Submission to City General Purpose Meeting

to be included in minutes

Schedule 3 to the Minutes of the General Purposes Committee Meeting of Monday, January 21, 2013.

1. Dec. 7 ALC Approval Letter for 9360 Finn Rd
2. "Guidelines for Farm Practices Involving Fill" Min Ag Dec. 2006 referenced in Stop Work Order letter Jan. 19, 2013
   intended to assist municipal governments in taking over jurisdiction of soil after provincial "Soil Conservancy Act" was repealed in 2002
3. Research on Soil Contaminents

Agricultural Land Commission
133–4940 Canada Way
Burnaby, British Columbia V5G 4K6
Tel: 604 660-7000
Fax: 604 660-7033
www.alc.gov.bc.ca

December 7, 2012

Reply to the attention of Thomas Loo
File: #49945

McTavish Resource Management Consultant Ltd
2858 Bayview St.
Surrey, BC, V4A 2Z4
(via email – bmct@intergate.ca)

TERMS OF APPROVAL from ALC

Dear Mr. McTavish:

Re: Proposal to Place Fill in the ALR
Property: 9360 Finn Road, Richmond, BC
PID: 003-593-118
Legal Description: LOT 6 EXCEPT: FIRSTLY: PART SUBDIVIDED BY PLAN 41056; SECONDLY: PART SUBDIVIDED BY PLAN 80324; SECTION 15 BLOCK 3 NORTH RANGE 6 WEST NEW WESTMINSTER DISTRICT PLAN 38989

This letter is in response to a proposal to deposit fill that was received at this office on October 25, 2012.

As described in the proposal and accompanying documents, the Commission understands the following about the proposal to place fill:

- The property is owned by Canada Future Investment Co. Ltd.,(BC 633844)
- The owners have appointed you, Bruce McTavish to act as their agent in this regard.
- The type of material proposed to be placed is Topsoil and granular fill.
- The area of the proposed fill is **10 ha.**
- The proposed volumes of fill material are **48133 m^3.**
- The intended depth of fill is **0.3 m.**
- The proposed duration of the fill project is **3 years.**
- The proposed fill area is included in Appendix A "Figure 7. Farm Layout"
- The area marked as "Container Nursery", will be built according to similar container nursery construction with the use of imported gravel and geotextile materials. The topsoil in the "Container Nursery" area shall be salvaged stored for the purposes of future restoration of the approximate 1.45 hectares.
- The project shall be done in accordance to the report as submitted by McTavish Resource & Management Consultants Ltd., dated October 25, 2012 (the "plan") and will be overseen by the Qualified Professional (QP) of record, Mr. Bruce McTavish
- Any and all imported materials shall must be screened and authorized by the QP prior to placement on the above noted property,
- The QP must provide updates as requested by the Commission
- Upon completion of the project, the QP is to submit a final report outlining the final agricultural capability and the placement of materials as it relates to the plan

(1) → wasn't in accordance with report

(2) fill → wasn't screened

Agricultural Land Commission
133–4940 Canada Way
Burnaby, British Columbia V5G 4K6
Tel: 604 660-7000
Fax: 604 660-7033
www.alc.gov.bc.ca

Based on the above, information, it is our understanding that the proposal will not substantially raise the property, but will allow the intended crop adequate root depth.

If at any time, that you feel as the Qualified Professional of record that you observe materials that you feel are unsuitable for this project or are no longer associated with the project, then you are to notify the Commission immediately.

(3) QP was not always on site.

If there is no oversight by a Qualified Professional at anytime during this project, the Commission may consider the deposition to be a non-farm use and deem it as being non-compliant with the Agricultural Land Commission Act

Please note, it is your responsibility to ensure that the placement of fill does not cause danger on or to adjacent land, structures or rights of way, or foul, obstruct or impede the flow of any waterway. In addition, this decision does not relieve the owner or occupier of the responsibility to comply with applicable Acts, regulations, bylaws of the local government. This includes zoning, subdivision, or other land use bylaws, and decisions of any authorities that have jurisdiction under an enactment.

Yours truly,

PROVINCIAL AGRICULTURAL LAND COMMISSION

Per:

Colin Fry, Executive Director

TERMS AND CONDITIONS

1. That the fill placement activities be restricted to the 10.0 ha area as shown on the attached air photo.

2. That the total fill placement shall be limited to 48133 m^3 to achieve the finished grade elevations as proposed and identified in the report, as prepared by Bruce McTavish of McTavish Resource & Management Consultants Ltd. dated October 25, 2012 (the "Plan").

3. The fill placement shall be in substantial compliance with the plan.

4. That, under the direction of the qualified professional of record, Mr. Bruce McTavish all existing 'topsoil' on the authorized site shall be stripped and salvaged for future soil reclamation purposes. Salvaged topsoil is to be stripped using an excavator with a cleanup bucket to ensure soil horizons are removed separately. Topsoil stockpiles are to be stored separately by horizon type and replaced in the reverse order of removal to prevent mixing of the horizons and to facilitate the re-creation of the present soil condition. Salvaged 'topsoil' shall not be removed from the property.

IS QP monitoring —

5. That Topsoil material is not authorized to be removed from the property.

6. That appropriate weed control must be practiced on all disturbed areas.

7. That all soil stockpiles shall be seeded and established to an appropriate plant cover, or other suitable soil erosion control measure shall be applied to protect the stockpiles from wind, runoff or other removal process. Protection is also to extend to damage which may be caused by recreational vehicles such as motorcycles etc.

8. That dust suppression practices, and/or restrictions on gravel pit vehicle traffic be applied when necessary to minimize air-borne dust from traffic on the access road and thereby potential negative impacts resulting from the dust on neighbouring properties.

9. A yearly report must be submitted to the Commission detailing volumes and quality of the soils, photos, as well as information relating to the placement as it related to the plan.

10. That a final report prepared by the qualified professional of record be submitted to the Commission upon completion of the project. The final report shall include a written description of the completed project, photos of the site, and evidence that the reclamation has been completed as well as professional assessments specific to:
    a) the soil reclamation outcomes for all areas within the fill placement area.
    b) the efficacy of site drainage on the total reclaimed area;
    c) identifying potential negative impacts on the drainage of soils elsewhere on the property, and/or on neighbouring properties, should the impacts be determined to be a result of the project and its activities.

11. That the proposed fill placement project, including all reclamation activities, be completed by September 1, 2015. Upon completion of the project, please submit a

closure report which includes photos and written confirmation of the project's completion as outlined above.

12. Should you require an extension of time beyond this date to complete the project, a request shall be submitted to the Commission prior to July 1, 2015. The request shall include a status report that includes details of the project, the reason for the extension request, and photos of the site.

13. Approval for fill is granted for the sole benefit of the applicant and is non-transferable without written approval of the Commission. Should ownership of the property change, please inform the Commission in writing.

Please advise this office, by signing and returning one copy of these conditions, whether or not you intend to proceed with the placement of fill proposal on the above basis. As the agent for this proposal, the Commission considers it to be your responsibility to notify your client. Should you, or your client not agree to restrictions as set out in the above 'terms and conditions', the option of submitting a formal Non-Farm Use application to the Commission is available. Should an application be made, please be advised that the Commission has the authority to grant an approval, with or without conditions, or deny the proposal. The application process is initiated by submitting the required forms and paying the requisite fee ($600) to the local government.

I, _____ agree to the above terms and conditions and intend to
(print name here) proceed with the placement of fill as outlined above.

