APPENDIX 1

SNOHOMISH
HEALTH
DISTRICT

ENVIRONMENTAL HEALTH DIVISION
3020 Rucker Avenue, Suite 104
Everett, WA 98201-3900
425.339.5250 FAX: 425.339.5254
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Darst Declaratn, Ex Ap 211

SOLID WASTE FACILITY PERMIT #SW-093

Issued by the Snohomish Health District in accordance with the provisions of Chapter 70.95 of the Revised Code of Washington (RCW), Chapter 173-350 of the Washington Administrative Code (WAC) and the Snohomish Health District Sanitary Codes, Chapter 3.1 and 3.2 (Adopted text of WAC 173-350).

PERMIT PERIOD: JULY 1, 2006 TO JUNE 30, 2007

PERMITTEE AND ADMINISTRATIVE INFORMATION	
NAME OF FACILITY:	Pacific Topsoils, Inc. Composting - Maltby
FACILITY LOCATION:	8616 219th Street SE, Woodinville, Washington 98072
FACILITY OWNER:	Dave and Sandra Forman
FACILITY OPERATOR:	Janusz Bajsarowicz
PHONE:	425.337.2700
PERMIT TYPE:	Composting Facility
ANNUAL FEE:	$2246.00

The conditions of this permit are contained on the following pages. This permit is the property of the Snohomish Health District and may be suspended or revoked upon violation of any rules and regulations applicable hereto. This permit is not transferable to a different site, and must be renewed annually. This permit or a legible copy must be displayed or stored in a manner, which allows easy access, by operating personnel.

Geoffrey W. Crofoot, R.S.
Solid Waste and Toxics Section
Environmental Health Division

8/28/06
Date of Issuance

SECTION I: STANDARD PERMIT CONDITIONS

A. This permit shall remain the property of the Snohomish Health District (Health District). The permit may be revoked, suspended, or appended upon violation of the permittee of any applicable local, state, or federal laws, or any of the conditions of this permit, by the Health Officer or any authorized agent of the Health District. If the permit is revoked, there is a procedure specified in the Snohomish Health District Sanitary Code, Chapters 3.1, *Solid Waste Handling Regulations;* and 3.2, Chapter 173-350 WAC *Solid Waste Handling Standards,* to appeal the revocation.

B. As a general condition of this permit, the permittee shall comply with Snohomish Health District Sanitary Code, Chapters 3.1, *Solid Waste Handling Regulations;* and 3.2, Chapter 173-350 WAC *Solid Waste Handling Standards* or other regulations, which may be subsequently adopted that affect this facility. Where any conflicts between any regulations are present, the more stringent regulations shall be in effect.

C. All conditions of this permit shall be followed for the permittee to remain in compliance. The permittee shall be responsible for all acts and omissions of all contractors and agents of the permittee. This requirement shall continue for the life of the site, including closure activity.

D. By applicant's receipt of this permit, applicant grants permission to any duly authorized officer, employee, or representative of the Health Officer of the Health District, or Washington Department of Ecology, to enter and inspect the permitted facility at any reasonable time for the purpose of determining compliance with Snohomish Health District Sanitary Code, Chapters 3.1, *Solid Waste Handling Regulations;* and 3.2, Chapter 173-350 WAC *Solid Waste Handling Standards*, and/or the conditions of this permit.

E. This permit or a legible copy of the original shall be displayed or stored in a manner which allows easy access by operating personnel.

F. This permit shall be subject to suspension or revocation if the Health District finds:

1. That the permit was obtained by misrepresenting or omitting any information that could have affected the issuance of the permit or will affect the current operation of the facility;

2. That there has been a significant change in quantity or character of the solid waste or method of solid waste handling, unless such change has been approved in advance by the Health District; or

3. That there has been a violation of any of the conditions contained in this permit.

G. This permit may be amended by the Health District. More stringent restrictions may be imposed on the facility during the period the permit is valid. Amendments shall be made in writing and become specific conditions of the permit.

