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Projet d'établissement d'un lieu d'enfouissement technique à Danford Lake
Alleyn-et-Cawood 6212-03-112

Brief to the Commission of the Bureau d'audiences publique sur l'environnement

concerning

the proposed Megadump in Alleyn and Cawood

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in Kazabazua and Alleyn and Cawood
for over 24 years

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Brief on the Bio-Physical Aspects of the Proposed Landfill Site

Executive Summary

This brief examines the properties of the proposed landfill site in Alleyn and Cawood to determine if the promoter's assessment of the environmental impacts is valid on the site itself and surrounding terrain. The brief primarily considers the bio-physical aspects of the proposed landfill site from the point of view of problems of landfills such as leakage of leachate into the groundwater, surrounding streams, wetlands and the Picanoc River.

A report from the Environmental Engineering Firm, Envir-Eau of Gatineau, which was retained by the Coalition against the Danford Mega-Dump to review the impact study, visit the site and assess the validity of the Teknika/LDC conclusions is part of this brief. This report was tabled in Phase 1 of the BAPE hearings and is listed on the Bape web site as document DC2.

Along with the representative from Envir-Eau and the President of the Coalition, I visited the proposed site by land where we observed the type of terrain on the site and surrounding areas, the soil type and the wells used by the promoter to determine the makeup of the soil layers, and the height of the water table. In addition, along with 5 others I canoed down the Picanoc River past the point (Grove Creek) where the treated leachate is proposed to be emptied into the river, and was able to view the location of the landfill site from the river.

From these visits, from the review of the promoter's environmental impact study report, and from the Envir-Eau document, the following conclusions are drawn.

- *The selected site is a far from ideal one, and that violates many of the criteria that should be used for site selection.*
- *There is no clay present and that the base is primarily sand, so that extraordinary attention must be paid to the mechanical features of the landfill in an attempt to prevent leachate from reaching the underground water table and the Picanoc River.*
- *Soil conditions are not uniform across the site so the potential exists for uneven compaction across the site, creating problems with the geo-membranes.*
- *The water table and the rock base are very close to the surface in some parts of the site so that the proposed base of the landfill would be below the level of the water table once these areas are excavated to receive the garbage.*
- *The site is bordered closely by several wetlands which will be put at risk both during operation of the site and by run-off from the sealed site once operations cease. The environmental impact studies did not refer*

to the regulations concerning protection of wetlands, nor advance any plan explaining how they would protect the wetlands.

- *The mountain of garbage will be visible from the Picanoc River and from Mount O'Brien, a local nature area for which the Mount O'Brien Association has applied for protected status. These findings are contrary to the conclusions by Teknika/LDC that the landfill will not be visible. Teknika/LDC did not consider the view from Mount O'Brien at all.*
- *The landfill would put at risk protected, endangered or rare species of flora and fauna, such as the wood turtle for which there are documented sightings in the area.*
- *The studies done by the promoter to validate the site were only superficial, and insufficient to demonstrate that the site was "safe".*
- *In particular, I supervised the study done by an environmental engineering firm Envir-Eau of Gatineau(engaged by the Coalition), who concluded that the data used by Teknika/LDC to determine how far leachate can travel in a year were the wrong data, and that the potential for fissures in the underlying bedrock was not studied at all, meaning that if this were the case, leachate could travel very much faster than concluded in the promoter's studies.*
- *Moreover, as concluded by Envir-Eau, Teknika/LDC did not fully map the soil conditions on the site and conducted inadequate pumping tests so that the environmental impact studies do not demonstrate that the aquifier under the site is not a good one. There may well be a direct underground link directly between the site and the Picanoc River. Until this can be specifically ruled out, and proof can be supplied that the aquifier is not a good one, the site must be rejected.*

For all these reasons I believe and that a landfill should be turned down for this site.

