



Ministry of Environment    Ministère de l'Environnement

119 King Street West, 12<sup>th</sup> Floor    119 rue King ouest, 12<sup>e</sup> étage  
Hamilton, Ontario L8P 4Y7    Hamilton (Ontario) L8P 4Y7  
Tel : 905 521-7640    Tél : 905 521-7640  
Fax : 905 521-7820    Téléc : 905 521-7820

## Memorandum

Date:            May 22<sup>nd</sup> 2008

To:                Lisa Benvenuti  
                      Environmental Officer  
                      Niagara District Office, West Central Region

From:             Jennifer Volpato  
                      Hydrogeologist  
                      Technical Support, West Central Region

Re:                Former Automotive Service Station,  
                      40-44 Killaly St. West, Port Colborne

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As requested, I have reviewed the following documents:

- Additional Hydrogeological Investigation, 40-44 Killaly Street West, Port Colborne, Ontario. Prepared by AMEC Earth & Environmental for the City of Port Colborne dated April 1<sup>st</sup> 2008.
- Letter Report Re: Soil Remediation Program. Prepared by AMEC Earth & Environmental for the City of Port Colborne dated April 11<sup>th</sup> 2008.

### **Background:**

An automotive services and petroleum retail facility was known to operate at 40-44 Killaly Street West (the site) in the City of Port Colborne (the city) from the 1950's to some point in 2005 at which time it became the property of the city. The site is located in a mixed commercial and residential area with residential homes located directly adjacent to southern property boundary. Over the years, several environmental investigations have been undertaken at this site and a number of the site's underground storage tanks (USTs) have been removed. In May 2007, petroleum hydrocarbon product was identified in a basement sump by the owner of the adjacent

property located immediately to the south of the site. As a result of this incident, an additional UST was identified and removed on June 12<sup>th</sup> 2007. A subsurface investigation was further undertaken and a monitoring well was installed in the southwest corner of the property, MW1, where free phase product was discovered. Consequently, the above additional hydrogeological investigation was undertaken to evaluate the distribution and extent of the petroleum hydrocarbon impacts.

### **Geology/ Hydrogeology:**

According to the information provided, the overburden on site appears to be primarily composed of asphalt, granular fill or topsoil overlying varying compositions of fill (silty sand, clayey silt, sand or silty clay fill) to a depth of approximately 0.3 to 2.6 m bgs. In some areas of the site, this fill was found to overlie a unit of silty clay to clayey silt, silt or sandy silt to sand. The borehole logs for this site indicate that the overburden is relatively thin with the depth to bedrock ranging from 1.1 m bgs to 3.8 m bgs.

Regionally, the shallow bedrock groundwater flow direction is anticipated to be east to southeast in the general direction of the Welland Canal and/or Lake Erie. However, locally, the shallow bedrock groundwater flow direction was interpreted by the consultant to be generally northwest across the site. It appears that the building as well as any underground services /structures along with the bedrock topography and fracture orientations may be influencing the shallow bedrock groundwater flow direction. In looking more closely at the water level data collected on January 7<sup>th</sup> 2008, there appears to be a south to southeasterly flow component in the southwestern corner of the property with a northwesterly flow component from the southeastern corner of the property towards the building.

### **Overall Comments and Recommendations:**

After reviewing the above document, the following comments and recommendations, were warranted, are made:

1. A soil remediation program was conducted by AMEC on behalf of the City of Port Colborne in September 2007 and discussed in the letter prepared by AMEC dated April 11<sup>th</sup> 2008. The purpose of this soil remediation program was to remove only the most significantly impacted soils in the vicinity of the former underground waste oil tank. The soils to be removed were determined through the use of visual and olfactory evidence as well as measured soil vapour concentrations. According to the report, approximately 114.24 metric tonnes of impacted soil/fill was removed and sent to the Niagara Waste Systems Limited Landfill in Thorold. The impacted soil was excavated to bedrock, as the UST was found to be sitting on-top of the bedrock surface during its removal, and soil sampling of the sidewalls of the excavation were taken with the worst case samples being sent to the laboratory and analyzed for petroleum hydrocarbon fractions F1 to F4 and VOCs. As stated by the consultant, exceedances of petroleum hydrocarbon fractions F1 to F4 and/or VOCs in soil were observed on all four walls of the excavation. Specifically, it was noted that petroleum hydrocarbon fractions F1 to F4 were found to exceed their respective Table 2 criteria and benzene, 1,2-dibromoethane (ethylene dibromide), ethylbenzene, methyl ethyl ketone and xylene were found to exceed

their respective Table 1 criteria. Elevated levels of these parameters remain on-site in the soils and, as such, can be considered a possible source of potentially impacted groundwater through either infiltrating surface water or a fluctuating water table. It is recommended that a groundwater monitoring program be implemented to at this site in order to determine if some form of additional remediation will be needed.