H. The operating permit shall be renewed annually, and if needed, additional conditions may be placed upon the permit at the time of renewal. A permit application shall be submitted at least thirty (30) days prior to the expiration date of the existing permit.

SECTION II: PERFORMANCE STANDARDS

The owner or operator shall:

A. Design, construct, operate, and close all facilities in a manner that does not pose a threat to human health or the environment;

B. Comply with Chapter 90.48 RCW, Water Pollution Control and implementing regulations, including Chapter 173-200 WAC, Water Quality Standards for Ground Waters of the State of Washington;

C. Conform to the approved local comprehensive solid waste management plan prepared in accordance with Chapter 70.95 RCW, Solid Waste Management – Reduction and Recycling, and/or the local hazardous waste management plan prepared in accordance with Chapter 70.105 RCW, Hazardous Waste Management;

D. Not cause any violation of emission standards or ambient air quality standards at the property boundary of any facility and comply with Chapter 70.94 RCW, Washington Clean Air Act; and

E. Shall comply with all other applicable local, state, and federal laws and regulations.

If the performance standards of this section are not met, corrective actions (approved by the Health District) shall be designed and implemented, and enforced on a time schedule approved by the Health District.

SECTION III: SPECIFIC CONDITIONS

A. The Pacific Topsoils, Inc. Compost Facility - Maltby shall operate in accordance with the approved Plan of Operation received by the Health District February 17, 1998, as part of PTI-Maltby's Revised General Solid Waste Handling Permit Application. The permittee shall notify the Health District in writing prior to any deviation from or change in the operating plan. These changes will require Health District approval prior to implementation.

B. Feedstock for composting shall be limited to type 1 as defined in WAC 173-350-100.

C. Conditions specifically regarding the acceptance of Pre-consumer Food Waste:

1. PTI must follow the plan of operation as proposed in the August 9, 2001 correspondence to the Health District.

2. All PCFW must be contained at all times on an impermeable pad that prevents leachate from impacting surface water, ground water or soils.

3. All rounds and other ejected PCFW material which is not incorporated must be collected and disposed of or collected and re-ground at regular intervals so that there is not accumulation of unincorporated PCFW available for scavenging.

4. PTI must process all PCFW feedstock during eight hours. There will be no holding of PCFW overnight. There will be no acceptance of PCFW if it cannot be processed (incorporated into the main pile) prior to the end of the working day.

5. PTI must comply with requirements set by other regulatory agencies such as but not limited to Puget Sound Clean Air Agency and Snohomish County Planning and Development.

6. If changes are needed in the plan of operations, PTI must submit these changes to the Health District for review prior to the implementation of the changes.

D. Additional Permitted Feedstocks

- Diatomaceous Earth from Breweries and Wineries - Spent diatomaceous earth (DE) is defined as a filter media comprised of siliceous remains of diatoms, and organic material which is filtered out of the final product. PTI is permitted to accept spent DE specifically from Redhook and Chateau St. Michelle.

- Wax Coated Cardboard and Plane Non-Colored Brown Cardboard – Provided the following conditions are met.

1. Composting standards outlined in WAC 173-350-220 are met or acceded.

2. Performance standards outlined in WAC 173-350-040 are met.

3. All current SHD Solid Waste Facility Permit Conditions for permit #SW-093 are met.

4. The addition of wax-coated cardboard will not result in litter conditions or material blowing down from the pile.

5. Cardboard must be free of contamination such as plastics, metals and CMPCFW other than permitted feedstock's.

6. Finished compost with integrated wax coated cardboard must meet the same analytical standards as outlined in permit # SW-093 and WAC 173-350-220(4)

7. The addition of wax-coated cardboard will be limited to the proposed volume.

E. The permittee shall remain in compliance with the site's Puget Sound Clean Air Agency (PSCAA) Order of Approval To Construct, Install, or Establish a Two-Acre Yard Waste Composting Operation" (PSAPCA Order No. 7265, dated July 9, 1998).

F. The facility must comply with all requirements of its Ecology Storm water Baseline General Permit For Industrial Activity, Permit No. SO3-003119.