_____
Signature of owner or agent

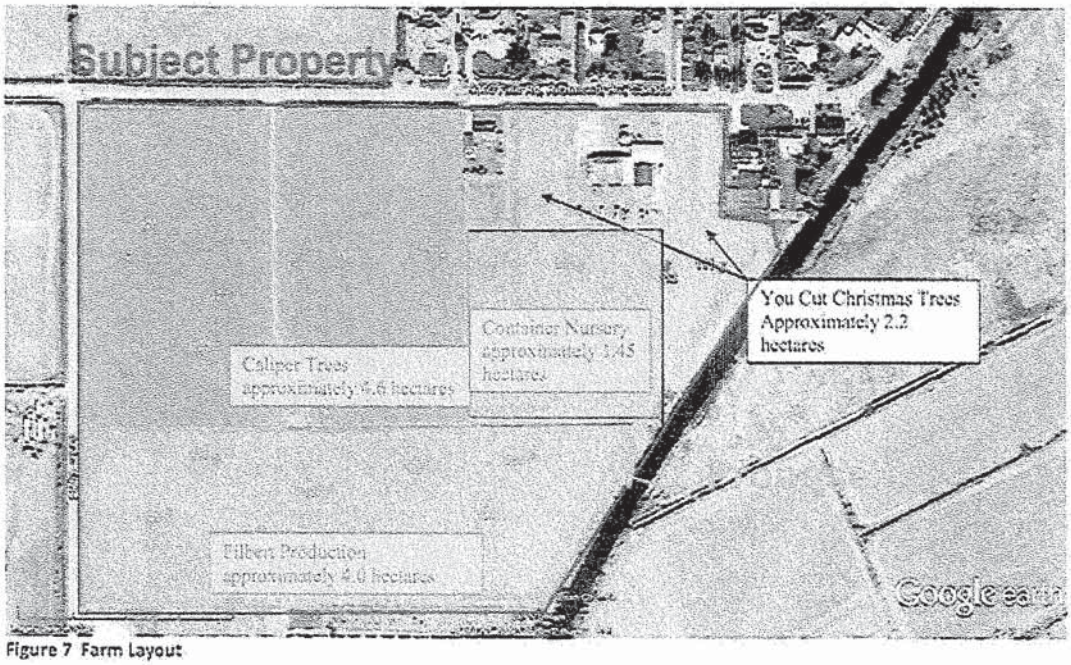


Figure 7 Farm Layout

Letter of Credit - Example

BENEFICIARY: Minister of Finance
c/o Provincial Agricultural Land Commission
#133 - 4940 Canada Way
Burnaby, BC V5G 4K6

Re: ALC Application # _____

We hereby issue in your favour our Irrevocable Letter of Credit #_____ for CAD

$_____ in the account of _____

(Name of Individual or Company)

_____

(Street Address and/or Legal Description)

TERMS AND CONDITIONS:

1. Expiry Date: _____

2. Drawings are to be made in writing to _____

(Name of Financial Institution)

3. Partial drawings are permitted.

4. The Bank/Credit Union will not inquire as to whether or not the Agricultural Land Commission has right to make demand on this Letter of Credit.

5. This Letter of Credit is irrevocable up to the expiry date.

6. This Credit is irrevocable up to the expiry date and unless it is extended in writing will be null and void after the expiry date whether or not the original credit is returned to us for cancellation. The amount of this credit may be reduced from time to time only by the amount drawn upon it by you or by formal notice in writing received by us from you that you desire such reduction.

7. Request for any amendment except reduction in amount must be made directly to our customer who will then instruct us accordingly.

8. Any drawings made under this letter of credit must be accompanied by the original of this credit.

9. **Mandatory Condition:**
"It is a condition of this letter of credit that it shall be deemed to be automatically extended without amendment from year to year from the present or any future expiration date hereof, unless at least 30 days prior to the present or any future expiration date, we notify you in writing, that we elect not to consider this letter of credit to be renewable for any additional period."

10. We engage to honour presentations submitted within the terms and conditions indicate above.

① Noncompliance: to Dec. 7 Approval letter

→ QP wasn't always on site
→ fill was not being screened
→ dumping was not in accordance of QP report (applicn to ALC)

② Inspector letter to Ray

→ width of road exceeds Min. Guidelines "Farm Practices involving Fill"
→ over 6" pieces.
→ monitoring did not take place
→ AAC was not informed.

Strengthening Farming
FACTSHEET

BRITISH COLUMBIA Ministry of Agriculture and Lands

Order No. 820.200-1
December 2006

GUIDELINES FOR FARM PRACTICES INVOLVING FILL

This Factsheet describes farm practices involving soil and/or woodwaste fill, and the rationale/references for these practices. The Factsheet also includes suggestions to local governments as to the type of notice they may require, in order to balance the needs of a viable agricultural industry with the local governments' ability to take action against property owners who violate a bylaw, Agricultural Land Commission requirements, or other provincial and federal regulations.

Be Advised:

- **The Agricultural Land Commission (ALC) Act defines "fill" as any material brought on land in the ALR. Except where exempted by regulation, the placement of fill in the ALR is a non-farm use activity and is illegal without approval or authorization of the ALC. The exemptions provided in the ALC Regulations, however, allow filling where necessary for farm uses, and other permitted uses, provided that the filling activity does not (a) cause danger on or to adjacent land, structures or rights of way, or (b) foul, obstruct or impede the flow of any waterway. For 'specified' farm uses a notification process is additionally set out in the Regulations.**

- **Fill to raise the soil surface elevation to address on-farm soil drainage issues typically requires an application to the ALC.**

- **Farmers are advised that a plan should be prepared prior to any fill use. The plan should describe the purpose as well as explain why the placement of fill is necessary for the farm use, or for a permitted use. It should include information on the location and area to receive fill, the volume, quality, and method of placement of the fill material, as well as any potential drainage impacts or requirements.**

- **Farmers should also check with their local governments in advance for any restrictive covenants, zoning, regulations or permit requirements that would prohibit/limit the use of fill.**

Recommended Local Government Notice

Local governments are encouraged to exempt or waive permit requirements and fees for farm uses that are consistent with these farm practice guidelines. However, individual local government approaches vary, and specific requirements may be identified by a local government upon receipt of a notification. A sample local government fill notice is appended to this factsheet.

Definitions of Terms use in this Guideline

The terms *"woodwaste"* and *"soil"* are used repeatedly throughout this Factsheet in reference to "fill" materials that are suitable and appropriate for particular farm uses on agricultural land. The commonly accepted definition of these two "fill" materials is given below.

Woodwaste*:

Code of Agricultural Practice for Waste Management (under EMA) "Woodwaste includes hog fuel, mill ends, wood chips, bark and sawdust, but does not include demolition waste, construction waste, tree stumps, branches, logs or log ends."

Note:

- While "woodwaste" is the term used in the regulations, it is actually a wood byproduct and not a waste material.
- Most woodwaste used for agricultural purposes may include bark material.

Farm Practices Description, BCMAFF, January 2004 "Woodwaste deposits must not exceed a total depth of 30 cm, which should be achieved by applying layers that do not exceed 15 cm per year. The volume and manner in which woodwastes are applied must follow good agronomic practices for the soil type, climatic area and crop to be grown."

Note:

- Woodwaste storage would obviously exceed the 30 cm depth.

