

YAMHILL COUNTY DEPARTMENT OF PLANNING AND DEVELOPMENT  
STAFF REPORT

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**DOCKET NO.:** SDR-16-14/FP-03-14

**REQUEST:** The site design review application is to review the development of the 37 acres proposed for the Riverbend Landfill expansion and ancillary facilities. The expansion of the landfill is permitted within the existing zone under Subsection 402.02(V) of the Yamhill County Zoning Ordinance. The request includes a floodplain development permit to allow for the placement of an earthen berm, a portion of which is in the floodplain.

**APPLICANT:** Riverbend Landfill Company, Inc.

**TAX LOT:** 5501-101, -200, -400 and -401

**LOCATION:** 13469 SW Highway 18, McMinnville, Oregon  
13475 SW Highway 18, McMinnville, Oregon  
13965 SW Highway 18, McMinnville, Oregon  
14325 SW Highway 18, McMinnville, Oregon

**ZONE:** EF-80 Exclusive Farm Use District

**CRITERIA:** Sections 402.02(V), 901, and 1101 of the Yamhill County Zoning Ordinance (YCZO)  
The floodplain development permit is subject to Section 901 of the YCZO  
The site design review is subject to Section 1101 of the YCZO  
Oregon Revised Statue 215.296(1)(a) and (b)

**REFERRALS:** *Public Works:* No comments received.\*  
*McMinnville Rural Fire Department:* No comments received.  
*McMinnville Planning Department:* We have reviewed the file and found no conflicts with our interests.<sup>1</sup>  
*SWCD:* No comments received.  
*Watermaster:* No comments received.  
*Department of Land Conservation and Development:* No comments received.  
*Oregon Department of Transportation:* No comments received.  
*Department of Environmental Quality:* No comments received.  
*Oregon Department of Fish & Wildlife:* No comments received.  
*Department of State Lands:* No comments received.

\*It should be noted that the public agency referrals contain the following statement: "If a comment is not received by the deadline indicated, the decision-making authority will assume

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<sup>1</sup> While the McMinnville Planning Department did not have any conflicts with the use, the City of McMinnville has previously commented on Riverbend Landfill. In Exhibit 4 please see the September 10, 2014 letter from City Manager Kent Taylor to Metro and the January 27, 2014 letter from Mayor Rick Olson to the Board of Commissioners.

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that there is no conflict between the request and the interests of your agency or organization, and make its decision accordingly.”

**PUBLIC COMMENTS:** The public comments submitted at the time of the staff report can be found in Exhibit 4 and a summary of these comments can be found in Finding B.8.

**EXHIBITS:**

1. Application
2. Public notice
3. Letter of Map Revision (LOMR)
4. Comments received

**FINDINGS:**

**A. Background Facts**

1. *Tax lot sizes:* The Yamhill County Assessor’s office records show Tax Lot 5501-101 is 25.7 acres. Tax Lot 5501-200 is shown on the Assessor’s records as 220.4 acres in size. Tax Lot 5501-400 is listed as 57.5 acres and Tax Lot 5501-401 is 36 acres.
2. *Access:* Oregon State Highway 18.
3. *On-site Land Use and Zoning:* All of the parcels are zoned EF-80 Exclusive Farm Use District. The combination of Tax Lots 5501-101 and -200 contains Riverbend Landfill. Attachments A-1 and A-2 show the layout of the facilities and existing buildings. Drawing A-2 shows the main entrance, the public recycling area, existing office building and the Landfill Gas to Energy Facility (LFGTE). Tax Lot 5501-400 has been used to grow poplar trees. Tax lot -401 contains the Mulky RV park.
4. *Surrounding Land Use and Zoning:* The majority of the surrounding area is zoned EF-80 Exclusive Farm Use District. There is an area to the south that contains the closed Whiteson Landfill which is zoned PRO Parks Recreation and Open Space and PWS Public Works Safety. To the north of the site is the Yamhill County Museum, which is an agricultural museum, located in the farm zone. The rest of the surrounding area predominantly contains agricultural uses and some rural residences. Attachment B of the application contains an extensive write-up of the neighboring farm uses. The surrounding farm uses includes grass, grain, hay, orchards, vineyards, and vegetable crops.
5. *Water:* Provided by a well.
6. *Sewage Disposal:* Provided by an on-site septic system.
7. *Fire Protection:* McMinnville Rural Fire Department.

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8. *Previous Land Use Approvals:* On Tax Lot 5501-101 applications have been made and approved for a gas control system (SDR-07-93), an office building and recycling center (SDR-14-00), and a public drop facility (PAZ-03-02/SDR-06-02). The rezoning was limited to five acres and also limited the use of the five acres to only accessory activities to support a sanitary landfill. On Tax Lot -200, the original landfill approvals were granted in 1980 through Docket files PA-79-80/Z-180-80 and CFP-16-80. In April of 2009 a site design review, Docket SDR-04-09, approved the Landfill Gas to Energy Facility (LFGTE). The following year that project was constructed and it is currently producing electricity. In 2012, a site design review (SDR-03-12) approved a major redesign of the entrance, public drop facilities and recycling center. In 2014, approval was granted (PAZ-02-13) to rezone the Riverbend Landfill property to EF-80 Exclusive Farm Use District.
9. *Floodplain:* FIRM 41071C 395D and 41071C415D, show that portions of the property are within the 100-year flood hazard area. Both of these maps have been modified through a Letter of Map Revision (LOMR) which was effective May 9, 2013. (See attached Exhibit 3).
10. *Fish and Wildlife:* The property is not within the Big Game Winter Range. The South Yamhill River, located to the south of the landfill, is identified as fish habitat. The river is shown on the 1979 Natural Resource Conservation Plan as resident trout spawning and rearing area and warm water game fish spawning and rearing as well as anadromous fish migration route. The stream to the north of Tax Lot 5501-101 is not identified as fish habitat.
11. *Soils:* The site of the proposed redevelopment predominantly contains Amity and Woodburn soils which are Agricultural Class II soils, classified as high-value farmland.

**Staff Report Format**

The application is very extensive and staff does not wish to simply repeat what is in the report. Therefore, in order to limit redundancy, where there is agreement it will simply be noted where in the record to find the applicant's response to the subject criteria. However, when there are issues that warrant additional discussion. These will also be noted.

**Deeming the Application Complete**

There seems to be some misunderstanding on deeming an application as complete. There have been comments made that the subject application was not complete. Deeming an application as complete is not the same as it being approved. Deeming an application as complete is only a cursory analysis of whether the applicant has submitted information to address the criteria. It does not mean that staff agrees with how the criteria has been addressed, or that more information won't be requested; only that it has been addressed. For example, 1101.02(c) requires consideration of traffic safety. In response to that criterion the applicant submitted a Traffic Impact Safety Analysis from August 2007. Have they addressed the criterion? Yes. Does the planning staff believe that this traffic study should be updated? Yes. While we do not expect the conclusions to

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be different, we do want the traffic study to be updated. Deeming an application complete does not mean that all the analysis has been done and that it has been approved.

### **How we got here:**

In 2008, Riverbend Landfill made an application for a plan amendment, zone change and exception to rezone farmland to the PWS Public Works Safety exceptions zone to expand the landfill. Ultimately the Court of Appeals ruled that an exception to Goal 3 Agriculture could not be taken since landfills were allowed in the farm zone. The court concluded that Yamhill County needed to modify its zoning ordinance if it wanted to allow landfills. In 2011, Subsection 402.02(V) was added by the Board of Commissioners to the permitted use section of the Exclusive Farm Use District which permitted expansion of landfills onto high-value farmland provided the landfill was wholly within the farm zone. This ordinance language was challenged in the courts and upheld by the Land Use Board of Appeals (LUBA) and Court of Appeals. In 2013, Riverbend Landfill made an application to rezone the existing landfill and neighboring expansion area to EF-80 Exclusive Farm Use District in order to make the landfill wholly within the farm zone. This application was approved in 2014 and was appealed to the LUBA. The LUBA appeal was eventually dismissed. As part of the zone change, the Board of Commissioners placed some conditions on any future expansion. One of the conditions was for a community meeting to solicit comments from interested parties on the Site Design Review application. This community meeting was held on November 11, 2014 and the comments generated as a result of that meeting will be discussed below in Finding B.8.

### **B. Site Design Review Provisions and Analysis**

1. Section 1101 for Site Design Review requires consideration of the following factors in the review of site development plans:

- (1) *Characteristics of adjoining and surrounding uses;*
- (2) *Economic factors related to the proposed use;*
- (3) *Traffic safety, internal circulation and parking;*
- (4) *Provision for adequate noise and/or visual buffering from incompatible uses;*
- (5) *Retention of existing natural features on site; and*
- (6) *Problems that may arise due to development within potential hazard areas.*
- (7) *Comments and/or recommendations of adjacent and vicinity property owners whose interests may be affected by the proposed use.*

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2. Regarding criterion 1101.02(A.1) above, the adjoining and surrounding uses on adjoining property are predominantly farm use. The landfill opened in 1982, has operated continuously since that time, and the impacts are established on-site. The applicant's findings related to this criterion on page 6-8 of the application are incorporated here by reference.
3. Regarding criterion 1101.02(A.2) above, the applicant responded to this criterion on page 9 of their Site Design Review Application. The findings point to the fact that the Board of Commissioners has previously adopted findings as part of the zone change where they conclude that there is a need for the continued operation of a local disposal option. The applicant's findings on page 9 and 10 are incorporated here by reference. There have been no economic factors that have been identified that prevent the use of the parcel for the proposed use.
4. Criterion 1101.02(A.3) above deals, in part, with traffic safety. In response to that portion of the criterion the applicant submitted a Traffic Impact Safety Analysis from August 2007, prepared by Ron Loewen, P.E. of Jones and Stokes. This traffic analysis was prepared and submitted in conjunction with a much larger proposed expansion of the landfill and it concluded that no traffic improvements would be necessary. However, it has been over seven years since this study was completed and the data and conclusions from the study may have changed. The Planning Department wants to be sure of traffic safety so an updated traffic study will be recommended as part of any approval.

Related to internal circulation and parking, as noted in the response on Page 11 of the application, "RLC's development proposal does not result in increased use of the site. Rather, the expansion will allow the current level of use to continue." As stated in the above Finding A.8, in 2012, a site design review (SDR-03-12) approved a major redesign of the entrance and public drop facilities. One aspect of this redesign was to separate the public traffic from the heavier commercial truck traffic. The existing design appears to provide a safe and efficient internal traffic and circulation pattern and adequate parking for the use.

5. Criterion 1101.02(A.4), requires adequate noise and/or visual buffering from noncompatible uses. One of the concerns that the Planning Department has is screening of the use from the neighboring State Highway 18. Screening of the use has always been a concern, and that concern has grown with the facility. Figure A.5 shows 35' in width of vegetation; including the poplar trees along the State Highway, will be maintained. In addition Figure A.5 also shows a 90' wide vegetated berm. While there is significant screening both existing and proposed along the State Highway for Module 11, it appears that the same is not true for Module 10. Figure 4 in the application shows the wooded area along the top of the bank, the northerly portion of Tax Lot -101, will be removed. While Module 10 would eventually be covered and planted, there appears to be little screening of this module in the interim when the solid waste would be deposited on-site. Module 10 is closest to the City of McMinnville and is in direct sight of the State Highway and the Yamhill County Museum.

In addition to visual buffering, the Site Design Review requires consideration of noise from the site. DEQ has rules in place addressing noise related to the operation of solid waste disposal facilities.

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The application states that Riverbend Landfill has, in the past, been in compliance with these DEQ standards. They also point to modification of their hours of operation to reduce noise conflicts within the local area. While these are both true, it is not the same as evidence. Our office is concerned with off-site noise impacts of both proposed Modules. An acoustical expert should be consulted to provide evidence that off-site noise impacts from the expansion areas are compatible with DEQ standards. This should be made a condition of approval.

6. Regarding criterion 1101.02(A.5) above, in response to this criterion, the application states at the top of page 14 of the application, "The site has several existing natural features, including heavily wooded areas, riparian vegetation, and scattered large trees (see Figure 1). RLC's application not only retains many of these existing natural features on-site, it enhances some of those features." As noted above, one of the concerns that the Planning Department has is screening of the use from the neighboring State Highway 18. While Module 10 would eventually be covered and planted, there appears to be little screening of this module in the interim. Module 10 is closest to the City of McMinnville and is in direct sight of the State Highway and the Yamhill County Museum. These natural features should either remain on-site or an alternative screening should be in place to screen the landfill from neighboring uses.
7. Regarding criterion 1101.02(A.6) above, the only natural hazard identified on the County zoning map is the Floodplain Overlay District. The development within the floodplain overlay district is evaluated using Section 901 of the Yamhill County Zoning Ordinance which will be discussed below.

In addition to the Floodplain Overlay District, on the bottom of page 14 and at the top of page 15 the application discusses the design adhering to modern seismic standards. These findings are incorporated here by reference. Requiring that the landfill expansion design adhere to modern seismic standards will be suggested as a condition on any approval.

8. Regarding criterion 1101.02(A.7), a Site Design Review is typically processed as a "Type A" application whereby the Director issues a decision and surrounding property owners are notified of that decision and given an opportunity to appeal. This application is in conjunction with a Floodplain Development permit which requires a Type B notice to surrounding properties. However, the Planning Director has the discretion to process the application as a "Type C" application, and decided to do so.

As noted above, as part of the 2014 zone change to EF-80, the Board of Commissioners placed some conditions on any future expansion. One of the conditions was for a community meeting to solicit comments from interested parties. The idea was to have an independent moderator at the meeting, have Waste Management present their plans, and to collect comments from interested parties in order to address them in the Site Design Review. This community meeting was held on November 11, 2014 and comment cards and subsequent e-mails and letters were submitted into the record.

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The following is a summary of the comments submitted into the record. The complete comments can be found in Exhibit 4.

### ***Compatibility with surrounding uses***

- *Odors from the landfill continue to be an issue for many.*
- *Noise.*
- *Lights.*
- *Visual impact along Highway 18 and from the City of McMinnville. The ugliness of the 8 acre expansion to the north of the existing landfill and the proximity of the 29 acre expansion to Highway 18.*
- *Impact to surrounding farm uses. The operation of the landfill has driven away farming operations that are incompatible with the landfill. Farming occurs in spite of the landfill. The lack of agri-tourism events in the vicinity indicates that the landfill is incompatible.*
- *The City of McMinnville realizes the impact of the landfill on its economic future and livability.*

### ***Floodplain***

- *Should not be located in a floodplain.<sup>2</sup>*
- *Using a 1000-year floodplain makes more sense. It seems foolish that an earthen berm will protect the garbage from a moving South Yamhill River.*
- *The application should include a Conditional Letter of Map Revision (CLOMR) from FEMA.*

### ***Seismic issues***

- *Both the berm portion holding back the waste and the berm portion holding up the road should meet the seismic requirements.*
- *The existing landfill should be brought up to meet the requirements for a 9.0 earthquake.*
- *There is a technical need for additional subsurface identification of suspect geologic materials due to a potential for liquefaction.*

### ***General comments/questions***

- *Is the expansion needed?*
- *Limit material accepted at the landfill to our county only.*
- *No monitoring to assure waste is non-toxic. No plans to sort and recycle.*
- *The plans are only 30% complete.*
- *How does building a road access across an existing wetland, removing trees and placing garbage in the floodplain retain existing natural features on site?*

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<sup>2</sup> Floodplain discussion. Staff would prefer that any development occurring on the Riverbend site be located outside of the floodplain. There is plenty of land under WM's ownership and outside of the floodplain that can be developed. However, the floodplain regulations are governed by federal rules and the county ordinance. Development in the floodplain is not only allowed it is anticipated. There are technical review/design standards that must be met. Prohibiting development under the regulations is not really an option so long as the standards are met.

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**Conditions Requested**

- *Condition approval on county acceptance of final seismic plan.*
- *Require Waste Management (WM) to implement a hazardous waste recovery program.*
- *Require a transfer station at the landfill to separate out recoverable items.*
- *Require a study, paid for by the county, about the livability of citizens and their property around the landfill.*

**C. Oregon Revised Statute 215.296(1)(a) and (b)**

1. Section 402.02(V) requires, in part, that “. . . The use must satisfy the standards set forth in ORS 215.296(1)(a) and (b). . .”, which requires showing:
  - a. *The use will not force significant change in accepted farming or forest practices on surrounding lands devoted to farm or forest use.*
  - b. *The use will not significantly increase the cost of accepted farming or forest practices on surrounding lands devoted to farm or forest use.*
2. Attachment B of the application contains CSA Planning’s “Farm Impact Assessment” which identified the neighboring farm uses in the surrounding area. The Planning Department anticipated this would be a significant issue with the planned expansion of Riverbend Landfill. We anticipate there will be significant testimony related to this issue.

**B. Floodplain Development Provisions and Analysis**

1. Section 901.05 of the Yamhill County Zoning Ordinance (YCZO) states that a floodplain development permit shall be obtained before the start of any construction or development within the FP Overlay District.
2. Section 901.06 of the YCZO states that prior to issuance of a floodplain development permit, the applicant must demonstrate that:
  - A. *The proposed development conforms with the permit requirements and conditions of this section and the use provisions, standards and limitations of the underlying zoning district and other overlay district.*
  - B. *The proposed development, if located within the floodway, satisfies the provisions of subsection 901.09.*
  - C. *The proposed development will not increase the water surface elevation of the base flood more than one (1) foot at any point.*

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- D. *All applicable permits have been obtained from federal, state or local governmental agencies, and all applicable National Flood Insurance Program requirements have been satisfied.*
- E. *The proposed development is consistent with policies j. and k. of the Comprehensive Plan, as amended by ordinance 471.*

*These policies are:*

- j. It is the policy of Yamhill County to protect riparian vegetation from damage that may result from land use applications for development that is otherwise permitted outright or conditionally under county zoning regulations. To achieve this goal, Yamhill County will review land use application for development in riparian areas in an effort to mitigate or prevent damage to riparian vegetation that might result from the development. For purposes of this policy, "riparian areas" refers to areas within 100 feet measured horizontally from the ordinary high water line of streams identified as "Fish Habitat" in the comprehensive plan inventory (National Resource Conservation Plan, Yamhill County, Oregon, May 1979 USDA Soil Conservation Service, that are not regulated under the Forest Practices Act.*
  - k. It is county policy that land use management practices and nonstructural solutions to problems of erosion and flooding are preferred to structural solutions. Water erosion control structures, including rip rap and fill, should be reviewed by the appropriate state permitting authority to insure that they are necessary, are designed to incorporate vegetation where possible, and designed to minimize adverse impacts on water currents, erosion and accretion patterns.*
- 3. Regarding criterion 901.06(A) above, the proposed project is not prohibited in the EF-80 zoning district under Section 402.02(V) of the YCZO.
  - 4. Regarding criterion 901.06(B), for the purposes of the zoning ordinance, the project is not located within a floodway. The application also contains justification for Section 901.09 of the YCZO. Therefore, the request complies with criterion (B).
  - 5. Regarding criterion 901.06(C), since this area is within the floodplain but not the FEMA floodway, a certification by a registered professional engineer will be required to demonstrate that the proposed development will not increase the water surface elevation of the base flood more than one (1) foot at any point during the time of a flood discharge. The application includes a hydrologic and hydraulic analysis of the proposed project conducted by a registered professional engineer. See Appendix A of the floodplain development permit application. A copy of the report with a professional engineers stamp will be required with any approval. With this condition, the request would comply with criterion (C).

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6. Regarding criterion (D), the applicant will be required to obtain any required permits from the Corps of Engineers and Oregon Department of State Lands. Copies of these permits will need to be provided prior to construction. By obtaining permits from these agencies, the request would comply with criterion 901.06(D).
7. Regarding criterion (E), the applicant's response to this criterion on page 9 of the Floodplain Development Permit is incorporated here by reference. With the condition to preserve/replace riparian vegetation, the request satisfies criterion 901.06(E).

**Fish Habitat**

The Natural Resource Conservation Plan shows that this tributary is fish habitat. In order to assure that the request is in compliance with State and Federal regulations a condition will be placed on any approval that requires the applicant to conduct a biological assessment (BA) for the purpose of analyzing the potential effects of the project on listed species and critical habitat. With this condition, the request would comply with the Natural Resource Conservation Plan.

**STAFF CONCERNS:**

**Odors:**

This continues to be an ongoing issue that has yet to be resolved to the satisfaction of vicinity property owners. Waste Management has indicated in the past that if the odors cannot be adequately controlled, continued operation of the landfill is at risk. Staff is disappointed that the applicant has not suggested any condition relative to monitoring, evaluating and controlling odors.

**Aesthetics/design:**

The City of McMinnville as a vicinity "interested party" has written letters to the Board of Commissioners and Metro expressing their concern with the continued operation of Riverbend. Module 10 as proposed is an 8 acre disposal cell adjacent to the north slope of the existing landfill. This cell expands the landfill closer to, rather than further away from the City of McMinnville. In addition, a stand of trees that currently mitigates/lessens the visual impact of the landfill from the direction of McMinnville is proposed to be removed. At the very least, this seems to be a poor choice for the direction/location of any future landfill expansion.

**Alternative Disposal Technology:**

The Board of Commissioners approved the zone change that permits expansion of the landfill with a very important condition:

7. *Alternative Disposal Technology. The applicant has stated its intent, to the extent feasible, to "add a Green Technology component to minimize landfill expansion" (an*

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*alternative solid waste disposal technology). The County recognizes, as stated in the application, that: "the construction of any particular facility depends on many factors including; proven commercialization of the technology, financial viability for the project, and ability to receive all necessary permits within the current regulatory structure." As such, it will take time to develop a Green Technology facility, as follows, in accordance with this condition:*

- (a) The applicant shall establish, on-site, a process or procedure to divert municipal solid waste from Riverbend Landfill to a Green Technology Facility.*
  
- (b) The process to be employed in meeting this condition shall be at the discretion of the applicant, consistent with applicable law, and may include, but shall not be limited to, the following processes or general classes of processes:*
  - (1) Advanced Thermal Recycling (also referred to as Mass Burn or Waste - to Energy incineration)*
  - (2) Gasification (also referred to as Plasma Arc)*
  - (3) Anaerobic Digestion*
  - (4) Thermal Depolymerization*
  - (5) Pyrolysis*
  - (6) Refuse-Derived Fuel (also referred to as RDF)*
  
- (c) Construction of a DEQ-approved facility to satisfy this condition shall commence no later than seven (7) years after the earlier of:*
  - (1) The date a DEQ permit for solid waste disposal outside the former PWS zone becomes final (i.e., no further DEQ action is required and all appeals have been exhausted or the time for filing an appeal has run with no appeal having been filed) and Riverbend has all DEQ authority necessary to commence disposal of waste on the site; or*
  - (2) The date the 3.6 millionth ton of waste is deposited at the expansion site.*
  
- (d) The alternative disposal technology facility shall be operational within 18 months after commencement of construction and shall, when fully operational, significantly decrease the current deposit of 510,000 tons per year of municipal solid waste in the landfill. The facility must be designed to function for the duration of the life of the landfill. The 18 month construction window may be extended as a result of unforeseen weather or other natural events, upon written approval by the Planning Director.*

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- (e) *Failure to construct and/or operate an on-site alternative disposal technology facility consistent with this condition shall require the landfill to cease operations.*

While staff understands that the actual implementation of the alternative technology element of the future expansion does not kick-in for at least seven years, we are concerned that there is minimal mention of this integral element in the SDR application (see pages 4 and 17 of application). Additionally, the life of proposed Module 11 is anticipated to be approximately double that seven year timeline. The design is such that there is to be a perimeter berm constructed around that 29-acre module and there are no specifics as to how to interrupt or end landfill expansion in that module before it reaches capacity. Although the application narrative indicates that this module will be constructed in multiple phases, there is nothing in the plan to indicate how the expansion would be phased and therefore limited to correspond with the timeline requirement for the Green Technology element.

**OBJECTIVES OF STAFF REPORT:**

There have been several questions raised regarding the reasons for and the components of this application (i.e. site design review, floodplain development and ORS 215.296; impact on farm or forest practices). As noted above, under “How we got here,” the Riverbend landfill and adjoining lands under its ownership are zoned EF-80. Further, Section 402.02(V) permits expansion of an existing landfill on the same tract subject to Section 1101, Site Design Review and ORS 215.296. In addition, in this case, because some expansion is proposed to encroach into the floodplain, Section 901 Floodplain Overlay District, is also applicable. One of the main objectives of this staff report is to assist the planning commission and public in focusing on these applicable review criteria. Another objective is to highlight areas of concern that have thus far been raised by interested parties and to summarize staff observations/concerns at this point in the review process. As the public hearing review process progresses, staff may prepare additional report(s) to address new information.

**STAFF RECOMMENDATION:**

*A staff recommendation, including any conditions, will be given after the receipt of public testimony.*

# 1. Applications

The two applications are available online at:

<http://www.co.yamhill.or.us/content/riverbend-landfill>

## 2. Public notice

# Yamhill County

## DEPARTMENT OF PLANNING AND DEVELOPMENT

525 NE FOURTH STREET □ McMinnville, Oregon 97128-4523

Phone:(503) 434-7516 □ Fax:(503)434-7544 □ TTY: (800) 735-2900 □Web: <http://www.co.yamhill.or.us/plan/>

### NOTICE OF PUBLIC HEARING

December 4, 2014, 7:00 p.m.