1.0 Introduction

Burying garbage in landfills is a technology for which the time is past. We are rapidly entering the post-landfill era. Throughout the world, whenever a new landfill site is proposed or an existing landfill is proposed to be expanded, concerned citizens are organizing to prevent this happening. A new consciousness is emerging where citizens are telling their governments that we can no longer treat our planet as a large garbage dump to be cleaned up by future generations. We must be responsible for our own actions and must improve on the legacy we leave behind us.

Despite recent advances in alternative and much less risky waste-management technologies, there are still attempts to establish new large landfills in rural areas away from urban sprawl, and to transport the problems from the concentration of people to small sparsely-populated rural communities that are little able to defend themselves, and who look on promises for economic benefit, however small, as a reason to burden their communities with risky technology. The proposed megadump in the Quebec municipality of Alleyn and Cawood is a case in point.

I recognize that the proposal to place an Engineered Landfill in Alleyn and Cawood is the promoter's version of the solution to the problem of residual waste in the Outaouais, a problem that must be dealt with. However, the promoter has selected a site close to the Picanoc River in a quiet rural area rich in pristine lakes and rivers, which is most suited to the development of eco-tourism, and proposes to establish there a large megadump which would receive garbage over a 30 year period, ultimately creating an 8.0 million tonnes mountain of garbage 60 meters high and 38.5 hectares in area.

This brief examines the properties of the proposed landfill and looks specifically at the site itself to determine if the promoter's assessment of the environmental impact is valid on the site itself and surrounding terrain.

2.0 Choice of Site and features

In the environmental impact report the promoter mentioned a 1988 study conducted in the region which identified 38 potential landfill sites, none of which were in Alleyn and Cawood. None of these were particularly suitable. LDC, in their first attempt to establish a landfill site, chose a location in Quyon. Opposition surfaced, and the project was eventually turned down by the municipality. Still determined to make money on garbage, LDC has re-surfaced with a proposal for a landfill site **on government land** in Alleyn and Cawood. The reasons given in the environmental impact report for selecting sites in Alleyn and Cawood that were not previously considered are not convincing. It seems more likely that the promoter first found a small poor municipality with a

compliant mayor and council prepared to host a landfill to gain extra revenue, and only then launched a search for possible sites. Three sites were eventually considered, and one was selected, but no convincing reasons were given for selecting this one over the other two. When a question was asked by the Coalition at one of the MRC meetings in the Pontiac as to "Why Danford Lake?" the response was that that Alleyn and Cawood was the only municipality that actually made a request for a landfill site. No mention was made of suitability.

The environmental impact report states that the following criteria were used to select a site:

1. Choice of a site where land movement is not a risk
2. Proximity of people with drinking water requirements greater than 1 km
3. Close to a highway
4. No inhabitants closer than 2 km
5. Closeness of lakes and river
6. No ecological reserves or parks or aeroports

Of these criteria only 1 and 3 were really satisfied. In Phase 1 of the BAPE hearings, it was made clear that criteria 2 and 4 were not satisfied by the site selected. The site is close to Lake Johnson, the source of the Kazabazua River and within a few hundred meters of the Picanoc River, a popular canoeing, kayaking, fishing and hunting river. As to Criterion 6, there are no aeroports near the site, but nearby Mount O'Brien is being developed as an ecological park and has been treated as a de facto one by residents and visitors for a number of years.

- *The report did not consider the impact of the Megadump on Mount O'Brien. Note that the Mount O'Brien Association voted recently at their annual meeting on May 20th, 2007 to oppose the project and present a brief at the BAPE hearings.*
- *The report also did not consider the impact on the Miljour estate.*

The site selected is relatively flat with an elevation of approximately 190 meters above sea level. To the south between the site and highway 301, the land rises to the order of 220 meters so the landfill will not be visible from Highway 301 as stated in the promoter's report. The Picanoc is close by and slightly lower in elevation. Around the perimeter of the landfill site there are major wetland areas, and two creeks which empty into the Picanoc – the land at the edges of the site selected slopes off to these. The terrain is mostly covered by conifers which are up to 60 feet high. The top surface of the soil is covered in moss, and under this is a soil consisting first of decayed vegetable matter, followed by coarse then fine silt-laden sand and eventually (in many areas) bedrock was observed.