Soil:**

The definition in the *Agricultural Land Commission Act* is "includes the entire mantle of unconsolidated material above bedrock other than minerals as defined in the *Mineral Tenure Act.*"

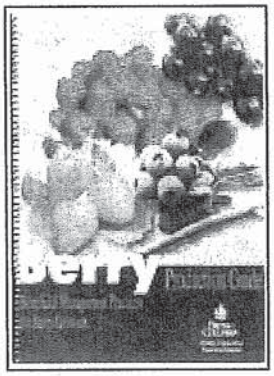
Note:

- A local government bylaw definition may wish to only include clay, silt, sand, gravel, cobbles or peat.
- Soil is typically a mixture of mineral material, organic (living and decaying) matter, air and water that is capable of supplying nutrients, moisture, and can serve as a growth medium for plants.

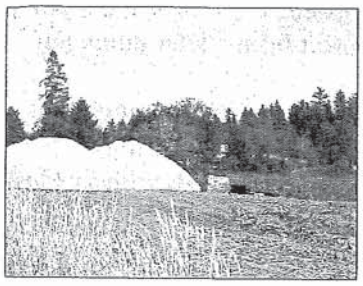
Guidelines

a) Applying woodwaste* as a soil conditioner at planting (e.g. for new plantings of blueberries or cranberries)

i) Berry Production Guide, BCMAFF, 2005-2006



- In blueberries, plants grown on mineral soil will benefit from the application of sawdust before planting.
- Woodwaste (shavings or sawdust) is used as a soil amendment to improve the tilth of raised planting beds on mineral soils. Build raised beds after the sawdust is incorporated.
- Good drainage can be promoted by incorporating a small amount of sawdust in the beds before planting.
- Before transplanting on mineral soils, apply a 5 to 10 cm layer of sawdust over the planting bed and incorporate into the top 15 to 20 cm.
- The optimum soil pH for blueberries is 4.5 to 5.2. Sawdust, incorporated into the soil when beds are formed, lowers the soil pH slightly and also increases the organic matter content.



ii) Crop Profile for Cranberries in British Columbia BCMAL, 2006

- Some growers, especially those who do not have ideal peat, may layer sand or sawdust over mineral soils in order to plant vines. This practice has been used very successfully to encourage vine establishment.
- In BC cranberries are grown primarily on peat soils. They are also grown on mineral soils with higher organic matter and in fields top dressed with sand or sawdust. They prefer an acidic pH of about 4.0 to 5.0 in the root zone.

iii) EFP Reference Guide, 2005

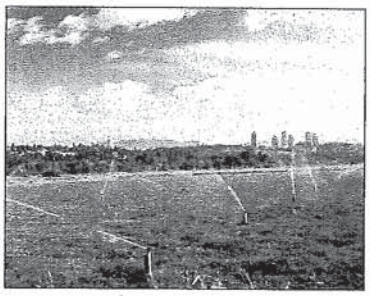
- Apply woodwaste as a soil conditioner only to mineral soils having a carbon-nitrogen ratio (C:N) of 30:1 or lower. Note: This C:N ratio does not apply to organic soils.

iv) Code of Agricultural Practice for Waste Management (under EMA)

- Part 7, Section 20: Wood waste may only be used for (a) plant mulch, soil conditioner, ground cover, on-farm access ways, livestock bedding and areas where livestock, poultry or farmed game are confined or exercised, b) berms for cranberry production, or c) fuel for wood fired boilers.

v) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- The storage and application of fertilizers, mulches and soil conditioners are designated farm uses and are specifically referred as 'permitted farm uses' under the Regulations. The placement of these types of 'fill' materials is exempted from the requirements for a non-farm use application to the Commission. The necessity for land applying these 'fill' materials requires that their placement is for an agronomic purpose and at an agronomically determined rate. These activities are permitted subject to not causing danger on or to adjacent lands or fouling, obstructing or impeding the flow of any waterway. These activities, which include land application of woodwaste as a mulch or soil conditioner, may be regulated but must not be prohibited by any local government bylaw except a bylaw under section 917 of the Local Government Act.



vi) BC Cranberry Growers' Association

- Up to one foot per acre of woodwaste may be used to develop a new field on mineral soils.
  Note: The use of soil amendments/composted organics is not part of a fill bylaw.

Typical Amounts Used

- For blueberries: 25 to 50 units per hectare, @ 5.7 cubic metres/unit.
- For cranberries: Up to 30 cm in depth, or 740 cubic metres/ha.

---

b) Applying an organic mulch (e.g. woodwaste*, coco fibre, etc.) to crops of blueberries, cranberries or strawberries

i) Berry Production Guide, 2005-2006

- Strawberries and blueberries are the two berry crops that most likely benefit from the use of mulches. In blueberries, woodwaste (shavings or sawdust) is used as mulch around established plants for improved weed, soil moisture, and temperature control.

- In strawberries, straw or wood chips can be used between crop rows to control weeds, reduce moisture loss by evaporation and protect from winter injury (BC Interior locations).
- In U-pick strawberry operations, wood chips or sawdust mulch can help in soil management and in keeping picker's feet clean.
- Other ways to promote good drainage include covering raised beds with sawdust mulch.
- Blueberries often grow more vigorously and produce better yields if they are mulched. Apply 5 to 10 cm of sawdust to the surface of the bed the first year and every 2 to 3 years to maintain the mulch. The roots tend to grow into the mulch so as it decomposes the plant roots may become exposed if the sawdust layer is not maintained.

ii) Code of Agricultural Practice for Waste Management (under EMA)

- Part 7, Section 20: as noted above in section (a) of this factsheet, indicates that woodwaste may be used as plant mulch.

iii) Waste Discharge Regulation

- Section 3(5) (a): The use of industrial wood residue as plant mulch is exempt from section 6(2) and 6(3) of the *Environmental Management Act* (i.e. the prohibition against introducing waste into the environment).

iv) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- The storage and application of fertilizers, mulches and soil conditioners are designated farm uses for the purposes of the Act. For an agronomic purpose, the use of these types of materials, including organic mulches, may be regulated but must not be prohibited by any local government bylaw except a bylaw under section 917 of the *Local Government Act*.

v) EFP Reference Guide, 2005

- Limit the total outdoor depth of woodwaste for all crop areas to 30 cm (suggested).

vi) BC Cranberry Growers' Association

- Woodwaste may be use to fill low areas in existing fields.

Typical Amounts Used

- For blueberries: 15 to 30 cm deep, 0.9 to 1.2 m wide, per row, (Note: typical row spacing is 3 metres).
- For cranberries: Up to 15 cm deep.

Additional Recommended Local Government Notice

- No notice required if re-applying mulch to existing plantings.

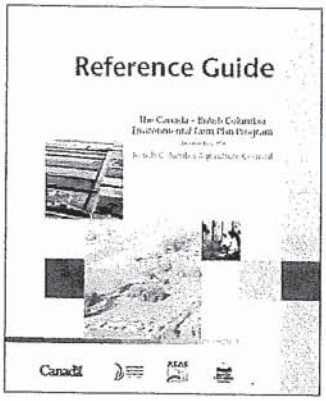
---

c) Applying woodwaste* as a ground cover

i) Code of Agricultural Practice for Waste Management (under EMA)

- Part 7, Section 20: as noted above in section (a) of this factsheet, indicates that woodwaste may be used as a ground cover.

ii) EFP Reference Guide, 2005



- Limit the total outdoor depth of woodwaste for all crop areas to 30 cm (suggested).

iii) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- Fertilizer, mulch and soil conditioner uses, that include storage and land application, and the placement of woodwaste as a ground cover on soil, are permitted farm uses for the purposes of the Act. For an agronomic purpose, the use of these materials may be regulated but must not be prohibited by any local government bylaw except a bylaw under section 917 of the *Local Government Act*.