G. The facility must comply with all requirements of its King County Department of Natural Resources Wastewater Discharge Authorization No. 611.

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H. The facility must comply with all requirements of its Cross Valley Water District permit(s) for discharge of leachate to the sanitary sewer.

- Surface water samples must be drawn and analyzed to provide baseline data for surface water conditions before feedstock is accepted. Surface water sampling locations and a list of sample parameters must be submitted to the Health District in advance of sampling, and approved by the Health District in advance of sampling.

I. The permittee shall not accept any of the following materials at the facility for uses in compost and topsoil production:

- Solid waste or industrial waste as defined in 173-350-100 WAC, and the Snohomish Health District Sanitary Code, Chapter 3.1-100, unless otherwise specifically permitted by the Health District.
- Mixed waste or garbage.
- Paper, including newspaper.
- Sewage sludge, septage or biosolids.
- Ash.
- Plastic bags.
- Post consumer food waste
- Tires.
- Roofing materials, including wood shingles.
- Tarpaper.
- Insulation.
- Sheetrock, gypsum wallboard, or wallboard paper.
- Treated or painted wood as outlined in WAC 173-350-100, under the terms "Wood derived fuel" and "Wood waste."
- Building demolition debris.
- "Contaminated soils" as defined in WAC 173-350-100. (NOTE: Site personnel shall follow plan outlined in the Plan of Operation when screening for potentially contaminated soils.)
- Any materials not specifically approved by the Health District in advance of receipt by the facility.

J. Only clean street sweepings, which meet the following criteria, may be accepted:

1. Incidental litter (trash) has been removed.

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2. Testing demonstrates less than 200 ppm total petroleum hydrocarbon (TPH) concentration (using an accepted test method), and levels of total metals less than those outlined in Method A residential cleanup standards of the Department of Ecology's Model Toxics Control Act Cleanup Regulation.

3. Testing is not required if the street sweepings contain 90%, or more (by volume), of recognizable vegetative debris (e.g., leaves, conifer needles, branches), and no obvious evidence of contamination is noted.

K. Any incoming loads containing greater than 10% regulated solid waste must be rejected.

L. The permittee must not accept more than 160,000 cubic yards, or 53,333 tons, (Phase One), whichever amount is the lesser, of yard debris, per year.

M. Material shall be composted using the static pile method, as per the approved permit application. Pile(s) of compost must be limited to forty (40) feet in height during the initial construction. No new materials may be added on top of the pile(s) after settling occurs during the composting process.

N. All leachate-generating materials at the facility must be placed on an impervious asphalt pad.

O. The leachate collection system (pad, sump, sump pump, and tanks) must be inspected routinely by site personnel for signs of disrepair or leakage. Inspection logs must be maintained on site.

P. All leachate shall be contained on the pad or in the leachate collection tanks and either recirculated onto the pile or piped to the sanitary sewer. Under no circumstances can leachate be discharged to surface water, groundwater or upon the surface of the ground.

Q. The permittee must follow an odor-control plan as detailed in the approved Plan of Operation. Processing of completed compost must stop if distinct malodors are produced when breaking into the pile(s), or if processing takes place during temperature inversions or during periods of calm winds. If the odor-control measures outlined in the facility's Plan of Operation fail to control the production of malodors at the site, the facility must stop accepting materials and transport the odor-causing material to a permitted landfill. If malodors are caused by the leachate collection system, and are not easily correctable, the Health District may require leachate discharge to the sewer system.

R. On-site dumpster for incidental waste that cannot be composted, such as garbage, must be rodent resistant, have a tight fitting lid and be emptied weekly.

S. The permittee shall keep the following records on site at all times, and make them available for Health District review upon request:

1. Self-inspection reports.

2. Source, type, and quantity of waste accepted.

3. Records of temperature readings for each batch of compost produced.

4. Records of any laboratory analysis performed on compost.

SECTION IV: TESTING REQUIREMENTS

A. Compost produced at the facility shall be sampled and tested per WAC 173-350-220(4)(a)viii.

B. Compost Testing Frequency: Monthly.

C. Finished compost must not exceed the allowable contaminant levels for compost as stated in WAC 173-350-220(4)(a)(viii.)

