

**BURNS BOG ECOLOGICAL CONSERVANCY AREA  
SCIENTIFIC ADVISORY PANEL MEETING  
Tuesday, March 17 2009 from 4:30 – 7:30 PM  
Park Centre – Pacific Spirit Regional Park  
4915 West 16<sup>th</sup> Avenue, Vancouver BC**

**Meeting Notes**

**ATTENDEES:**

Dr. Richard Hebda, Scientific Advisory Panel  
Dr. Geoff Scudder, Scientific Advisory Panel  
Dr. John Jeglum, Scientific Advisory Panel  
Allan Dakin, Scientific Advisory Panel  
*Chair*, Greg Paris, Metro Vancouver Regional Parks  
Markus Merkens, Metro Vancouver Regional Parks  
Wendy Warn, Metro Vancouver Regional Park  
Heather Sinclair, Metro Vancouver Regional Parks  
Barry Smith, Environment Canada  
Mike Brotherston, Corporation of Delta

**REGRETS:**

Jennifer McGuire, BC Ministry of Environment  
Mitch Sokalski, Metro Vancouver Regional Parks  
Sarah Howie, Corporation of Delta  
Dr. Paul Whitfield, Scientific Advisory Panel  
Angela Danyluk, Corporation of Delta  
Loger Aure, Metro Vancouver Regional Parks  
Hamish Kimmins, Scientific Advisory Panel

**GUESTS:**

Timothée Merle d'Aubigné, Gateway Program  
Gabor Vasarhelyi, CH2M Hill (Gateway Project)  
Richard Sims, EBA (Gateway)  
Scott Postma, Gateway Program  
Ron Lepage, Gateway Program

**1.0 INTRODUCTIONS**

**2.0 REVIEW AGENDA & JANUARY 20 2009 MEETING NOTES**

- 2.1 Item 3.3.1 of January 20 2009 Meeting Notes should read “coroplast signs are suitable for use in ditch blocking because the material is inert.”

**3.0 ACTION ITEMS FROM LAST MEETING**

**3.1 October 2008 – January 2009 Hydrology Data**

- 3.1.1 Carried over; Sarah Howie and Paul Whitfield to present this data next meeting.

**3.2 Research and Monitoring Strategy**

- 3.2.1 Markus Merkens has reviewed draft; final version to be developed with SAP. SAP wants to review all Research Permits in the interim.

**ACTION:** MM to send out the "Research Strategy" document to SAP members.

**ACTION:** MM to circulate the two BBECA Research Permit Applications currently under review.

**3.3 Method Manual**

**3.3.1** Distributed by Loger Aure on February 4, 2009.

**3.4 LiDAR Survey**

**3.4.1** Carried over; Sarah Howie to present this data next meeting.

**4.0 BBECA NORTH BOUNDARY HYDROLOGY MANAGEMENT**

**4.1 Scientific Advisory Panel March 2 2009 Paper presented by Richard Hebda et al; Response by Geoff Freer, Ministry of Transportation**

**4.1.1** See Attachments 1 and 2

**4.1.2** RH notes that the building of the South Fraser Perimeter Road (SFPR) will likely provide benefit to the BBECA by the creation of a basin between the uplands and the bog within which water levels could be controlled; however, water level control must ensure that mineralized water is not allowed into the Bog as is currently happening at the North boundary (as evidenced by the encroachment of Reed Canary Grass in the area documented by SAP members).

**4.1.3** Of particular concern to SAP is the necessity to keep water levels high in the East-West Ditch in order to support the water table of the Bog without concentrating mineralized water in the ditch in the process, which could percolate through the existing spoil bank during high water events. Maintaining high water levels in the East-West Ditch may increase in importance depending on the impact of loss of flow from precipitation that will in future fall on SFPR and be directed away from the Bog.

**4.1.4** RH is concerned about the likelihood of mineral-rich water flushing into the East-West Ditch during heavy precipitation and the possibility that this water may breach the spoil bank which separates the ditch from the Bog proper, especially when the bog water table is low. The water level in the ditch must be high enough to impede bog water loss from the water mound of the bog, but low enough to prevent mineralized water from overflowing the spoil bank.

**4.1.5** SAP members are concerned that many of the berms proposed in Gateway's plans for SFPR will have minimum benefit for bog hydrology. They propose that a simpler and more cost-effective measure would be to augment the existing spoil bank using peat from one side of the ditch to create a berm approximately 2 metres wide and approximately 50-75 centimetres high.