Typical Amounts Used

- For landscaped areas around buildings, or weed suppression on berms, up to 15 cm per year.

Additional Recommended Local Government Notice

- No notice required if re-applying over existing ground cover.

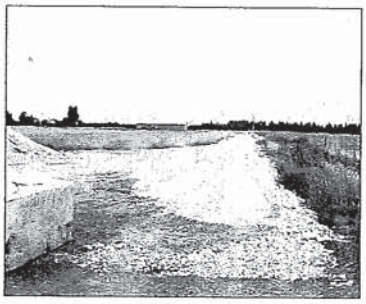
---

d) Using woodwaste*/soil for berms and on-farm access roads (e.g. on cranberry farms)**

i) Berry Production Guide, BCMAFF, 2005-2006

- The use of woodwaste as described by the "*Code of Agricultural Practice for Waste Management*" is allowed on on-farm access ways and for berms in cranberry production.

ii) Code of Agricultural Practice for Waste Management (under EMA)

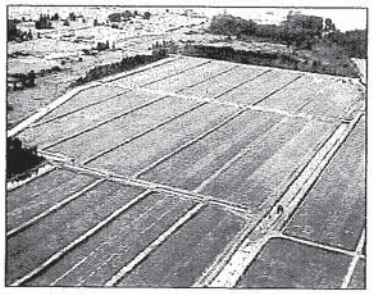


- Part 7, Section 20: as noted above in section (a) of this factsheet, indicates that woodwaste maybe used for on-farm access ways and berms for cranberry production.

iii) Code of Agricultural Practice for Waste Management (under EMA)

- Part 4, Section 8 (2): Solid agricultural waste may be stored on a field for more than 2 weeks if the agricultural waste is located at least 30 m from any watercourse or any source of water used for domestic purposes. Note: To ensure that field storage of manure is meeting setback requirements from watercourses, farmers may need to construct temporary access roads to manage manure storage sites.

iv) Crop Profile for Cranberries in British Columbia, BCMAL, 2006



- Fields are usually surrounded by roadways, which also act as dikes. The top of the dike should be wide enough to accommodate all equipment, including heavy trucks, and firm enough to support them at least 0.5 m higher than the maximum water level expected in the bed for harvest. Flood harvesting relies on the natural buoyancy of the fruit. The bed is flooded with 20 to 30 cm of water, depending on the evenness of the bed, vine growth, and method of harvest. Booms are used to trap the floating berries and direct them to a corner of the bed, where they are lifted into trucks by elevators.

v) BC Cranberry Growers' Association

- Cranberry fields are long term (greater than 50 year) investments. It takes 7 years after planting for a field to reach the financial break-even point. Cranberry field berms act as dykes and as roads, and are required for two types of farm traffic. Main roads must bear the weight of a fully loaded semi-trailer truck (e.g. 25,000 kg of cranberries for a total weight of 43,000 kg). Secondary roads/berms must be able to bear the weight of a pick-up truck. A typical berm will have a bottom width of 9 to 10.5 m narrowing to 3.5 to 5 m at the top. Some larger berms may be as wide as 7.5 m at the top. The berm profile typically consists of a layer of soil/woodwaste/structural fill at the bottom, topped with an optional geotextile fabric, followed by an 45 cm layer of coarse material (e.g. rock or broken concrete), and then topped with a 15 cm layer of fine material (e.g. crushed rock (e.g. "*3/4 inch minus*") or ground asphalt). Note: Sand is too pervious, and woodwaste breaks down over time. The minimum total height is 1 m, and there is no maximum height.
- The overall footprint of berms is decreasing as the quality of the roads is improved and older roads are removed.
- Similar material and construction is used for irrigation reservoirs.

(Harold) → soil contaminated w/ rock.

new use:
- crushed limestone = fert.
- hogfuel
- maybe - 3/4" minus

vi) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- Berming, as a land development work, is designated a farm use that includes the construction, maintenance and operation of a driveway necessary for that farm use. This is interpreted to include building on-farm access roads on the top of berms. The placement of fill necessary for this type of land development work is also considered to be a designated farm use. To be necessary requires that the amount of fill brought on to the land for building the berms and roads shall be commensurate with the scale, scope and needs of the farm operation, as well as the parcel area and soils on the property.

Typical Amounts Used

- There is no typical amount of material per hectare for cranberry berms/roads, as their construction is site-dependent.
- Fill placed 6 metres wide and up to 60 cm deep would be typically suitable for other types of farm roads. The length and location of the road would vary, depending on the site.

Additional Recommended Local Government Notice

- No notice is required if maintaining an existing road or berm and volume to be used is less than 200 m^3.

---

e) Using woodwaste*/soil** for livestock bedding/livestock pens/ exercise yards/riding arenas/turnout yards/ containment pens/feedlots

i) Code of Agricultural Practice for Waste Management (under EMA)

- Part 7, Section 20: as noted above in section (a) of this factsheet, indicates that woodwaste may be used for livestock bedding.

ii) Waste Discharge Regulation (under EMA)

- Section 3(5) (b) and (c): The use of industrial wood residue as foundation material for animal bedding, and in sports areas is exempt from section 6(2) and 6(3) of the Environmental Management Act.

iii) EFP Reference Guide, 2005

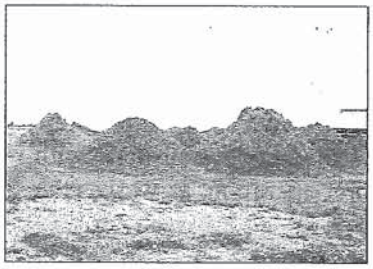
- Limit the total outdoor depth of woodwaste for all livestock areas to 30 cm (suggested).

iv) Horses in the Community....a Yea or a Neigh?
BCMAL Factsheet, 2005

- A common problem to horse holdings in the wetter areas of BC is excess water and mud. This often results in damp stalls, hoof disease, wet feed, wet bedding and poor drainage in pastures, turn out paddocks, and exercise areas.
- Planning and hard work are required to maintain an outdoor riding arena or track that has clean, safe footing, is fairly easily maintained, that holds up in all kinds of weather and does not cause pollution. Riding arenas located on high dry land have proven to be the most trouble free and maintainable. Earth moving equipment may be required to level the site and create diversion ditches.
- Leveling the site beforehand eliminates the practice of leveling with woodwaste as a landfill and creating a potential source of contaminated runoff. Woodwaste use must not exceed a total depth of 45 cm and the maximum application rate at any one time should not exceed 15 cm. The best time to top-up woodwaste is in April or May. Look at alternate footing materials to replace woodwaste where wet land is a problem. Sand, combinations of sand and woodwaste, ground up rubber from tires and a host of products are intended to improve the riding arena footing.

v) Building an Environmentally Sound Outdoor Riding Ring
BCMAL Factsheet, 2005

- The average size ring is approximately 21 m x 42 m. The minimum recommended size is 20 m x 36 m.
- The factsheet describes in detail the types of materials that may be used, including geotextile membrane, aggregate, sand, woodwaste, or organic materials.