2. During the additional subsurface investigation, nine additional monitoring wells were installed throughout the property in December 2007. Eight of these wells were screened within the upper weathered portion of the bedrock aquifer terminating between 4.4 and 6.9 m below ground surface (m bgs) and one well was screened within the overburden to a depth of 3.8 m bgs. All of the bedrock monitoring wells were constructed with 3.0 m screen lengths with the overburden monitoring well being constructed with a 1.5 m screen length. With the exception of the previously installed MW1, no free phase petroleum hydrocarbon product (free product) was observed in any of these new on-site monitoring wells during this investigation (December 2007/January 2008). In looking at the borehole logs provided with the report, the static water levels for all of the monitoring wells, with the exception of MW1 and MW600B, appears to be above the screened interval. This could be influencing the detection of free product in the wells within the vicinity of MW1. As such, additional monitoring of these newly installed monitoring wells should be undertaken to confirm that no free product is present during periods when the groundwater table is expected to be lower, i.e. in July/August, and are likely to be within the screened intervals. Further to this, given the fact that it appears that the adjacent home owner identified the presence of significant petroleum hydrocarbon product in his sump, and the fact that sump pumps primarily run during significant rainfall events, monitoring for the presence of free product and groundwater sampling should also be undertaken within a reasonable period of time after a significant rainfall event.
3. During the advancement of the boreholes on-site, four soil samples were collected and analyzed for petroleum hydrocarbon fractions F1 to F4 and VOCs. With the exception F4 detected at concentration of 7,690 µg/g observed at MW800 between 0.76 to 1.06 m bgs, no petroleum hydrocarbon fractions were detected above their respective MOE Table 2 criteria for soil. This well appears to be within the vicinity of the historical USTs in the north eastern portion of the site, which have since been removed, and may represent residual contamination that may have been left behind. It is noted that this site is considered a sensitive site under O. Reg. 153/04, due to the depth to bedrock being less than 2.0 m across at least 1/3<sup>rd</sup> of the site, and is subject to MOE Table 1. However, there are no Table 1 criteria available for petroleum hydrocarbon fractions F1 to F4 in soil or groundwater and, as such, for the purposes of this assessment, the consultant had compared the results to the Table 2 criteria. It should be noted that the consultant has indicated that there is no known permanent surface water features within 30 m of the site. Further to this, the surrounding area is municipally serviced and, as such, the shallow groundwater in this area is not used as a potable source.
4. As stated by the consultant, soil samples were also analyzed for VOCs and were generally found to be either below the laboratory method of detection limit or below their respective MOE Table 1 criteria with a few exceptions at MW600A and MW800-2.

- a. MW600-2A - Benzene was observed at a concentration of 0.247µg/g, ethylbenzene at 0.2µg/g, toluene at 0.003µg/g and xylene at 0.381 µg/g.
- b. MW800-2 – Chorobenzene was observed at a concentration of 0.222 µg/g, ethylbenzene at 0.004 µg/g, toluene at 0.003 µg/g and xylene at 0.067µg/g.

These exceedances may represent residual contamination left behind in these areas.