McMinnville Civic Center Hearing Room

200 NE Second Street

McMinnville, Oregon

The YAMHILL COUNTY PLANNING COMMISSION will hold a public hearing at the above time and place to consider the request described below. The request may be heard later than the time indicated, depending on the agenda schedule. Interested parties are invited to send written comment or may appear and testify at the hearing. All issues and concerns should be raised for consideration by the Planning Commission prior to the close of the hearing because any appeal may be limited to the record of the hearing. Failure to raise an issue, either in person or in writing, or failure to provide statements or evidence sufficient to allow an opportunity to respond to the issue precludes an affected party's appeal of the decision to the Board of Commissioners or Land Use Board of Appeals on that issue.

The application, all documents and evidence submitted by or on behalf of the applicant and applicable criteria are available for inspection, and copies may be purchased at a reasonable cost. A staff report will be available for inspection at no cost seven days prior to the hearing, and copies will be available for purchase at a reasonable cost. The location of the hearing is accessible to persons with disabilities. Please call the Planning Department office (503) 434-7516, if you will need any special accommodations to attend or participate in the meeting. For further information, contact Ken Friday at the Yamhill County Department of Planning and Development, 525 N.E. Fourth Street, McMinnville, 97128, or at (503) 434-7516.

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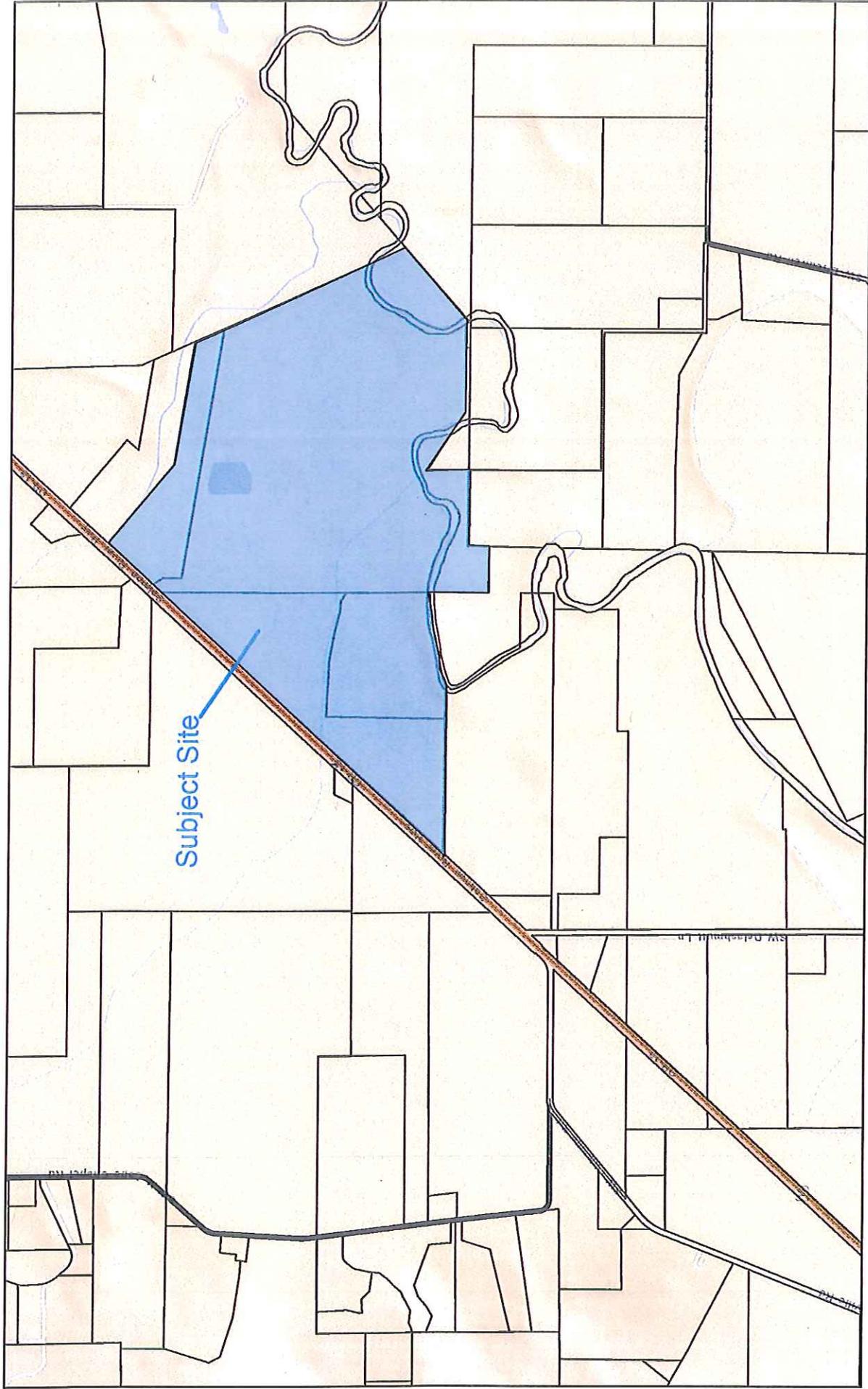
**TAX LOTS:** 5501-101, -200, -400 and -401

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The floodplain development permit is subject to Section 901 of the YCZO  
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Oregon Revised Statute 215.296(1)(a) and (b)

**NOTICE TO MORTGAGEE, LIENHOLDER, VENDOR, OR SELLERS:** ORS Chapter 215 requires that if you receive this notice, it must be promptly forwarded to the purchaser.

SDR-16-14/FP-03-14



November 6, 2014

- SL
- County Roads
- City Boundary
- Taxlots
- County

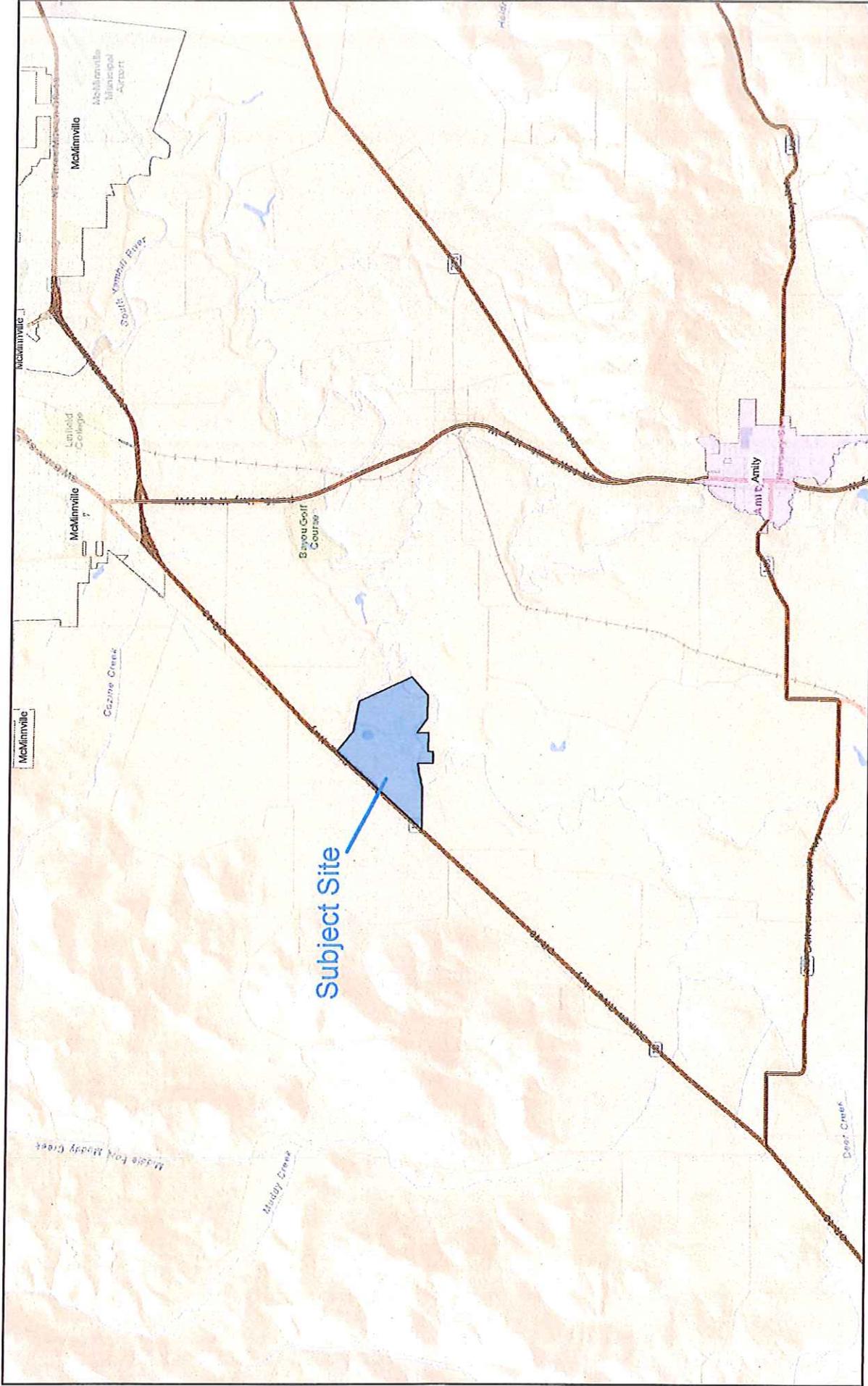
1:25,278

0 0.2 0.4 0.8 mi

0 0.325 0.65 1.3 km

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri-Japan, METI, Esri China (Hong Kong), Esri (Thailand),

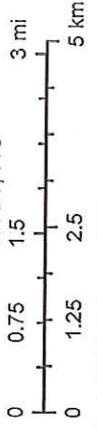
# SDR-16-14/FP-03-14



November 6, 2014

- Amity
- Carlton
- Dayton
- Dundee
- Gaston
- Lafayette
- McMinnville
- Newberg
- Sheridan
- Willamina
- Yamhill
- County

1:101,113



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand),

# *Procedures Regarding Hearings by the Planning Commission Acting on Quasi-judicial Actions in Yamhill County*

## **The Nature and Conduct of Public Hearings**

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1. Parties to quasi-judicial proceedings are entitled to an opportunity to appear, either in person or through a representative, to present and rebut testimony and evidence before an impartial authority, to record the proceedings, and to receive a written notice of the decision, based on the record made at the hearing.
2. The following persons qualify as parties:
  - (a) the applicant;
  - (b) all persons that are entitled by ordinance to receive a notice of the hearing; and
  - (c) other persons who demonstrate that the action affects a substantial right of those persons.
3. No person shall testify without:
  - (a) receiving recognition from the Planning Commission chairperson;
  - (b) stating his or her full name and address; and
  - (c) if requested, stating the basis on which he or she is entitled to status as a party. A challenge to this status may be made by the Planning Commission or another party. A ruling shall be made by the Planning Commission regarding the person's right to testify.
4. No person shall be disorderly, abusive, or disruptive of the orderly conduct of the meeting. Audience demonstrations, applause, and display signs shall not be permitted. The chairperson of the Commission shall have the authority to inform, reprimand, or remove any person or persons for violation of the rules of conduct.

## **Order of Procedure**

## **Rules of Evidence**

---

1. No person shall present irrelevant, immaterial, or unduly repetitious testimony or evidence.
2. Testimony and evidence must be directed toward the criteria applicable to the subject hearing.
3. Failure to raise an issue accompanied by statements or evidence sufficient to afford the Commission and parties an opportunity to respond to the issue precludes appeal based on that issue beyond the local level.

## **Hearing Procedure**

---

In the conduct of a hearing, the Planning Commission shall have the authority to:

1. Determine who qualifies as a party;
2. Regulate the course, sequence, and decorum of the hearing;
3. Dispose of procedural requirements or similar matters;
4. Rule on offers of proof and relevancy of evidence and testimony;
5. Impose reasonable limitations on the number of witnesses heard and set reasonable time limits for oral presentations and rebuttal testimony;
6. Grant, deny, or approve with conditions the matter being heard.

## **Burden of Proof**

---

The burden of proof is placed upon the applicant. Such proof shall show that the request complies with all applicable standards and criteria of the Comprehensive Plan and Zoning Ordinance.

- 
1. Announce the nature and purpose of the hearing;
  2. Ask for disclosure of any potential conflicts of interest or ex parte contact by those on the Commission;
  3. Ask parties of the hearing if there is a challenge to the ability of any member of the Commission to make an unbiased decision on the case;
  4. State that testimony and evidence must be directed toward the relevant criteria or other criteria in the plan or ordinance which a person believes to apply to the decision;
  5. State that failure to raise an issue accompanied by statements or evidence sufficient to afford the Commission and parties an opportunity to respond to the issue precludes appeal beyond the local level;
  6. Request the Planning Director or his designee to present a summary of staff findings and the criteria applicable to the request;
  7. Allow the applicant to be heard first, testifying on his own behalf or by a representative.
  8. Allow parties or witnesses in favor of the proposal to be heard;
  9. Allow parties or witnesses opposed to the proposal to be heard;
  10. Ask for comments submitted by governmental agencies;
  11. Allow rebuttal testimony;
  12. Ask for the staff recommendation.

13. Prior to the conclusion of the initial hearing, any party may request an opportunity to present additional testimony or evidence regarding the application. The Commission shall grant such a request by continuing the public hearing or leaving the record open for additional written evidence or testimony.
14. Upon conclusion of the initial hearing, if there is no request to present additional testimony or evidence, the Commission shall decide whether to close the hearing and render a decision or continue the hearing to a later date. The Commission may request proposed findings and conclusions from any party to the hearing.

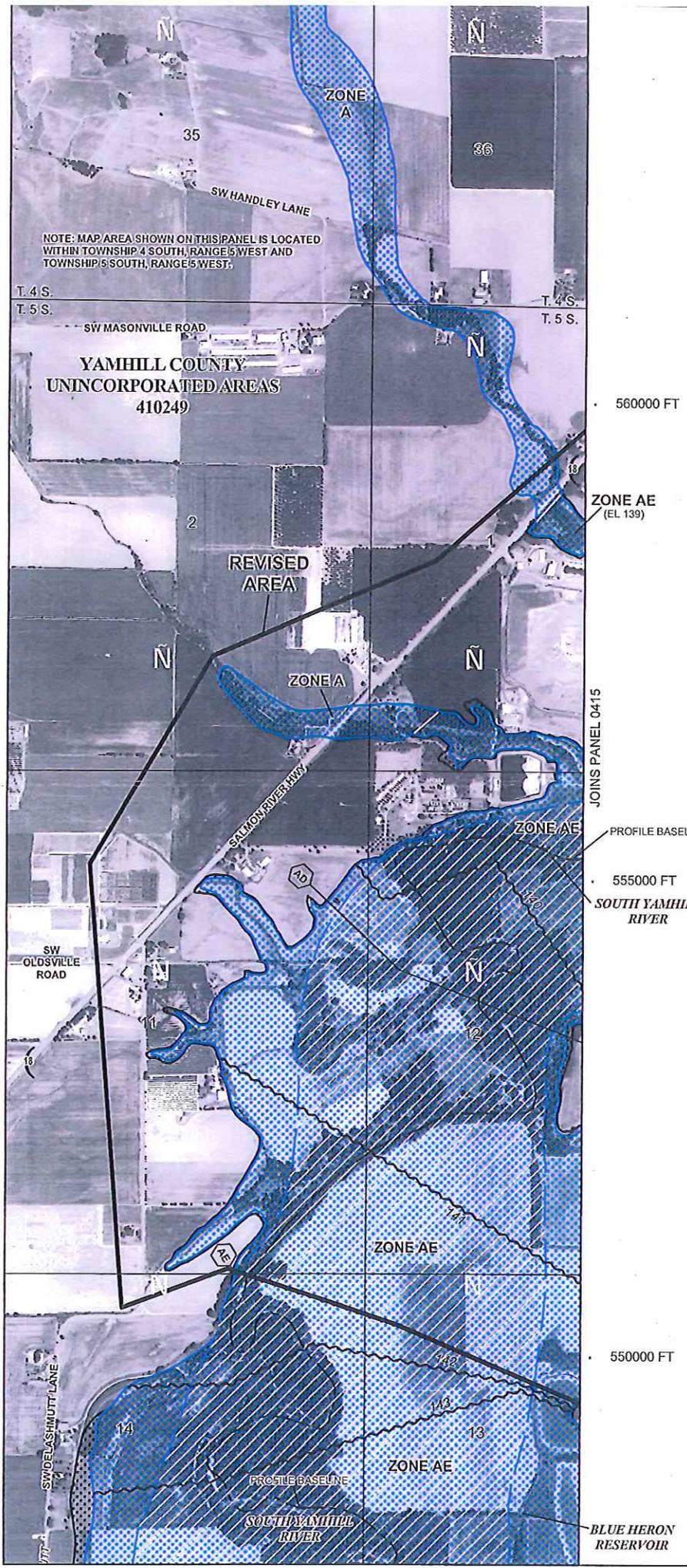
### Appeal of Commission Decisions

1. A decision of the Planning Commission may be appealed to the Board of County Commissioners for review. A petition for review must be submitted to the Planning Department within fifteen (15) days of the date of decision. The date of decision is the date the notice of decision is mailed, not the date of the hearing.
2. Only parties to the subject action may appeal the Commission's decision.

### Accommodation of Physical Impairments

Please notify the Planning Department of any special physical or language needs as far in advance of the hearing as possible. The courthouse is handicapped accessible.  
TDD 503-434-7519.

### 3. Letter of Map Revision (LOMR)



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 4 SOUTH, RANGE 5 WEST AND TOWNSHIP 5 SOUTH, RANGE 5 WEST.

YAMHILL COUNTY  
UNINCORPORATED AREAS  
410249

REVISED  
AREA

Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 1000'

**NFIP** PANEL 0395D

**FIRM**  
FLOOD INSURANCE RATE MAP  
YAMHILL COUNTY,  
OREGON  
AND INCORPORATED AREAS

PANEL 395 OF 675  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:  
COMMUNITY NUMBER: 410249  
EFFECTIVE DATE: 03/02/10

**REVISION TO REFLECT LOMR EFFECTIVE: May 9, 2013**

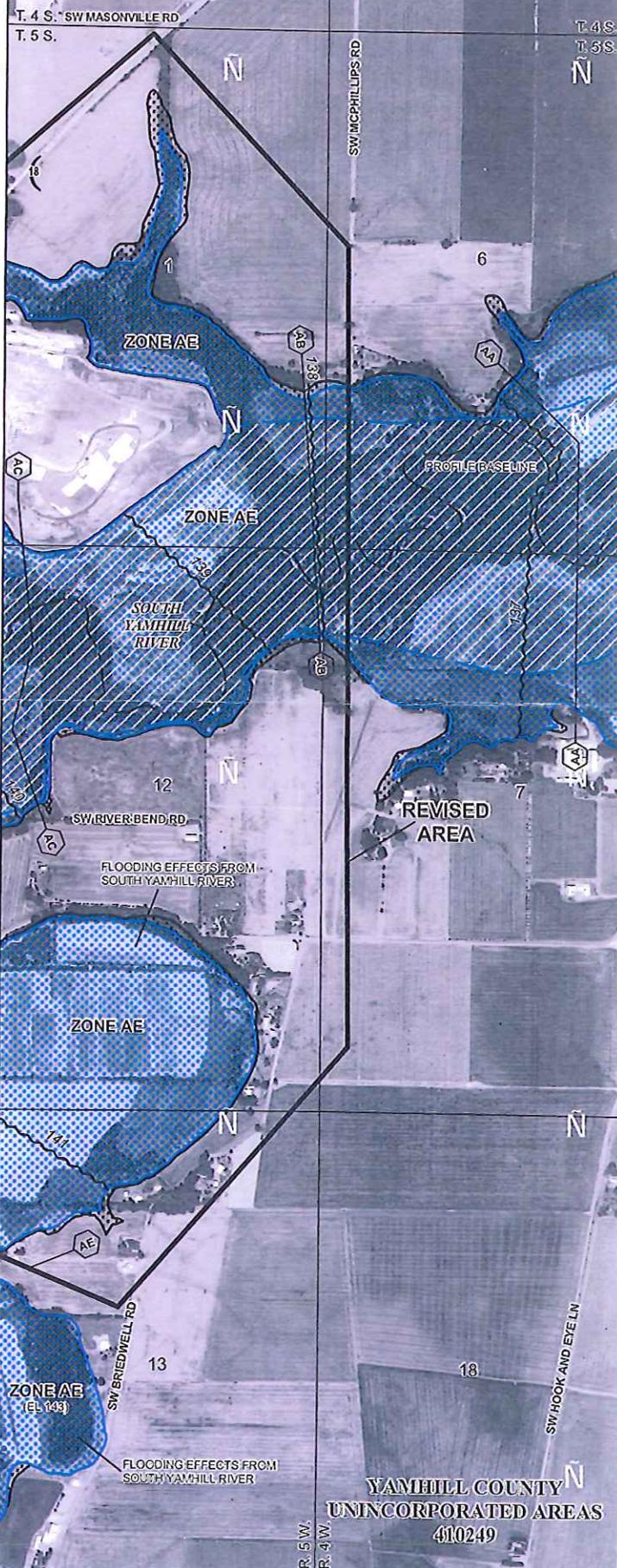
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER 41071C0395D**  
**EFFECTIVE DATE MARCH 2, 2010**

Federal Emergency Management Agency

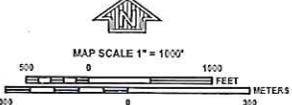
NATIONAL FLOOD INSURANCE PROGRAM

**YAMHILL COUNTY  
UNINCORPORATED AREAS  
410249**



50° 02' 00.000" N  
50° 01' 00.000" N  
50° 00' 00.000" N  
49° 99' 00.000" N  
49° 98' 00.000" N

- Legend
- 1% annual chance (100-Year) Floodplain
  - 1% annual chance (100-Year) Floodway
  - 0.2% annual chance (500-Year) Floodplain



**NFIP**

PANEL 0415D

**FIRM**

FLOOD INSURANCE RATE MAP  
YAMHILL COUNTY,  
OREGON  
AND INCORPORATED AREAS

PANEL 415 OF 675  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY        | NUMBER | PANEL | SUFFIX |
|------------------|--------|-------|--------|
| MONMOUTH CITY OF | 41025  | 0415  | D      |
| YAMHILL COUNTY   | 41029  | 0415  | D      |

**REVISION TO  
REFLECT LOMR  
EFFECTIVE:  
May 9, 2013**

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER  
41071C0415D

EFFECTIVE DATE  
MARCH 2, 2010

Federal Emergency Management Agency

**YAMHILL COUNTY  
UNINCORPORATED AREAS  
410249**

## 4. Comments received

RECEIVED  
NOV 12 2014

YAMHILL COUNTY PLANNING

# Yamhill County

## DEPARTMENT OF PLANNING AND DEVELOPMENT

525 NE 4TH STREET • McMinnville, OREGON 97128  
Phone: (503) 434-75 16 • Fax: (503)434-7544 • TTY: (800) 735-2900  
Internet Address: <http://www.co.yamhill.or.us/plan/>

Date: November 7, 2014

- To:
- |  |                                       |
|--|---------------------------------------|
| <input type="checkbox"/> Public Works                    | <input type="checkbox"/> Water Master |
| <input type="checkbox"/> McMinnville Rural Fire District | <input type="checkbox"/> ODOT         |
| <input type="checkbox"/> SWCD                            | <input type="checkbox"/> DEQ          |
| <input checked="" type="checkbox"/> City of McMinnville  | <input type="checkbox"/> ODF&W        |
| <input type="checkbox"/> DLCDC                           | <input type="checkbox"/> DSL          |

Re: **Docket SDR-16-14/FP-03-14**, Riverbend Landfill, Tax Lot # 5501-101, -200, -400 and -401

The referenced docket is currently under consideration by Yamhill County. The application is a request by Riverbend Landfill Co., Inc. for site design review and floodplain development to allow for the expansion of Riverbend Landfill on 37 acres of land adjacent to the landfill. The subject property is located at 13469, 13475, 13965 and 14325 SW Highway 18, McMinnville. The application materials can be found at:

<http://www.co.yamhill.or.us/content/riverbend-landfill>

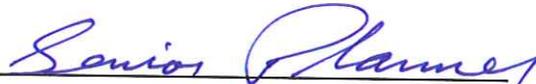
Your recommendations and suggestions will be used to guide the decision-maker when reviewing this request. If you wish to have your comments on the enclosed material considered, please return this form by this date: **November 25, 2014.**

Your prompt reply will facilitate the processing of this application and will ensure consideration of your recommendations. Please check the appropriate space below, and provide any comments you wish in the space provided, or on additional sheets.

### PLEASE NOTE

If a comment is not received by the deadline indicated, the decision-making authority will assume that there is no conflict between the request and the interests of your agency or organization, and make its decision accordingly.