**4.1.6** Gateway notes that it is bound to meet commitments laid out in the Environmental Assessment Certificate signed off by provincial

and federal regulators, and that designs are based on mitigating a variety of concerns (such as noise, wildlife disruption, and dust); the hydrology of the Bog is not the only factor addressed by these structures.

- 4.1.7** Gateway notes that the building of its mineral berms adjacent to the SFPR does not preclude the creation of an organic peat berm south of the basin which will be created between the SFPR alignment and the East-West Ditch; it agrees that the organic berm may be beneficial to the long-term restoration of the Bog. However, this work would be in the ECA and well outside of the SFPR right-of-way. Further, this work would be restoration, not mitigation.
- 4.1.8** SAP members are concerned about the exposure of decommissioned landfills as a result of construction of the SFPR; Gateway assures that all necessary precautions (such as lining the runoff area and collecting and removing runoff water) will be taken to ensure that contamination from these sites does not reach the Bog. The closure of landfills currently operating on the perimeter of the Bog will be one of the net benefits of the SFPR.
- 4.1.9** In response to SAP's concern regarding orphaned sites created by the SFPR, Gateway states that only two will be formed, the South Alpha and the Southern Cross. A plan has been submitted to Delta regarding management of the South Alpha orphaned section, while the Southern Cross section is still the subject of legal action before the courts.
- 4.1.10** SAP identified that the creation of the SFPR will define the Bog forever and imposes a necessity to manage the water table. Gateway is in the process of creating a water balance model for the Bog which will allow the water table in the Bog to be monitored and to control the flow of water.
- 4.1.11** Barry Smith pointed out that the obligations and commitments are intended to protect the Bog and should take into account that this is an ongoing process of monitoring and mitigation, and should therefore be flexible to allow for adaptation based on new data pertaining to the best methods for protection and management of the Bog.  
***ACTION:** Metro Vancouver will work with the Corporation of Delta, SAP, and other agencies to establish a process to move the issues raised by SAP towards resolution.*

## **5.0 OTHER BUSINESS**

## **6.0 ADJOURN**

Next Meeting May 19, 2009

## ATTACHMENT 1

### Burns Bog Ditch and the ecological integrity of Burns Bog

Prepared by Richard Hebda, John Jeglum, Allan Dakin

In our role of providing advice to the SFPR project we recently have visited several sites at the northern margin of the Burns Bog Ecological Conservancy Area along the major east-west ditch. Our objective was to provide advice concerning the best manner of creating a transition from Burns Bog (the Bog) to the proposed SFPR road system.

Our observations of the ditch, areas adjacent and their hydrochemistry have given rise to two strategic issues that are of great concern:

1. serious incipient and potential future impacts on the ecological integrity of the Bog
2. ensuring that any construction and management, by any agency not just SFPR, does not affect future potential actions to support the recovery of the Bog.

We note that these are explicit requirements of the approved Hydrology Work Plan for SFPR. The first issue is a central matter for all agencies signatory to the covenant and is a core principle in the Burns Bog Management Plan.

Our observations lead us to conclude that the Bog's ecological integrity is at serious risk along the northern margin and a coordinated plan and intervention including a partnership of the SFPR project, Metro Vancouver, The Corporation of Delta, BCMOE and Environment Canada is required urgently. The imminent construction of the SFPR provides an opportune window to carry out the necessary intervention in the most ecologically effective and least expensive way.

The issues;

1. The east-west perimeter ditch is carrying Type 2 or 3 water (pH above 6 and even above 7) and bringing it in direct contact with the north edge of the acid Bog ecosystem along the south bank for the full length of the ditch. Recent measurements of water pH and conductivity by EBA Engineering staff confirm this.

At high water, during the week of February 9<sup>th</sup>, for example, the water in the east-west ditch is at the same level as the water in the Bog just the other side (only 5-10 m away) of a spoil bank (debris ridge) of peat extracted from the ditch which separates the Bog from the ditch. This nutrient-rich water could easily percolate southwards through the ridge and get into the Bog, and it is toxic to Bog plants, especially *Sphagnum*. Over time if not controlled it could (and likely will) alter adjacent Bog hydrochemistry.

