios. In accordance with Mr. Patrick's expert testimony, ethylbenzene, toluene and xylenes will be preferentially biodegraded over benzene in an aerobic environment (the vadose zone). In addition, benzene will preferentially diffuse out of the product (gasoline) and partition into the groundwater. The 2001 and 2002 results therefore indicate that the gasoline migrated some distance through the vadose zone prior to partitioning into the groundwater. The results from the 1996 EBA report were benzene - 157 µg/L, ethylbenzene - 13 µg/L, toluene - 186 µg/L and, xylenes - 341 µg/L. These readings show ratios of 0.08 to 1, 1.18 to 1 and 2.17 to 1 for ethylbenzene, toluene and xylenes to benzene respectively. This is a much closer relationship to the unleaded gasoline ratios than are the results from MW01-2S. Mr. Patrick's evidence indicates that the source of this gasoline was relatively close to the groundwater table and fairly quickly partitioned into the groundwater. The Panel agrees with Mr. Patrick's expert testimony stating that the hydrocarbons in the EBA monitoring well are from a different source than those in MW01-2S. Because the patterns of hydrocarbons in the Geddes, McCombe and Former Penner Wells are similar to that in MW01-2S (i.e. very low to non-detectable concentrations of ethylbenzene, toluene and xylenes compared to benzene), the Panel concludes that the hydrocarbons in these wells are from a different source than those in the EBA monitoring well.

The Panel notes that the results from the November 2001 analysis of the groundwater at MW01-2D are more closely akin to the results from the EBA monitoring well than to those from the Geddes, McCombe and Former Penner Wells. This well is about 34.5 metres deep compared with the 01-2S well at 23 metres and the EBA well at 16 m. The ratios to benzene for ethylbenzene, toluene and xylenes respectively are 0.9, 3.8 and 6.2 to 1, which may indicate that this contamination came from the same source as that for the 1996 EBA results and has continued to migrate downwards. The readings at 01-2D in November 2001 were benzene, 1.6 µg/L, ethylbenzene 1.4 µg/L, toluene 6.0 µg/L, and, xylenes 10 µg/L. All of these are less than drinking water standards. If the EBA and MW01-2D readings represent the same source, the readings support the conclusion that substantial attenuation of hydrocarbons in the groundwater-soil matrix at this site occurred over the 5-year period. The decay from 157 µg/L to 1.6 µg/L over 5 years falls

within the range of the results from the 251 sites in the Texas and California Studies. These studies showed that benzene decreased (assuming a first order decay model) from 1000 µg/L to 1 µg/L over periods ranging between 5 and 10 years.

The Panel is satisfied that the original hydrocarbons in the EBA well have decayed to the point where they are less than the drinking water standards.

Accordingly, the Panel finds that the BETX monitoring results that were produced in 1996 are unreliable for a finding by the Regional Manager that the Penner Lands constitute a contaminated site in May 2001, as that contamination is no longer there.

For the reasons cited under Issue 1 (Whether the Order should be reversed or varied on the basis that the Penner Lands are not the source of the contamination), the Panel is satisfied, on a balance of probabilities, that the 2001 to 2002 contamination found in the Former Penner Well and in MW01-2S arose from the same source to the northeast as the one that contaminated the McCombe and Geddes Wells.

The presence of the high vapour concentrations measured at MW01-7D (south of the gas bar pump island), MW01-8S (near the McCombe Well) and MW01-2S (between the USTs and the Wildwood Store) are troubling. The Panel notes that a high concentration of 4840 parts per million (ppm) was measured at MW01-7D on November 14, 2001. At this time, the concentrations of hydrocarbons in water samples from MW01-7D were all less than detection limits. Also at this time, the vapour concentrations in MW01-2S and MW01-8S were 770 ppm and 30 ppm respectively. On April 16, 2002, the vapour concentration at MW01-7D was measured at 225 ppm while MW01-2S and MW01-8S concentrations were measured at 9350 and 6600 ppm respectively. This was at a time when the hydrocarbon concentrations in the groundwater at MW01-8S, the Geddes Well and the Former Penner Wells were diminishing fairly rapidly. On May 7, 2002, the vapour concentration at MW01-2S remained high at 9000 ppm while MW01-8S had dropped to 40 ppm. MW01-7D remained low at 320 ppm. By August 2002, the vapour concentration in MW01-2S had dropped to 660 ppm while MW01-7D rose to 550 ppm and MW01-8S rose to 200 ppm. During this time period, the vapour concentrations in MW01-9S (near the Trailer Park Well) fluctuated between 30 and 550 ppm.

The Panel notes the relatively rapid decrease in vapour concentration at the McCombe Well. In the 3-week period between April 16 and May 7, 2002, the vapour concentration dropped from 6600 ppm to 40 ppm. This provides some evidence of the relatively rapid decay of vapour concentrations and possibly of the relatively rapid increase of vapour concentrations immediately following a spill.