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> 1. We have reviewed the file and find no conflicts with our interests.        | <input type="checkbox"/> 4. We would like to suggest some changes to the proposal.   |
| <input type="checkbox"/> 2. A formal recommendation is under consideration and will be submitted to you by: _____ | <input type="checkbox"/> 5. Please refer to the enclosed letter.   |
| <input type="checkbox"/> 3. Please contact our office immediately.  | <input type="checkbox"/> 6. All existing and proposed primary and repair drainfield sites must be within the property lines that they serve or a recorded easement must be provided. |

Signed  Title 



RECEIVED

SEP 12 2014

3

YAMHILL COUNTY BOC

230 NE Second Street • McMinnville, Oregon 97128-4831 • www.ci.mcminnville.or.us

September 10, 2014

RECEIVED

SEP 16 2014

YAMHILL COUNTY PLANNING

~~Metro  
600 NE Grand Avenue  
Portland OR 97232-2736~~

ATTN: Roy W. Bower  
Solid Waste Compliance and Cleanup Manager

RE: Non-System License Renewal Applications to Transport Metro-Area Solid  
Waste to Riverbend Landfill

Dear Mr. Bower:

Thank you for the opportunity given to the City of McMinnville to comment on the proposed renewal of various Metro-issued Non-System Licenses. Simply put, METRO's renewal of the NSL's involving hauling of solid waste to Riverbend Landfill would be inconsistent with the City of McMinnville's position on the future of Riverbend Landfill.

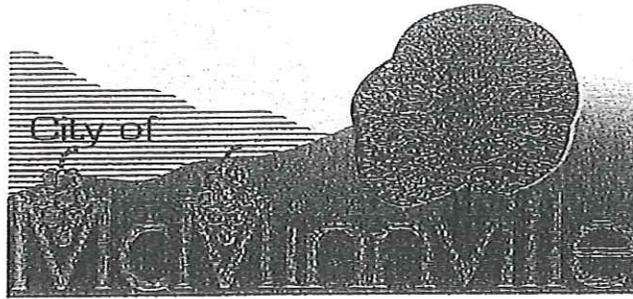
In January of this year the Mayor, on behalf of the McMinnville City Council, sent a letter to the Yamhill County Board of Commissioners, in which the City stated its concerns over Riverbend Landfill, including the importation of solid waste. The letter states that the City does not see continued operation of Riverbend Landfill as being in the best interests of the community for the long term. A copy of that letter is attached.

The City of McMinnville understands that it has no jurisdiction over Riverbend Landfill and is providing this input as part of the public testimony to be received.

Sincerely,

Kent L. Taylor  
City Manager

cc: Mayor and City Council  
Yamhill County Board of Commissioners



230 NE Second Street • McMinnville, Oregon 97128-4831 • [www.ci.mcminnville.or.us](http://www.ci.mcminnville.or.us)

January 27, 2014

Yamhill County Board of Commissioners  
434 NE Evans Street  
McMinnville OR 97128

RE: Riverbend Landfill

Dear Chair Stern and Commissioners:

I am writing on behalf of the McMinnville City Council. First, we would like to recognize the very difficult position you are in with regard to decision-making on landfill issues like that involving Riverbend Landfill. The voices from both sides of the issue are many and come from very organized fronts and developed positions on the matter. The McMinnville City Council recognizes that the legally required task of applying relevant land-use criteria to a land-use decision and the testimony you hear is a very real challenge.

Given that the County Planning Commission voted to recommend against the zone change proposed by Waste Management, Inc. and the County Planning Director's neutral statement that there was sufficient evidence and testimony presented to support either approval or denial, we had hoped to see a vote for denial of the zone change. We are pleased that there is a condition attached that requires some form of green technology facility to be initiated at the site within seven years. We look forward to hearing more of what the details are to this condition and hope that implementation of such technology will begin sooner than later and the implementation and startup will be within the seven-year period.

Over the past several years the McMinnville City Council has grown increasingly concerned that continued operation and growth of the Riverbend Landfill are contrary to sustaining a high quality of life for the current and future citizens and children of McMinnville. The concerns and objections that we have increasingly heard from a range of our constituents can be summarized as follows:

- **Negative impacts on the quality of life** – Much of the year McMinnville is downwind of the landfill. Despite efforts to control odors, the landfill odor can still be smelled in many different parts of McMinnville. This is particularly an issue on the south and west sides of the City. Outdoor activities are negatively affected. McMinnville's residents and visitors are frequent users of Highway 18, and the **size and height** of the landfill have grown substantially over the years – more than anyone ever imagined. Tree barriers and earthen berms have had little impact on what is more and more often referred to as a significant "eyesore." Increasing large **truck traffic** on the City's perimeter roads, such as Lafayette Avenue and surrounding highways, being used by haulers of imported garbage is also generating increased complaints and concerns. The substantial increase in the volume of garbage being imported has also increased **highway litter**. Despite good faith efforts to control it, the amount of litter seems to be increasing rather than subsiding.
- **Negative impacts on a growing tourism sector of the local economy** – Simply put, the negative quality of life impacts discussed above are not consistent with the effort to grow the City's and the County's tourism economy, one centered on the wine industry, and are having a major impact on the Council's vision of McMinnville in the future. There is a growing sense that we could soon reach a tipping point, and the growth in the tourism sector begins to flatten or diminish as potential visitors choose to avoid the negative conditions. The International Pinot Noir Celebration (IPNC), held annually at Linfield College, is a world-class event, drawing industry representatives and visitors from around the world. Representatives from the IPNC have expressed their concerns about the landfill's negative impacts on the future viability of the Linfield outdoor venue. The loss of these types of events, along with other major tourism events and venues, more than likely would have a negative impact on the County's agri-tourism effort and McMinnville's tourism-related businesses.
- **Environmental & public health concerns** – While the technical experts can battle the specifics of how large and when it will occur, there seems to be very little disagreement that a large-scale Cascadia subduction zone earthquake is in northwest Oregon's future. The age of the landfill, its original construction techniques and codes, and its proximity to the South Yamhill River give rise to citizen concerns about the potential environmental damage and threats to public health that could arise when such an earthquake occurs. The South Yamhill River flows along the easterly edge of McMinnville. While not an issue directly affecting City residents, they express concern about long-term groundwater impacts due to landfill leachate leaking below the surface.
- **Importation of solid waste from outside Yamhill County** – Importation of huge volumes of garbage exacerbate the problems discussed above and have reduced the life of the landfill. What was once envisioned as a small county landfill has become a large regional landfill receiving refuse from not only Yamhill County but from all of northwest Oregon, including the Portland Metropolitan

January 27, 2014

area. As the need for additional landfill disposal continues to increase in areas outside of Yamhill County, it is a concern that the anticipated 20 years of additional capacity that expansion would bring would be recognized in a much shorter period of time. Although the Council recognizes that there may be trade-offs in garbage rates for less volume, parties on both sides of the issue have difficulty stating exactly what that rate would be if Riverbend is not expanded.

In summary, the City Council does not envision Riverbend Landfill being part of our vision for a vibrant McMinnville and Yamhill County for the long term. As we move forward together, it is our hope that: implementation and construction of a viable green technology alternative takes place as soon as is possible; that Waste Management significantly reduces the amount of garbage that is imported to the landfill from outside of Yamhill County; that proactive steps to abate the odor and litter problems be put on a fast track; that the County and the Riverbend operator support increased efforts to reduce the amount of local solid waste entering the waste stream in the first place. And, finally, with regard to the last item, we hope County solid waste revenues will be allocated to help develop and administer this waste reduction effort and that Waste Management, Inc. will support it, working with other local partners such as Recology.

Sincerely,



Richard J. ("Rick") Olson  
Mayor

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Amita Mann Email N/A

Street address P.O. Box 673 City McMinn State OR Zip 97128

Comments to the environment team ---

Won't the flood plain change when the  
ice floes melts?

Isn't the 100yr flood plain a joke now because of  
climate change?

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes? climate change?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

WM's obligations are further backstopped by a requirement to fund and maintain financial assurance sufficient to last at least 30 years. In fact, there is \$12 million already in a state-controlled fund for this purpose. Learn more at [riverbend.wm.com](http://riverbend.wm.com).

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.

If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.



Name (please print) Annette Madrid Email \_\_\_\_\_

Street address PO Box 683 City Carlton State OR Zip 97111

Comments As a Yamhill Co. resident/former winery owner, I am so disappointed a the siting of expansion of our former "county landfill" (99 year lease) being co-opted to overflowing in 30 years!

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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[riverbend.wm.com](http://riverbend.wm.com)

Printed on recycled paper

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.

If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.



Name (please print) Bruce Sigloh Email brusig@msn.com

Street address 14730 Salt Creek Rd. City Dallas State OR Zip 97338

Comments \_\_\_\_\_

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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Name (please print) \_\_\_\_\_ Email \_\_\_\_\_

Street address \_\_\_\_\_ City farm State \_\_\_\_\_ Zip \_\_\_\_\_

Comments the farm impact study studied "practices" & not the financial impact of the dump on neighboring farms, & it did not look at the business impacts. Also, the study was only of a 1 mile from the dump & farm impacts impact a much larger area.

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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Printed on recycled paper

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If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Susan Watkins Email \_\_\_\_\_

Street address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Comments What do stewardship lands have to do with expansion? If expansion does not happen, or terminates because WM never establishes a green Yock, will the stewardship lands continue to be available for community use?

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Riff Canady Email rffc2000@yahoo.com

Street address 27600 City Sheldon State OR Zip 97137

Comments Please give a definitive answer as to when expansion will cease and the site is permanently closed!

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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[riverbend.wm.com](http://riverbend.wm.com)

Printed on recycled paper

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Riff Canady Email \_\_\_\_\_

Street address 27600 SW Thomson Mill City Sheldon State OR Zip 97137

Comments My concern is that Riverbend will continue to expand and consume more of our beautiful agricultural land. Other and flood plain concerns are major issues, as well. Contamination of farm land and the ASD table need to be addressed,

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Erin Ranney Email ranneyer94@gmail.com

Street address 1170 SW Riverbend City McMinnville State OR Zip

Comments what is the plan for  
frequency of maintenance or enhancement  
plow for South for butane - Red Canyon  
grass, blackberries don't go away in 1 year

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?  
**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Pat England Email patengland@frontier.com

Street address 218 N.W. 7th City McMinnville State OR Zip 97128

Comments concerns about readability of the size of print on  
overhead projections, concerns about floodplain and wetlands  
impact. Also river quality. I am not assured that  
the site will remain clean. I am not feeling trust

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?  
**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

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**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Susan Watkins Email \_\_\_\_\_

Street address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Comments No WM responses are to be recorded. So why are they here?  
I hear them talking about building a landfill.

Thanks to Mike for correcting my apparent mis understanding of his earlier statement that what was said at this meeting would be submitted on the record.

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?  
**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

WM's obligations are further backstopped by a requirement to fund and maintain financial assurance sufficient to last at least 30 years. In fact, there is \$12 million already in a state-controlled fund for this purpose. Learn more at [riverbend.wm.com](http://riverbend.wm.com).

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Sharon Rollins Email \_\_\_\_\_

Street address PO Box 953 City Mac State OR Zip 97128

Comments 1. Put into context of damage and casualties expected  
in a 7.0, 2. Can we harvest the grass off the site to make  
bed pellets for livestock?

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?  
**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

WM's obligations are further backstopped by a requirement to fund and maintain financial assurance sufficient to last at least 30 years. In fact, there is \$12 million already in a state-controlled fund for this purpose. Learn more at [riverbend.wm.com](http://riverbend.wm.com).

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Susan Watkins Email \_\_\_\_\_

Street address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Comments <sup>①</sup> Condition County approval on County acceptance of final seismic plan.  
② Both the berm portion holding back the waste + the berm portion holding up the road  
should meet the seismic reqs.

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

WM's obligations are further backstopped by a requirement to fund and maintain financial assurance sufficient to last at least 30 years. In fact, there is \$12 million already in a state-controlled fund for this purpose. Learn more at [riverbend.wm.com](http://riverbend.wm.com).

[riverbend.wm.com](http://riverbend.wm.com)

Printed on recycled paper

**Your input is important.** You may use this form or the written medium of your choice to provide input for the public record regarding the Riverbend expansion application.



If you wish to receive information from Yamhill County about this application as it is processed, your mailing address is required.

Name (please print) Susan Watkins Email \_\_\_\_\_

Street address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Comments Re No-name creek to south of existing landfill: Enhancements appear to  
affect only that portion of creek NW of the existing leachate pond. How does  
this improve fish + water + wetlands connectivity to S. Yamhill River?  
Approval should not be based on ineffective if pretty interventions in the flood plain.

**Q:** Who is responsible for the long-term liability and environmental protections after the landfill closes?

**A:** Waste Management is responsible for the long-term care and liability after closure until such time, if ever, that the Oregon DEQ determines that human health and the environment are protected and that there is no longer any need for active site supervision or maintenance. The period of post-closure care is 30 years, at a minimum.

WM's obligations are further backstopped by a requirement to fund and maintain financial assurance sufficient to last at least 30 years. In fact, there is \$12 million already in a state-controlled fund for this purpose. Learn more at [riverbend.wm.com](http://riverbend.wm.com).

11 November 2014

Carl Aplin  
PO Box 2  
19399 SW Cherryhill Road  
Sheridan, Oregon 97378  
carlda@centurylink.net  
1-503-843-1246

RI

NOV 12 2014

YAMHILL

Dept. of Planning and Development  
Attn: Mr. Mike Brandt  
525 NE 4th Street  
McMinnville, Oregon 97128

Dear Sir;

I am the guy who spoke up to get everyone to shut up and let Riverbend at least give their presentation. You asked for an immediate comment - Ok, here it is.

Having listened to the Waste Mgmt presentation, I have one HUGE concern. The 25 acres NEXT TO THE MAIN HIGHWAY !!! That part of the plan is soooo clearly and obviously insensitive to any vestige of common sense, or aesthetics, it seems to me that Waste Mgmt is really saying, "Screw you Yamhill County bitches and complainers". They could take space on the south side of the mountain of garbage - expand down the length of that side - 25 acres equivalent. They could take some of their operations area for garbage (well back from the main highway).

Think about it, those big upended trucks, big bulldozers pushing garbage around - right next to the main highway ?? That idea is beyond insensitive and foolish - stupid maybe, but more like a corporate policy statement. I don't know if you have been up on that pile of garbage, but it stinks, it is ugly, and there is stuff blowing around. Do the Yamhill county planners really want that kind of mess - right along side OUR main highway??

Think about the LONG lines of cars going to and from the coast ( and that gambling place ) each weekend. Is that the image and smell you planners want to impose on all of those passers by (not to speak of us residents)??

Is Yamhill county soooo broke it must do this ?? Yes, we heard about the \$15k "incentives" from Waste Mgmt.

On the bright side, discounting the obvious error in location, I think Waste Mgmt is trying to do it by the book. I trust they will carry through with what they say they are going to do. I had a concern about the slumping / failure of the ground ( berm ) supporting the pile of garbage. The guy (foreign speaking guy) assured me they were going to inject concrete into that berm base to firm it up and we didn't need to be concerned of it giving away in flooded / standing water situations. Based on aerial photographs of the dump site, surrounding areas standing in water, the dump was dry - I tend to agree with them - it is controllable.

The issue which I think most concerns us all is, IF in fact Waste Mgmt intends just this expansion ( 37 acres ), then why did they buy 700 acres ?? What is to stop them from piece meal expanding 37 acres at an argumentative session, every few years, until we finally end up with a 700 acre pile of garbage ?? Is it down firm ( legally ) in writing somewhere, what the max limit on garbage acreage will be ?? How big of pile are we really talking about ??

Respectfully yours,



Carl D, Aplin

Ken Friday

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**Subject:** FW: County Website Contact

**From:** Richard Thompson [<mailto:richard@richardthompsonart.com>]

**Sent:** Wednesday, November 12, 2014 10:13 AM

**To:** Mike Brandt

**Subject:** County Website Contact

Mr. Brandt....Thank you for your portion of the WM meeting last evening.

I was born and grew up in Yamhill County. My family had a farm near Dayton. Several years ago I retired following a 30+ year career as a university dean and professor and we returned to live of what remains of that family farm. I currently serve as a board member for the Dayton Community Development Association.

Improving Dayton's recreational access to the Yamhill River and the water quality therein is one item that we included in our strategic plan, Dayton Forward. That plan was adopted by the City of Dayton.

As someone who grew up fishing and exploring the Yamhill River and as a citizen volunteer on local issues I attended last night's meeting.

**Here are my questions for Waste Management:**

☛ It was stated that with an approved application, WM would be accepting material until 2030 at which time it would be "full".

*If not approved when would it be filled?*

*When it is filled, where will future Yamhill County waste be hauled and to what impact on the county?*

*Does WM have plans to create any more such landfills in Yamhill County to accommodate future waste disposal needs?*

☛ The stream enhancement plan was presented as a portion of the expansion application.

*If the expansion plan is not approved will the stream enhancement go forward?*

*If not why not?*

Thank you, Richard

Richard Thompson  
6860 Thompson Lane S.E.  
Dayton, Oregon 97114  
503.864.3524 [h]  
503.435.7991 [c]  
[richardthompsonart.com](http://richardthompsonart.com)

**Ken Friday**

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**Subject:**

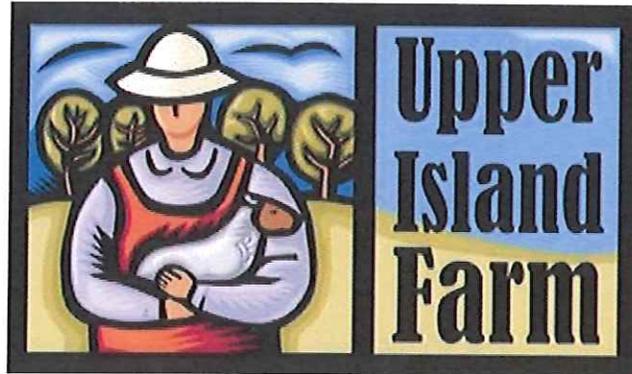
FW: For the Record: Riverbend Landfill Expansion application

**From:** Stephen Bledsoe <[Steve@Bledsoes.net](mailto:Steve@Bledsoes.net)>

**Date:** November 12, 2014 at 11:35:47 AM PST

**To:** Mike Brandt <[brandtm@co.yamhill.or.us](mailto:brandtm@co.yamhill.or.us)>

**Subject:** For the Record: Riverbend Landfill Expansion application



18695 S.E. UPPER ISLAND ROAD  
DAYTON [GRAND ISLAND], OREGON  
97114

Dear Mike:

As a citizen, small farm owner, voter and taxpayer of Yamhill County, I have never been so personally and thoroughly insulted as I was by the Riverbend Landfill "information meeting" held last evening (11 Nov 2014). Never once was the core question addressed: Is an expansion of the landfill needed?

For the record, here are my thoughts on the current state and future of the blight which is the Riverbend Landfill:

1. The vast majority of the solid "waste" deposited in the landfill is recyclable and Waste Management has no plan to sort and recycle;
2. Waste Management currently has absolutely no monitoring process in place to assure that material dumped at Riverbend is non-toxic;
3. If dumping at Riverbend was limited to material only from our county, the currently-permitted landfill site and capacity could handle our local needs for decades.

Very simple. We have all the capacity we need; morally, other counties should be responsible for the handling of their own solid waste generation and not, by acts of omission, destroy our precious rivers, water and farm land. I plead that you and our county Planning Commission consider whether this application for expanding what is already a suppurative wound in our landscape is defensible in any way. I think not.

Thank you for your consideration,

Steve Bledsoe  
18695 S.E. Upper Island Road  
Dayton (Grand Island), OR 97114

Stephen W. Bledsoe, M.D., Ph.D.  
Medical Physician, retired  
Former Chief of Anesthesia, Willamette Valley Medical Center, McMinnville

Former Clinical and Research faculty, Department of Anesthesiology, University of Washington School of Medicine, Seattle

[Steve@Bledsoes.net](mailto:Steve@Bledsoes.net)

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C 503.437.3029

H 503.868.7968

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Please consider the environment before printing this e-mail.

November 17, 2014

TO: Mike Brandt  
FROM: Susan Meredith  
RE: Comments for Riverbend Site Design Review

Mike,

My sense is simply: here we go again. To me Riverbend's expansion application is nothing more than trying to make a silk purse out of a sow's ear.

First, I am very offended by the attitude presented by Waste Management/RLC both in the expansion application and at the meeting by their consultant, Jay Harland, that expansion of Riverbend landfill is perfectly compatible with the surrounding area land simply because "it has been there for many years". This is totally convoluted reasoning: justifying a waste disposal operation that should never have been there to start with by saying just because it has existed there, it therefore now has justification to expand into the future. ??? The bottom line is: *Riverbend landfill never was, and never will be, compatible with the surrounding farmland, its location in/near the floodplain of the river, the geology of the site, let alone the cities and towns in this valley.*

People have continued to live and farm in the area *in spite of the presence of Riverbend* because that is where they and their families have owned the land and farmed for a very long time, *not because it has not had any negative impacts on them.* The truth is they have managed to survive in a very miserable situation. Is this possibly the reason the consultant interviewed *only ONE* farmer for his farm compatibility review? There are nearly 600 landowners within the 3 mile radius of Riverbend; surely he could have found at least 5 or 10 to talk to.

The problems associated with Riverbend, i.e., odor, noise, lights and visual impacts, the significant seismic issues, as well as vermin, birds, traffic, dirt on the highway, etc., have been repeatedly reported to DEQ and the County by area landowners and other citizens, but, unfortunately to no avail whatsoever. Thus, for WM/RLC to even suggest, and to further try to justify their case, that because farming still exists in the area there is no impact of the dump on the area and its farmers/neighbors is not only ludicrous and untrue, but is an insult to every one of them.

Since 1992, when WM applied for the Title V permit to make it a regional facility, the uproar of the community began with its initiative to close the site and has *never* subsided; in fact it has multiplied many times over since then. Unfortunately during the time from then until the present, each time a critical decision point arose where the County Commissioners could have, and should have, put an end to this operation, they chose not to. In essence, because none of them have ever lived near the landfill and therefore have no idea whatsoever of the impact of it, they thumbed their noses at the local citizens, especially those who live in the landfill's vicinity and who know full well, and suffer, the consequences of this constantly metastasizing cancer in their midst.

Secondly, it is important to recognize that the City of McMinnville now realizes the impact of this landfill, just a few short miles from its city limits, on the economic future and livability of their community. They stated their opposition in a letter to the County earlier this year by publicly stating their opposition to

Riverbend's continued operation. They have also stated their opposition in a letter to Portland Metro. It is clear they fully understand that Riverbend is *incompatible* with their city and its citizens.

What will it take to convince the Planning Commission and the County Commissioners that this landfill is *totally incompatible with this community*? *There are no design modifications that will correct the root problem: Riverbend landfill is in the wrong location on the banks of a river, near a large city, right beside a well-traveled highway.* One could probably not find a worse location if you tried.

Thirdly, why should RLC be allowed to expand even a fraction of an inch into the floodplain? And, then to announce that because of this, they will need to "reconfigure a creek back to its original meandering course" in order to accommodate this incursion on the floodplain – what is going on?? Where the creek is today *is* its natural course – that is how creeks work, they find their own path; it doesn't need to be "engineered" anywhere. Doing that is clearly unnatural and totally unnecessary! Moving this creek, just as they proposed doing previously, simply to accommodate their expansion plan, should be eliminated from this application. Planning should require them to stay out of the floodplain and leave the creek alone! If they cannot do the expansion without encroaching into the floodplain, too bad.

Lastly, RLC/WM have finally acknowledged that Riverbend is in a 9.0M Cascadia Subduction Zone. What took them so long? So, they are going to build this expansion to 9.0M standards; what about the other 88 acres of landfill that are now built only to 7.2M and a berm built only to 8.5M. Since this expansion is going in "include the existing landfill and berm area" they need to be required by Planning to bring those areas also up to meet the 9.0M standard. To do any less, is undermining the entire seismic stability of the operation because when it happens, all of the existing trash mountain underlying the new 37 acres of trash will be destroyed. Thus, it is hard to imagine that the 37 acre modules will survive no matter what standard they are built to.

Overall, it appears to me that WM has once again spent an enormous amount of time and money in its latest application trying to justify the continued operation a landfill in a location where it doesn't belong. Moving creeks, creating huge earthen berms, trying to restore damaged wetlands, building a new section to meet a seismic standard that will be meaningless unless the existing landfill is brought up to the same standard, etc., while at the same time ignoring the incompatibility of this operation with the entire surrounding area, is simply creating "engineering fixes" while completely ignoring the larger issue: get rid of the root of the of problem instead of trying to reconfigure the earth to accommodate it.

Susan Meredith  
14100 SW McCabe Chapel Rd  
McMinnville OR 97128

✓  
**Ken Friday**

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**From:** Mike Brandt  
**Sent:** Monday, November 17, 2014 11:02 AM  
**To:** Ken Friday  
**Subject:** FW: County Website Contact

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

[FYI and the record. mb](#)

**From:** Jim Kreutzbender [<mailto:jimkbender@gmail.com>]  
**Sent:** Monday, November 17, 2014 10:25 AM  
**To:** Mike Brandt  
**Subject:** County Website Contact

Mike Brandt

I spoke to you after the WM presentation last week concerning a study about the livability of citizens and their property around the dump. They did a study about the effects on garbage on crops that was mandated. The county receives about a million dollars a year for all that garbage, the county can use some of that money to do something in the "sacrifice zone". Maybe you could require that this be done. I do not have the time nor money to do this, the county receives all this money to use for bike trails and other projects away from the "sacrifice zone" but no projects in that area. Not a WM "feel good, community project", an independent survey with questions that the Stop the Dump, concerned citizens, maybe a Realtor, a real farmer- maybe from another area, the SWCD, etc.

thanks  
jim kreutzbender

RECEIVED

NOV 18 2014

Are you aware that the Riverbend Landfill just up the road is planning to *expand* its operation by 37 acres so that:

1. the landfill reaches the *edge* of Highway 18?
2. the stench you already smell each morning when it rains will now be *considerably* stronger?
3. that 2/3 of the garbage (65-70%) is *not our own*, but shipped in from Portland and Beaverton?
4. the new projection date for the landfill being full would be 2030?