- Select a convenient well-drained site. Remove all vegetation and topsoil. Crown the ring with a 2% slope from centre and form a swale around the outside. Compact the sub-base. Add a base of uniform dense graded aggregate; dampen and compact to 10 to 15 cm. Add a 5 to 7.5 mm cushion of sand, sawdust or a combination of sand and organic material.
- Note: Sawdust and shavings are also used in livestock barns (e.g. poultry, dairy) for bedding, and for trucks/trailers transporting livestock.

vi) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- Livestock operations and horse riding facilities (if the stables do not have more than 40 permanent stalls) are farm uses that include the construction, maintenance and operation of structures necessary for these uses. This is interpreted to include livestock pens/exercise yards/riding arenas and outdoor riding rings/turnout yards/containment pens/feedlots, etc.
- The placement of fill necessary for these farm uses is also considered to be a designated farm use. To be necessary it is required that the amount and type of fill used for the above structures shall be commensurate with the scale, scope and

needs of the livestock/equestrian facility, as well as the parcel area and soils on the property.

Typical Amounts Used

- 400 m^2 for three horses is a typical paddock area required, and a typical maximum depth is 30 cm.
- A typical riding ring size is described above.
- Amounts and fill materials used will be site dependent.

Additional Recommended Local Government Notice

- No notice required for bedding materials to be used in existing livestock barns, pens, yards or riding arenas.

---

f) Bringing in soil (and possibly woodwaste*) for the building of berms for horizontal light abatement for greenhouses, for aesthetics, or as an urban/rural buffer**

i) BCGGA and UFG Good Neighbour Guidelines for Lighting Greenhouses

- Greenhouses should have sidewall light abatement measures (for example curtains/screens, berms, trees etc.) for all walls that expose houses and streets to light emissions.
- Note: Greenhouses may be able to use soil previously excavated for buildings on the property.
- Note: Hedges may also be planted on top of berms, and mulched with woodwaste or spent growing media. Light abatement structures (i.e., berms plus plantings and/or fencing) would typically be at least 3 m high.

ii) BC Cranberry Growers' Association

- Berms may be built along the edge of property lines to contain sprinkler drift, spray drift, liquid fertilizer drift, to reduce visibility and protect equipment from theft. The profile would be similar to profile described in d) above. Hog fuel or gravel would be added on the top if the berm was also intended to be used as a road. Otherwise, cedar hedges may be planted on top.

iii) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- Berms, as a land development work, are a designated farm use that includes the construction, maintenance and operation of a structure necessary for that farm use. This is interpreted to include berms for building light abatement structures including the planting of hedges on top of the berms and fencing as a means of screening light from greenhouses. The placement of fill necessary for the farm use is also considered to be a designated farm use. To be necessary it is required that the amount and type of fill used for the berms shall be commensurate with the scale, scope and light abatement needs of the farm operation, as well as the parcel area and soils on the property.

Typical Amounts Used

- The amount of material varies as the footprint and size of the berms vary.

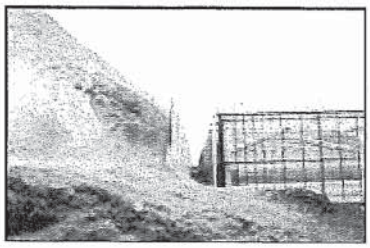
Additional Recommended Local Government Notice

- No notice is required if constructing a new berm or maintaining an existing berm and the volume to be used is less than 200 m^3.

g) Using woodwaste* as fuel for wood fired boilers

Note: This is not a fill practice; however it is included in this factsheet as the storage of woodwaste for use as fuel may be misconstrued as being used for fill.

i) Code of Agricultural Practice for Waste Management (under EMA)



- Part 7, Section 20: as noted above in section (a) of this factsheet, indicates that woodwaste may be used for fuel in wood fired boilers.

Typical Amounts Used

- Amounts vary, depending on the size of the storage facility and boiler requirements.

Additional Recommended Local Government Notice

- No notice required if a boiler is installed.

h) Using woodwaste*/ /gravel/sand for container nursery bed production or ball and burlap production

i) Nursery and Landscape Pest Management & Production Guide, BCMAFF, 2002

- Land suitable for nursery stock production should be devoid of low frost pockets.
- Conifers and broadleaf evergreens are dug, and balled and burlapped, which means that a quantity of soil is left around the roots and secured with burlap and twine. In order to conserve topsoil on the site, efforts should be made to replace soil removed in the root ball by the addition of amendments such as compost. On the Coast it is possible to overwinter some (bareroot) material in a (60 to 90 cm) deep bed of sawdust. Heeling in sawdust will prevent desiccation.
- Managing soil organic matter is integral to sound soil management and is a key to long-term productive field operations, particularly where significant quantities of topsoil are removed over time. As an example, straw and woodwaste can be beneficial to soil, however, when added directly to the soil, nitrogen can be 'tied-up'. In order to avoid this, urea or an ammonium salt should be added at the same time. Woodwaste should only be applied in the top 10 cm of soil.
- When used for a container bed, woodwaste should be less than 30 cm deep and should be placed back from any waterway including a drainage ditch.

ii) EFP Reference Guide, 2005

- For preparation of nursery beds, geotextile fabrics either alone or in combination with sand and gravel are recommended as alternatives to woodwaste.

iii) Nursery and Turf – Commodity Description, BCMAFF, January, 2003

- For container production, mulch is required to create a stable working and growing area. Nursery growers use a considerable amount of woodwaste for on-farm and access roads, soilless media and container beds.

iv) BC Landscape and Nursery Association

- For ball and burlap production, growers may create a temporary bed of woodwaste that may be 1.5 m deep. After selling the plants they will spread the material to add organic matter to the field. Nurseries may also store piles of sawdust mixes/soilless media.

Note: Because of disease issues, e.g. Sudden Oak Death Syndrome, the Canadian Food Inspection Agency may require the building of deeper nursery beds to prevent the formation of standing water.

v) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- As a potential soil amendment, and where applied when collected, stored and handled in compliance with Part 7, Storage and Use of Woodwaste in the *Code of Agricultural Practice for Waste Management*, the use of woodwaste for container bed production is a designated farm use. To be necessary it is required that the amount of woodwaste applied to the land shall be commensurate with the scale, scope and container nursery bed needs of the farm operation, as well as the parcel area and soils on the property.

Note: In the ALR, the placement of soil** fill materials, for container nursery bed production requires an application to the ALC.

Typical Amounts Used

- Amounts and materials used will be site dependent.

Additional Recommended Local Government Notice

- No notice required if maintaining an existing nursery bed.

---

i) Applying sand or sawdust to cranberries

i) "Cranberries," April-May 2005

- A process called "sanding" may take place. Sanding applies a fresh layer of sand into the fields where the cranberry vines are located. The sand will then sink to the bottom of the vines – to provide a new rooting zone along the cranberry stems, as well as aid in disease control by burying old plant residues. It covers up the old woody growth of the cranberry vines and forces the plant to produce what is referred to as "upright" – the young stems with the fruit buds. This makes for a much healthier plant.

ii) Crop Profile for Cranberries in Washington, 2000

- Beds have been drained, cleared, leveled and covered with a one to two inch layer of sand before the field is planted to select vines. A thin layer of sand spread over the bed stimulates new root and vine growth, improves aeration and drainage of surface water, and levels out low spots to make dry harvesting easier.

iii) Crop Profile for Cranberries in British Columbia, BCMAL, 2006

- Some growers, especially those who do not have ideal peat, may layer sand or sawdust over mineral soils in order to plant vines. This practice has been used very successfully to encourage vine establishment.