D. Annual reports must be submitted to the Health District, and the Washington Department of Ecology.

E. All analytical samples for compost quality must be processed by a Department of Ecology-accredited laboratory.

SECTION V: FACILITY CLOSURE CONDITIONS

A. The permittee must notify the Health District of the intent to close the operation, no later than sixty (60) days prior to final receipt of regulated waste.

B. At closure, all piles of material must be removed from the premises, the site must be decontaminated, and the permittee must contact the Health District indicating completion of this condition.

C. Leachate stored in aboveground storage tanks, or in/on other parts of the leachate collection system at the time of closure (i.e., in pipes, underground storage tanks, on pad, etc.) must be disposed of according to applicable regulations in effect at the time of closure (i.e., discharge into sanitary sewer system, etc.).

SECTION VI: COMPLIANCE SCHEDULE FOR OPERATING

A. RCW 70.95.030 (4) states that:

- "Composted material" means organic solid waste that has been subjected to controlled aerobic degradation at a solid waste facility in compliance with the requirements of this chapter. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.

B. WAC 173-350 echoes the state RCW.

C. Composting processes at the Maltby location do not meet the aforementioned definitions and can not meet the requirements without either change to the process or change to the RCW and subsequently the WAC.

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D. PTI must either seek a legislative remedy to this compliance issue or change the process so that it complies with the current regulation with in the compliance period.

E. PTI's compliance period will begin with the issuance of the 2006-2007 operating permit and end when the 2008-2009 operating permit expires on June 30, 2009

SECTION VI: APPROVED PERMIT AMENDMENTS

Date approved	Request and Conditions
	The permittee must comply with the conditions set forth in the site's Snohomish County Planning and Development Services "Water Storage Tank or Reservoir Permit" (Permit No. 99110506 WT), issued on October 11, 1999, and expiring on October 10, 2001.
	The permittee is currently operating under a revised Grading Plan (revision dated May 12, 1999), which differs from the Grading Plan received by the Health District February 17, 1998, as part of the PTI-Maltby Revised General Solid Waste Handling Permit Application.
August 17, 2004	1 PTI-Bothell is permitted to accept only those waste currently defined in the current operating permit. As such, if PTI is currently accepting a material other that what is listed in that permit, it must be documented and reported to the Health District within thirty days of the date of this permit. 2. PTI-Bothell will submit a request to the Health District for any new or un-permitted waste/feedstock that PTI wishes to import to the site. The request should include the following: - Origin of the material and contact for the generator - Volume accepted at PTI - Brief summary of the process used to created the waste - A completed waste designation form, if necessary - Analytical results, if needed 3. Please note changes in section III C.
August 17, 2004	Spent Diatomaceous Earth is approved as a feedstock.
August 17, 2004	Pre-consumer Food Waste is approved as a feedstock.
August 17, 2004	Wax Coated Cardboard and Plane Non-Colored Brown Cardboard
August 17, 2004	Changes to testing language, which is more reflective of requirements, outlined in WAC 173-350-220(4)(a)viii.
July 1, 2005	Parameters listed in WAC 173-350-220 for compost analysis must be met or material will be considered a solid waste.

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Puget Sound Clean Air Authority Permit

Facility: Pacific Topsoils Inc Reg #: 18478

Notices of Construction/Notifications Special Conditions:

3. Composting at this two-acre facility (phase one) is permitted for operation without total enclosure restricted to the following feedstocks: the lesser of 160,000 cu-yds or 53,333 tons per year of yard debris as defined by Snohomish County Code 7.42. Unlimited amounts of land clearing debris, clean wood waste, pallets bark and sawdust, soil and sod, and street sweepings tested for no greater than 200 ppm petroleum based hydrocarbon, may be combined with yard waste and composted at this site.