Mr. Michael Brandt, the Planning Director for Yamhill County, should hear your ideas about stopping this defamation of our valley since he alone will be *unilaterally* making the decision about the expansion. If you feel that any one of the 4 issues above is wrong for our neighborhood, please send the statement at the bottom of the page, or write one of your own, to:

C/o Mr. Michael Brandt  
County of Yamhill  
525 NE 4<sup>th</sup> Street  
McMinnville, OR 97128

Email: [brandtm@co.yamhill.org](mailto:brandtm@co.yamhill.org) 503-434-7516

On December 5, the Planning Commission will be holding a hearing at 7:00 at the Civic Center (200 NE 2<sup>nd</sup> Street). Please come and address your concerns publicly!

Dear Mr. Brandt:

I am a resident of McMinnville, and I oppose the expansion of the Riverbend Landfill.

Signed:

*Bill Thomas*



**Bill & Phyllis Thomas**  
2389 SW Hannah Circle  
McMinnville OR 97128

Dear Mr. Brandt:

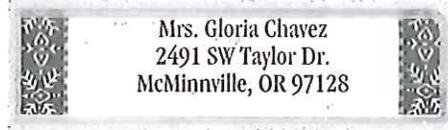
I am a resident of McMinnville, and I oppose the expansion of the Riverbend Landfill.

Signed: *Rudy & Gloria Chavez*

RECEIVED

NOV 20 2014

YAMHILL COUNTY PLANNING



Dear Mr. Brandt:

I am a resident of McMinnville, and I oppose the expansion of the Riverbend Landfill.

*Debbie L Allison  
Craig R Allison*

Signed: *Debbie L Allison*

RECEIVED

NOV 20 2014

YAMHILL COUNTY PLANNING

*2332 SW Taylor Dr  
Mac, OR 97128*

Dear Mr. Brandt:

I am a resident of McMinnville, and I oppose the expansion of the Riverbend Landfill.

RECEIVED

NOV 21 2014

Hilary Beth Kramer  
2405 SW Hannah Cir  
McMinnville, Or. 97128

Signed: *Hilary Beth Kramer*

*Hilary Beth Kramer*

ENVOY by Everhart™ CUPS YAMHILL COUNTY PLANNING

November 21, 2014

To: Mike Brandt, Director, Yamhill County Planning Department  
Subj: Riverbend Landfill

Dear Mr. Brandt

The landfill controversy is surely the highest profile, most important issue facing the county. I attended the November 11 meeting sponsored by Waste Management at the Grand Ballroom, and I was impressed by your explanation of the situation and ability to somewhat calm the unruly crowd. On the other hand, because of the seriousness of the landfill controversy, I have been disappointed by the weakness of the county approach to directing activities there. The county seems more interested in the short-term convenience and economic factors than in the long-term quality-of-life issues and the potentially large deferred costs we face as a result of not taking stronger action now.

Waste Management does not strike me as being a reliable steward of our interests. As one small example, I have heard reports that the much-ballyhooed enhanced recycling center at Riverbend is very poorly laid out. I believe the county should be much more pro-active in protecting our living environment, and should expect far more of our partners such as WM. In particular, as a minimum, I would like to see the following implemented at Riverbend:

1. With so much of the Riverbend waste coming from outside the county, we should demand a transfer station at the landfill to separate out the recoverables from the true waste;
2. To greatly reduce the toxic material going into the landfill, Waste Management should be required to implement a hazardous waste recovery program, with collection on a regular (e.g., weekly or monthly) schedule;
3. The Ordinance 887 requirements for the "alternative disposal technology" should be tightened substantially. As currently worded there is too much reliance on WM to dictate the terms of this function, too little in the way of oversight by the county and state, and a very loose time frame to boot. It is imperative that we explore advanced methods for managing our waste, but let's do a better job of focusing the approach.

Maybe we are stuck with Riverbend Landfill in the near term – an overlarge trash heap in a very unfortunate and vulnerable location. The county needs to step up and do its part to prevent this very bad situation from becoming worse.

Respectfully,  
Steve Iversen  
1033 SW Courtney Laine Dr  
McMinnville

## Ken Friday

---

**From:** Mike Brandt  
**Sent:** Friday, November 21, 2014 2:51 PM  
**To:** Ken Friday; Stephanie Armstrong; Tommy Brooks  
**Subject:** Fwd: County Website Contact

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

FYI

mb

Begin forwarded message:

**From:** Patricia Angland <[patriciaangland@frontier.com](mailto:patriciaangland@frontier.com)>  
**Date:** November 21, 2014 at 2:45:31 PM PST  
**To:** Mike Brandt <[brandtm@co.yamhill.or.us](mailto:brandtm@co.yamhill.or.us)>  
**Subject:** County Website Contact

Dear Mike-

Thanks for reading again an email from me regarding concerns about the dump expansion. I am a resident of the county since 1992 and have loved making this valley my home. I have already testified about the smell from the dump that I can experience almost every time going from town to my friend's place on Oldsville road. This summer I noticed it all the way to Roth's Market in McMinnville, and eastward on the campus of Linfield. The smell is horrible! Today I want to speak about visuals.

As a volunteer at the Heritage Center for YCHS, I have often glanced southward and noticed the mountain of trash. I understand that the deployment of the 8 acre parcel to the north of this mountain, is part of the expansion plan. I am wondering about what vegetation that they plan to use to mask the ugliness. Right now it seems that they are using the plantings of nearby farms to partially cover the problem. If they go another 8 acres in that same direction with trash piles, they will be taking the dump to the fence line almost. There will not even be room for plantings. The view will continue to degrade.

I am sure that none of the residents of McMinnville prefer the smell, nor do they enjoy the view at present. An expansion will only diminish our quality of life here. Please take some action to prevent this, Mike.

Sincerely,  
Patricia Angland  
218 NW 7th St  
McMinnville, OR 97128

## Ken Friday

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**From:** Mike Brandt  
**Sent:** Friday, November 21, 2014 3:12 PM  
**To:** Ken Friday; Stephanie Armstrong; Tommy Brooks  
**Subject:** Fwd: Riverbend Comment

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

FYI

mb

Begin forwarded message:

**From:** Mark Davis <[mark@startlivingthetruth.com](mailto:mark@startlivingthetruth.com)>  
**Date:** November 21, 2014 at 3:00:43 PM PST  
**To:** Mike Brandt <[brandtm@co.yamhill.or.us](mailto:brandtm@co.yamhill.or.us)>  
**Subject:** Riverbend Comment

Mike,

Thanks for stepping in to rescue Riverbend's meeting last week. That facilitator totally misread the audience and seemed to anger everyone. I can't say people are in a good mood when they come to one of these meetings, but there is no sense antagonizing people.

Anyway, below are a couple of comments based on the presentation that evening. I have not read the application yet.

1. The River and the Floodplain: The consultant made everything sound reasonable and it is nice they are trying to reconfigure the creek. What never seems to be taken seriously is that the South Yamhill River is not a stationary object. It meanders through the valley and has changed channels over the centuries. There is no way to predict what future changes might be and how they might impact that mountain of garbage. The South Yamhill essentially runs free (ie, there are no significant flood control dams), so the flow depends on the weather. Given the uncertainties of what future weather will be like due to climate change, it seems foolish to assume that an earthen berm will protect the garbage if the river moves in that direction. Also, due to the long-term toxicity of the garbage at the site, I would think using a 1000-year flood plain would make more sense.

2. Compatibility with Surrounding Farming Operations: The consultant sounds like he did a thorough job of analyzing what sort of farming takes place around the landfill. Given that it has been in that location for more than 20 years, it strikes me that its very operation has driven away farming operations that are incompatible with the deleterious affects of the landfill that we hear about from the neighbors at every hearing. The fact that Riverbend has bought up much of the surrounding property despite declaring no intention to expand onto most of that land suggests that it is not a desirable place to farm and raise a family. Finally, I would ask you to consider how many requests the Planning Department has received to hold non-farm events (weddings,

concerts, etc) in the area around the landfill. I believe the law considers these acceptable on farmland; if so, the lack of such events would indicate that the landfill is incompatible with activities that take place on farming ground in the County.

Best wishes on getting through hearing process.

Mark Davis  
652 SE Washington St  
McMinnville, OR 97128

**Ken Friday**

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**From:** Richard McJunkin <rdmcjunkin@yahoo.com>  
**Sent:** Friday, November 21, 2014 4:32 PM  
**To:** Mike Brandt  
**Cc:** Ken Friday; armstongs@co.yamhill.or.us  
**Subject:** Comments: Riverbend Landfill  
**Attachments:** Tech Comments & Discussion Ltr-FINAL.pdf; Liquefiable Suspect Foundation-MSE Berm6.pdf

November 21, 2014

Mike Brandt, Planning Director  
Yamhill County Planning Department  
525 NE 4<sup>th</sup> Street  
McMinnville, OR 97128

**SUBJECT: RIVERBEND LANDFILL AND A POTENTIAL FOR LIQUEFACTION IN  
THE GEOLOGIC FOUNDATION: TECHNICAL NEED FOR ADDITIONAL  
SUBSURFACE INVESTIGATION TO IDENTIFY SUSPECT GEOLOGIC  
MATERIALS**

Dear Mr. Brandt,

This E-Mail provides technical comments for the geologic foundation of 'Riverbend Landfill.' Similar comments have previously been provided to the Oregon Environmental Quality Commission (EQC), Oregon Department of Environmental Quality (DEQ), and Waste Management, Incorporated (WMI). There are two significant issues that are not resolved from previous comment submittals: 1) incomplete and poor characterization of geologic materials during drilling operations that provides for insufficient subsurface characterization and resolution of geologic stability conditions; 2) total lack of physical samples analyzed for liquefaction potential by a soils laboratory using accepted analytical standards and techniques.

A discussion of technical geologic and seismic issues is provided in two papers previously submitted to EQC, DEQ, and WMI: 1) *Technical Comments and Discussion Letter: Riverbend Landfill, Yamhill County Oregon*, (Letter) dated August 27, 2012, and 2) *Liquefaction Review Paper for Riverbend Landfill: Suspect Geologic Foundation Materials Identified* dated February 11, 2013. Both of these papers were ignored by the regulatory agencies and WMI and went without comment even though these papers questioned collecting procedures and resulting data interpretations that are currently accepted by all three parties. Both papers reference subsurface data collected for the Mechanically Stabilized Earthen (MSE) Berm by WMI; however, field techniques to gather data have not been changed and will be used in the future. My comments challenge present data gathering techniques and interpretations for subsurface geologic conditions and materials as being too general for engineering and seismic stability needs and therefore are *positively bias* and of very limited cost-effective value.

A significant change in field work is needed that performs "continuous coring" in all characterization boreholes for the entire length of drilling with cores preserved and maintained in storage boxes. All intervals of geologic material that are *loose and lacking in cohesion* are (definitely) suspect for being liquefiable during earthquake shaking. Such samples should be collected and sent to a soils lab for proper liquefaction analysis -- this has never been done by WMI except in a fraudulent way for which the data were withdrawn and never resubmitted (see, Letter-page 10).

Please review technical comments and issues in the 'Letter, especially those listed in the 'Conclusions and Recommendations Section' (page 10) as well as those presented in the Liquefaction Review Paper and consider how the content involves stability issues at Riverbend landfill as well as other areas around Yamhill County. Also, consider the absolute fact: 100-years of global earthquake experience indicates that due to site affects, earthquakes of only magnitude 6 may cause incredible damage and loss of life; and, a full-break Cascadia earthquake at magnitude 9 will release ~2700-times the energy of a magnitude 6 event! In this consideration, most of what WMI writes about adequate seismic engineering stability for Riverbend Landfill, with full acceptance by DEQ and EQC, is probably in serious optimistic error, especially for liquefaction in the geologic foundation.

Thank you for the opportunity to comment on Riverbend Landfill. I trust my comments will be of assistance to the Yamhill County Planning Department.

Sincerely,

Richard D. McJunkin  
Professional Geologist (#3605)  
Certified Hydrogeologist (#875)  
Certified Engineering Geologist (#1280)

cc: Ken Friday, Planning Division Manager  
Stephanie Armstrong, Associate Planner

**Technical Comments And Discussion Letter**

**Riverbend Landfill  
Yamhill County, Oregon  
(August 27, 2012)**

To: Bob Schwarz, Permit Engineer: Riverbend Landfill  
Oregon Department of Environmental Quality

From: Richard McJunkin  
Yamhill County Small Woodlands Owner  
Professional Geologist  
Certified Hydrogeologist  
Certified Engineering Geologist



## Subjects Addressed in Technical Comments and Discussion Letter

- 1) Non-Liquefaction Testing by Waste Management, Incorporated: Inadequate
- 2) Additional Subsurface Geologic Site Investigation: Needed
- 3) Additional Liquefaction Testing: Needed
- 4) Seismic/Liquefaction Considerations: Needed
  - Earthquake History of Northern Oregon: Needs Consideration in Review Process
  - Approval of Mechanically Stabilized Earthen (MSE) Berm: Additional Data Needed
  - Seismic Ground/Structural Shaking and Wave Amplification: Needs Resolution
  - \*\* GREAT Cascadia Earthquake - Pending
- 5) Additional Data Collection: Needed, Studied, and Resolved Prior to ANY Further Expansion of Riverbend Landfill

**Cover Photograph:** Aerial view to east-southeast of Riverbend Landfill. Black high-density polyethylene (HDPE) covers much of the landfill surface and overlies waste cells where trash is incorporated. Note that the South Yamhill River (upper background and center-right) is in spring flood stage with flood water encroaching the southern perimeter of the landfill. Flood water is also invading the subsurface foundation and base of the lowest waste impoundment cells and after flood waters recede, groundwater movement from the base of the waste cells will reverse and flow back toward the South Yamhill River.  
Photograph Credit: Leonard Rydell - April 2, 2012.

August 27, 2012

Bob Schwarz, Permit Engineer  
Oregon Department of Environmental Quality  
400 E. Scenic Drive, Suite 307  
The Dalles, Oregon 97058

**SUBJECTS: 1) REVIEW COMMENTS FOR REPORT: RESPONSE TO COMMENTS  
RELATED TO: SEISMICITY AND SEISMIC SLOPE  
STABILITY – PHASE 1 MSE BERM, RIVERBEND LANDFILL,  
MCMINNVILLE, OREGON: GEOSYNTEC CONSULTANTS,  
PROJECT WG1597 – PREPARED FOR WASTE MANAGEMENT, INC.**

**2) TECHNICAL NEED FOR ADDITIONAL SUBSURFACE  
LIQUEFACTION INVESTIGATION, CONCERNS FOR SEISMIC  
STABILITY, AND SITE-SPECIFIC SEISMIC AMPLIFICATION  
CONSIDERATIONS AT RIVERBEND LANDFILL, YAMHILL  
COUNTY, OREGON**

Dear Mr. Schwarz,

This ‘Technical Comments and Discussion Letter’ (Letter) addresses Riverbend Landfill (RL) (see, Photo 1 on Page 2) data deficiencies and provides technical comments for three main issues: 1) the report “Response to Comments Related to: Seismicity and Seismic Slope Stability – Phase 1 MSE Berm, Waste Management, Inc., McMinnville, Oregon: Geosyntec Consultants, Project WG1597” by Sharma (2012a); 2) the need for additional subsurface and liquefaction investigation at RL; and 3) seismic stability issues that should be addressed and resolved prior to any expansion of RL. For most perceived data gaps at RL, published references are used to note and associate points of deficiency and address technical issues (see, References Cited - Page 30).

Comments enclosed in this Letter are arranged in two main categories: ‘OVERVIEW’ and ‘CONCLUSIONS AND RECOMMENDATIONS’ (C&Rs). In the ‘OVERVIEW’ section, two main issues are discussed: 1) a ‘generalized’ history of earthquakes and faulting as they affect Oregon, including methods of measuring earthquake magnitude and shaking, and 2) liquefaction and liquefaction analysis by Waste Management, Inc. (WMI) respective to RL. In the section ‘C&Rs,’ numerous issues are discussed and recommended: 1) liquefaction analysis by WMI for foundation geologic materials at RL; 2) drilling and sampling by WMI to collect samples for foundation analysis for the Mechanically Stabilized Earthen (MSE) Berm at RL, including those for liquefaction analysis, with a proposal for a new investigative drilling program; 3) specifics of the proposed drilling program at RL that focuses on locating liquefiable geologic materials in



**Photo 1.** Aerial view to north of Riverbend Landfill (upper-middle of view) showing black high-density polyethylene (HDPE) covering much of the upper landfill surface and overlying waste cells where trash is incorporated. South Yamhill River, in its normal annual winter flood stage, trends through center of photograph between the rows of trees (poorly defined). Flood water, after inundating the river terrace south of the landfill, encroaches to the base of the actively managed site. The height of this annual high flood water provides for groundwater to invade the subsurface base of some “unlined” waste cells; after flood water recedes, groundwater movement will reverse and flow back toward the South Yamhill River. Note that during a 100-year flood event, or greater, the elevation of surface water from the South Yamhill River would be much higher than shown in this photographic and in time, will probably cause significant erosion and subsequent damage to the southern margin of the landfill. Photograph Credit: Peter Ovington - January 20, 2012.

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the subsurface; 4) drilling slurry control (i.e., mud control) for proposed mud rotary drilling to address needed subsurface characterization issues; 5) cement formulations to seal boreholes (and wells) that have been proven to be very effective; 6) findings by WMI for seismic site response at RL and a recommendation for alternative considerations of site-specific peak ground acceleration (PGA), and 7) seismic wave amplification issues as they may apply to underlying geologic foundation materials at RL as well as RL structures.

The total effort and points made in this Letter are to provide for better geologic characterization and design criteria at RL by the addition of more complete geologic data that are fully accurate

and precise. By addressing these issues, any future seismic exposure to the landfill will (hopefully) not generate damage that may be otherwise avoided. In addition, the Oregon Department of Environmental Quality (DEQ) should be aware that additional subsurface field investigation is warranted and needed at RL. The proposed investigation described in this Letter should be focused totally on an effort to thoroughly characterize subsurface geologic conditions at RL and to evaluate the possible presence and location, including lateral continuity in the subsurface, of geologic materials that are subject to liquefaction from earthquake shaking.

Most of the issues discussed are specifically addressed in the 'C&Rs' section (Page 10) which I hope will be thoroughly reviewed and considered by DEQ. All comments, and individual 'C&Rs' presented in this Letter, are based on my 45-years of working geological experience and focused experiences gained from using my two geologic 'specialty licenses,' one of which is in 'Engineering Geology,' and the other in 'Hydrogeology.'

## OVERVIEW

### Earthquake History of Oregon

Many Oregon residents consider earthquakes in the state to be a rare occurrence. This is an incorrect assumption because historic earthquakes have occurred in all areas of Oregon. However, because Oregon is a very large state, not heavily populated with numerous high-density areas (excluding Portland), and lacking complex infrastructure, earthquakes have not impacted most residents. Therefore, a general but incorrect perception has been fostered for Oregon being a state with low exposure to seismicity. This perception is further perpetuated by the fact that most Oregon earthquakes during the last 150-years have been mostly small to moderate events. For the most part, none of the historic earthquakes in Oregon have caused major and wide-spread damage, on a relative scale, compared to earthquakes in other more densely populated states such as California.

Plate tectonic forces that drive and activate faulting to cause earthquakes form a sub-marine trench just off the Oregon coast. In this area, the Juan de Fuca Plate, and smaller sub-plates, are being under-thrust beneath the North American Plate in a process termed subduction. This has been occurring for millions of years and will continue. The oceanic plate(s) now being subducted beneath the western part of the North American continent underlies much of the Pacific Northwest, including the State of Oregon and RL. Brittle fracture of rocks in the lower and overlying plate cause the great Cascadia earthquakes.

Earthquake 'modifiers' are used in this Letter to describe the size of earthquake events such as low-magnitude, moderate-magnitude, extreme-magnitude and so forth. A description of earthquake modifiers is provided in Figure 1 (Page 4).

During earthquakes, natural events are triggered such as 'liquefaction' (described more fully in the next section – Page 6) of unconsolidated geologic materials and landsliding. Where human interests are involved with earthquake-induced liquefaction and landslides, property destruction

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| <u>Magnitude</u> | <u>Modifier</u> |
|------------------|-----------------|
| 4 - 4.9          | Low             |
| 5 - 5.9          | Moderate        |
| 6 - 6.9          | Strong          |
| 7 - 7.9          | Major           |
| 8 - 8.9          | Great           |
| 9 - above        | Extreme         |

**Figure 1.** Magnitudes and Modifiers for various earthquakes of increasing size as used in this Letter.

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may be substantial, as well as loss of life. More importantly, in only the last 20-years, or so, has the scientific community discovered that Oregon is periodically exposed to great- and extreme-magnitude earthquakes; however, the frequency of these events is longer than the state has been populated by people of European descent. For example, Oregon experienced the last great Cascadia earthquake ‘about’ 125-years prior to the arrival of European settlers and prior Native American records for Cascadia earthquakes are incomplete. Scientific investigation was thus required to discover the facts of past earthquake frequency and intensity. In the interim, a general consideration for Oregon not being a seismically active state has been developed by residents that is (again), totally incorrect.

Shaking effects of an earthquake on the Earth's surface are best defined in terms of intensity. The favored earthquake intensity scale consists of a series of key responses such as people awakening, movement of furniture, and damage to structures; the upper limit(s) of the intensity scale includes essentially total destruction. Although numerous intensity scales have been developed over the last several hundred years to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli Intensity (MMI) Scale presented in Appendices I and II. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. The MMI scale is composed of 12 increasing levels of shaking intensity that range from imperceptible to catastrophic destruction, with each individual scale designated by a Roman numeral. It does not define shaking and incurred damage using a mathematical basis; instead, it is an arbitrary ranking based on observed effects.

A description of the 12 levels of MMI is listed in Appendix I. Appendix II not only lists intensity levels but also PGAs using ‘gravity’ (g) as a mathematical indicator for acceleration and velocities for movement in centimeters per second (cm/s). MMI values assigned to specific earthquake shaking that occur at a site have a more meaningful measure of severity than magnitude values. This is because MMI refers to the actual shaking experience and damage ‘at a certain place.’ The **lower** numbers of the MMI scale generally deal with the manner in which the earthquake is felt by people. The **higher** numbers of the scale are based on observed structural damage. Structural engineers usually assign intensity values that cause structural

damage to begin at between MMI values of VII-VIII. For a Cascadia earthquake in the range of a magnitude ~9 'great' to 'extreme' event, MMI numbers in the range of "X-XII" may be expected. These MMI values involve total damage and destruction to most engineered structures as well as severe damage to the land surface and underground utilities.

Many earthquakes of low- to strong-magnitude, and a few of major-magnitude, have occurred in Oregon, Washington, and Northern California during the last 120-years. The strongest events have caused millions of dollars in property damage and taken many lives. An abridged description of the 120-year history of earthquakes local to Oregon, Washington, and Northern California, by date of event, is provided in Appendix III. The frequency and wide-spread occurrence of these moderate- to strong-magnitude events should indicate that RL is totally exposed to earthquakes and subsequent shaking and could receive significant foundation and structural damage from even a local moderate-magnitude event. The U.S. Geological Survey (USGS) has determined that the McMinnville area has a 36.8-percent chance of exposure to a magnitude = 5 earthquake in the next 50-years; further, the chance for being exposed to a magnitude = 6.5 event in the same time period is 9.1-percent. Either of these magnitude events has the potential to be quite destructive to RL.

Earthquakes indicate a release of 'stress and strain' from geologic compressional or extensional forces within the crust of the Earth. Unrelieved crustal strain causes earthquakes when rocks fracture in a brittle fashion. A simple rule follows: the greater the amount of stored strain to be relieved, the larger the magnitude of the subsequently occurring earthquake. As earthquake magnitude increases, so do expected values for MMI.

The earthquake history described in Appendix III indicates Oregon and Washington are being subjected to crustal forces that subsequently result in seismic activity. In areas involving Oregon, Washington, and California, these forces directly relate to plate tectonic processes and subduction occurring just off the coast in the Pacific Ocean. The RL area is not exempt from being impacted by earthquakes as forecast by USGS and could be exposed to a damaging earthquake at any time.

It is noted that low- to major-magnitude earthquakes relieve very little accumulated strain in crustal rocks, especially in areas where great- to extreme-magnitude events occur on a frequent basis respective to geologic time. Only great- to extreme-magnitude earthquakes truly relieve crustal strain in these areas. For example, after the 1906 San Francisco (California) earthquake, which is estimated to be have been of magnitude ~8 and for the most part destroyed the city, seismic activity in the region essentially ceased until occurrence of the 1980 Livermore earthquake; after the 1980 Livermore event, earthquakes began to occur more frequently in this area. Therefore, the apparent large number of earthquakes that have occurred in Oregon and Washington in historic times have not significantly relieved crustal strain to postpone the next great Cascadia event. Regionally accumulating crustal strain will truly only be relieved by the occurrence of the next Cascadia earthquake or other great- to extreme-magnitude earthquakes that may subsequently occur in the Pacific Northwest.