- Sanding cranberry vines is a method of stimulating the production of new uprights and roots, and is a cultural method of pest control.

- In BC cranberries are grown primarily on peat soils. They are also grown on upland mineral soils with higher organic matter and in fields of sand or sawdust. They prefer an acidic pH of about 4.0 to 5.0 in the root zone.

Typical Amounts Used

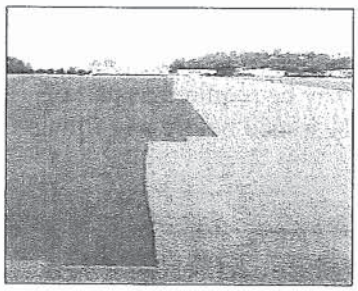
- The initial application is 15 to 20 cm deep (when planting). Topdressing every few years would be 2.5 to 5 cm deep. Filling of holes in established fields would be 15 to 20 cm deep.

Additional Recommended Local Government Notice

- No notice required for existing fields.

---

j) Soil** or woodwaste* amendments for turfgrass production



i) Nursery and Turf – Commodity Description, BCMAFF January 2003

- Mineral and/or organic material, such as sand, sawdust, compost or manure, is sometimes placed on the field to replace the soil that was removed in previous harvests.
- Note: The use of soil amendments/composted organics is not part of a fill bylaw.

ii) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- Turf farms are a specified farm use for which a notification to the commission is required for the placement of fill.

Typical Amounts Used

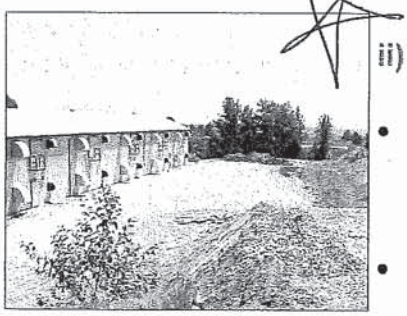
- 2.5 to 4 cm per crop; 1 crop harvested every 15 months.

Additional Recommended Local Government Notice

- No notice for existing turf fields using up to 4 cm of material per crop.

---

k) Farm buildings that take up less than 2% of the parcel



i) ALR Regulation Use, Subdivision and Procedure Regulation (under ALC Act)

- The construction, maintenance and operation of farm buildings, including, but not limited to any of the following: (i) a greenhouse; (ii) a farm building or structure for use in an intensive livestock operation or for mushroom production; (iii) an aquaculture facility, are designated farm uses for the purposes of the Act. They may be regulated but must not be prohibited by any local government bylaw except a bylaw under section 917 of the Local Government Act.
- For 'specified' farm uses, that includes the construction of greenhouses and farm buildings for an intensive livestock operation or for mushroom production, and where the fill 'footprint' exceeds 2 % of the property area, a notification process is additionally set out in the Regulations.

ii) ALC Policy: Placement of Fill or Removal of Soil: Construction of Farm Buildings

- The ALC, by policy, further sets limits for the placement of fill for particular farm uses (e.g. for construction of a single family residence the area is limited to 0.2 ha; for the construction of farm buildings the area is limited to 2 % of the parcel area).
- Where it has been determined through the building approval process that placement of fill or removal of soil is necessary for the construction of a farm building, of which the building area is less than 2% of the parcel, the acceptable volume of fill or soil removal is that needed to undertake the construction of the building.

- The over-riding principle is that the volume is reasonable and the quality of material is not deleterious to the agricultural quality of the land or the environment and all activity must be done in accordance with good agricultural practice.

iii) ALC Policy: Placement of Fill or Removal of Soils: Construction of a Single Family Residence

- The ALC allows fill for a single family residence building of up to 0.2 ha, subject to the local government approval process, typically through a building permit.

Typical Amounts Used

- The amount of materials used will vary.

Recommended Local Government Notice

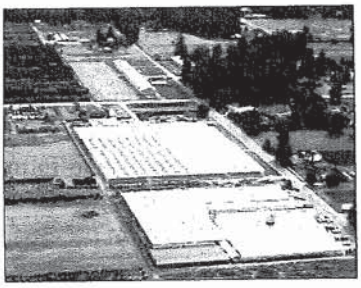
- Building construction is typically regulated by municipal bylaws, and formal applications must be made to the local government. Requirements vary by municipality. Geotechnical reports and/or fill plans may be required as part of this process. In many cases, a building permit must be issued before any filling can proceed.

---

l) Farm buildings that take up more than 2% of the parcel

i) ALR Regulation Use, Subdivision and Procedure Regulation (under ALC Act)

- Buildings for 'specified farm-uses'(e.g. greenhouses, farm buildings or structures for an intensive livestock operation or mushroom production) greater than 2% of the parcel area, the owner must submit a Notice of Intent to the ALC and applicable local government of their intention to remove soil or place fill at least 60 days beforehand. The ALC's CEO may request additional information within 30 days or receipt of the notice, and may order restrictions or set the terms and conditions for the conduct of that use.



Typical Amounts Used

- The amounts of materials used will vary.

Recommended Local Government Notice

- Some local governments may require the approval of a building permit application before any filling can take place
- Building construction is typically regulated by municipal bylaws, and formal applications must be made to the local government. Requirements vary by municipality. Geotechnical reports and/or fill plans may be required as part of this process. In many cases, a building permit must be issued before any filling can proceed.
- Applicants should include copies of the completed ALC "notice of intent" with their building permit application.

---

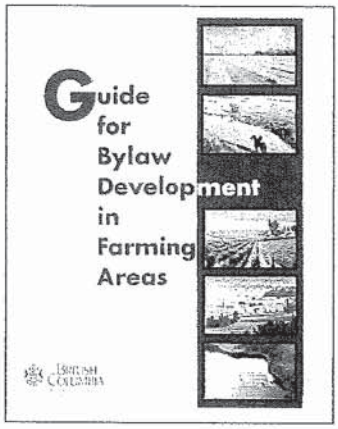
m) Fill for parking, loading and turnaround areas

i) ALR Use, Subdivision and Procedure Regulation (under ALC Act)

- Any activity designated as farm use for the purposes of the Act, including the construction, maintenance and operation of a building, structure, driveway, ancillary service or utility necessary for that farm use, may be regulated but must not be prohibited by any local government bylaw except a bylaw under section 917 of the *Local Government Act*. To be necessary, the amount and type of fill used for the above, which includes loading and turnaround areas and parking, shall be commensurate with the scale, scope and needs of the farm operation, as well as the parcel area and soils on the property.

- An application to the ALC is required where the proposed fill area on an individual parcel, for the above uses, exceeds 2% of the property area.

ii) Guide for Bylaw Development in Farming Areas, BCMAFF, 1998



- Off-street parking spaces should be required for all commodities that undertake direct farm marketing. Produce stands/Nurseries: 1 parking space per 20 m^2 of direct farm marketing area; Greenhouses: 1 parking space per 15 m^2 of direct farm marketing area.

iii) BC Cranberry Growers' Association

- Areas for periodic staging and loading of large trucks, including semi-trailers, are required. Also required are areas to temporarily store/compost vine cuttings/trimmings. Parking is commonly required for workers during the harvest season.

iv) BC Greenhouse Growers' Association

- In order to accommodate staff/worker parking an area equivalent to about 400 m^2 per hectare greenhouse area under production may be required. Up to an additional 10% may be required for loading and turn around areas.