- *In the south-east sector, the water table is very close to the surface – within half a meter in one test site.*
- *There are deer signs everywhere, and it is clear that this is a preferred winter site for deer. The landfill would interrupt their winter habitat.*
- *The report claims that the landfill will not be visible from the Picanoc – this brief disputes this claim.*

2.1 Soil Conditions are not suitable for landfill site

The 1988 study referred to above states (p. 8) that, even if the use of membranes reduce the risk of underground water contamination, that risk is never completely eliminated, and that's why the study is concentrating on soils that are naturally impermeable. This is generally understood to mean clay soil where the particles are much finer than the particles in a sandy soil. Mayor Joseph Squitti of Alleyn and Cawood, in his letter of October 5, 2004, to his ratepayers says that the reason why they "should close the trench landfill is because it lies on sand and gravel, the worst type of soil, a type of soil that allows underground water contamination."

- *Despite this, the Mayor has been prepared to see a Megadump in his municipality based on the soil conditions he does not consider suitable for the trench landfill.*

In the site finally selected, the depth of the coarse sand and fine sand layers varies across the site (limited drilling was undertaken, interspersed with digging to shallow depths with a mechanical shovel, so that a complete map of the layers in all parts of the site is not available). In some areas rock lies very close to the surface (1.2 meters observed in one location) and the water table is above the rock as evidenced by one such excavation we observed near the south-eastern corner, where water lay within a half meter of the surface.

- *Any landfill in the south-east corner would lie below the water table, which is totally unacceptable.*

Sand is permeable to water and the question of leachate leaking into the underground water and migrating to the perimeter of the site and beyond must be raised. Soil cross-sections shown in PR5-1-Ann.E show that in a number of areas the water table lies in the coarse sand. Yet the study used an average migration speed of untreated leachate close to that in fine sand, and concludes it would take 140 years for leachate to reach the nearest wells. I consider this a misuse of information to make their case look better.

- ***Had coarse sand data been used, this computed time would be only 28 years which is even more unacceptable***.

To the South West and along the southern perimeter there are wetlands covering 49.5 hectares. Because no detailed drilling was undertaken in the southwest sector, as there should have been, it is impossible from the data to deduce the time for the leachate to flow to the wetlands – the land slopes quickly down to the wetlands which are very close.

- *As an Engineer, I consider that worst case scenarios must be used in considering the impacts of landfill - the potential impact of migration of leaked and untreated leachate is much greater than stated in the Promoter's study.*

- *No study was done of the underlying rock base. If the rock is fractured, then untreated leachate could travel very fast along fissures and could even reach the site's perimeter in less than one year. The risk of this is too great to be ignored.* (I will consider this more later).

LDC proposes to use the sand from the excavation in providing the layers above the membranes, etc. However, since much of this is silt-like this will lead to clogging of the pipes drawing off leachate, unless it is washed. So they will either have to set up a facility to wash and sieve the sand or more likely, buy and haul in washed sand, leading to more traffic and higher cost. The report does not mention this, and the promoter does not seem to be aware of this elevated cost probability. Hauling in washed sand would increase the truck traffic to the site.

3.0 The proposed landfill design is an attempt to compensate for unsuitable soil conditions

3.1 Problems with liners

A compacted and thick clay base is generally considered best for landfill site, however, there is absolutely no clay on the site which is considered here. Therefore a double High Density Polyethylene (HDPE) liner configuration is proposed by the promoter to meet current regulations which recognize that all liners leak from the start and that leaks will increase with time. If a leak develops and leachate moves into sand it can move rapidly down through the sand and into the water table.