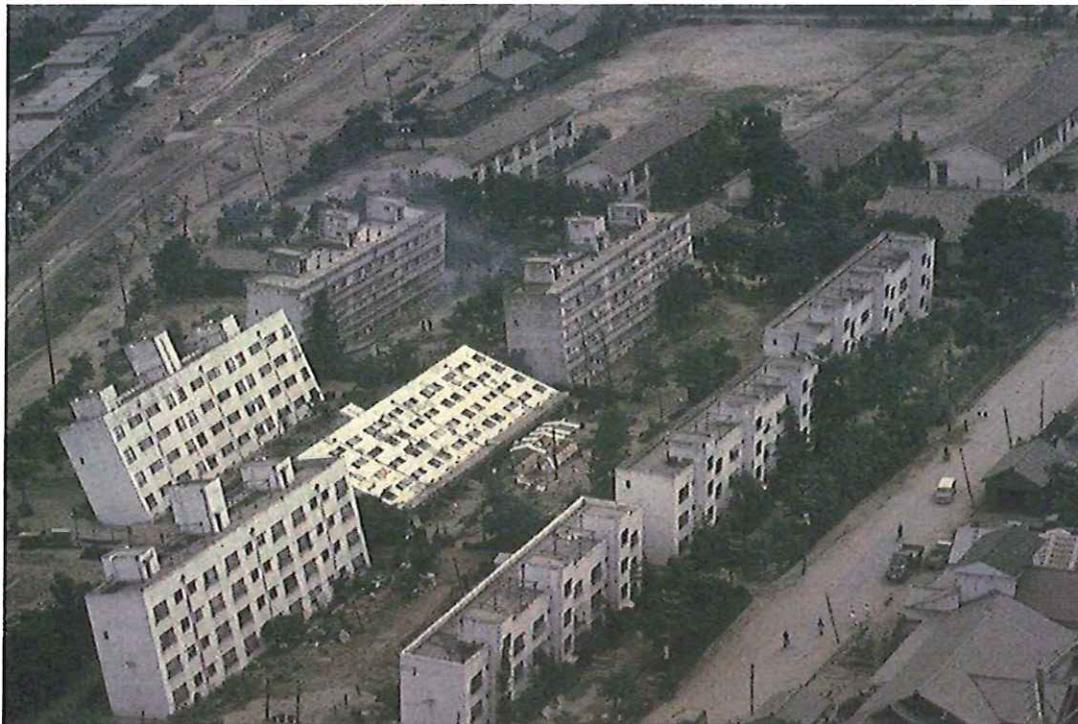
## Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a saturated geologic material, especially fine-grained sands and silts, and some gravelly deposits, is reduced to that of a viscous liquid; usually, this phenomenon is caused by earthquake shaking or other rapid and repetitive loading. Earthquake shaking is the most common trigger for generating a liquefiable increase in interstitial water pressure. However, construction related activities such as blasting, pile driving, or any type of harmonic and rapid energy input may also cause interstitial water pressure to increase and generate liquefiable conditions in certain geologic materials that are saturated and usually fine-grained.

Seismic shaking and the induced liquefaction phenomena have been responsible for a tremendous amount of damage during most moderate- to great-magnitude historical earthquakes. Damage has occurred in all areas globally where unconsolidated, and especially fully saturated, geologic materials are impacted by earthquake shaking. In saturated soils, where the space between individual particles is mostly to totally filled with water, during shaking, this interstitial water exerts a pressure on individual soil particles that influences how tightly the particles are pressed together. Prior to an earthquake, the water pressure is relatively low. However, during an earthquake, shaking will cause the interstitial water pressure to increase to the point where individual soil particles readily move apart with respect to each other. The consequence of this action is to essentially liquefy the affected medium by reducing shear strength to essentially zero such that the medium thereby becomes a viscous liquid (Photo 2 - Page 7).

The potential for seismic liquefaction in geologic foundation materials underlying RL, initially identified and provided to you during a meeting on April 20, 2012, is from evaluation of WMI geologic logs GT11-01 through GT11-07. These geologic logs are from a report entitled MSE Berm Permit Design Report, WMI, McMinnville, Oregon (Sharma, 2011a). They were part of a drilling operation conducted to evaluate foundation materials for the MSE Berm as proposed for installation by WMI to expand landfill capacity. The drilling logs reveal that geologic samples were collected at approximately five-foot intervals during the drilling of seven boreholes. Due to specifications selected and utilized by WMI for the location of sample collection, only about 40-50 percent of total borehole length was sampled for direct visual identification. The remaining 50-60 percent of the drilled borehole was essentially not sampled, pulverized by the mud rotary tri-cone drill bit, and evacuated from the borehole in the mud-based drilling slurry. Therefore, these cuttings, representing the type(s) of subsurface geologic material(s) present, are forever lost. Without a physical geologic sample to examine, visual and physical liquefiable characteristics that could indicate whether a geologic material is a candidate to liquefy are not available.

At numerous places in boreholes GT11-01 through GT11-07 where samples were collected, only a 'push' on the sampling device by the drilling rig was needed for penetration of the sampler into the geologic material to be sampled. In other areas, during Standard Penetration Testing (SPT), which involves the number of sampling hammer impacts (blow counts) to drive the sampling device into the geologic material to be collected, very few blow counts by the sample hammer were required to provide for inserting the sampler. Further, when blow counts were needed for



**Photo 2.** Aerial view of visual damage from liquefaction showing that when this phenomenon occurs, the strength of soil decreases such that the bearing capacity of a geologic material to support foundations for engineered structures is significantly reduced. This is reflected in the photo where apartment buildings sank into liquefied geologic materials under their own bearing weight with subsequent rotation during settlement. Photo from the 1964 Niigata (Japan) earthquake. Photo from Karl V. Steinbrugge Photographic Collection, Earthquake Engineering Research Center, University of California, Berkeley.

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driving the sampling device, only the hammer of least weight (i.e., 140-pound hammer dropped 30-inches) was necessary for most samples collected. This is suggestive of a generally unconsolidated nature for sediments being drilled and sampled.

The two samples selected for liquefaction evaluation in the Sharma (2012a) report are from borings GT11-01 and GT11-02. Depths of samples tested from GT11-01 were from 45-65 feet below-ground-surface (bgs). Depths of samples tested from GT11-02 were from 45-60 feet bgs. Blow counts per foot to collect both samples were relatively high compared to other intervals in all of the boreholes where samples were collected; for example, in GT11-01, blow counts per foot varied between '17-76' and in GT11-02, blow counts per foot varied between '37-81.'

Prior to making any further considerations or formal decisions involving the liquefaction potential for geologic materials underlying RL, DEQ should consider and evaluate details provided in the C&Rs section of this Letter which follows (Page 10). In this section, previous drilling and sampling techniques at RL are discussed as well as proposed drilling and sampling to obtain needed geologic characterization that is at present not part of the technical record.

CONCLUSIONS presented provide for a discussion of technical geologic issues that lead to corresponding RECOMMENDATIONS. RECOMMENDATIONS provided are essentially 'technical specifications' that are known to be routinely addressed and applied in investigations at sites where geologic conditions are similar to those present at RL. I propose that DEQ consider and apply each 'CONCLUSION' and each 'RECOMMENDATION' together as they directly apply to significant issues that should be resolved prior to any further approval of engineering expansion at RL.

Several significant technical issues should and need to be addressed and resolved prior to any final decision making respective to future expansion of RL. Your consideration of the details provided in this 'Letter' is appreciated. I hope the issues discussed and C&Rs provided will assist and benefit you in your future DEQ decision making efforts.

Lastly, I look forward to assisting you and others at DEQ in the future to address the numerous and significant technical issues related to operation and expansion of RL. Also, please feel free to contact me regarding DEQ uncertainties/issues for technical needs or for any questions or comments regarding details provided in this 'Letter,' especially from the 'C&Rs' section.

Sincerely,

Richard McJunkin  
Yamhill County Small Woodlands Owner  
Professional Geologist\*  
Certified Engineering Geologist\*  
Certified Hydrogeologist\*  
\*All Licenses Active and Clear

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## CONCLUSIONS AND RECOMMENDATIONS

Individual ‘CONCLUSIONS’ and individual ‘RECOMMENDATIONS’ are provided for several aspects and details related to characterization issues at RL: 1) the Sharma (2012a; 2012b) technical evaluations; 2) a proposed drilling program to further characterize subsurface geologic conditions underlying RL; 3) potential liquefaction issues underlying RL; 4) drilling slurry (i.e., mud control) specifications for mud rotary drilling; 5) cement formulations for borehole/well sealing; 6) seismic site response issues at RL respective to historic local earthquakes; and 7) seismic amplification issues that may be related to site-specific geologic conditions underlying RL.

Comments are paired such that each ‘CONCLUSION,’ which is provided first, discusses technical details and specifications that provide for each ‘RECOMMENDATION’ that follows in **bold print**. The specific topic of each ‘CONCLUSION’ is also provided as a part of the heading.

CONCLUSION: Utilizing Only Two Geologic Samples For RL Liquefaction Testing (Sharma, 2012a)

Only two geologic samples were tested from RL drilling and sampling for their potential to liquefy. However, many samples were collected during the drilling program for the MSE Berm foundation investigation. This seems to be a significant disparity respective to needed and required testing of foundation materials at RL, especially for such a significant endeavor as the MSE Berm.

### RECOMMENDATION:

**DEQ should consider that the use of only two samples to evaluate the potential for liquefaction of geologic materials underlying RL is absolutely unacceptable. Numerous samples from numerous depth intervals within numerous boreholes should be evaluated with the most suspect samples (e.g., tentatively identified by visual and physical characteristics as possibly liquefiable) selected to assist in evaluating their potential to liquefy. Sample selection and evaluation should be representative of all subsurface areas underlying and in proximity to RL.**

CONCLUSION: Samples Selected for Liquefaction Testing (Sharma 2012a).

The samples selected for evaluation by Sharma (2012a) are not at all representative of liquefiable geologic materials. Given that the blow counts to collect these samples were so high (i.e., 17-81 counts per foot), it should have been a very clear indication that these two samples would not liquefy. In addition, the fact that the samples were mostly semi-consolidated gravel is also generally an indicator of geologic materials that are non-liquefiable.

### **RECOMMENDATION:**

Given the significance for potential liquefaction of site foundation materials underlying RL, as well as the results from the Sharma report (2012a), DEQ should counter the 'general appearance' inferred by the study which is suggestive of two significant issues: 1) "non-liquefiable" geologic material underlies RL, and 2) liquefaction is a non-issue for geologic foundation materials underlying RL. DEQ should further justify that the use of only two geologic sample intervals being tested, that were essentially "a given" as not being liquefiable due to the specific nature and type of geologic material analyzed (see 'Recommendation' above), is an incorrect approach to resolve such an important issue.

**CONCLUSION:** Drilling/Sampling Program For Evaluating Foundation Materials Underlying the RL proposed MSE Berm

The drilling program implemented to evaluate foundation integrity of geologic materials underlying the proposed MSE Berm (Sharma, 2011a) installed only seven boreholes (identified as GT11-01 through GT11-07). Installation of all boreholes utilized a mud rotary drilling technique.

Sample collection of geologic materials, for evaluation and testing of integrity, utilized split spoon 'drive' types of samplers and/or Shelby Tubes that are pushed to collect soil samples. Split-spoon sampling utilized different weight hammers, depending on the inherent induration of geologic materials being sampled. Hammers for driving sampling devices weighed either 140-pounds for lesser consolidated geologic materials or 300-pounds for more competently consolidated geologic materials. Both sample-driving hammers were dropped from a standard height of 30-inches.

Shelby Tube samplers are thin-walled sampling devices, compared to split spoon samplers, which provide for collecting samples that are less disturbed/damaged by compression during penetration of the sampler. The places and reasoning by WMI for where Shelby Tubes versus split-spoon samplers were used, at specific locations in boreholes, is uncertain.

In several subsurface borehole locations, samples were not recovered and apparently fell from the sampling device as it was being pulled back for retrieval to the surface. This may be interpreted to indicate the presence of 'unconsolidated' and 'saturated' geologic materials. For the most part, these geologic materials were probably saturated fine-grained sandy material, possibly subject to seismic liquefaction. Because the sample was never collected, the specific type of geologic material and its physical characteristics are unknown.

### **RECOMMENDATION:**

DEQ needs to propose to WMI that they implement a new drilling program to more fully evaluate geologic foundation materials along the route of the proposed MSE Berm. Drilling techniques need to provide for sample collection and retrieval where

such samples will not be lost and will completely characterize subsurface geologic conditions.

Proposed drilling should utilize NUMEROUS boreholes sited along the proposed MSE Berm construction route. Borehole spacing should be between 100-150 feet, depending on site-specific conditions along the proposed route; however, the closer proposed spacing of 100-feet between boreholes should be preferred. The drilling technique implemented should provide for “accurately and precisely” identifying all of the type(s) of geologic materials present. It should also provide for collecting geologic samples to study/evaluate for their potential to liquefy when subjected to seismic shaking. Depth of proposed drilling for the program needs to be ‘at least’ 100-feet bgs. This is the depth interpreted to be subject to liquefaction during a magnitude ~9+ Cascadia earthquake (Scott Burns, 2012, personal communication).

The proposed drilling technique needs to incorporate a “continuous coring” methodology that collects samples for the entire length of the borehole drilled. Geologic cores, once collected, need to be placed into core boxes designed for the purpose of storing such cores, labeled correspondingly to respective depth collected, and placed in storage for future sample identification, verification, laboratory testing/evaluation, and for reference with other samples/materials underlying the RL site. The cores should also be made available to any evaluator for the purpose of observation, identification, and confirmation of results provided by WMI respective to the specific type(s) of geologic materials and conditions present.

For foundation evaluation, either mud rotary (mud-based drilling fluid) or hollow stem auger (no fluids) drilling should be utilized for borehole placement along the route of the proposed MSE Berm. Continuous coring utilizing either drilling technique should incorporate a type of sample retrieval system attached to the coring device (e.g., wire-line) so that the drill rod or auger flights remain in the borehole as samples are collected and the borehole is advanced.

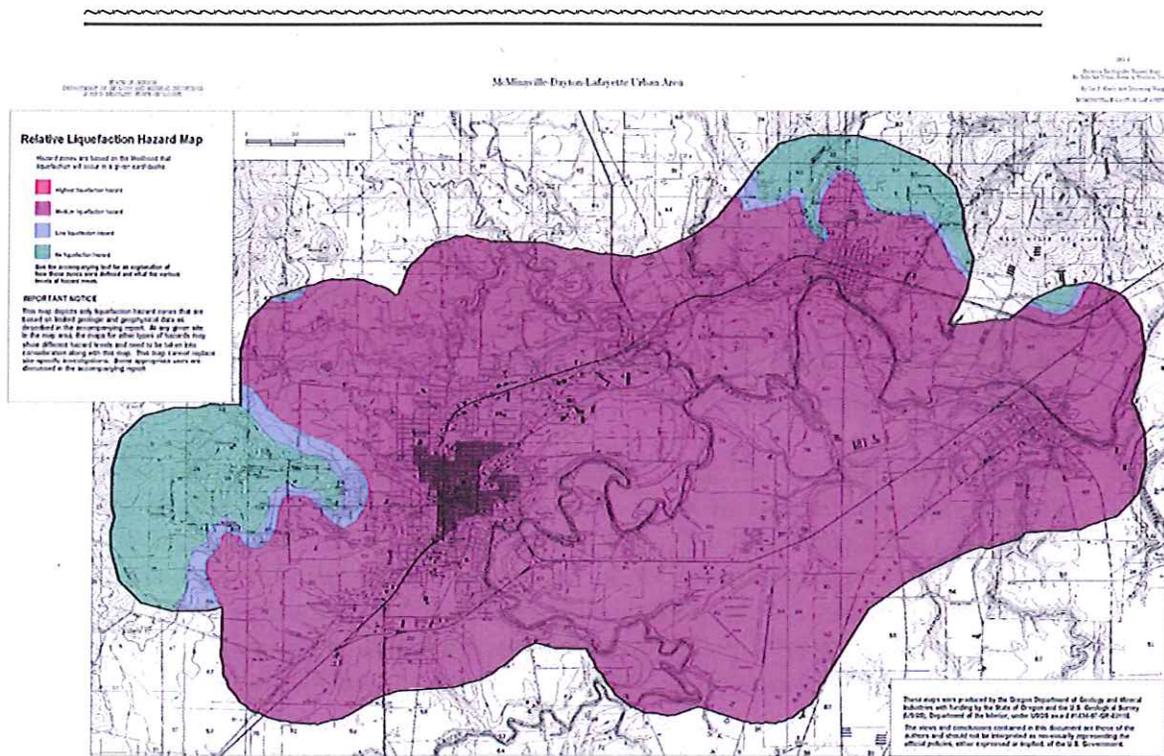
#### CONCLUSION: Site-Wide Investigation of Geologic Materials Underlying RL

Most, if not all, of the geologic foundation material underlying RL is comprised of Willamette silt which consists of fine-grained silts, sand, and clayey materials. WMI data have shown that some of these units are continuous (generally) in the subsurface underlying the site; for example, Recent (Holocene) alluvium and the Willamette silt are shown to be somewhat continuous in the subsurface underlying the site as well as a bedrock-type of unit. Unfortunately, none of these geologic materials appear to have been fully evaluated and characterized by WMI for their potential to liquefy during seismic events. Even though WMI has performed drilling across the site for numerous years, it appears that none of the drilling techniques were adequate for total sample collection from boreholes drilled (i.e., continuous coring).

Continuously cored boreholes would provide for the ‘accurate and precise’ determination of the type(s) of geologic material present, lateral continuity of these materials in the subsurface, and

the potential for these materials to be subject to seismic liquefaction. The impact to seismically generate liquefaction of RL foundation materials could provide for a truly catastrophic environmental event of huge proportions. This type of an environmental disaster at RL, as opposed to a natural disaster, is one that is preventable.

The potential for liquefaction of geologic materials underlying areas in proximity to RL is shown in Figure 2 by Madin and Wang (1999a). Data in Figure 2 clearly show that the general RL area is (most likely) in a ‘moderate’ zone for being subject to liquefaction during an earthquake. This interpretation is not based by using WMI characterization data for the subsurface but rather, it reflects the scientific opinion of other academic researchers for evaluating the occurrence of potential liquefaction in the McMinnville-Dayton-Lafayette area; thus, in proximity to RL. It should not be discounted as too general other than the ‘moderate’ zone classification may be too low respective for the liquefaction potential when site-specific geologic conditions are considered (for example, seismic amplification).



**Figure 2.** Relative ‘Liquefaction Hazard Map’ for McMinnville-Dayton-Lafayette area after Madin and Wang (1999a). RL is just southwest of the ‘Moderate Hazard Zone’ along Highway 18 (lower left). Given that geologic conditions are similar along the Highway 18 corridor, it may easily be interpreted that RL is also within the same zone proposed for a moderate liquefaction potential by Madin and Wang (1999a).

During an April 12, 2012 television interview on the Public Broadcasting Station (PBS) 'Evening NewsHour,' for a feature entitled Would a Major Earthquake Sink Portland or Seattle in Liquefied Soil?, reporter *Tom Bearden* asked *Scott Ashford*, Ph.D., Interim Dean of the School of Engineering, Oregon State University, about liquefaction occurring during a seismic event (see, Ashford, 2012, in References Cited for a '*hot link*' to view the television interview). Scott Ashford, stated "when we're looking at liquefaction and the subsequent lateral spreading, we typically see that along riverbanks, where there's enough of a slope that, when the ground liquefies, you essentially have a slope failure. And you can have several meters of movement of the ground toward the river." RL is sited on the upper slope of the South Yamhill River and may have a direct association with statements provided by Professor Scott Ashford during his PBS television interview.

### **RECOMMENDATION:**

Foremost, from a site-wide perspective, the impact of foundation materials (mostly including thin layers of fine-grained saturated sand) that underlie RL, needs to be evaluated for the potential to seismically liquefy. Given that RL is most likely in a zone of (at least) "moderate" for susceptibility to experience liquefaction during a seismic event (Madin and Wang, 1999a), is further justification for DEQ to make such a liquefaction study a requirement.

The drilling program proposed in this Letter, should be required by DEQ to evaluate all geologic materials underlying all areas of RL. To achieve necessary results, a site-wide drilling program is needed that provides for complete borehole sample collection and recovery. Geologic samples should be selected based on their physical characteristics that suggest a susceptibility to be liquefiable in the subsurface during seismic events.

Results of sample evaluation for liquefaction potential from the proposed site-wide drilling investigation should be used for future planning purposes by WMI and DEQ. If a potential for liquefaction is identified in geologic foundation materials underlying RL from the proposed investigation, WMI should investigate any and all remediation options. Remediation measures should be focused and pursued to potentially save the citizens of Yamhill County and the State of Oregon large amounts of money, time, effort, and possibly prevent the loss of life.

For investigating foundation materials underlying areas where RL has already accumulated waste/trash, DEQ should propose that WMI utilize a drilling technique incorporating mud rotary-based "slant oriented" drilling with boreholes initiated beyond the limits of waste cells. This drilling technique should provide for 1) "accurately and precisely" identifying the type(s) of geologic materials present underlying existing waste cells, and 2) collect geologic core samples to assist with liquefaction study/evaluation to a depth of 'at least' 100-foot bgs which is interpreted to be the depth for potential liquefaction from a Cascadia earthquake (Scott Burns, 2012, personal communication). It is noted that the methodology for 'slant-oriented' mud rotary drilling to achieve needed goals is not state-of-the-science, but has been routinely used (for years) in resource recovery and to drill

many types of rock for investigating geologic conditions; further, it has been previously used for contaminant characterization and remediation at hazardous waste sites (e.g., Sacramento Army Depot, Sacramento, California). The number and locations of proposed 'slant-oriented' boreholes to achieve needed objectives is at this time uncertain.

#### CONCLUSION: Mud Control Specifications For Mud Rotary Drilling Operations

Mud rotary drilling incorporates a mixture of bentonite-based clay (sodium-montmorillonite) which is a type of clay formed from weathering volcanic ash. The mud rotary drilling fluid is formulated by thoroughly mixing bentonite into water to form a viscous mud slurry. This slurry provides for lubricating the drill bit, maintaining borehole stability, and removing cuttings from the bottom of the borehole and transporting them to the surface. However, during any mud rotary drilling operation, the mud slurry 'wears out' as bentonite in the slurry is used to seal the borehole wall during drilling. Therefore, the bentonite-based drilling slurry needs to be monitored and maintained with the addition of fresh bentonite when needed. This is of utmost importance for the integrity of a borehole wall such that borehole sealing (i.e., decommissioning) operations will be adequate and complete. In other words, to adequately provide for decommissioning a borehole, it needs to be fully and adequately 'sealed' such that the seal replicates the natural pre-drilling geologic conditions respective to vertical permeability and does not foster a potential pathway to cross-contaminate in the subsurface.

Sodium-montmorillonite bentonite for mud rotary drilling is available in a 'pure form' with no additives or with a polymer-based additive that is termed "beneficiated" or "extended." These additives provide for increasing fluid viscosity once the mud slurry is formulated. Polymers, beneficiating additives, or extenders, when added to bentonite, decrease the amount of bentonite that is needed to achieve fluid viscosity and thus adds to 'some' cost-savings. A significant drawback and concern for using 'beneficiated' bentonite involves its use for drilling environmentally impacted sites. Because the extenders in beneficiated bentonite are polymers, which are essentially sugary-type compounds, they may foster bacterial growth. For this reason, the use of beneficiated bentonite is discouraged (usually) for drilling operations involving environmental investigation. Drilling at RL, due to the landfill waste cells containing waste materials, including some hazardous waste, should be considered an environmental investigation.

#### Recommendation:

Utilizing a mud rotary drilling technique should always involve mud control specifications and procedures. The mud drilling slurry should be formulated and maintained during the drilling operation and monitored at regular intervals. If this performance standard is not met, borehole integrity is compromised such that the borehole wall will be "caked by drill cuttings" (termed filter cake) and sealing the borehole, once drilling is completed, will provide for very suspect results at best. MWI should always strive to adequately seal boreholes so that future pathways to the subsurface are not created which could foster cross-contamination from shallow to deeper depths. In situations where contaminants are present, this potential

migration pathway can be very deleterious to potable ground water and provide for false-positive analytical data respective to groundwater sampling.

Given that RL involves environmental concerns, any mud rotary drilling performed should only use a pure form of bentonite (i.e., non-beneficiated), especially for any on-site drilling. The use of non-beneficiated bentonite has a proven track record in drilling operations where environmental concerns are involved. The use of extended or beneficiated bentonite is discouraged from being used respective to cost-savings because it is insignificant compared to the liability involved with post-drilling concerns.

Three issues are especially important when using mud rotary-based drilling. All three are remedied by the use of a de-sanding device (hydro-cyclonic separator) through which all drilling fluid is continuously circulated during the drilling operation. These de-sanding devices are commonly present on all mud rotary drill rigs but DEQ and WMI should specify that such a device be present as a precaution. DEQ and WMI should further specify that three criteria always be addressed for controlling the bentonite-based drilling fluid (i.e., mud control). These criteria are listed with explanations:

1) Marsh funnel velocity for the drilling mud slurry should be measured to be between 35-seconds at a minimum velocity and no more than 45-seconds (for most drilling jobs) for a maximum velocity; velocities greater than 45-seconds usually provide for a drilling slurry that is too viscous and thus circulation is hindered. As a comparison example, pure water has a Marsh Funnel velocity of 29-seconds.