2. In response to the nutrient-rich waters in the ditch, Reed Canary Grass, a well-known aggressive wetland invader, has occupied the ditch and wetland areas adjacent to it. It has largely replaced the native Hardhack which predominated as late as the mid 1990's and reversed the *Sphagnum* regeneration that was taking place along the ditch corridor at that time. Small patches of Reed Canary Grass are now evident on the south side of the ditch and pose a very serious potential threat to the ecological integrity of the Bog.

Not far south of the ditch there are signs that *Sphagnum* regeneration may be beginning following peat harvest. Incursion of mineral-enriched water or spread of Reed Canary Grass would undoubtedly reverse this process.

The mineral enrichment comes from the landfills to the north of and in some cases immediately in contact with the east-west perimeter ditch. To some extent the highway construction and proposed berms may reduce the mineral flux. However it is not known what its effect on the internal hydrology of the orphaned and future fill sites will be. The degree of mineralization is now such that it may take decades or longer to reverse it, such that it is not realistic to expect the redevelopment of bog conditions in the Pipeline and perimeter ditch corridor. The best that we could hope for is the reduction of mineral water input from the highway landfills and runoff such that the east-west perimeter ditch becomes a lagg with Type 2 water adjacent to the Bog.

### Potential Solution

The current configuration with upland fill to the north and west of the east-west ditch and raised bog to the south creates an elongated impounded basin: essentially a “lake” within peat whose outlet is at 96<sup>th</sup> Street. Construction of the SFPR will further constrain the “lake”, making the basin much smaller especially south of the route and proposed berm in area B of the hydrology plan. The SFPR hydrology plan recognizes the influence of SFPR and that water levels in this basin have to be controlled to support the Bog with the explicit inclusion of a water control structure at 96<sup>th</sup> Street outflow. The water table in the basin (which encloses also the east-west ditch) will have to be manipulated in such a manner that it:

1. is high enough not to act as a “sink” (excessive discharge zone) for water from the Bog (especially in the dry months);
2. stays low enough to prevent mineral-rich water from flowing into the Bog; especially important during heavy rain events when the bog water table is low (spring, fall); the north side of the basin will have a much steeper hydrograph (more rapid response time) than the south side; and
3. is not depleted by demands for drainage and water along the SFPR route (flushing away from the Bog).

These hydrological and hydrochemical challenges can be met by a three part approach which involves regulating the water table in the basin and preventing incursion of the basin waters into the acid Bog ecosystem on the south side of the ditch. This approach will have the added benefit of creating conditions for the development of an ecologically functioning lagg zone in the basin along the east-west ditch axis and will support *Sphagnum* growth and restart of peat formation in the adjacent acid Bog ecosystem.

Specifically, we recommend that Gateway significantly reduce the size and complexity of two or three of the proposed berms, eliminate cross-highway culverts, reconfiguring the east –west ditch in one area, construct a peat berm along the south side of the east – west ditch and install water level and flow control measures.

- 1) Changes to SFPR proposed drainage measures.

The Hydrology Plan is proposing to install many culverts under the SFPR which could drain runoff and seepage from the north side of the highway into the east-west ditch.

We recommend that all runoff from the highway and the areas north of the highway be directed to the ditch on the River Road side and not to the east-west ditch.

Also the east-west ditch should be diverted along the south side of the proposed new berm in the 80<sup>th</sup> Street northwest corner area, and it should be extended to connect with the 80th Street ditch to isolate bog water from external influence.

## 2) Control water levels in East-West ditch

The SFPR designers are proposing to construct flow and water level control structures on the principal out flow ditches along the north side of the Bog (notably 96<sup>th</sup> Street outflow). By installing a set of small weirs with adjustable invert along the East-West ditch it would be possible to ensure that the water level in this ditch does not rise above the water levels in the Bog, along the south side of this ditch. It should be possible to maintain a slight stepped gradient from the Alpha land fill area (southern cross) eastward to the 96<sup>th</sup> Street control. By partitioning the basin at pinch points it might also be possible to constrain accidental spills or discharges into segments of the basin for clean up. We understand that the SFPR designers plan to construct drainage control measures along the SFPR and that these will be diverting most, if not all, of the runoff from the south side of the road pavement to the north. This should lead to less minerotrophic water flowing into the east-west ditch and should also result in significantly reduced peak flows, when compared the current flows in the ditch. When the SFPR drainage control measures are in place, it will be much easier to control water levels in the East-West ditch. However, the drainage intensity requirements of the SFPR cannot be such as to influence the basin water levels unduly, especially in moisture deficit intervals.