As an extra safety measure, the promoter proposes to use a Geosynthetic Clay Liner (GCL) under the bottom HDPE liner. According to the Layfield Plastics Design Guide for Geo-membranes (Layfield call themselves a "speciality fabricator of geo-membranes"), a GCL is a sandwich that consists of an inner layer of bentonite bound on both sides by a layer of geo-textile. The two geo-textile layers are needle stitched together.

For an intact and properly hydrated (wetted) GCL it is assumed that the bentonite layer will swell and form a low permeability barrier. A properly hydrated GCL is supposed to have a hydraulic conductivity of less than 5×10^{-9} cm/sec for approximately 1 cm of thickness. This is stated to be comparable to 1 meter of compacted clay with a hydraulic conductivity of 1×10^{-7} cm/sec. Layfield states on Page 42 of its Design Guide, that the GCL would have **a penetration time of about 32 years, which I would note is only two years after active operations of the megadump are proposed to cease**.

The problem with this bentonite layer in a landfill is that it is laid down dry and is not hydrated before the HDPE liner is put in place. When dry, the less than 1 cm thick bentonite layer has very poor shear strength and therefore is subject to puncture by sharp stones or other sharp material on the base, when under pressure by machines backfilling above it or by being pushed downwards by the weight of garbage. When it is wet, the material is soft and mobile and easily displaced. Either holes or displacement of the wet bentonite (laid dry but later exposed to leachate) will destroy the barrier offered by this material.

- ***I conclude that the GCL is at best a poor compromise for a thick layer of compacted clay and does not offer a long-term barrier to leachate passing through it into the sandy soil underneath.***

- *The site with its burden of sand is unsuitable and no attempts to totally seal it with liners will succeed forever.*

- *There will always be a risk of untreated leachate finding its way into the soil*.

As for the HDPE liners, this material is an extruded and relatively stiff sheet and can not be folded without destroying it, so the liner must be fabricated on site from rolls. **In all extrusions there are pinholes**, and it is these pinholes that cause leaks even through pristine liners. On-site welding site must be perfect or there will be additional leak sites. A careful study of the Layfield Design Guide will reveal that extreme precautions must be taken to prepare the liners and to backfill them properly to prevent holes being punched through them. All angular or sharp stones or hard clumps of earth must be removed from the base and from the backfill material since (as the Layfield Design Guide states) **even a sharp stone less than 25 mm (1 inch) in size can penetrate a 1.5 mm thick HDPE liner.**

- *Removing all hazards is a formidable task, since all areas of the site are unlikely to be compacted identically so that a hidden stone can be encountered when the weight of a bulldozer or the weight of garbage presses down on the liner and hence the base material*.

3.2 Using a sloped surface to cause leachate to move to a collection point

In an attempt to prevent leachate from leaking through the liners, the landfill surface is normally prepared with a 2 % slope, so leachate can run towards a collection point. However, as Layfield states, **folds can occur in the HDPE liners up to 200 mm** (8 inches) in height (partly because slack must be left to allow for expansion and contraction of the liners). It is for this reason that a backfill of 400 to 500 mm is recommended over the liners.

- *A 200 mm high fold running across the 2% flow slope means that leachate will build up behind the fold and stay there essentially forever until it leaks through the liners*.

Certain chemicals can eat through the membranes including acetic acid. With the leachate sitting on the membrane, the probability of degradation goes up increasing the risk of penetration.

- *Because of folds, or waves in the liner, chemicals in the leachate will have a long period to attack the liner and eventually penetrate it. This effect will reduce the lifetime of the liner dramatically from the expected lifetime. This is a risk not mentioned by the promoter*.

Document DB21 on the BAPE web site confirms that temperature induced waves or wrinkles do not disappear when subject to overburden stress. This means that the above conclusion is supported by findings of the EPA in the USA.