2) Mud slurry weight should be as low as possible to lift cuttings to the surface and stabilize the borehole. Mud slurry weight should be (approximately) ~9.25-pounds per gallon at a minimum, and no more than 9.5-pounds per gallon at an absolute 'maximum' for environmental drilling. Mud rotary drilling fluid weight is an indicator of fine-grained particulate material (i.e., cuttings) being present in the drilling fluid which significantly adds to the weight. When drilling fluid weights are greater than 9.5-pounds per gallon, fluid invasion subsequently occurs through the borehole wall and into the formation being drilled. In doing so, an extensive 'filter cake' of mud is created on the borehole wall. The presence of any filter cake needs to be removed, but to do so is not easily achieved. A thick filter cake could severely compromise borehole sealing once drilling is completed and thus the potential for cross-contamination in the subsurface - a situation that is never repairable.

3) Sand content of the mud rotary drilling fluid should always be maintained to contain less than three-percent sand, with two-percent preferred. Sand content should be measured every 20-30 feet of drilling, and if too high, drilling advancement of the borehole should be halted with the drilling fluid circulated through the hydro-cyclonic separator (de-sander) until sand content in the fluid, including fluid weight, is reduced. Once sand content and drill fluid weight are reduced, borehole advancement may resume.

**It is noted that the equipment for measuring and maintaining specified mud control needs to be present on the drill site and is very inexpensive to purchase. It is also readily available with off-the-shelf availability (i.e., NL Baroid, Inc.).**

**CONCLUSION:** Formulations for Cement as a Borehole Sealing Agent

Portland cement and/or sand-cement at a 50:50 ratio that contains no additional products such as bentonite, extended bentonite, accelerators, etc., has a very successful track record of being used to seal wells and decommission boreholes. It is a fundamental product in the industry. Ratios of Portland cement and water, where sand is at a 50:50 ratio with cement 1) are critical for obtaining an adequate product that is impermeable when cured, 2) will provide for a long-term subsurface seal that is strong and will resist cracking, and 3) will not be chalky and fail if correctly installed. Incorrect mixtures or types of ingredients, such as too much water and too much bentonite, if used, may render a final product that is slow or fails to cure or, when set, is chalky and weak. Very commonly, irrespective of whether a written workplan exists that specifies Portland cement mixes and blending procedures, the ratios of cementing ingredients and the mixing operation used are inappropriate when performed at the job-site. This is because 1) ratios of cement to water are not measured/metered, 2) blending and mixing procedures are determined just prior to the cementing operation by on-site drillers whose specialty is drilling and not the formulation of cement, and 3) processes are not standardized and vary from job to job. This is very inappropriate in consideration of potential consequences involved with poor seals and subsequent concerns for cross-contamination from shallow to deeper depths (see, for example, McJunkin, 2003; Ross, 2010).

**RECOMMENDATION:**

**Cement grouts for sealing boreholes should preferably be formulated by a commercial cement plant and not on the job-site, especially by most drilling contractors whose experience is drilling and not formulating cement. Ratios of all ingredients, and the type of mixing operation to formulate the slurry, should be specified in a written workplan prior to initiating field activities. A technical workplan should not be altered without written consent by WMI. All deviations need to be logged in a field notebook and documented in a final written report or memorandum from WMI that is submitted to DEQ.**

**Pure Portland cement formulations, with or without the addition of a clean sand, are recommended for sealing the annulus of open boreholes and wells. The use of bentonite as an additive ingredient in Portland cement is discouraged. If bentonite is used as an ingredient in Portland cement, very restrictive and specific weighing, blending, and especially mixing requirements must be followed. These specifications are commonly unknown or ignored by individuals who formulate cement mixtures on the job-site. If bentonite is used in Portland cement, it should be non-beneficiated (i.e., pure bentonite) and formulated by a “professional” cement distributor or cementing company (i.e., Halliburton, etc.). Beneficiated bentonite (‘extended’ or polymer-based) should NEVER be added to cement in formulating a**

bentonite-cement grout because the polymers present, being essentially sugary-type compounds, will 'retard' curing of cement and significantly compromise and reduce integrity. Instead of a hard and competent cement, a soft and chalky cement is produced that is commonly severely fractured; sealing properties of the end product will generally provide for excess permeability and thus the potential to cross contaminate in the subsurface.

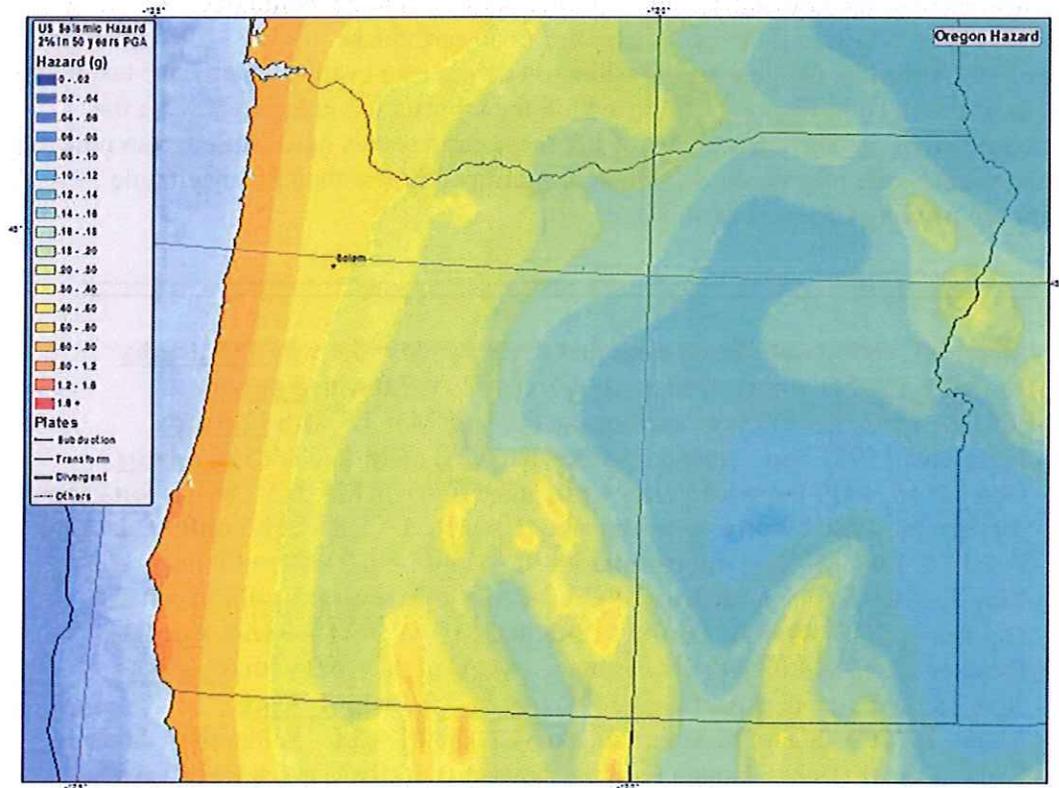
Methods for using several formulations of cement are listed in Appendix IV. The three formulations are based on guidance by McJunkin (2003). This guidance provides for metering ingredients, mixing/blending the ingredients, and includes several formulations: 1) pure Portland cement, 2) Portland cement with a 50:50 mixture of 'clean' sand, and 3) bentonite-cement. If mixing ratios are followed and blending efforts are addressed as noted in Appendix IV, without exception, they are proven to provide for a cured cement formulation of excellent quality; one that will minimize post-cure cracking, a chalky nature of the final product, and thus provide for decreasing inherent permeability.

#### CONCLUSION: WMI Seismic Site Response for RL

Geosyntec performed a site-specific seismic hazard evaluation which addressed both shallow crustal and subduction zone earthquakes that could impact the site. According to Sharma (2011b), this evaluation was "to meet U.S. EPA guidelines." Further, Sharma (2011b) states that the "deaggregated seismic hazard for the site shows that the design earthquake will be a magnitude 8.5 with a peak rock (i.e., ground) acceleration of 0.415g" and also notes that for subduction zone earthquakes, "magnitude and acceleration controls design." Sharma (2012b, personal communication) indicated that an earthquake distance of 70-km was used to calculate a peak ground acceleration (PGA) of 0.415g for RL. This distance is not representative of what may be expected from a Cascadia earthquake which could conceivably have a 'focal point' for the earthquake directly beneath RL on the subducting plate, thereby significantly decreasing the 70-km distance as recommended and used by Sharma (2012b).

It also appears that the Geosyntec proposal for a 0.415g PGA did not reference USGS 2008 data for northern Oregon to make this determination (reference, Figure 3 - Page 19). Note that USGS data in Figure 3 clearly show proposed PGAs for the RL area to be in the range of 0.5g - 0.6g at a minimum, and possibly as high, or higher, than 0.6g - 0.8g as a maximum. USGS (2008) data do not provide for site effects for individual areas which may experience enhanced shaking due to wave focusing from geology, wave propagation characteristics, or seismic amplification of wave energy from site-specific geologic conditions.

It appears that for seismic design parameters, WMI has not taken into account the growing body of research publications that indicate a Cascadia earthquake could be of magnitude ~9 or larger and generate MMI values of XI-XII. The occurrence of an earthquake of this magnitude could have devastating impacts to engineered structures in the Pacific Northwest. Furthermore, an earthquake of magnitude ~9 will release approximately 15-times (or more) the energy as compared to a magnitude 8.5 earthquake as referenced by Sharma (2011b) for RL. Global experience from similar earthquakes in the magnitude ~9 range indicate that severe ground



**Figure 3:** U.S. Geological Survey (USGS) Seismic Hazard Map Oregon: USGS National Seismic Hazard Maps display earthquake ground motions in Peak Ground Accelerations (PGAs) for various probability levels. PGA data are derived from seismic hazard curves calculated on a grid of sites across the United States that describe the frequency of exceeding a set of ground motions. These PGAs are applied in seismic provisions for building codes, insurance rate structures, risk assessments, and other public policy and incorporate findings on earthquake ground shaking, faults, seismicity, and geodesy. The map clearly shows that RL is within the 0.5g -0.8g PGA envelope. NOTE: A renewed PGA data map for Oregon is being prepared by Ian Madin (Oregon Department of Geology and Mineral Industries) and is soon to be released.

shaking may be on the order of 0.4g - 0.6g, or higher, for many seconds, if not a minute or more. Such shaking provides for engineering structures to attain their natural construction frequency after which they begin to rapidly build significant dynamic motion until structural limits are exceeded thus causing subsequent failure. This process for generating structural failure is always the case during catastrophic earthquakes and not the exception.

The amount of significant structural damage and loss of life that have occurred during California, Oregon, and Washington earthquakes during the last 90-years, from only magnitude < 7 events, exemplifies how vulnerable engineering structures are to earthquake shaking. These examples are also a testament to the devastation, and potential loss of life, that could occur at RL by shaking and structural failure if the site is exposed to an earthquake. A 1933-2012 abridged sampling of 16 California, Oregon, and Washington earthquake events, which have taken a total of **334 lives**, is provided in Figure 4. In reviewing the information in Figure 4, note the significant amount of destruction and loss of life these earthquakes have caused; also note that many of the events were magnitude < 7 which is significantly less than the magnitude ~9 as forecast for the pending Cascadia earthquake.

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- March 11, 1933 Long Beach earthquake (CA) @ M = 6.4 with **115 deaths**
  - April 13, 1949 Olympia earthquake (WA) @ M = 7.0 with **8 deaths**
  - July 21, 1952, Kern County earthquake (CA) @ M = 7.3 with **12 deaths**
  - February 9, 1971 San Fernando earthquake (CA) @ M=6.6 with **65 deaths**
  - October 15, 1979 Imperial Valley earthquake (CA) @ M = 6.5 - \$8 million damage
  - January 24, 1980 Livermore earthquake (CA) @ M = 5.8 - \$11.5 million damage
  - April 24, 1984 Morgan Hill earthquake (CA) @ M = 6.2 - \$8 million damage
  - May 2, 1983 Coalinga earthquake(CA) @ M = 6.5; several \$ million damage
  - October 1, 1987 Whittier Narrows earthquake (CA) @ M = 6 with **8 deaths**
  - October 17, 1989 Loma Prieta earthquake (CA) @ M = 6.9 with **63 deaths**
  - June 28, 1992 Landers earthquake (CA) @ M = 7.3 with **1 death**
  - March 25, 1993 Scotts Mills earthquake (CA) @ M = 5.6 - \$28 million damage
  - September 21, 1993 Klamath Falls earthquake (OR) @ M = 6.8 with **2 deaths**
  - January 17, 1994 Northridge earthquake (OR) @ M = 6.7 with **57 deaths**
  - February 28, 2001 Nisqually earthquake (WA) @ M = 6.8 with **1 death**
  - December 22, 2003 San Simeon earthquake (CA) @ M = 6.5 with **2 deaths**

**Figure 4.** Listing of California, Oregon, and Washington destructive earthquakes from 1933-2003 (abridged and reduced in number of earthquakes). Note that all but three of these earthquakes are magnitude < 7 and yet they have caused millions of dollars in property damage and taken the toll of **334 lives** lost (abridged after, Topozada and others, 2000; Coffman and others, 1982; Wong and Bott, 1995)

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#### **RECOMMENDATION:**

DEQ should seriously reflect upon and fully consider the reality of potential significant damage that could be caused to RL by an earthquake of magnitude < 7 (reference data in Figure 4). Also, for an earthquake of magnitude = 8.5 to only generate a peak (rock) acceleration of 0.415g at RL as proposed by Sharma (2012a; 2012b). A peak rock acceleration of 0.415g is here interpreted to be a significant underestimate because the distance from the earthquake as used to perform

calculations is 70-km which is too great a distance. DEQ should consider that the earthquake 'focus' (place of origin for brittle fracture to generate the earthquake) of a Cascadia earthquake could be directly beneath the RL site along the boundary of the subducting sea floor plate with overlying continental crust. Further, the area along plate boundaries being subjected to brittle fracture could include several hundred square miles thereby providing for a very wide-spread area of shaking and destruction at the Earth's surface.

DEQ should also refer to scientific published data from global seismic records showing that magnitude < 7 earthquakes are capable of generating PGAs greater than 1.0g (Appendix V). Three examples from Appendix V are listed: 1) 2011 Tohoku earthquake (Japan) which generated a PGA = 2.7g; 2) 2011 Christchurch (New Zealand) earthquake that generated a 2.2g PGA; 3) 1994 Northridge, earthquake (California) which generated a PGA = 1.7g. Many other records of 1g+ PGA accelerations are also available. Two such examples are cited: a USGS record from the 1971 San Fernando, California earthquake (magnitude = 6.6) recovered at Pacoima Dam (~1g PGA), and a California Strong-Motion Instrumentation Program record from the 1979 Imperial Valley earthquake (magnitude = 6.5) recovered at a local fire station (~1g PGA). There are numerous published records for earthquake PGAs being greater than 1g; however, WMI proposes only a PGA exposure of 0.415g at RL and to provide for this reduced PGA, uses an 'excessive' earthquake distance of 70-km . These proposed data by RL need to be seriously reconsidered by DEQ as being incorrect because the acceleration is minimized based on a maximized distance of 70-km from the earthquake.

DEQ should consider that ground motion from a Cascadia earthquake could generate PGAs in the range of .4g - 0.8g, at a minimum (Figure 3; Appendix V) that could be sustained for 30-seconds to possibly more than one-minute, or LONGER. Further, DEQ should consider whether PGAs as listed in Appendix V, which are six to seven times greater than the PGA as proposed by Sharma (2012a and 2012b), should be incorporated into RL 'design criteria' for structures and foundations. In making any future calculations, moisture content for geologic materials needs to be based on actual measurements and not estimations.

DEQ should also consider significant aftershocks that will occur post a Cascadia earthquake. These events could be of magnitude > 7 and add to the damage that would have occurred during the main event. As time passes from the main Cascadia event, the magnitude of aftershocks should decrease; however, magnitude 5 - 7 events could continue for years. Already damaged structures from the main event will suffer additional damage, if not collapse, from being already weakened and compromised. The loss of life from such aftershocks is also likely to occur.

## CONCLUSION: Seismic Amplification for RL From/During Earthquakes

RL is sited on loosely consolidated sand, silt, and clayey geologic materials (Willamette silt) that overlie more-consolidated bedrock-type geologic materials. Shear velocities in boreholes GT11-01 and GT11-02 are cited as being between ~475 to ~1150 feet per second between the depths of 3- 65-feet bgs with higher shear wave velocities present in both boreholes below a depth of 35-feet bgs (Sharma, 2011b).

These shear wave velocities in the upper 65-feet of RL foundation materials are relatively low when compared to velocities that would be present in more indurated and consolidated geologic materials. For example, in bedrock or bedrock-type materials, shear wave velocities may be on the order of a few thousand feet per second. Shear wave velocities at deeper depths within bedrock-type geologic materials underlying RL are unknown but must be assumed to be much higher than those in the near surface which are less than 1200-feet per second; this should be interpreted as a given fact.

Geologic conditions at RL for low shear wave velocity in relatively unconsolidated sediments that overly bedrock-type geologic materials, with much higher shear wave velocities (site effects), creates a condition for seismic amplification of wave energy during an earthquake. Ground shaking that is accentuated and increased by site effects will create a much greater potential for liquefaction to any susceptible geologic material that underlies RL.

Seismic amplification means that, during an earthquake, as seismic energy propagates to the surface beneath RL, it will be transferred from relatively high-velocity bedrock-type geologic materials across an interface into overlying geologic materials that are less consolidated and have much lower shear wave velocities. When seismic wave energy crosses the interface between the two types of geologic materials that have differing shear wave velocities, conservation of total energy must be maintained; therefore, to conserve total energy, wave propagation requires that seismic wave amplitude be increased in the near-surface environment. Thus, it is interpreted that RL could be subjected to "amplified seismic energy" during any earthquake.

Irrespective of seismic wave amplification interpretations provided above, Figure 5 (Page 23) shows a 'Seismic Amplification Map' by Madin and Wang (1999b) for the McMinnville-Dayton-Lafayette area that designates most of the geologic materials along both sides of the South Yamhill River, and in the general vicinity of RL, as being in an area of a "Medium" designation for the potential to experience seismic wave amplification. Given that RL is adjacent to the South Yamhill River indicates that geologic conditions are similar to those designated as having a 'medium' potential for seismic wave amplification by Madin and Wang (1999b).

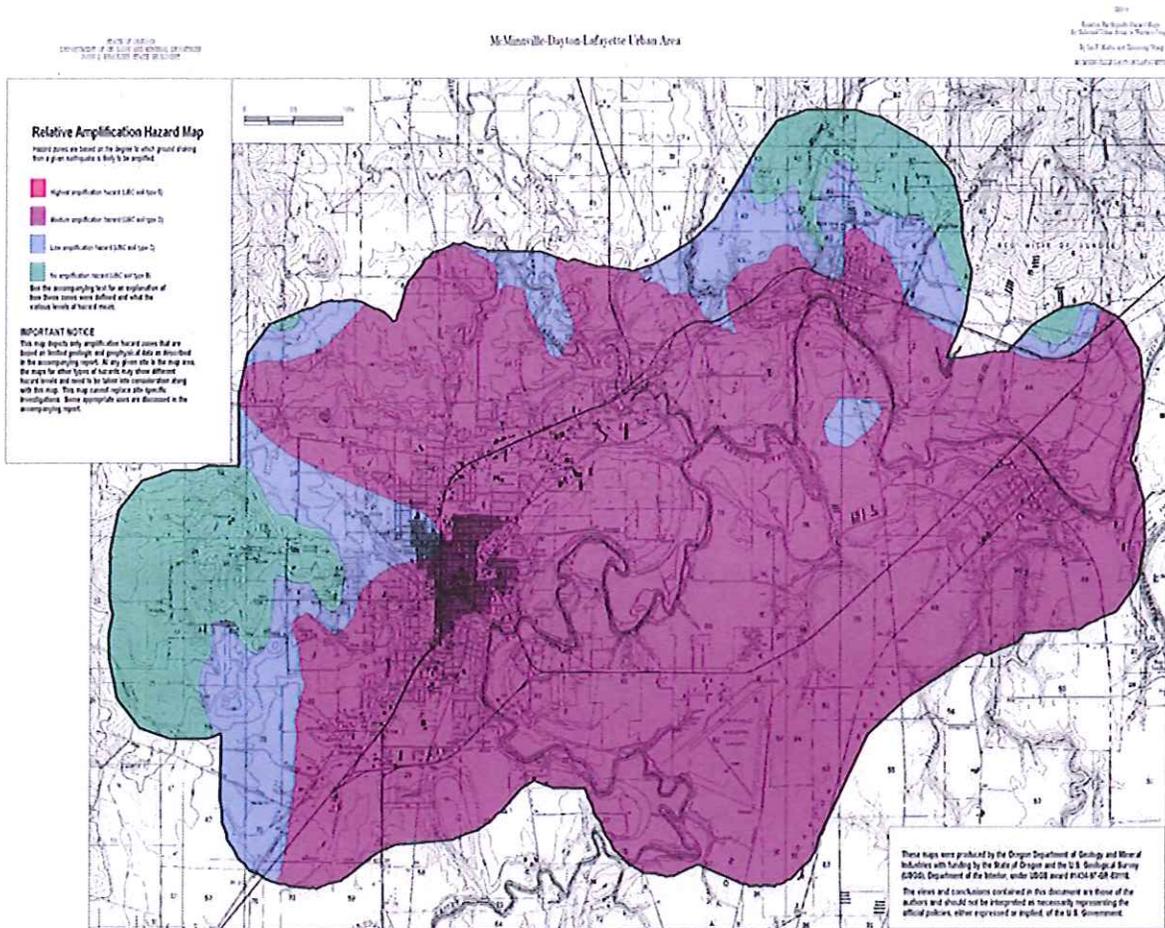


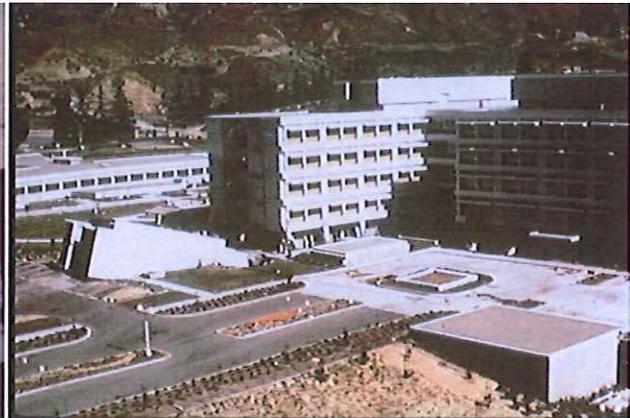
Figure 5. Relative seismic ‘Amplification Hazard Map’ for the McMinnville-Dayton-Lafayette area after Madin and Wang (1999b). RL is just southwest of ‘Medium Amplification Hazard’ Zone along Highway 18 (lower left). Note that most of the medium hazard zone as defined by Madin and Wang (1999b) includes geologic materials along both sides of the South Yamhill River. Given that RL is adjacent to the South Yamhill River indicates that geologic conditions are similar with those in the seismic amplification map designated as having a medium potential for seismic amplification.

This type of phenomena is documented in earthquake literature. Three such occurrences are identified here but there are many other similar cases described in publication:

- 1) Olive View Hospital which was built to withstand earthquake shaking but was destroyed by foundation failure during the February 9, 1971 San Fernando (California) earthquake of magnitude = 6.6 (Photos 3 and 4; Photos 5 and 6 - Pages 25);
  - 2) Cypress Viaduct freeway structure of Interstate 880, as an approach to the Bay Bridge from Oakland, was built to withstand earthquake shaking but was destroyed during the October 17, 1989 magnitude = 6.9 Loma Prieta (California) earthquake (also known as the 'Quake of 89' and 'World Series Earthquake') and killed 42 people (Photos 7 and 8 - Page 26);
  - 3) And from a more personal experience, Don Johnson Ranch strong-motion instrumentation site (instrumented by the California Strong-Motion Instrumentation Program for which I worked as the Program Engineering Geologist) where, during numerous seismic events, 0.4g - 0.5g PGAs were generated from only magnitude ~4 aftershocks from the August 1, 1975 Oroville, California earthquake.
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**Photo 3.**



**Photo 4.**

**Photos 3 and 4.** Views of catastrophic foundation failure of the then newly built Olive View Hospital (less than one-month old) from the February 9, 1971 San Fernando (California) earthquake (magnitude = 6.6). The hospital was seismically engineered to resist earthquake shaking/damage. Note that the building itself did not 'come apart' or collapse (i.e., pancake) from shaking but suffered total foundation failure as displayed in Photo 3 which also shows that the final catastrophic seismic ground motion was moving from left to right in the photo. Three of four external stairways separated from the building and collapsed to the ground (Photo 4); the one stairway that did not completely pull away and collapse is shown to the left-center in Photo 3. The hospital was sited on weakly consolidated geologic materials that comprised the foundation which overlies more indurated geologic materials at depth. Site-specific seismic wave amplification is deemed responsible for the damaging ground motion that destroyed this structure (Perry Ehlig, 1972, personal communication). Photos from USGS archives (1971).

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**Photo 5**



**Photo 6**

**Photos 5 and 6.** Close-up view of Olive View Hospital foundation damage showing severe column failure from vertical and horizontal accelerations that exceeded structural integrity of supports columns. Note support column in Photo 5 that totally failed and exposed internal structural reinforcing-bar (Re-bar); failure of this support column caused strain that propagated to second floor of building to also damage the structure (Photo 6). Photos after Kachadoorian and from USGS archives (1971).