Typical Amounts Used

- Areas required will vary, depending on the commodity. For cranberries and greenhouses see the estimates listed above.
- Parking and loading areas should be appropriately sized and located so as to minimize removal of land from production.
- Local governments should be consulted prior to constructing such areas as some local government bylaws contain site coverage restrictions.

---

n) Using woodwaste* and sand for cranberry field drainage trenches

i) Crop Profile for Cranberries in British Columbia BCMAL, 2006

- Reservoirs and ditches are constructed to contain and move water for frost protection, irrigation and harvest, and to store water recovered from these operations. Some new fields are being constructed with perimeter drains which eliminate the need for a ditch around the fields inside the dike and allows for a greater usable crop area.

ii) BC Cranberry Growers' Association

- Drains are installed by digging a 60 cm deep trench (10 to 15 cm wide), placing a 75 to 100 mm perforated plastic drainage pipe, then filling with approximately 50 cm of woodwaste (usually aged cedar chips, not hog fuel), adding a geotextile cloth, and then topped with up to 15 cm of sand. The trenches would be placed approximately every 3 to 3.5 m throughout the field, in both new and existing fields.

Typical Amounts Used

- As described above.

Additional Recommended Local Government Notice

- No notice for existing fields.

Example:

NOTICE OF PROPOSED "FILL" ACTIVITY

Local Government: _____
Bylaw Number: _____
Fax form to: _____

Note: The information required by this form is collected under the Local Government Bylaw. This information may be available for review by any member of the public. If you have any questions about the collection or use of this information, please contact the Local Government.

Owner: _____	Agent: _____
Address: _____	Address: _____
_____	_____
_____	_____
Telephone: _____	Telephone: _____
Cell: _____	Cell: _____
Fax: _____	Fax: _____
E-mail: _____	E-mail: _____

Civic Address of Property: _____
Legal Description: _____
Size of Property / Parcel: _____ (hectares or dimensions)

Zoning of Property:	○ Agricultural	○ Residential	○ Commercial	○ Industrial
	○ Other – specify:			
Current Use:				
Proposed Land Use: (if different than current use)				

Adjacent Uses: North _____ East _____
South _____ West _____

Type of Fill Material	○ Topsoil	○ Excavation soil	○ Sand	○ Gravel
	○ Ditch-cleanings	○ Woodwaste	○ Soil Conditioner	○ Mulch
	○ Other – specify:			
Source of Fill materials:				
Volume: _____ cubic metres		Depth: _____ metres		
Total Project Area: _____ hectare or dimensions				
Duration of the Project: _____ weeks / months				

Purpose of Project: (refer to Factsheet "Guidelines for Farm Practices Involving Fill" BC Ministry of Agriculture and Lands as appropriate) _____
_____
Proposed Reclamation Measures: (if applicable) _____
_____

Has either a Professional Agrologist and/or a Professional Engineer reviewed the project and provided a written report? □ Yes □ No (If Yes, please attach a copy of the report.)

Declaration and Consent: I/we declare that the information is to the best of my/our knowledge, true and correct. I/we consent to the use of the information provided in this notice and all supporting documents. Furthermore, I/we understand that the Local Government may take the necessary steps to confirm the accuracy of the information and documents provided.

_____	_____	_____
Date	*Signature of Owner or Agent*	*Print Name*

METRIC CONVERSIONS

Metric	Imperial Equivalent	Metric	Imperial Equivalent
2.5 cm	1 inch	10.5 m	35 feet
4 cm	1.5 inches	20 m	65 feet
5 cm	2 inches	21 m	70 feet
7.5 cm (75 mm)	3 inches	36 m	120 feet
10 cm (100 mm)	4 inches	42 m	140 feet
15 cm	6 inches	15 square metres	160 square feet
20 cm	8 inches	20 square metres	215 square feet
30 cm	12 inches (1 foot)	400 square metres	4300 square feet
45 cm	18 inches	0.2 ha	0.5 acre
50 cm	20 inches	1 ha	2.47 acre
60 cm	24 inches (2 feet)	16.2 ha	40 acre
90 cm (0.9 m)	3 feet	40 ha	100 acre
1.2 m	4 feet	5.7 cubic metres	200 cubic feet (1 volumetric sawdust unit)
1.5 m	5 feet		
3.5 m	12 feet	1,230 cubic metres	1 foot depth over 1 acre
4.5 m	15 feet	18,300 cubic metres	23,900 cubic yards
5 m	16 feet	25 volumetric sawdust units per hectare	10 volumetric sawdust units per acre
6 m	20 feet	400 square meters per ha	1800 square feet per acre
7.5 m	25 feet	25,000 kg	55,000 pounds
9 m	30 feet	43,000 kg	95,000 pounds

Conversions in this table are rounded to a convenient number.

LIST OF ACRONYMS

ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
BCGGA	BC Greenhouse Growers' Association
BCMAFF	BC Ministry of Agriculture, Food and Fisheries
BCMAL	BC Ministry of Agriculture and Lands
EFP	Environmental Farm Plan
EMA	Environmental Management Act
UFG	United Flower Growers Co-Op Association

RESOURCE MANAGEMENT BRANCH
Ministry of Agriculture and Lands
1767 Angus Campbell Road
Abbotsford, BC Canada V3G 2M3
Phone: (604) 556-3100 Toll Free: 1-888-221-7141
December 18, 2006

WRITTEN BY
Geoff Hughes-Games, PAg
Provincial Soil Specialist
Kathleen Zimmerman, PAg
Regional Agrologist

Update for City Council

Re: contaminents, toxins

[redacted] - UBC student helping us with policy research, getting other students involved
[redacted] - friend, publishing a book on bioremediation
[redacted] - friend helping us with soil sampling

★ need local enforcement of "deliterious" fill

From [redacted]

contaminants maybe leaching

On soil/water contamination - I did a quick survey of literature on the issues and I think we can safely say that there are contaminants in the waste material and there is *potential* of contaminants leaching from the waste into the soil and potentially into the groundwater and beyond. What type of contaminants depends on the materials and what the materials were previously used for which we don't know so can't make conclusive statements regarding contaminants. Concrete on its own is not so dangerous as it is primarily aggregates and limestone/calcium carbonate (could maybe raise pH, but I am not confident this would be an issue), asphalt on the other hand definitely is problematic as it contains organic compounds that are consdiered toxic and monitored in environmental monitoring. Asphalt usually contains bitumen, which is a form of petroleum and which contains (PAH) Polycyclic aromatic hydrocarbons - organic (carbon based) pollutants that can be dangerous to humans (in soil or drinking water). Various heavy metals can also be leached from these waste materials such as zinc. The scraps of unknown material is a concern cause we don't even know what it is or where from. The other thing is that aside from material depending on what it was used for it may have contaminants form the urban environment on it - example if it is road waste it could have pollutants that accumulate from cars.

asphalt

heavy metals

In terms of enviro effect it is difficult to say anything conclusively because there are many variables from the type of contaminants, levels, mobility in the enviro and and each one's level of toxicity. For instance PAHs must pass a certain threshold in the enviro before they are considered a contaminant (according to regulation). Maybe Lis has more insight on this??

future irreversible

Art made what I think is the most convincing points - that putting contamination issues aside - we can state for sure that this land will no longer be able to produce food. If tree farm fails in a few years the productivity of the land and potential for reverting to food production has been destroyed. It would be an astronomical cost to reclaim the land - removal of all that material, cost of properly disposing, rebuilding topsoil fertility, and then you would want to test to ensure there are no contaminants that would impact food.

costs

One idea is contacting somewhere like Cottonwood to inquire about costs/challenges of establsihing food production on land that may be contaminated form urban environment. (I will do this)

Another idea (Art's) is to contact the agrologist who signed off for the company's application (Bruce McTavish) and get him out to the site to see what is happening and respond to communities concerns - hold him accountable. Art also pointed out that the guy the ALC has monitoring (Thomas Loo) is not an agrologist or environmental scientist.