3.3 Wells to detect leachate

The number of wells (9) proposed to detect leachate is inadequate in view of the fact that leachate in landfill sites is often observed to follow in narrow plumes from the leakage point. Thus if a plume travels between two wells, it is possible that neither will detect the leachate. When, and if it is detected, it may be too late to correct the problem and prevent the groundwater (or river water) from being contaminated beyond safety levels.

- The only sure way to be able to detect contamination in the ground water is to use a much larger number of closely spaced test wells.

4.0 Differences in site soil profile will interfere with leachate collection

In addition to the site having the wrong type of soil for a landfill site, there is another flaw in the selected site which can interfere with the removal of leachate

by flow down a slope. A careful examination of the drilled points and the points where the soil was examined only through superficial digging with a mechanically shovel, reveals that there are dramatic differences in the depth where rock is reached. This is very evident in Figure 1 of the "Commentaires Techniques Sur La Rapport de LDC-Gestion et Services Environnementaux" prepared in May, 2007 by Envir-Eau for La Coalition de Citoyens Contre le Projet de MegaDepetoir de Danford Lake. **This report, which should be considered as part of this brief, was filed with the BAPE in Phase 1 of the environmental hearings. It is listed on the BAPE web site as document DC2.** The points of study by Fondex/Teknika are shown in this figure and the points where bedrock was reached are also noted in the figure.

In their environmental impact study Fondex/Teknika carried out 29 excavations to shallow depths with a mechanical shovel (labeled with P in the figure) and drilled14 holes (labeled with F) which stopped at depths between 13 and 21 meters. In the middle of the site, two holes were drilled to 38 meters (F-113) and 49 meters (F-114) and these did not hit bedrock. In these two sites, below the top layers of sand, coarse sand/gravel was again found.

Rock was reached in the south-east of the site at 1.2 meters for P-31 and 2.9 meters for P-26 and P-32. In the South-west, rock was reached 12.9 m for F-110. In the north, rock was reached at 14.5 m for F-101, 12.9 m for F-102 and 15.7 m for F-107. No drilling was done in the rock to determine its characteristics. The only digging in the North Western and Western sectors was by mechanical shovel – to shallow depths, so the actual depth of rock in these areas is not known.

- *Too few holes were drilled to properly map the proposed site.*

It is clear from the data that in the site, there is a deep sand/gravel filled depression or crevasse in the middle of the site, running roughly in the east-west direction, with rock at relatively shallow depths on either side (no mention is made of this in the study). The data found by Fondex/Technica are insufficient to establish whether or not the depression continues to, and beyond, the western boundary of the site, which the data suggest might be a possibility (The implications of this will be discussed further later on).

- *Because of the differences in underlying rock depth, there are likely to be differences in the compaction levels of the underlying soil under pressure of the weight of garbage above it. This would very likely cause a sag in the linings in the middle, which would have the tendency to cause leachate to flow to the middle and sit there attacking the liner, rather than to the edge where it is collected and treated.*

This effect is site-specific and is in addition to the normal folds present in landfill sites due to the allowance for expansion and contraction of the liners. This was not considered in Document DB21. I conclude the following:

- *From the standpoint of leachate collection it is very clear that the site is far from desirable as a landfill site and that failure to collect all the leachate will have strong negative implications.*

5.0 The aquifer on the site may be a good one

With reference to the report by Envir-Eau (Document DC2), there is no evidence that Fondex did a complete hydrological study. The regulations state that a landfill must not be placed where there is a useful aquifer. To determine the quality of the aquifer, it is necessary to drill a well and pump from it measuring the amount of water that can be removed over several hours. If more than 25 m^3 per hour can be pumped and replaced, the aquifer is judged to be a good one. Fondex/Teknika did not do a pumping test in the original study. When this was questioned by the Ministry of Sustainable Development, a test was done, however the well selected was at F-102 where the drill hit bedrock after 12.9 meters. A pipe with screen at the bottom was then sunk into the well to less than 3 meters below the water table. This means that in the selected well, there was not a large height of water above the underlying rock. Despite this, Fondex/Teknika concluded that the aquifer was not a good one.