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As a comparison for MMI and associated PGAs to be expected for various magnitude earthquakes refer to data in Appendix II and Appendix V (provides for global earthquake data). Appendices II and V clearly show that PGAs greater than the 0.415g, as proposed by Sharma (2011b), are common for earthquakes of magnitude < 7; in addition, such earthquakes may be expected for generating MMI values of XIII and above. Also, MMI values of XIII and greater are to be expected for many seismic events of magnitude = 6 if site effects are considered which could provide for seismic amplification or seismic wave focusing/directivity. It is a given that the pending Cascadia earthquake will generate MMI values of XIII-XII with PGAs as reflected for these events displayed in Appendices II and V (i.e., much greater than 1g for maximum PGAs).

Examples of earthquake damage and loss of life as cited in 1) Figure 4, 2) the three examples describing seismic wave amplification (above), 3) visual damage as shown in Photos 1-8, and 4) PGA data correlated with MMI in Appendices II and V, should be compared with the suggested 0.415g PGA data as provided by Sharma (2011b) for RL. In addition, examples in



Photo 7



Photo 8

**Photos 7 and 8.** View of catastrophic damage to Cypress Viaduct Structure of I-880: Freeway Approach to Bay Bridge from Oakland, California shown in aerial view (Photo 7) and ground view (Photo 8). The upper deck of the Cypress Viaduct, as the freeway approach to the Bay Bridge from Oakland, collapsed (pancaked) during the 1989 Loma Prieta earthquake, subsequently killing 42 people. Note that foundation piers resisted earthquake shaking and did not totally fail (Photo 7 and 8). At least two properties of the Earth's crust conspired to cause this collapse: 1) the structure was built on loose soils that shook much more strongly than surrounding regions which were on stronger ground, and 2) variations in the thickness of the Earth's crust between the epicenter of the Loma Prieta earthquake in the Santa Cruz Mountains and Oakland actually focused energy toward Oakland and downtown San Francisco (Brocher, 2005). Photos from USGS archives (1989b).

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the Appendices should be used by DEQ to provide for addressing design criteria regarding the proposed MSE Berm, and seismic evaluations as they apply to the continued operation of RL. Even if a Cascadia earthquake of magnitude ~9 is disregarded, there appears to be a significant discrepancy involved with the suggested 0.415g PGA of Sharma (2011b) and the history, shaking reality, damage caused, and loss of life by 'historical' moderate- to strong-magnitude earthquakes in California and the Pacific Northwest. It is noted that the geologic settings between California, Oregon, and Washington for referenced earthquakes are very similar and may easily be equated as geologically the same for the near-surface in all impacted areas, thus supporting the suggested potential for seismic wave amplification at RL.

It is further suggested that additional loading to RL foundation materials adds to a facility that is already 'at risk' for seismic failure. Foundation materials underlying RL, due to inherent geologic site effects, are a candidate for liquefaction in ANY seismic event, even if the magnitude is ~5.0; this should be especially a concern if the epicenter is local to the site. The referenced scenario for 'seismic wave amplification' during an earthquake at RL, again

well-documented in literature (see, for example, Wong and others, 1993; Madin and Wang, 1999b), is interpreted to be unavoidable.

**RECOMMENDATION:**

DEQ should thoroughly reference acceleration data in Appendices II and IV and consider how these data correlate with RL. DEQ should also consider that geologic site effects underlying RL (i.e., unconsolidated sediments overlying bedrock-type geologic materials) should probably influence seismic design criteria. Referenced site effects should also be interpreted to have the potential to increase PGA at RL. An increase in PGA would provide for sustained ground and structural motion and thereby subsequent structural displacement and potential structural damage, or failure, during seismic events.

DEQ should consider that earthquake shaking at RL, during future seismic events, has the potential to create a much greater risk for the landfill than that proposed by WMI. This is due to the pending exposure to a Cascadia earthquake and possible foundation liquefaction that may be enhanced from amplification of seismic wave energy caused by local geologic site effects. DEQ should also consider this scenario by reviewing historic earthquakes of magnitude < 7, that have caused billions of dollars in structural damage, as well as taken many lives due to structural collapse.

It is proposed that DEQ request WMI to install a “strong-motion accelerograph” on-site that is permanently affixed to undisturbed ground and positioned away from structures that could influence motion readings. This accelerograph would measure strong earthquake ground motion during seismic events. Strong-motion accelerometer readings from the proposed accelerograph would provide for valuable engineering data to analyze ground accelerations, including PGA, as well as velocities and displacements involved with earthquake motion. Data from such an accelerograph would be most beneficial to seismic engineering concerns, especially if RL sustained damage from an earthquake event.

**SUMMARY CONCLUSION AND RECOMMENDATION:**

It is suggested that DEQ review and address the above ‘C&Rs’ to assist with resolving data deficiencies and needs at RL. In addition, DEQ should also refer to the published record of ‘historic and documented’ earthquakes, the Appendices in this Letter, references that describe seismic wave amplification, existing liquefaction data, and liquefaction data to be collected in the future. The many scientific investigators, who have compiled extensive documentation regarding impacts of earthquakes to engineered structures and associated loss of human life, should not be ignored. To not consider these references and associated data would be nothing more than regarding the published record as extraneous and un-needed information for the purpose of important decision making.

The February 2011 ‘Christchurch earthquake’ in New Zealand, which was only a magnitude = 6.3 event, generated a PGA of 2.2; and, the March 2011 ‘Tohoku earthquake’ in Japan, of magnitude = 9, generated a PGA of 2.7 (refer to Appendix V). These data have fostered renewed interests in seismic engineering. From these devastating events, geologists and civil, structural, and seismic engineers are reassessing previous engineering assumptions about the next Cascadia earthquake that is forecast to impact the Pacific Northwest, including Oregon.

The last Cascadia earthquake is dated at January 26, 1700 (Atwater, 1987) from the orphan Tsunami (i.e., no earthquake involved) that hit Japan on this date (Satake and others, 1996; Atwater and others, 2005). However, numerous Great Cascadia earthquakes have occurred during the last few thousand years (Adams, 1990; Atwater, 1996; Griggs, 2011). Given that the last Cascadia earthquake was 312-years ago, stress has been accumulating along the Cascadia subduction zone and building seismic energy for a release of strain that will cause the next major devastating event. MMI values of IX-XII should be expected from the pending Cascadia earthquake.

Ashford, (2012) has placed a frequency of 300-years between some Cascadia earthquakes which in a time-perspective, places Oregon within the window for another great Cascadia event. Goldfinger and others, (2012), who studied submarine turbidites off the Oregon coast, forecast the probability for a segmented rupture of the “full or nearly full margin” of the Cascadia subduction zone at 7- to 12-percent within the next 50-years. In addition, a time-dependent failure analyses by Goldfinger and others (2012) indicates that by the year 2060, Cascadia will have exceeded ~27-percent of all Holocene earthquake recurrence intervals for the northern margin of the subduction zone. A full-margin rupture would most definitely generate an earthquake of great- or extreme-magnitude. As for the southern margin of the Cascadia subduction zone, which extends from southern Oregon to northern California, Goldfinger and others (2012) place a 37- to 42-percent chance for this area experiencing an earthquake in the next 50-years.

Due to public safety concerns, structures in the Pacific Northwest that were previously considered acceptable for seismic engineering are now being reevaluated for their resistance to earthquake shaking, especially during magnitude > 7 events. With renewed considerations for seismic design criteria during a Cascadia earthquake, engineered structures, including those comprised of earthen materials such as the proposed MSE Berm at RL, should now be reconsidered for design engineering respective to concerns for seismic stability during earthquake shaking, especially strong shaking that lasts up to a minute or more.

Decisions made by DEQ, for RL and all other environmental issues, should focus on addressing the significant and total impacts that a Cascadia earthquake could cause to the financial, environmental, human, and industrial systems of supply and demand in Oregon. For the future, DEQ should fully and completely analyze all technical issues and data for RL respective to completeness and total “accuracy and precision.” Decisions made by DEQ today, in light of new geologic and foundation engineering, along with updated

seismic design information from recent global earthquakes, will forever impact the citizens of Yamhill County and the State of Oregon.

After reflecting on the information provided thus far in this Letter respective to Photos 1-8, Figures 2-4, Appendices I, II, III, and V, and especially the fact that a local earthquake has occurred in the McMinnville area in the past (i.e., April 2, 1896; see also, Appendix III), DEQ should ask of itself and answer a few important questions that should and need to be answered prior to any expansion of RL:

- 1) If earthquakes with magnitudes  $< 7$  have caused the incredible amount of structural damage and loss of life as illustrated in Photos 1-8, Figure 4, and Appendix V, even to structures seismically engineered to be subjected to dynamic seismic forces, what would happen to RL if it were subjected to earthquake shaking from a seismic event of magnitude  $< 7$ ? Or, from a seismic event of magnitude  $\sim 9$ ? Given that geologic foundation materials underlying RL are not yet fully characterized for their potential to liquefy, and that the landfill itself has no significant engineered shear support or strength, should also be considered to answer this question.
- 2) Is the continued use of RL, and the proposed expansion of RL waste capacity, really worth the price and risk for an already 'at risk' landfill in view of historically documented examples for extensive structural damage and loss of life from many earthquakes with magnitudes  $< 7$ ? Or, from a Cascadia earthquake of magnitude  $\sim 9$ ?
- 3) Irrespective of magnitude  $< 7$  earthquakes, what will be the devastation at RL due to seismic shaking, and possible extreme foundation liquefaction and failure, from a Cascadia or Cascadia-type earthquake that is 'a given' to impact the site at some time in the future?
- 4) What will be the environmental impact(s) if the RL foundation endures seismic liquefaction and waste and/or leachate is moved by failure of the landfill into the South Yamhill River?
- 5) Who will sign off at DEQ for the proposed expansion plans at RL and be willing to take the chance of 'beating USGS-forecasted odds' of pending seismic events for which RL is exposed, especially considering data provided in Figures 3, 4, and 5 and Appendices II and V. The potential for loss of life also needs to be considered in the answer provided by DEQ?

Lastly, DEQ should always be aware that difficult decision making and often difficult answers to important questions are the main part of professionalism and professional ethics. Citizens of the State of Oregon depend on such ethics being utilized and exercised by DEQ.

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## APPENDIX I

### Modified Mercalli Intensity (MMI) Scale For Earthquakes

Modified Mercalli Intensity (MMI) Scale for measuring shaking from earthquake ground motion (abridged after, U.S. Geological Survey, 1989; Wong and Bott, 1995). The values are site-specific and commonly determined after seismic events by using surveys from postal zip code areas.

- I. Not felt except by a very few under especially favorable conditions.
- II. Felt only by a few persons at rest, especially on upper floors of buildings.
- III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may slightly rock. Vibrations occur that are similar to that of a passing truck. Duration of shaking must be estimated.
- IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sounds. Sensation the same as if a heavy truck struck the building. Standing motor cars noticeably rock.
- V. Felt by nearly everyone; many awakened from sleep. Some dishes and windows broken. Unstable objects overturned. Pendulum clocks may stop.
- VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of plaster falling. Possible slight damage to structures.
- VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary structures built to code with partial collapse possible. Damage great in poorly built structures. Chimneys, factory stacks, columns, monuments, walls fall. Heavy furniture overturned and changes of water levels in wells. Definitely noticed by persons driving vehicles.
- IX. Damage considerable in specially designed structures; damage great in structures built to code and partial collapse common; well-designed frame structures thrown out of plumb; buildings shifted off foundations. Conspicuous ground cracking and underground pipes broken.
- X. Some well-built structures destroyed; most masonry and frame structures with foundations destroyed. Railroad rails bent and deformed. Ground badly cracked; landslides common from river banks and steep slopes; sand and mud shifted with water slopped and splashed over banks.
- XI. Few, if any, masonry structures remain standing. Bridges destroyed. Railroad Rails greatly bent. Broad fissures in ground with underground pipelines destroyed; earth slumps and landslides common with land slips in soft ground.
- XII. Damage total. Lines of level and sight are distorted with earthquake waves visible on ground surface. Objects are thrown into the air.

## APPENDIX II

### Correlation of Acceleration and Velocity Data with the Modified Mercalli Scale

The United States Geological Survey (USGS) developed an Instrumental Intensity scale which maps peak ground acceleration (PGA) and peak ground velocity on an intensity scale similar to that noted in the Modified Mercalli Scale (MMI). These values are used to create shake maps by seismologists around the world.

| <b>Instrumental Intensity</b> | <b>Acceleration (g)</b> | <b>Velocity (cm/s)</b> | <b>Perceived Shaking</b> | <b>Potential Damage</b> |
|-------------------------------|-------------------------|------------------------|--------------------------|-------------------------|
| I                             | < 0.0017                | < 0.1                  | Not Felt                 | None                    |
| II-III                        | 0.0017 - 0.014          | 0.1 - 1.1              | Weak                     | None                    |
| IV                            | 0.014 - 0.039           | 1.1 - 3.4              | Light                    | None                    |
| V                             | 0.039 - 0.092           | 3.4 - 8.1              | Moderate                 | Very light              |
| VI                            | 0.092 - 0.18            | 8.1 - 16               | Strong                   | Light                   |
| VII                           | 0.18 - 0.34             | 16 - 31                | Very Strong              | Moderate                |
| VIII                          | 0.34 - 0.65             | 31 - 60                | Severe                   | Moderate to Heavy       |
| IX                            | 0.65 - 1.24             | 60 - 116               | Violent                  | Heavy                   |
| X+                            | > 1.24                  | > 116                  | Extreme                  | Very Heavy              |

## APPENDIX III

### Oregon-Washington-Northern California Earthquakes from 1892-2012 by Date of Occurrence

Earthquake History: 1892-2012 in Oregon, Washington, and Northern California. Note that most earthquakes are moderate-magnitude events (abridged after, Berg and Baker, 1963; Von Hake, 1976; Coffman and others, 1982; Wong and Bott, 1995). Modified Mercalli Intensities (MMI) are used to indicate the degree of damage and ground failure associated with shaking from each of these earthquakes. See Appendices I and II for a description of effects associated with MMI values.

February 3, 1892: a severe earthquake occurred near Portland causing buildings to sway and making terrified people rush into the street. The earthquake was felt strongly at Astoria and Salem with the total area affected covering about 26,000 square kilometers. A value of MMI: V is estimated for this event.

March 6, 1893: an earthquake caused some damage to buildings at Umatilla, OR. Due to its pre-1900 occurrence in a sparsely populated area, specific details on this earthquake and the shaking felt are lacking. The earthquake is estimated to have been MMI: VI-VII.

April 2, 1896: three earthquakes occurred in succession and awakened almost all residents in **McMinnville, OR**; no significant damage was reported but the earthquakes were felt as far away as Portland and Salem, OR. A value of MMI: VI is assigned to these events.

April 19, 1906: an earthquake occurred at Paisley, OR which awakened people and was followed by three aftershocks within 1.5 hours of the main shock. A value of MMI: V is assigned to this event.

May 18, 1915: a sharp local earthquake in the Portland area rattled dishes, rocked chairs, and caused some fright to local residents; three after-shocks were reported following the main shock. A value of MMI: V is assigned to this event.

April 14, 1920: a three-earthquake swarm was felt at Fort Klamath, OR. The earthquakes were probably centered in the vicinity of Crater Lake. A value of MMI: V is assigned to these events.

February 25, 1921: an earthquake in the area around Cascadia, OR was felt. A value of MMI: V is assigned to this event.

January 10, 1923: a rather strong earthquake occurred in an unsettled region of southern Oregon causing plaster to fall in buildings in Alturas, California; the tremor was felt strongly at Lakeview, OR and extended to the Klamath Falls area. A value of MMI: V is assigned to this event.

April 8, 1927: an earthquake in eastern Baker County, OR was strongly felt over a wide sparsely settled area in eastern Oregon with shaking described at Halfway, OR and Richland, WA. A value of MMI: V is assigned to this event.

(con't)

July 15, 1936: an earthquake of magnitude 5.75 occurred at 11:08 PM near the Washington and Oregon State line between Milton-Freewater, OR, and Walla Walla, WA causing wide-spread damage in the local two-state area and adjacent Idaho; ground cracking was observed about 6.5 kilometers west of Freewater and marked changes in the flow of well water were noted; many chimneys were damaged at the roof level in Freewater where plaster also was broken and walls cracked. Similar damage was reported at Umapine, OR. Total area affected was about 272,000 square kilometers with damage amounting to \$100,000. A value of MMI: VII is assigned for areas damaged by this event. There were numerous aftershocks up to November 17, 1936 and more than 20 moderate aftershocks occurred during the night of the main event; the strongest aftershocks occurred on July 18 and August 4 and 27. A value of MMI: V is assigned for these aftershocks.

December 29, 1941: an earthquake in the vicinity of Portland caused a downtown display window to shatter and a few other windows to be broken in other parts of the city. Shaking was also strongly felt at Hillsboro, Sherwood (where many residents were frightened), and Yamhill, and extended into Washington with minor damage reported in Vancouver and Woodland; the area of shaking covered about 13,000 square kilometers. A value of MMI: VI is assigned for areas damaged by this event.

April 13, 1949: a major earthquake of magnitude 7.0 occurred near Olympia, WA causing eight deaths and an estimated \$25 million in property damage; shaking impacted a broad area around the city. In Oregon, widespread damage was observed and several injuries occurred at Astoria and Portland where values of MMI: VII-VIII are assigned to this event; at Clatskanie and Rainier, many chimneys twisted and fell and considerable damage was reported for brick and masonry structures. Focal depth of this earthquake was estimated to be slightly greater than normal which probably accounted for the wide-spread area shaking which included 388,000 square kilometers. A value of MMI: VIII is assigned for areas damaged by this event.

December 15, 1953: an earthquake in the Portland area cracked chimneys and caused slight damage to fireplace tile with additional reports of plaster cracking in Roy, OR, and Vancouver, WA. Shaking was reported to cover an area about 7,700 square kilometers. A value of MMI: VII is assigned for areas damaged by this event.

November 16, 1957: an earthquake in northwestern Oregon caused damage in Salem, OR frightening all city residents and causing some plaster cracking in West Salem. The earthquake was felt over an area of 11,600 square kilometers. A value of MMI: VI is assigned for areas damaged by this event.

August 18, 1961: an earthquake of magnitude 4.5 occurred just south of the November 16, 1957 epicenter (probably an aftershock) near Albany and Lebanon, OR where it was felt by all residents; minor damage was caused in the two cities which included house chimneys toppled and cracked plaster; shaking was felt as far away as Cowlitz County, WA and covered a region of 18,000 square kilometers. A value of MMI: VI is assigned for areas damaged by this event.

(con't)

November 7, 1961: another moderately strong earthquake in the Portland area, possibly an aftershock from the August 18 event, cracked plaster, toppled a chimney, and broke windows and lights. The earthquake was felt throughout northern Oregon and southwestern Washington over an area of 23,000 square kilometers. A value of MMI: VI is assigned for areas damaged by this event.

November 6, 1962: an earthquake in the Portland, OR-Vancouver, WA area of magnitude 5.2-5.5 caused some property damage. A value of MMI: VII is assigned for areas damaged by this event.

March 7, 1963: an earthquake in the area of West Salem and Salem, OR of magnitude 4.6 caused some property damage. A value of MMI: V is assigned for areas damaged by this event.

December 27, 1963: an earthquake in the Vernonia, OR area caused minor damage in the epicentral area. A value of MMI: VI is assigned for areas damaged by this event.

May 26-June 11, 1968: an earthquake swarm near the Oregon-California border continued daily from May 26-June 11 and was mostly felt in the Adel, OR - Fort Bidwell, CA area. Some ground fissures opened in Bidwell Creek Canyon where old chimneys fell or were cracked and part of a rock cellar wall also fell. Shaking was reported over an area of about 18,000 square kilometers. A value of MMI: VI is assigned for areas damaged by this event.

April 13, 1976: an earthquake in the remote area of Deschutes Valley, OR of magnitude 4.8 caused minor damage to structures. Values of MMI: V-VI are assigned for areas damaged by this event.

March 25, 1993: an earthquake in the Scotts Mills, OR area, south of Portland, of magnitude 5.6 caused \$28 million in property damage and was felt over a large area in northern Oregon. A value of MMI: VII is assigned for areas damaged by this event.

September 21, 1993: two earthquakes in the Klamath Falls, OR area with magnitudes of 5.9 and 6.0 impacted wide area causing two deaths and \$7.5 million in property damage. An assigned aftershock from this event of magnitude 5.1 occurred on December 4, 1993. Values of MMI: VII-VIII are assigned for areas damaged by this event.

February 28, 2001: an earthquake termed the Nisqually, WA event of magnitude 6.8 caused one death and generated \$400 million in property damage, especially to the flight tower at Sea-Tac International Airport. Values of MMI: VII-VIII are assigned for areas damaged by this earthquake.

July 21, 2012: four small earthquakes in the Portland area occurred between Thursday (7/19) and Saturday (7/21) with no damage reported. These events indicate the Earth's crust is locally being subjected to strain great enough for causing rocks to fail by brittle fracture.

**APPENDIX IV**  
(guidance after McJunkin, 2003)

Portland Cement

- One (1) Sack of Portland Cement (Type I-II; A-B) Weighing 94-Pounds
- 5.2-6.0 Gallons Potable Water (5.5 to 5.75 Gallons is recommended)

If the Portland cement slurry is mixed at the job site, the “metered or measured” amount of water should be placed in a mixing container. While vigorously blending and agitating the water with a high-shear mixing device, cement should be slowly added to the water and blended to a lump-free creamy slurry using the high-shear mixing device. Venturi mixing devices work very well for blending cement into water.

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Portland Cement and Sand  
(Preferable)

- One (1) Sack of Portland Cement (Type I-II; A-B) Weighing 94-Pounds
- 5.2-6.0 Gallons Potable Water (5.5 to 5.75 Gallons Recommended)
- 100-200 Pounds Sand (Size #1/20 to 1C Annular for Well Seals; #30 for Well and Borehole Decommissioning)

If the Portland cement-sand slurry is mixed at the job site, the “metered or measured” amount of water should be placed in a mixing container. While vigorously mixing or agitating the water using a high-shear mixing device, cement should be slowly added to the water and blended to a lump-free creamy slurry. Sand should not be mixed into water prior to adding cement. Before adding sand, the cement slurry needs to be thoroughly hydrated and should have enough viscosity to maintain sand within the slurry to keep it from settling out of solution. Venturi mixing devices work very well for mixing cement into water and blending sand into the slurry.

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Portland Cement and Bentonite

- One (1) Sack of Portland Cement (Type I-II; A-B) Weighing 94-Pounds
- 5.2-6.0 Gallons Potable Water (5.5 to 5.75 Gallons Recommended) With an Additional 0.65 Gallons of Water for Each Pound of Bentonite Used
- 2-5 Pounds of “Accurately Weighed” Pure Bentonite (Non-Beneficiated)

If the Portland cement-bentonite slurry is mixed at the job site, the “metered or measured” amount of water should be placed in a mixing container. While vigorously mixing or agitating the water using a high-shear mixing device, an “accurately weighed amount” of pure bentonite that contains no additives, polymers, or extenders (i.e., non-beneficiated) should be slowly added to the water and blended to a lump-free watery solution. The bentonite-water solution should be vigorously mixed using a high-shear mixing device until the bentonite is thoroughly hydrated and the slurry has a very light creamy consistency. Cement should not be mixed into water prior to making the bentonite-water solution. After the bentonite is thoroughly hydrated, cement should be slowly added to the bentonite-water solution and the mix blended again using a high-shear mixing device to a lump-free creamy consistency. Venturi mixing devices work very well for mixing cement, and especially bentonite, into water.