4. The following materials shall not be composted at this facility: manures, mixed waste or garbage, sheet rock or paper/cardboard recycled from sheet rock, pre-consumer or post-consumer food wastes, building demolition debris, treated or painted wood, insulation, roofing materials (including wood shingles), garbage, or any other waste materials not listed in Condition No. 3.

5. Leachate from the compost facility shall not be used for dust or fire control.

6. All fresh incoming yard wastes received by the facility are to be immediately assessed. Bulking materials shall be mixed with the yard wastes until a carbon-to-nitrogen ratio of 30:1 is achieved. Then the amended feedstock shall immediately be added to the compost pile and be covered by more mature (odor stabilized) compost. This facility is prohibited from grinding yard wastes prior to placement in the compost pile.

7. Static piles shall be limited to 40 feet in height during initial construction. No new wastes shall be added on top of the curing compost after settling occurs.

8. Each compost pile shall remain in place for at least six months undisturbed. Reclamation shall only occur after six months, and only when both the internal temperature of the compost pile drops to 20 degrees C (68 degrees F) above ambient, and a Solvita Jar Test shows that the compost has decomposed to a finished state. Reclamation shall cease should distinct odors be released when the pile is broken into, and shall not take place during temperature inversions or during periods of calm (< 4 knots) winds. Site personnel shall use a windsock and weather reports to determine when to cease reclamation operations. Temperature readings and samples for the Solvita Jar Test shall be taken at least nine feet inside the pile.

9. Should odor be detected emitting from a static compost pile, the area of the emissions shall be identified and the pile sealed with a bulking agent. If a section of a static pile becomes anaerobic, a layer of hog fuel at least two feet in thickness shall be placed on that section to act as a biofilter. If the pile continues to emit odors despite these efforts, the section of the pile producing the odors shall be removed and taken to a solid waste disposal facility, as directed by the Snohomish County Solid Waste Management Division, for final disposal at a solid waste landfill.

10. An Operation and Maintenance (O&M) Plan shall be submitted to PSAPCA for approval prior to commencement of operations at the site. This Plan shall be consistent with the requirements of Regulation I, Section 5.05(e) and shall also include procedures for determining, handling, or refusing especially odorous loads brought on site; shall describe procedures for the prevention and removal of leachate

PUGET SOUND AIR POLLUTION CONTROL AGENCY
KING COUNTY KITSAP COUNTY PIERCE COUNTY SNOHOMISH COUNTY

JUL 9 1998

Daniel D. Syrdal
Heller Ehrman White & McAuliffe
6100 Columbia Center
701 Fifth Ave
Seattle, WA 98104-7098

Dear Mr. Syrdal:

Pacific Topsoils Inc. (PTI) Compost Facility Proposal in Woodinville, Washington

We have reviewed the comments submitted in your April 15, 1998 letter concerning Pacific Topsoils' proposed compost facility in Woodinville.

You are correct; PSAPCA's rules do require Best Available Control Technology (BACT) for odor control. Generally, we do follow a "top-down" type process to determine BACT, even when EPA's guidance does not require it. Like EPA's rules, our rules also require a case-by-case BACT analysis, taking into account energy, environmental, and economic impacts. For both agencies, the BACT process results in an emission standard. In this case, we established the top for BACT as the technology that results in little or no odor or odor complaints. We also determined that a numerical emission standard, such as 100 ppm, is not appropriate. In evaluating Pacific Topsoils' proposal, we considered technologies appropriate for the size of the facility and the amounts and the types of feedstock that it handles. The proposed technology and others could achieve this level of control. However, the proposed technology may not be able to achieve the low level of odors at a larger facility or one that handles different feedstock, like manure. As provided by our rule, PSAPCA established work practices and operational controls for Pacific Topsoils to achieve levels of emissions that would result in little or no odor or odor complaints.