- *This conclusion regarding the aquifer is not valid based on the tests done. The wrong test hole was used.*

It should be noted that there are two deep drilled sites, F-113 down to 38 meters and F-114 down to 49 meters. In these test sites, after passing through the fine sand layer, coarse sand and gravel were again located. Bedrock was not reached in either test site.

- *The deepest hole clearly should have been the one selected for testing – no one preparing a well would dig it in a shallow hole that has rock close to the base of the well and only a few meters of water table above the rock.*

It is clearly possible that the aquifer is a good one. Pumping in an area where the water is deeper, so there is a much greater volume available could show that the aquifer is a good one. This would be particularly true if there is an underground crevasse which links the site with Grove Creek or the Picanoc directly. (The profile as mentioned above suggests that this could be true, however there are insufficient data to prove it one way or the other). During pumping tests, if there is a link, water could actually come from the Picanoc River to replace the water removed, meaning that the aquifer would include the Picanoc as a source. (If such a link exists, then leachate could move quickly in

the opposite direction to contaminate the Picanoc). Also if there were fissures in the rock, the same action could occur, and contamination of the Picanoc would occur in a very short time.

- *Envir-Eau and I conclude that the testing was incomplete and that Fondex/Teknika have not proven that the aquifier is not a good one, and moreover have done insufficient testing to determine if there is a link between the site and the Picanoc. The project should be refused on this basis alone.*

6.0 Location near Picanoc River and Grove Creek is Undesirable

Grove Creek runs along one edge of the landfill site and empties into the Picanoc. No discussion of this creek is carried out in the impact studies. In fact Grove Creek is clearly visible in Map PR3-1-0-Fig. 3-9. An additional creek runs along the northern boundary being obscured along most of its length by the boundary line drawn on the map for the property proposed to be acquired by LDC. No mention is made of this creek.

- *The time for leachate leaked into the soil, to reach the Picanoc would likely be dramatically shortened by the presence of these Creeks, since contaminated water has only to migrate to the Creeks, in particular Grove Creek, and then flow to the Picanoc.*

6.1 Dispersal of Treated Leachate into the Picanoc

On May 12, 2007, six of us canoed by the Grove Creek entry into the Picanoc, entering the river at one of the access points upstream of the proposed megadump location (contrary to the statements of Monsieur Poulin of Teknika, access points are available upstream as noted in Document DC7 deposited with BAPE by Mary Massotti). Grove Creek empties into an area of the Picanoc where the river is wide and the water moves relatively slowly. Grove Creek at this point is a slow moving waterway in a swampy area devoid of any major trees. There are no rapids on the Picanoc at this location as stated by the Promoter's colleagues during Phase 1 of the hearings. This means that any treated leachate emptied in bulk in the area will take a relatively long time to dissipate. This will also be true of leachate leaked into the groundwater and into the Creek. So the conclusions of the study that the amount of treated leachate planned to be emptied into the Picanoc is small in comparison to the flow of water, and therefore there will be no significant environmental impact, is suspect.

The table on page 68 of the main LDC report shows that the water in the Picanoc is very clean. The Envir-Eau Report also refers to the water as being very clean. Thus any effluent that is emptied into it will have a much greater impact than if it already had significant pollutants present.

Even though the flow of treated leachate into the Picanoc is stated to be 500 times less than the lowest volume of pure water flowing along the Picanoc, there is the potential for water being contaminated to a substantial level at the leachate outlet and this contaminated water flowing along the river at levels of contamination that will affect fish and plants along the river for a substantial distance before being diluted to a non-harmful level.