5. Groundwater sampling was undertaken at each of the on-site monitoring wells, with the exception of MW1, between January 7<sup>th</sup> and 9<sup>th</sup> 2008. These samples were analyzed for petroleum hydrocarbon fractions F1 to F4 and VOCs. As noted above, are no Table 1 criteria for petroleum hydrocarbon fractions F1 to F4 in groundwater and, as such, these values were compared to Table 2. Based upon the results presented by the consultant, there were no concentrations of F1 to F4 detected either above the laboratory detection limit or below their respective Table 2 criteria. According to the data provided, with the exception of 1,4-dichlorobenzene (2.1 µg/L) at MW500 and toluene (3.5 µg/L) at MW600A, all of the VOC parameters were either below the laboratory method of detection limit or below their respective Table 1 criteria. The detection of toluene at MW600A could be a result of residual contamination that has been left in the soils after the nearby USTs had been removed. 1,4-dichlorobenzene, on the other hand, is generally associated with air fresheners, mothballs and toilet deodorizers and may not be directly related to the presence of the USTs at this site. Continued monitoring should be required in order to confirm these results as well as to determine if there are any observable concentration trends.
6. Due to the presence of free product at MW1, the consultant has recommended that additional remedial work be completed at this site to remove the free product. In order to accomplish this, the consultant has recommended the continuation of free product removal from MW1 through the use of a vacuum truck pump on a weekly basis for an additional eight week period. During this time, the consultant has indicated that additional monitoring will be undertaken in order to assess the amount of free product that may be present on-site within the subsurface. After which, the need for the installation of a full time product recovery system will be evaluated. This appears to be a reasonable approach, however, no details on what kind of monitoring, or the frequency of that monitoring, were provided. It is recommended that a detailed monitoring program be provided to the ministry for review.
7. In order to assess the hydraulic connectivity of the bedrock fractures in this area, the consultant has recommended that a brief pumping test be conducted. The consultant proposes that this mini-pump test be completed during the period when MW1 is being pumped out by the vacuum truck for a period of six to eight hours. Pressure transducers are to be placed in each of the on-site monitoring wells, with the exception of MW1, as well as the residential sump. At this time I agree with the consultant in that the information collected from this mini-pumping test would be useful in evaluating the migration pathways in the shallow bedrock as well as aid in the design of a full time product recovery system if required. This, combined with water level monitoring, monitoring for the presence of free product and groundwater sampling during dryer periods as well as after a significant rainfall

event, should provide sufficient information to assess the amount of free product present as well as the migration pathways present at this site.

### **Summary of Recommendations:**

As summarized from the above comments, it is recommended that:

1. a groundwater sampling program be developed and initiated at this site in order to determine if some form of additional soil remediation will be needed. This groundwater sampling program should include, at minimum, semi annual sampling and at least one sampling event within a reasonable period of time after a significant rainfall event. This groundwater sampling program is warranted as free product has been identified and, since it appears that impacted soils above their respective Table 1 and Table 2 criteria have been left on-site.
2. a monthly water level monitoring program, including the monitoring for free product, be initiated at this site. This is particularly important during the summer months when water levels are likely to be lower, i.e. within the well screen intervals and after significant precipitation events. This will aid in the delineation of the extent free product on-site as well as aid in determining the fluctuations in groundwater levels, and possibly flow directions, as a result of seasonal influences.
3. the mini-pumping test be completed as recommended by the consultant. This, combined with recommendation No. 1 and No. 2 above, should provide sufficient information to assess the amount of free product present as well as the migration pathways present in this area.

### **Conclusion:**

Petroleum hydrocarbon free product has been identified at this site. This free product has also been found in a basement sump by the owner of an adjacent residential property located immediately to the south of the site. In addition to the presence of free product, it appears that impacted soils have been left in-situ. As part of the additional investigation, nine new monitoring wells were installed on-site. During this investigation, no free product was identified in the newly installed monitoring wells. This could have been a result of the water levels being above the screened intervals for the majority of the monitoring wells at that time. Based upon the information provided, I have recommended that a groundwater monitoring program be implemented at this site. Further to this, I have recommended that the mini-pumping test be undertaken as proposed by the consultant. A number of additional comments have also been provided for your consideration.

Please note that this review and subsequent comments and recommendations pertain to the assessment of groundwater only and is subject to the Statement of Limitations outlined below. If you have any questions and or require additional information/clarification please contact me at [jennifer.volpato@ontario.ca](mailto:jennifer.volpato@ontario.ca) or at (905) 704-3911.

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**ORIGINAL SIGNED BY**

Jennifer Volpato M.Eng., P.Geo., P.Eng.  
Hydrogeologist

cc. Paul Odom, Supervisor, Water Resources Unit  
Jamie Connelly P.Geo., Senior Hydrogeologist, Groundwater

**Statement of Limitations:**

The purpose of the preceding review is to provide advice to the Ministry of the Environment regarding subsurface conditions based on a review of the information provided in the above referenced documents. The conclusions, opinions and recommendations of the reviewer are based on information provided by others. The Ministry cannot guarantee that the information that has been provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.