Concerning your March 10, 1998 letter, we agree that PSD requires the application of BACT regardless of increment consumption. As outlined above, in reviewing the PTI proposal, PSAPCA used a top-down BACT process that is consistent with the PSD type BACT analysis. Under PSD, BACT is an emission limit based on available technology. Also, once a permitting agency determines that emission limit (which in this case would be little or no odor), an applicant is free to use whatever technology it chooses to achieve that standard. Pacific Topsoils has demonstrated that its technology is capable of operating with no odor problems. PSAPCA has identified the critical work practices and operational controls that Pacific Topsoils has used to achieve this level of control and listed them as approval conditions. Unlike a PSD analysis, odor has no NAAQS or PSD increment to protect, so analyzing air quality impacts is more subjective. The PSD analogy, however, does provide for a de minimis level below which ambient impacts, or even BACT, are not considered. For odor sources, PSAPCA generally

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establishes the standard at the odor threshold a de minimis level. Below the odor threshold, there is little evidence that additional controls result in any benefit. Hence, we set the top in the top-down analysis at a level that would result in de minimis impacts.

Finally, you express concern that no permit should be issued for this project until the applicant has demonstrated that they will implement BACT. PSAPCA agrees. PSAPCA has reviewed the technology that Pacific Topsoils has proposed, and is using at its Mill Creek site, and has determined that Pacific Topsoils has demonstrated that the technology in its proposal is capable of achieving BACT.

A copy of the final Order of Approval is enclosed.

If you have any questions, please call me at (206) 689-4066.

Sincerely,

Claude M. Williams, PE
Air Pollution Engineer II

CMW:mj
Enclosure

cc: N. D. Birnbaum
J. M. Willenberg

Jonelle Fenton
Snohomish Health District
3020 Rucker Ave., Ste. 104
Everett, WA 98201-3900

Jim Lindsay
Pacific Topsoils Inc.
14002 35th Ave SE
Bothell, WA 98012

APPENDIX 2

MS. KOLER: Okay. Dr. Brown.

HEARING EXAMINER: Do you swear or affirm that the testimony you'll be offering in this hearing will be the truth, the whole truth, and nothing but truth?

THE WITNESS: I do.

HEARING EXAMINER: Thank you. State your name and spell your last for the record, please.

THE WITNESS: Sally Brown, B-r-o-w-n.

HEARING EXAMINER: Sally with a Y?

THE WITNESS: Yes.

HEARING EXAMINER: Thank you.

DIRECT EXAMINATION

BY MS. KOLER:

Q Dr. Brown, can you describe your educational background, please?

A I have a bachelor's in political science from Williams College.

MR. UBERTI: I don't know Dr. Brown. I hadn't heard her name until day. But if she has a resume that she's prepared to hand us, I'll stipulate to it.

HEARING EXAMINER: Okay. In the interest -- in the interest of trying to get her substantive testimony on the record before her own self-imposed time of having to leave --

THE WITNESS: My son is not --

HEARING EXAMINER: Let's enter her curriculum vitae as an exhibit and march on.

MS. KOLER: Okay.

HEARING EXAMINER: So do we have a copy to enter as an exhibit? Entered as Exhibit 7.

Q (By Ms. Koler) As a result of this study, you've done studies in the area of soils and soil composting?

A Yes.

Q And --

HEARING EXAMINER: Can I at least ask what is your academic specialty?

THE WITNESS: I have a master's and a Ph.D. in soils. My master's is --

HEARING EXAMINER: So you're a soil scientist?

THE WITNESS: I'm a soil scientist. My area of specialization is use of residuals in soils, including a wide range of materials, municipal biosolids, composts.

HEARING EXAMINER: Thank you. Okay.

Q (By Ms. Koler) So in your study have you had occasion to do composting?

A Yes. I've been funded look at compost as a way -- compost addition as a way to reduce metal availability in metal contaminated soils. I've been -- that was funded by USEPA and the Water Environment Federation. I've been funded by Weyerhaeuser to look at degradation of some of their drink cups, and that's where I actually first met someone from Pacific Topsoils. And I have recently been funded by

Environmental Credit Corporation, which is a carbon offset provider for the Chicago Climate Exchange to do a greenhouse gas balance for composting operations.

Q And as a result of your involvement with soils and recycling -- and by the way, have you received numerous recycling awards?