- *This has not been adequately addressed by the promoter and I believe that the risk of contamination of the Picanoc by the landfill is too great to be risked. Thus I recommend that this be taken into account and that the project not be allowed to proceed.*

- *We also heard in Phase 1 of the hearings that one person who has a cottage on the Picanoc within 1 km of the landfill site uses the river water as drinking water. A landfill in the area would put his drinking water supply at serious risk.*

7.0 Biogas generation

Rotting garbage generates methane and sulphur dioxide. These cause odour problems. However, methane is also one of the worst of the greenhouse gases. Over a period of 100 years a volume of methane has over 23 times the effect of an equal volume of carbon dioxide. It is impossible to capture all the methane. In fact most studies of landfill suggest that it is difficult to capture more than 40% of the methane. LDC naively stated when presenting the project in Otter Lake on February 28, 2007 that they will capture and incinerate 75% of the methane. Charitably, if we allow 50%, this means that half the methane generated will escape into the atmosphere and be around 100 years later. The 50% which is incinerated will also contribute to the carbon dioxide in the atmosphere.

- *It is far better to dispose of waste in a manner that does not generate methane than to landfill it and allow for biogas generation.*

During study of the web site of Waste Management Inc., one of the major North American operators of landfill sites, an article was found commenting on locating of a landfill site in a depression – as the one proposed by LDC. Biogases such as sulphur dioxide and methane can build up and eventually prevailing winds will carry the odours from these gases over the depression's boundaries. The downstream population will smell the result. The intensity of the smell can thus be high at various times. From this standpoint location in a depression is not good since biogas dilution can be slow to occur.

- *During its dwell time in the depression, biogas can have negative effects on the nearby flora and fauna*.

8.0 Visibility of Mountain of Garbage

The report states that the choice of a site in an area surrounded by higher features will mean that it is not visible from either the Picanoc River or highway 301. However, they did not consider some specific characteristics of the area that will make it visible from certain key locations regularly visited by large numbers of users.

8.1 Visibility from the Picanoc river

Line of sight observations taken by Fondex/Teknika (shown in Figures 3.25 to 3.33 of the Report) do not present the true picture of visibility of the planned mountain of garbage. Where Grove Creek empties into the Picanoc, the land is flat and swampy with very few trees.

- *Anyone canoeing or kayaking down the river, and there are hundreds every year (refer to document DC7 for a partial list) will be able to look up along Grove Creek and clearly see the landfill mound. This will have a significant impact on their enjoyment of the river*.

8.2 Visibility from Mount O'Brien

Further, no observations were taken from high points of land in the area such as Mount O'Brien, which is finding increased use as a hiking area with the numbers of members of the association and tourists increasing annually.

- *Mount O'Brien at 386 meters is well above the approximately 190 meters level of the landfill base, and the landfill will be readily observed from that location. Once the mountain of garbage is in place, the elevation of the top would be to 250 meters, and the site would stand out even more clearly.*

- *The150 mm thickness of the vegetation layer planned over the top cover when the dump is sealed off is inadequate for trees to grow and cover the dump so that it is not visible. The absence of trees means that the landfill site will be readily visible and identifiable from Mount O'Brien for the next 100 years, standing out from the surrounding forest. This will detract from the use of Mount O'Brien by tourists.*

9.0 Flora and Fauna

9.1 Wood Turtle

The wood turtle is a protected species in Quebec. There are documented sightings of the wood turtle a protected species in the area – a certificate of such a sighting is on file in the Museum of Nature in Ottawa.

The LDC environmental impact study reports no wood turtles were seen during a site visit in June of 2005. However to conclude that none were present displays an ignorance of the habits of the wood turtle. The period of the survey corresponds to the period when the wood turtle is nesting, so it is nearly impossible to spot them during this period.

Wood turtles are killed by heavy truck traffic, so additional traffic would endanger the species.

- *The study is not justified in stating that the risk to the wood turtle is small*.

It is my understanding that a world expert on the wood turtle (originally from Gatineau), Dr. Raymond Samure, will present a brief, so I will not comment further.