QP's (Bruce McTavish) report misrepresents the ~~current~~ (recent) use & fertility of the land. Need local control.

Asphalt is a constituent of petroleum with most crude petroleum containing some asphalt. It is comprised mainly of polycyclic aromatic hydrocarbons (PAH's). Asphalts are highly complex and can contain up to 150 carbon atoms, as well as sulfur, and several heavy metals, like nickel, lead, chromium, mercury, arsenic, and more. Asphalt is a solid or semisolid substance and is mixed with solvents to make it easier to work with. These solvents are volatile organic compounds like naphtha, toluene, and xylene. PCB's have also been added to asphalt in the past, to add fire resistance, flexibility and inhibit corrosion. Im not sure if this is still done, as PCB's are banned in North America (though not around the world), so it may be more of a problem in old asphalt than in new stuff.

For some info on the impacts of PAH's and VOC's, see below. Hope this helps for now!
;)
Leila

Volatile Organic Compounds (VOCs)
At elevated concentrations, VOCs affect the cardiovascular, neurological and nervous systems, and many are known carcinogens. The following VOCs, present in oil spills and other industrial processes, can pose a particular health risk to humans and the surrounding environment.
{SH3}Benzene{SH3}
Benzene is a natural part of crude oil and gasoline, and is also used to make some types of rubbers, lubricants, plastics, dyes, detergents, drugs and pesticides. Industries that involve the use of benzene include the rubber industry, oil refineries, petroleum pipelines, coke and chemical plants, shoe manufacturers and gasoline-related industries and associated infrastructure. In most accidents and spills involving petroleum, benzene is definitely a concern. Natural sources of benzene include volcanoes and forest fires.
Benzene is a known carcinogen and can cause a rare form of kidney cancer and leukemia as well as other blood cancers. Short-term inhalation of high levels of benzene can be fatal, and low levels can cause drowsiness, dizziness, headaches, tremors, rapid heart rate, confusion or mental fog and unconsciousness. Eating foods or drinking water contaminated with high levels of benzene can cause vomiting, stomach irritation, dizziness, sleepiness, convulsions and death. Benzene damages the bone marrow and can lead to a decrease in red blood cells and anemia. It can also cause excessive bleeding and depress the immune system, resulting in a higher incidence of infections. It can impact the reproductive systems of men and women and cause birth defects such as spina bifida and anencephaly. When animals have been exposed to benzenes in studies, results have shown low birth weights, delayed bone formation and bone marrow damage.
{SH3}Ethyl Benzene{SH3}
Ethyl benzene is found in coal tar and petroleum. It is used primarily to make the chemical styrene. It is used as a solvent, a constituent of asphalt and naphtha and is a constituent of synthetic rubber, fuels, paints, inks, carpet glues, varnishes, tobacco products and insecticides. It is a component of automotive and aviation fuels.
Acute exposure to ethyl benzene can cause eye, throat, nose, upper respiratory tract, and mucous membrane irritation; chest constriction; redness and blistering of the skin. Neurological effects include dizziness, fatigue and lack of coordination. Animal studies have shown impacts to the

central nervous system, pulmonary system and effects on the liver, kidney and eyes. Chronic exposure to ethyl benzene can cause fatigue, headache, and eye and upper respiratory tract irritation, as well as drying, dermatitis and defatting of the skin.

{SH3}Toluene{SH3}

Toluene occurs naturally in crude oil. It is also produced in the process of making coke from coal and gasoline and other fuels (such as jet fuel) from crude oil. Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives and rubber and in some printing and leather tanning processes. Low to moderate exposure to toluene can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite and loss of hearing and color vision. Toluene is also know to impact the cardiovascular system and the neurological/nervous system. Higher exposure levels can cause unconsciousness and death.

{SH3}Xylene{SH3}

Xylene occurs naturally in petroleum and coal tar; it can catch on fire easily. It is found in small amounts in airplane fuel and gasoline. It is used in paints, paint thinners and varnishes. It is used also as a solvent and cleaning agent, and in the printing, rubber and leather industries.

Xylene exposure can damage the central nervous system, liver and other body systems. Signs and symptoms of acute exposure to xylene include headache, fatigue, irritability, lassitude, nausea, anorexia, flatulence, irritation of the eyes, nose and throat, issues with motor coordination and balance, flushing, redness of the face, a sensation of increased body heat, increased salivation, tremors, dizziness, confusion and cardiac irritability. Chronic exposure can cause central nervous system depression; conjunctivitis; dryness of nose, throat and skin; dermatitis; anemia; mucosal hemorrhage; bone marrow hyperplasia and kidney and liver damage.

{SH3}Trichloroethylene (TCE){SH3}

TCE is used primarily as a degreasing agent for metal and electronic parts; as an extractant for oils, waxes and fats; a solvent for cellulose esters and ethers; a dry-cleaning fluid (although it has largely been replaced since the 1950s by tetrachloroethylene); refrigerant and heat exchange fluid; fumigant; carrier agent in paints and adhesives; a scourant for textiles and as a feedstock for manufacturing organic chemicals. When first widely produced in the 1920s, its major use was to extract vegetable oils from plant materials such as soy, coconut and palm, as well as in coffee decaffeination. It has also been used in the medical field as an anesthetic. TCE can enter groundwater and surface water from industrial discharges or from improper disposal of industrial wastes at landfills. It can also be found in typewriter correction fluid, paint, spot removers, carpet-cleaning fluids, metal cleaners and varnishes.

When inhaled, TCE can cause central nervous system depression, liver and kidney damage. The symptoms of acute exposure can look similar to alcohol intoxication, beginning with a headache, dizziness and confusion and progressing with increasing exposure to unconsciousness. Respiratory and circulatory depression can eventually lead to death. TCE is believed to cause cancer (liver and kidney), leukemia, non-Hodgkin lymphoma as well as congenital heart defects. There are many other VOCs (Tetrachloroethane, 1,2,4-Trichlorobenzene, Vinyl chloride) to be concerned about - those named above are just a few common ones.

Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons are a group of over 100 different semi-volatile organic compounds that are formed during the incomplete burning of coal, oil and gas, garbage or other organic substances like tobacco or charbroiled meat. PAHs are found in coal tar, crude oil, creosote and roofing tar, but a few are used in medicines or to make dyes, plastics and pesticides.

When coal is converted to natural gas, PAHs can be released, which is why some former coal-gasification sites may have elevated levels of PAHs. They are also found in incinerators, coke ovens and asphalt processing and use. They are also a major concern when it comes to human and environmental health impacts at oil spills, as they are present in crude oil. Although hundreds of PAHs exist, two of the more common ones are benzo(a)pyrene and naphthalene. Polycyclic aromatic hydrocarbons can cause red blood cell damage that can lead to anemia; they can also suppress the immune system. Possible long-term health effects from exposure may include cataracts, kidney and liver damage and jaundice. Some polycyclic aromatic hydrocarbons are cancer-causing. Also, high prenatal exposure to PAHs is associated with lower IQ and childhood asthma, as well as low birth weight, premature delivery and heart malformations in babies.