## APPENDIX V

### Notable Recent World-Wide Earthquakes Listing Acceleration Data

Data (modified and abridged from original figure) for notable recent world-wide earthquakes indicating PGAs (single direction and maximum recorded), magnitude, depth, fatalities, and earthquake name. Note that references for data are provided for each earthquake event (assigned by number) at the end of the data set. Earthquake PGAs should be compared to the 0.415g acceleration proposed by Sharma (2011b) for RL when considering the occurrence of a local earthquake(s) as well as a potential > 1g+ PGA from the pending Cascadia earthquake.

| PGA: Single Direction<br>(maximum recorded) | Magnitude          | Depth                | Fatalities             | Earthquake   |
|---|--------------------|----------------------|------------------------|--|
| 2.7g <sup>[1]</sup>                         | 9.0                | 30 km <sup>[2]</sup> | >15,000 <sup>[3]</sup> | 2011 Tohoku, Japan Earthquake and Tsunami                  |
| 2.2g <sup>[4][5]</sup>                      | 6.3 <sup>[4]</sup> | 5 km                 | 185                    | 2011 (February) Christchurch, New Zealand Earthquake       |
| 2.13g <sup>[4][6]</sup>                     | 6.4                | 6 km                 | 1                      | 2011 (June) Christchurch, New Zealand Earthquake           |
| 1.7g <sup>[7]</sup>                         | 6.7                | 19 km                | 57                     | 1994 Northridge, California Earthquake                     |
| 1.26g <sup>[8][9]</sup>                     | 7.1                | 10 km                | 0                      | 2010 Canterbury/Christchurch, New Zealand Earthquake       |
| 1.01g <sup>[10]</sup>                       | 6.6                | 10 km                | 11                     | 2007 Chuetsu, Japan (offshore) Earthquake                  |
| 1.01g <sup>[11]</sup>                       | 7.3                | 8 km                 | 2,415                  | 1999 Jiji, Taiwan Earthquake                               |
| 1.0g <sup>[12]</sup>                        | 6.0                | 8 km                 | 0                      | 2011 (December-XMAS) Christchurch, New Zealand Earthquakes |
| 0.8g  | 6.8                | 16 km                | 6,434                  | 1995 Kobe, Japan Earthquake                                |
| 0.78g <sup>[13]</sup>                       | 8.8                | 23 km                | 521                    | 2010 Chili Earthquake                                      |
| 0.6g <sup>[14]</sup>                        | 6.0                | 10 km                | 143                    | 1999 Athens, Greece Earthquake                             |
| 0.5g <sup>[15]</sup>                        | 6.4                | ----                 | 612                    | 2005 Zarand, Iran Earthquake                               |
| 0.5g <sup>[7]</sup>                         | 7.0                | 13 km                | 92,000-316,000         | 2010 Port-au-Prince, Haiti Earthquake                      |
| 0.438g <sup>[16]</sup>                      | 7.7                | 44 km                | 28                     | 1978 Miyagi, Japan Earthquake                              |
| 0.367g <sup>[17]</sup>                      | 5.2                | 1 km                 | 9                      | 2011 Lorca, Spain Earthquake                               |

(con't)

|                              |     |       |                       |                                 |
|------------------------------|-----|-------|-----------------------|---------------------------------|
| 0.25g – 0.3g <sup>[18]</sup> | 9.5 | 33 km | 1,655 <sup>[19]</sup> | 1960 Valdivia, Chili Earthquake |
| 0.24g <sup>[20]</sup>        | 6.4 | ----  | 628                   | 2004 Morocca Earthquake         |

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(con't)

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## Liquefaction Review Paper For Riverbend Landfill: Suspect Geologic Foundation Materials Identified

**February 11, 2013**

*(previous versions superseded)*

*by:*

Richard D. McJunkin  
Professional Geologist (CA #3605)  
Certified Engineering Geologist (CA #1280)  
Certified Hydrogeologist (CA #675)

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This 'Liquefaction Review Paper' (Paper) For Riverbend Landfill identifies geologic foundation materials 'suspect' for being **liquefiable**<sup>1</sup> from seismic loading. These materials underlie the proposed MSE Wall/Berm and are clearly identifiable in drilling log exploration boreholes GT10, GT11, and GT12. These boreholes were installed to characterize geologic foundation materials for the MSE Wall/Berm. 'Suspect' soil samples mostly consist of unconsolidated fine-grained sand/gravel. Some samples are so 'unconsolidated and lacking apparent **cohesion**,<sup>2</sup> that they fell and were lost from the sampler as it was being retrieved upward (i.e., no sample recovery). *Wood fragments* are identified in numerous samples at depths of 55- to 65-feet below-ground-surface (bgs) and indicate that the 'Cut and Fill' Mass-Balance of the South Yamhill River system is very dynamic with changes subject to occurring quickly and most probably, during flood events.

Fine-grained sands and gravels with +/- silt that lack cohesive properties, as identified in the drilling logs, are potentially very subject to seismic liquefaction and warrant further study on an individual basis. To fully identify potentially liquefiable suspect geologic materials requires that exploration drilling install boreholes using **continuously-sample/core**<sup>3</sup> drilling from surface to total depth drilled (totally), as Standard Practice.

**Significant Issue:** Considering that the Riverbend Landfill geologic logs are correct as presented, they clearly show that in each exploration borehole less than one-half (45-50-percent) of the geologic material drilled was thoroughly characterized by obtaining continuous samples/cores. Therefore, the extent of suspect liquefiable geologic material is fully uncharacterized in 50-55-percent, or the majority, of each exploration borehole. Additional 'continuous-sample/core' drilling is necessary to provide for data collection that will verify adequate foundation support is present, or not present, for the MSE Wall/Berm. Total depth of proposed exploration boreholes should be to 'at least' 100-feet bgs. A depth of 100-feet bgs is personally interpreted as reasonable for the occurrence of liquefaction during a 'Massive' M~9 Cascadia Subduction Zone Earthquake; this interpretation is also supported by Professor Scott Burns, Ph.D., Professor, Portland State University (2012, personal communication).

**Interpretation:**

Some, if not most, of the 'suspect' sandy geologic intervals identified in exploration boreholes GT10, GT11, and GT12 (shown below) are subject to seismic liquefaction, especially for those sandy intervals where the sample was lost from the sampler and NOT RECOVERED. If the identified 'suspect' geologic materials are argued to not be liquefiable, the question remains for the ~55-percent of geologic materials per borehole that were, and remain, totally uncharacterized. Due to this significant uncertainty, MSE Wall/Berm foundation characterization is (absolutely) incomplete for identifying 'suspect' liquefiable fine-sand and fine-gravel in the subsurface.

**Conclusion:**

Using only the existing drilling data as adequate foundation characterization for the MSE Wall/Berm would be essentially "derelict geologic practice" and to argue otherwise, is technically unsupported. Resolving seismic stability concerns for engineered structures such as the MSE Wall/Berm are especially important; therefore, using only the present subsurface data, any approval for MSE Wall/Berm 'full foundation characterization' by DEQ is at this time premature and unacceptable.

**Recommendations:**

Continuous-sample/core drilling is needed to complete characterization of the 'geologic foundation,' for the MSE Wall/Berm at Riverbend Landfill, especially to address liquefaction concerns. All exploration drilling for characterization needs to be to 'AT LEAST' 100-feet bgs to fully characterize concerns for seismic liquefaction in the geologic foundation of Riverbend Landfill.

The threat of seismic liquefaction in the foundation of Riverbend Landfill needs to be further addressed because at the present time, it is less than 50-percent complete with more geologic materials uncharacterized than characterized. Fine-sands and gravels identified as 'suspect' for seismic liquefaction in the exploration boring logs (listed below) need further investigation. Continuous sampling/coring to a depth of 100-feet bgs is required to fully provide for satisfactory geologic characterization and to address the threat of seismic liquefaction in the foundation of Riverbend Landfill.



- <sup>1</sup> Liquefaction (Liquefiable): Sudden decrease in shear strength of a soil commonly from seismic shock/strain loading; process involves increasing pore water pressure on individual grains thereby reducing soil shear strength to that of a semi-liquid
- <sup>2</sup> Cohesion: Ability for individual sand grains in a soil sample to 'stick' together; directly related to shear strength where low-shear generally corresponds with low-cohesion.
- <sup>3</sup> Continuous Core: The drilled 'round center' of an exploration borehole including ALL geologic materials penetrated by drilling, from top to bottom of the borehole; collected as a cylindrical sample with sample loss from collection processes at a minimum; samples/cores should be preserved for long-term storage in core boxes.

## Identified: Suspect 'Liquefiable' Geologic Materials From Seismic Loading

Fine-sands and fine-gravel 'suspect' for liquefaction from seismic loading are listed in the table below by: 1) drill log/borehole number, 2) depth, 3) sample number, and 4) sample description. Note the number of sample intervals identified as 'UNKNOWN' because the geologic material fell and were lost from the sampler as it was being retrieved upward. This characteristic is a strong indication for the geologic material being sampled (i.e., fine-sand/gravel) to have undergone liquefaction during insertion of the sampler and thus 'flowed from the sampler' during its upward retrieval. Each 'suspect' stratum identified, as well as the undrilled and unknown geology to a depth of 'at least' 100-feet bgs, warrant further geologic characterization.

### GT10 Drilling Logs

| <u>Drill Log</u> | <u>Sample Location</u><br>(depth) | <u>Sample Number</u> | <u>Sample Description</u>                                                                   |
|------------------|-----------------------------------|----------------------|---------------------------------------------------------------------------------------------|
| GT10-04          | 44-ft                             | 4-19                 | Fine-Sand: Dense, slightly friable.                                                         |
| GT10-04          | 57.5-ft                           | 4-24                 | <b>UNKNOWN: NO SAMPLE RECOVERY.</b>                                                         |
| GT10-04          | 62-ft                             | 4-26                 | Silty Sand: Fine- to medium- grained sand ~70%; some <i>wood fragments</i> .                |
| GT10-04          | 66.7-ft                           | 4-27                 | Silty Fine-Sand: Grades to fine- to medium-grained sand = 80%; some <i>wood fragments</i> . |
| GT10-5           | 26-ft                             | 5-8                  | Sand & Gravel w/ 40% fine- to coarse-grained sand.                                          |
| GT10-5           | 35-ft                             | 5-10                 | Gravelly Sand: Fine- to medium-grained sand = 90%.                                          |
| GT10-5           | 40-ft                             | 5-11                 | Sandy Gravel: Fine-sand = 60%.                                                              |
| GT10-5           | 45-ft                             | 5-12                 | Gravelly Sand: Fine- to medium-grained sand = 80%.                                          |

### GT11 Drilling Logs

|         |       |      |                                                                                       |
|---------|-------|------|---------------------------------------------------------------------------------------|
| GT11-01 | 45-ft | 1-10 | Sandy Gavel: Fine- to medium-grained sand ~ 20-30%.                                   |
| GT11-01 | 50-ft | 1-11 | Gravelly Sand: Medium- to coarse-grained sand = 70%.                                  |
| GT11-01 | 55-ft | 1-12 | Gravelly Sand-Sandy Gravel: Fine- to medium-grained sand = 80%.                       |
| GT11-01 | 60-ft | 1-13 | Gravelly Silty Sand: Fine- to medium-grained sand ~ 40%; some <i>wood fragments</i> . |

(GT11 Log con't)

| <u>Drill Log</u> | <u>Sample Location</u><br>(depth) | <u>Sample Number</u> | <u>Sample Description</u>                                                                                                |
|------------------|-----------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------|
| GT11-02          | 60-ft                             | 2-13                 | Gravelly Sand: Fine- to medium-grained sand = 40%.                                                                       |
| GT11-03          | 55-ft                             | 3-17                 | <b>UNKNOWN: NO SAMPLE RECOVERY;</b><br><u>push-only for 12-in sample penetration.</u>                                    |
| GT11-03          | 60-ft                             | 3-18                 | Clayey Sand: Fine- to medium-grained sand = 80%.                                                                         |
| GT11-04          | 47.9-ft                           | 4-13                 | Sandy Silt: <u>Very soft</u> , fine grained sand ~30%;<br>50-54-ft = <u>ZERO BLOW COUNTS (push only).</u>                |
| GT11-04          | 50-ft                             | 4-14                 | Sandy Silt: <u>Very soft</u> , fine-grained sand; <u>sampler inserted by rod weight only = lacking cohesion.</u>         |
| GT11-04          | 55-ft                             | 4-16                 | Sandy Gravel: Fine- to medium-grained sand = 70%.                                                                        |
| GT11-05          | 55-ft                             | 5-17                 | Silty Fine-Sand: Fine- to medium-grained sand = 60%.                                                                     |
| GT11-05          | 60-ft                             | 5-17                 | Clayey Sand: Fine- to medium-grained sand = 80%.                                                                         |
| GT11-06          | 55-ft                             | 6-19                 | Silty Fine-Sand: Sand = 80%; <i>wood fragments.</i>                                                                      |
| GT11-06          | 60-ft                             | 6-20                 | Clayey Gravel: Fine- to coarse-grained sand/gravel = 70%.                                                                |
| GT11-07          | 42.5-ft                           | 7-15                 | <b>UNKNOWN: NO SAMPLE RECOVERY.</b>                                                                                      |
| GT11-07          | 45-ft                             | 7-16                 | <b>UNKNOWN: NO SAMPLE RECOVERY.</b>                                                                                      |
| GT11-07          | 55-ft                             | 7-19                 | Fine Sandy Silt: <u>Low plasticity sand to 40%;</u><br><u>sample catcher needed to retrieve sample = lacks cohesion.</u> |

#### GT12 Drilling Logs

|          |         |       |                                     |
|----------|---------|-------|-------------------------------------|
| GT12-01A | 4.5-ft  | 1A-2  | <b>UNKNOWN: NO SAMPLE RECOVERY.</b> |
| GT12-01A | 7-ft    | 1A-3  | <b>UNKNOWN: NO SAMPLE RECOVERY.</b> |
| GT12-01A | 22.5-ft | 1A-7  | <b>UNKNOWN: NO SAMPLE RECOVERY.</b> |
| GT12-01A | 37.5-ft | 1A-11 | <b>UNKNOWN: NO SAMPLE RECOVERY.</b> |

(GT12-01A Log con't)

| <u>Drill Log</u> | <u>Sample Location</u><br>(depth) | <u>Sample Number</u> | <u>Sample Description</u>                                                                                              |
|------------------|-----------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------|
| GT12-01A         | 55-ft                             | 1A-15                | Sandy Gravel: Fine- to coarse-grained sand = 50%.                                                                      |
| GT12-01A         | 60-ft                             | 1A-16                | Silty Sand: Fine- to medium-grained sand = 80%.                                                                        |
| GT12-01A         | 65-ft                             | 1A-17                | Silty Sand: Fine- to medium-grained sand = 50%;<br>fine-gravel ~25%.                                                   |
| GT12-02A         | 45-ft                             | 2A-17                | Clayey Sand: Fine- to coarse-grained sand = 60%.                                                                       |
| GT12-02A         | 50-ft                             | 2A-14                | Silty Fine-Sand: Fine-grained sand = 80% and<br>identified as ' <u>loose</u> ' ( <u>suggests little/no cohesion</u> ). |
| GT12-02A         | 65-ft                             | 2A-17                | <b>UNKNOWN: NO SAMPLE RECOVERY.</b>                                                                                    |
| GT12-02A         | 66.5-ft                           | 2A-18                | Gravelly Sand: Fine- to medium-grained sand = 70%.                                                                     |
| GT12-03A         | 46.5-ft                           | 3A-15                | Sandy Clayey Gravel: Fine- to medium-grained<br>sand = 40%.                                                            |
| GT12-03A         | 55-ft                             | 3A-17                | Gravelly Sand: Fine- to medium-grained sand = 40%.                                                                     |
| GT12-03A         | 60-ft                             | 3A-18                | Gravelly Sand: Fine- to medium-grained sand ~ 40%.                                                                     |
| GT12-03A         | 65-ft                             | 3A-19                | Fine- to Medium-Sand: Predominantly fine-grained.                                                                      |
| GT12-03A         | 70-ft                             | 3A-20                | Silty Sand: Fine- to coarse-grained = 60%.                                                                             |
| GT12-04A         | 45-ft                             | 4A-13                | Fine- to Medium-Sand: <u>Low blow counts to drive<br/>and insert sampler.</u>                                          |
| GT12-04A         | 50-ft                             | 4A-14                | Gravelly Sand: Fine- to medium-grained sand = 80%.                                                                     |
| GT12-04A         | 55-ft                             | 4A-15                | Sandy Gravel: Fine- to medium-grained sand = 80%.                                                                      |
| GT12-04A         | 60-ft                             | 4A-16                | Sandy Gravel: Fine- to coarse-grained sand w/<br>fine gravel.                                                          |
| GT12-05A         | ~38-ft                            | 5A-10                | Silty Fine-Sand: Fine-grained sand ~ 70%.                                                                              |
| GT12-05A         | 40-ft                             | 5A-11                | Silty Fine-Sand: Fine-grained sand ~ 70%.                                                                              |
| GT12-05A         | 41-ft                             | 5A-11                | Gravelly Sand: Fine- to coarse-grained sand = 80%.                                                                     |
| GT12-05A         | 45-ft                             | 5A-12                | Gravelly Clayey Fine- to coarse-grained Sand ~ 20%.                                                                    |

(GT12-05A Log con't)

| <u>Drill Log</u> | <u>Sample Location</u><br>(depth) | <u>Sample Number</u> | <u>Sample Description</u>                                                                              |
|------------------|-----------------------------------|----------------------|--------------------------------------------------------------------------------------------------------|
| GT12-05A         | 50-ft                             | 5A-13                | Sandy Gravel: Fine- to medium-grained sand ~ 90%.                                                      |
| GT12-05A         | 55-ft                             | 5A-14                | Silty Fine-Sand: Fine- to coarse-grained sand ~ 70%.                                                   |
| GT12-05A         | 60-ft                             | 5A-15                | Gravelly Sand: Fine- to coarse-grained sand ~ 80%.                                                     |
| GT12-05A         | 65-ft                             | 5A-16                | Gravelly Sand: Fine- to coarse-grained sand ~ 80%; loose ( <i>little cohesion</i> ) w/ wood fragments. |
| GT12-05B         | 27.5-ft                           | 5B-8                 | Sandy Gravel: Fine- to coarse-grained sand ~ 60%.                                                      |
| GT12-05B         | 32-ft                             | 5B-9                 | Gravelly Sand: Fine- to medium-grained sand ~ 80%.                                                     |
| GT12-05B         | 36-ft                             | 5B-10                | Gravelly Sand: Fine- to medium-grained sand ~ 80%.                                                     |
| GT12-05B         | 40-ft                             | 5B-11                | Sandy Gravel: Fine- to medium-grained sand ~ 80%.                                                      |
| GT12-06A         | 42.5-ft                           | 6A-13                | Silty Fine-Sand: ~80%.                                                                                 |
| GT12-06A         | 43-ft                             | 6A-13                | Silty Sand: Fine- to medium-grained sand ~80% w/ some gravel.                                          |
| GT12-06A         | 50-ft                             | 6A-14                | Sandy Clayey Gravel: Fine- to medium-grained sand ~20%.                                                |
| GT12-06A         | 55-ft                             | 6A-15                | Sandy Gravel: Fine- to medium-grained sand = 30-40%.                                                   |
| GT12-06A         | 56-ft                             | 6A-15                | Gravelly Sand: Fine- to medium-grained sand ~ 20%.                                                     |
| GT12-06A         | 60-ft                             | 6A-16                | <b>UNKNOWN: NO SAMPLE RECOVERY.</b>                                                                    |
| GT12-06A         | 61.5-ft                           | 6A-17                | Silty Sand: Fine-sand; ~20% gravel.                                                                    |
| GT12-6B          | 26.5-ft                           | 6B-7/8               | Sandy Gravel: Fine- to medium-grained sand = 70%                                                       |
| GT12-6B          | 30-ft                             | 6B-9                 | Sandy-Clayey Gravel: Fine- to coarse-grained sand = 20%.                                               |
| GT12-6B          | 35-ft                             | 6B-10                | Sandy Gravel: Fine- to medium-grained sand = 70%.                                                      |
| GT12-6B          | 40-ft                             | 6B-11                | Gravelly Sand: Gravel matrix = 70% fine- medium-grained sand.                                          |
| GT12-6B          | 41-ft                             | 6B-11                | Gravelly Sand: Fine- to medium-grained sand = 80%.                                                     |

## Stephanie Armstrong

---

**From:** Mike Brandt  
**Sent:** Monday, November 24, 2014 5:26 AM  
**To:** 'Tommy Brooks' (tbrooks@cablehouston.com)  
**Cc:** Ken Friday; Stephanie Armstrong  
**Subject:** FW: Where's the beef?

FYI and for the record. mb

---

**From:** Ramsey McPhillips [<mailto:hortivangelist@mac.com>]  
**Sent:** Sunday, November 23, 2014 4:15 PM  
**To:** Mike Brandt  
**Subject:** Where's the beef?

Mike, couple things. One, I was not the individual who screamed when they left the community meeting the other night! I was leaving because I didn't see that I could provide anything constructive at that meeting. My anger at losing my farm comes off as destructive sometimes - So I left. Really nothing more than that. You quelled my fears that that meeting is not going to be a replacement for the common practice of public involvement and that it will not be used as an excuse to say I had my time to speak then for the record. "Da novo et al!"

But that's not why I'm writing. You asked us to give you reasons in advance that we see as stumbling blocks to the RBL application.

Where's the CLOMR? The first application was delayed because they had to provide a FEMA conditional letter of map revision for their build out plan. Remember, me at the counter furious that while I was running a countywide floodplain initiative the dump and county were remapping my flood property. That 2008 application, and thus the CLOMR were rejected and no longer are in play. However, this time Riverbend landfill proposes filling in some floodplain and reconfiguring some tributaries. I think I'm right? So, they need to do a new CLOMR before their application should be considered by the county. I think it is a serious "t" you have not crossed. Floodplain maps are county issues, not DEQ's responsibility. I'm telling you man, this time the egg DOES come before the chicken! At least that is how YC and RBL played it last time. One of the benefits of winning that court case was that the whole baby was thrown out with the bathwater. That includes the last CLOMR.

I contacted FEMA and ACOE and there is no pending CLOMR at Riverbend landfill. The LOMR that was issued in the recent past does not cover this new land development.

How can the County deem a floodplain app of this size "complete" without one?

My other issues will be over 215.269 blah blah which I will not have til the 4th.

Thanks for considering my understanding of this condition to proceed.

Ramsey  
McPhillips Farms  
Since 1862

Dear Mr. Brandt:

I am a resident of McMinnville, and I oppose the expansion of the Riverbend  
Landfill.

RECEIVED  
NOV 24 2014  
YAMHILL COUNTY PLANNING

Signed: David & Judy Edlin  
2452 SW Taylor Dr.  
McMinnville, OR  
97128

Planning Department  
Attention: Ken Friday  
McMinnville, Oregon 97128

REC-  
NOV 25 2014  
YAMHILL COUNTY PLANNING

Please enter this into the  
record for Riverbend  
Landfill Expansion Plan  
December 4th, 2014

A group of us fought several years in the early nineties against Sanifill making us a regional dump.

How our Commissioners could pass 87 acres, a mountain of garbage, back to exclusive farm use is beyond me. I'm not sure how Waste Management buys everyone off, but they do.

Our land connects with Waste Management land. I don't need to remind you of the many ways they've ruined our valley and the future damage that can happen. Remember, it leaked zinc into Yamhill River.

Waste Management piece meals-one expansion after another. Please vote "NO" on this expansion..



Helen Pritchett  
13550 SW Masonville Rd.  
McMinnville, Oregon 97128-8504

RECORDED  
NOV 25 2014  
PLANNING

Mr. Brandt,

In a very polite, but ineffectual letter earlier this year to the Yamhill County Commissioners regarding Riverbend Landfill, McMinnville Mayor Olson expressed hope that the implementation of "green" technology will begin sooner than later within the required seven year period. I have been passing by the dump for 18 years and have watched it grow exponentially. Waiting seven years—fewer—holding hearings, eating pizza, drinking Koolaid, etc. is too long to hope for a sea change in thinking from Waste Management. Over a period of a several years, everything Waste Management has assured us they would not do, they have done. They have been taking little steps, pretending to listen to the concerns of citizens who oppose the latest expansion, offering warm, fuzzy town meetings with free pizza, designing purposefully suggestive "green" graphics in their presentations in order to disguise their true character and intentions. All the while hiring PR people to obfuscate and lawyers to implement—one little step at a time—their intention to expand the dump *as long as we let them*. They own 600 acres. Why? I hope I don't live long enough to see a 600 acre, 200 foot high butte of garbage with a Hwy 18 tunnel through it. My affairs are in order. It sounds like exaggeration, but that's the potential, extrapolating from Waste Management's history and business practices. It is mind numbingly naive to think for one moment they wouldn't—couldn't!—continue down the roads we tax payers so graciously maintain for them. Enough.



The Mayor also stated that he has "grown increasingly concerned" and went on to summarize various legitimate objections to dump expansion, which would be more accurately described as *dire emergencies about to happen in the near future*. Emergencies from which McMinnville, Yamhill County, the State and Region could not recover for decades and millions of dollars. Not even counting the eventuality of an earthquake. (I particularly enjoyed Waste Management's attempt to make the subduction zone seem nearly twice as far away by giving the distance in kilometers instead of miles, in a dazzlingly condescending example of weasel-speak, typical of their strategies.) Waste Management claims—not to worry—that they have a state-controlled, \$12 million fund ready to use for 30 years to clean up the dump site, should it ever close. You will forgive my skepticism. When the time comes to pony up, they will resist for another 30 years, the \$12 million ending up in court. And DEQ, that Champion of Human Health and the Environment, will be right there, holding Waste Management's hand.

"Now, in direct response to community input" Waste Management is "proposing a smaller landfill expansion with a shorter operating life." What this encouraging statement really means is that they are taking a smaller bite now and will be proposing yet another—albeit again smaller—expansion in the future. Remember that 600 acres. Their "out of sight, out of mind" visual screening idea indicates just how really stupid they think we are. The dump will still be there, growing and stinking, no matter what they plant along the highway to hide it.

Waste Management is motivated by one thing: money. So far, the cost of doing business has penciled out for them, because those who decide have been seduced by money, ie, "jobs", phony concerns about garbage rates and a so-called "anti-business" climate falsely attributed to those who work to restrain Waste Management. They will do *nothing* they are not forced to do. They will do *everything* they can get away with.

I would ask you to fight—lead—instead of politely hoping for circumstances so totally contrary to Waste Management's mission and history. This is no time for deferential appeasement and "hope". Waste Not and Stop The Dump Coalition have, over many years, been the very model of decorum. It has gotten them nowhere. Waste Management is like a weed growing through asphalt: slowly and surely it emerges on top.

Sincerely, Marilyn Higginson

A handwritten signature in black ink, appearing to be "MH" or similar initials, written in a cursive style.

Marilyn Higginson  
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