The establishment of the appropriate water level in the basin and its seasonal fluctuation are challenging tasks and requires completion of the DEM and **a well-calibrated hydrology model.**

In addition to a finely regulated water level in the basin, the acid bog ecosystem has to be isolated as much as possible from the chronic influence of the mineral-rich waters and sediments of the east-west ditch basin, including any extreme incursions. There is no room for error; a single dump of mineral water, especially laden with even a minor amount of sediment, could reverse recovery in this part of the Bog for decades.

Culverts should be installed in the more significant south-north oriented ditches from the Bog at their intersections with the recommended peat berm. These should be fitted with flow and level control measures.

## 3) Construct a peat berm along the south side of the east-west ditch

The acid bog ecosystem has to be isolated from water incursion from the east-west perimeter ditch before major construction of the SFPR begins (such as excavating the fills, for example). This can be accomplished simply and inexpensively by building a low, relatively narrow peat berm along the full length of the ditch extending from about the "Southern Cross" fill to the outlet at 96<sup>th</sup> Street at the edge of the Conservancy area.

Briefly, a narrow strip (max 10 m) along the south side of the ditch would be cleared of trees (beavers have done a good job already). There is a bit of a spoil bank already and it rises some 0.5-1 m, but is only 1.5 to 2.0 m wide, incomplete and irregular in profile. The original spoil material must be reshaped into a berm, and widened to 2 m by using peat either from the adjacent ditch bottom or sides, or from an inner shallow ditch dug parallel to the spoil bank. The peat is highly decomposed at shallow depths, at this site at least, and it is desirable to use catotelmic (deeper) peat with a low hydraulic conductivity, which is good both to hold ditch water out and bog water in.

Steps as follows:

- 1) Peat is excavated from the adjacent ditch margin (shallow depth) and deposited on the back side of the spoil bank.
- 2) The surface is smoothed and reshaped into a berm having a uniform height of about 1 m and width of about 2-3 m.
- 3) The berm is compacted by driving over with tractor pad, and/or pressing down with the backside of shovel head.
- 4) The berm may need a plastic or other internal cover on the ditch side to prevent excessive mineral soil water incursion.
- 5) The berm is revegetated with ericaceous bog shrubs, or other dry bog species that will stabilize the surface (include dry bog mosses). Vigorously growing trees probably should not be used owing to their roots creating pipe flow and also when becoming large toppling over into ditch and damaging the berm structure.
- 6) Monitor and remove invasive species on berm until good native cover is established.

Construction of a berm as detailed above can be accomplished using established technology and methods from forest drainage. Finnish forest drainage tractors have been used in Canada with success, especially if experienced operators are employed and closely supervised. However, Finnish tractors are not the only ones, tractors with V-shaped shovels have been and are presently being used in Quebec, and we are in contact with the main officers of the Quebec government in charge of supervising forest drainage. The costs should not be high. Preliminary calculations based on a single contact with an excavation company suggests the job of constructing the berm (without plastic sheeting) could be done for about \$25,000-50,000 over a period of 11 days. (More detailed calculations of costs and job specifications would have to be done.)

This project is not solely a responsibility of Gateway, but we hope that they can contribute to it. The SFPR has the potential to increase the runoff of sediment and mineral water, from which the berm is intended to protect. The potential for further minerotrophic incursion of type 2 and 3 water is certainly a factor influencing the integrity of the Bog, even if the SFPR is not directly located on the Bog or Bog Partnership Lands. All parties need to agree to the action.

We note that two and possibly three of the proposed highly designed and complex berms along SFPR, notably Berms A, B and C of the hydrology plan, will not have the desired positive effect to protect the Bog and may serve to further concentrate mineralization into the Bog because the east-west ditch is on the Bog side of the berms: by channeling mineral soil and mineral soil water coming off of exposed landfills, such as at the West DLC Site and the Interchange Site, in the Pipeline pathway and perimeter ditch; by narrowing the channel there are potentially higher water levels during wet

seasons and periods, and thus danger of mineral waters rising high enough to spread onto the Bog surface. We recommend that berms A, B and C could be constructed more economically and savings used to help with the construction of the peat berm on the perimeter of the Bog itself. Berms A, B and C could be much narrower and lower, functioning to support tree growth to block road particulates. A simple roadside ditch between low berm and SFPR would suffice to direct the limited road drainage from the bog side of the low berm. Its levels would have to be controlled to avoiding robbing the bog side basin water table. Altered size and complexity of the roadside berms would markedly reduce the need to integrate with the Terasen Pipeline.