Based on the data available, there may have been a spill near MW01-7D that first affected MW01-7D and then affected MW01-2S. It seems very unlikely that such a spill would have affected MW01-8S at the same time as the effect on MW01-2S because of the distances between these wells. A spill close to MW01-2S in mid-

April 2002 could not have created the high concentration at MW01-7D in November 2001. A spill close to MW01-8S in mid-April 2002 is unlikely to have produced a 40% higher concentration at MW01-2S at the same time and certainly would not have produced the November 2001 high concentration at MW01-7D. The three maximum concentrations at MW01-7D, MW01-2S and MW01-8S do not appear to have been caused by the same spill. Because these high vapour concentrations occurred between November 2001 and May 2002, the above evidence indicates that they are unrelated to the groundwater maximum concentrations measured in February and July 2001 at the Geddes and McCombe Wells.

The Panel also notes that all of these high vapour concentrations occurred during the period of active site investigation. No evidence was provided indicating gasoline spills during this time. There was also no evidence presented regarding what size of spills would be necessary to cause these high vapour concentrations. No evidence was presented regarding monitoring well security that would prevent hydrocarbons from being discharged directly into the wells.

Mr. Patrick's comments on this point bear repeating. With regard to the high vapour concentrations, Mr. Patrick wrote:

> These data are consistent with the presence of volatile products such as gasoline **near each of these wells.** Where such **localized releases** of gasoline hydrocarbons have occurred, the gasoline will have potentially penetrated the fractured rock toward the water table, and have evolved vapours that can be detected. Vertical migration of gasoline along the fractures towards the water table following a release would be expected to occur **relatively quickly (i.e. on the order of days to weeks)**. (Emphasis added).

Mr. Patrick went on to write:

> It is not possible to conclude whether there are single or multiple sources of gasoline in the vadose zone at the WGB site.

In his oral testimony, Mr. Patrick stated that the high vapour concentrations in the wells are an issue above the water table and not in the groundwater system.

Based on the evidence before it, the Panel agrees with Mr. Patrick's comments. The Panel is unable to draw any conclusions regarding the high vapour concentrations, their source or the size or the number of any hydrocarbon releases that may have caused these high readings. The Panel concurs that the high vapour measurements are unrelated to the hydrocarbon contamination of the groundwater in the vicinity of the high readings. The Panel can only draw the conclusion that, without additional evidence, the high hydrocarbon vapour measurements alone cannot lead to a conclusion that the site is a contaminated site.

The Panel concludes that, while there is some evidence that some quantity or quantities of gasoline may have been spilled on one or more of the properties,

there is no evidence that the vapour concentrations found in the monitoring wells are indicative of hydrocarbon contamination in the underlying groundwater.

The Panel notes that the above reasoning would apply to any detected gasoline odours.

The Panel does not accept the Regional Manager's assertion that, since no alternative point source of contamination has been firmly identified, the benzene could not have been migrating from a source northeast of the Geddes and McCombe Wells. For the purposes of these appeals, the issue is not whether an alternative source can be identified on a balance of probabilities, but rather, whether the Penner Lands can be identified on a balance of probabilities as the source of the benzene in those wells. In this case, no such conclusion can be arrived at. Accordingly, the Panel finds that it cannot reasonably be concluded that the gas bar is the source of any existing contamination on the Penner Lands.

For these reasons, the Panel finds that the Order should be rescinded, and the Penners, Petro-Canada and any other persons who owned or operated the Penner Lands are not persons responsible for remediation of the benzene contamination addressed in the Order pursuant to section 26.6(1)(i) of the *Act*.

3. Whether the Board should order any of the parties to pay the costs of any of the other parties in relation to these appeals.

A number of the parties have requested that the Board order other parties to pay their costs in relation to these appeals. Specifically:

- Race Trac requests an order for its costs against Petro-Canada;
- Ms. Geddes requests an order for her costs against Petro-Canada and any other responsible persons;
- Petro-Canada requests an order for its costs against the Regional Manager; and
- The Penners request an order for their costs against the Regional Manager.

The Board's authority to order costs is found in section 11(14.2) of the *Environment Management Act*, which states:

> **11(14.2)** In addition to the powers referred to in subsection (2) but subject to the regulations, the appeal board may make orders for payment as follows:
>
> a. requiring a party to pay all or part of the costs of another party in connection with the appeal, as determined by the appeal board…

The Board's policy on requests for costs is found in the *Environmental Appeal Board Procedure Manual*. It states that costs should only be ordered in special circumstances. For example, the awarding of costs may be used to discourage

improper claims and compensate parties who are unduly inconvenienced or incur unnecessary costs as a result of frivolous or vexatious appeals. In deciding whether to award costs, the Board may weigh the importance of these concerns against the danger of deterring parties from participation in the appeal process.

The Panel finds that it would be inappropriate to award costs in favour of any of the parties in this case. The Panel notes that these appeals were not frivolous or vexatious. The appeals involved consideration of substantive factual issues and complex technical evidence. The Appellants were successful in having the Order cancelled. Further, there is no evidence that the Order was issued maliciously or for an improper purpose. In these circumstances, the Panel denies the requests for costs.

DECISION

In making this decision, the Panel has carefully considered all of the evidence before it, whether or not specifically reiterated herein.

For the reasons provided above, the decision to issue the Order is reversed pursuant to section 47 of the *Act*. The appeals are allowed.

The applications for costs are denied.

Alan Andison, Chair
Environmental Appeal Board

January 29, 2003