9.2 Attraction of Pests

In a private conversation I had with Paula Armstrong a biologist, we discussed the risk of scavengers on the wildlife in the area. Not mentioned in the environmental impact report is the risk of raccoons being attracted to the garbage site. Raccoons are particularly adept at finding access to food. They are well known to feed on bird and turtle eggs. Thus with a higher than normal population of raccoons in the dump area, birds and turtles will be at risk.

Similarly seagulls are scavengers and feed on eggs. The distance to the Gatineau River is not that great, and it is clear that gulls find their way to where there is food. I have personally seen seagulls on lakes in the area – including Danford Lake and McConnell Lake which are only a few km from Danford Village.

It should be noted that sirens, guns or other noise generators to scare away gulls will interfere with the peaceful enjoyment of the Picanoc River.

9.3 Rare Plants

The environmental impact report states that no protected or threatened plants were observed on the site. However, in passing, it should be noted that the

relatively rare plant the Lobelia Cardinalis grows along the banks of the Picanoc River. There is a potential for this to be threatened by gas fumes and by contamination of the Picanoc by material dumped there, either planned or through liner leakage. .

10.0 Protection of the wetlands

A 48.5 hectares wetlands exists to the south of the site and the land at the edges of the proposed landfill site slope into this wetlands.

- *MDDEP has published a document entitled "Traitement des demandes d'autorisation des projets dans les milieux humides". There is no evidence in LDC's environmental impact studies that this was addressed, and I have seen no plan on how LDC would protect the wetlands either during the operation of the landfill or after operations cease.*

10.1 Water flow from site after active operations cease

In the Layfield Design Guide for using Geomembranes, it is noted on Page 40 (see Appendix which includes the pages in the document dealing with HDPE) that the friction angle of HDPE is 18°. LDC plan to cover the completed cells with HDPE membrane and then cover with earth and plant vegetation. If the slope is more than 18°, the earth covering will not properly adhere and erosion is possible. (The slope shown in PR5-1-Ann H is shown as 30% maximum, which equates to approximately 18°).

The 18° outward slope and the smooth surface of the underlying cover means that rainwater will run down the slope to the edges of the site and into the nearby streams and wetlands, despite the proposed trenches around the landfill. In years of high rain such as 2006, this will have much larger impact than normal. The extra water from the site will raise the height of the water in the wetlands and can drown many species of plants and trees. The promoter has not considered this effect in the impact studies. Thus the statement that the impact on the wetlands would be small is not justified.

- *I believe that this extra water effect in combination with the prospect of leachate leaking into the water table and traveling to the wetlands will put the wetlands seriously at risk, and is another cause for refusing to authorize the project.*

The water table studies on the site were made in 2005. In 2006 there was far more rainfall than normal, which would cause the water table to rise. Climate change is causing changes in the weather patterns, and this is likely to lead to

more years of “higher than normal” rainfall. Excess rainfall when active operations cease would cause more flooding of the wetland areas.

- *During our visit to the site, we noted that excess runoff of rainwater near the site caused washing out of culverts and logging roads – presumably from the high rains in the autumn of 2006.*

11.0 Conclusion

I firmly believe that landfill is a thing of the past - entombing garbage for future generations to deal with is irresponsible and unacceptable especially since new and better alternatives are becoming available.

In this brief, a number of conclusions have been drawn. Most of these are represented as bulleted items and are italicized. Some of the most serious deficiencies in the studies, and ones which I believe should cause the project to be rejected are:

(a) the environment studies are incomplete and in many cases superficial,
(b) the soil conditions are not suitable for a landfill site,
(c) the proximity of the site to Picanoc places this river at risk,
(d) the study does not demonstrate that there is not a good aquifier or that there is no direct link between the aquifier and the Picanoc, and
(e) the underlying soil conditions vary sufficiently that problems will occur in leachate collection, creating unacceptable risks of leachate leakage and groundwater contamination.

I strongly urge that the Commission recommend against the LDC request to establish an engineered landfill project in Alleyn and Cawood.

R.E. Thomas,
June, 2007