We urge that a meeting of the stake (covenant) holders be held as soon as possible to address these very serious issues and to discuss the suggested solutions.

Signed by

Richard Hebda  
John Jeglum  
Allan Dakin  
Geoff Scudder



## ATTACHMENT 2

March 13, 2009

File: TRAN-42000-40/24205A

Mr. Mitch Sokalski  
West Area Manager, Metro Vancouver Regional Parks  
6<sup>th</sup> Floor, 4330 Kingsway Ave.  
Burnaby, BC  
V5H 4G8

### **Re: Burns Bog Mitigation and Restoration Initiatives**

Dear Mitch,

Thank you for the comments from Burns Bog Scientific Advisory Panel (SAP) regarding existing conditions along the northern edge of Burns Bog, mitigation infrastructure planned, and opportunities to address impacts associated with past land use activities adjacent to the Burns Bog Ecological Conservancy Area (BBECA).

Project technical specialists, who have spent time in the field with SAP members observing existing conditions, concur with observations of current conditions regarding water chemistry, water levels and the presence of plant species associated with non-bog ecosystems. The Ministry also agrees with SAP comments that, in general, the mitigation infrastructure proposed in the Hydrology Work Plan (Version 3.2, September 3, 2008) will help reduce existing sources of mineral enriched waters from developed lands to the north.

Project technical specialists are confident that through improved water management practices between the SFPR alignment and the BBECA, existing drainage conditions will be improved. Some of the SAP suggestions for refining current hydrology infrastructure also appear to be focused on providing the capacity to better manage water levels, and we are interested in exploring the concepts put forward.

In this context, some opportunities exist to refine the mitigation infrastructure and mitigation monitoring methodologies as described in the Hydrology Mitigation Monitoring Plan (Version 2.0, February 11, 2009). The staff will contact you and the Corporation of Delta for a follow-up meeting to discuss specific proposals put forward by the SAP. However, as we are required, under the terms of federal and provincial environmental assessment approvals, to construct hydrology mitigation infrastructure as described in the Hydrology Work Plan (Version 3.2, September 3, 2009), the Ministry cannot make significant changes to the mitigation concepts proposed without approval from federal and provincial regulatory agencies.

.../2

The project is prepared to collaborate on other initiatives that may emerge. As you know the project has undertaken a number of works that are providing benefits in terms of building better capacities for managing the BBECA. Some of the contributions made to date include:

- Development of a water budget model to be used in drainage design for the SFPR project, which can also be used by Metro Vancouver and the Corporation of Delta for shorter- and longer-term management activities associated with Burns Bog;
- Cost sharing of the collection of LIDAR elevational data to assist in SFPR planning, but which will also support, in particular, the Corporation of Delta's ongoing water management activities within and adjacent to Burns Bog; and,
- Collection of a significant amount of baseline and monitoring biophysical data including water chemistry, water level/flow, air quality, and health of plant communities that collectively adds to the body of scientific knowledge regarding Burns Bog, and which can be used by multiple parties in support of BBECA management objectives.

The project is committed to ensuring that the design, construction and operation of the SFPR complements longer-term management objectives established for the BBECA. To continue to advance the SFPR project in a way that meets the spirit of this commitment, the project proposes to:

- Meet with representatives of Metro Vancouver, the Corporation of Delta, and the SAP to discuss refinements that could be made to the proposed mitigation infrastructure identified in the Hydrology Work Plan; and,
- Participate in a committee established by Metro Vancouver to identify potential restoration initiatives for the BBECA, to be implemented by Metro Vancouver, the Ministry of Environment and the Corporation of Delta, where synergies with SFPR construction and operation may exist.

We look forward to meeting with you in the near future to ensure that the SFPR Project continues to advance in a way that complements long terms efforts to protect and restore the BBECA.

Sincerely,

Geoff Freer  
Project Director  
South Fraser Perimeter Road