A We have his and her trophies at home, yes. Yes. I have been awarded by -- I've gotten recognized by the Washington State Association of Business, USEPA on a national level, Professional Association Bio-Cycle, and I've also won the King County Green Globe award.

Q And as a result of your familiarity with composting, are you aware of Pacific Topsoils?

A I've heard their name. I've never been to the site.

Q And have you been -- do you have any impressions of Pacific Topsoils?

A It's my understanding, and this is primarily through a graduate student that had been a landscaper, that they make a quality product.

Q And are -- and have you reviewed Pacific Topsoils plan of operations?

A I have briefly looked at their plan of operations.

Q And have you -- and you heard Dr. Henry testify today?

A Yes.

Q And have you had any opportunity to review literature about composting in recent years?

A In the -- in developing a greenhouse gas balance for composting operations, the primary gas emissions from composting operations that are of concern from a greenhouse gas perspective are methane, which is produced in an anaerobic environment, and nitric oxide, which is produced in an anoxic or a reduced oxygen environment.

So I did a review of a range of composting, a literature review. Mostly the literature has -- in the peer view literature has been generated in Europe and Canada. There's not much in the U.S. on greenhouse gas emissions from a range of different composting operations, so yes.

HEARING EXAMINER: CH4 is methane. What's the --

THE WITNESS: CH4 is -- N20 is nitric oxide.

HEARING EXAMINER: Thank you.

Q (By Ms. Koler) And are you aware of static pile composting systems?

A In my general knowledge of composting, as well as through this review of the literature for this specific purpose, static pile composting is one of the accepted methods of composting that you see in the literature.

Q And what, if anything, have you found out about static piles with respect to greenhouse gas emissions?

A In this case one of the concerns is --

MR. UBERTI: Just for the record, I will object to the relevancy of this line of questioning.

THE WITNESS: And I will be able to clarify that.

HEARING EXAMINER: I'm the one that gets to make the ruling.

THE WITNESS: I'm sorry.

HEARING EXAMINER: I'm going to allow it to continue for a little while to see how she's going to connect.

THE WITNESS: When organic matter decomposes in an aerobic environment, and CO2 is the primary emission. When it decomposes, it's an anaerobic environment methane, which is a greenhouse gas. It is your primary emission. So looking at greenhouse gas emissions from composting operations, looking for methane emissions, you're finding evidence of a greenhouse gas impact but you're simultaneously finding evidence of anaerobic conditions. So this is how these two issues overlap. Is that sufficient clarification?

MR. UBERTI: No, it's not. I'll renew my objection to relevancy. I want to know how it relates to Pacific Topsoils.

HEARING EXAMINER: Given that this witness has started by saying she's never been to the site, I am understanding her testimony to be, if you will, more scientific -- well, more generic. Scientifically precise, but generic in terms of composting and to a -- for a while here I'll -- I'm willing to listen to it and see what I can learn.

Objection overruled.

THE WITNESS: To continue. In the literature I've

read in aerated static piles, in forced aeration systems, in turned windrows, in static piles without turning, in each case you can have methane emissions. In fact, methane emissions can be very, very high in an aerated static pile.

The main controls or main variables that govern methane emissions from these systems -- and this is from the literature -- are feedstocks. Feedstock inputs, characteristics of the feedstocks. There's one study -- and I can get the reference on my laptop -- but it was two static piles were looked at. And the moisture content and the carbon to nitrogen ratio of the feedstocks were varied.

In one case it was a wetter more nitrogen rich feedstock. In the other case, same basic feedstock, it was pig manure with addition of straw, which brought the moisture content down and the carbon content up.

What they found was methane emissions were eliminated by the addition of excess carbon and by lowering the moisture content. So in a static pile system they were able to maintain aerobic conditions as documented by the absence of methane released from the pile by altering conditions of the feedstock, or altering characteristic of the feedstock.

In another study where municipal biosolids were composted with wood ash in a forced aeration system, they were detecting nitric oxide throughout the process also in the good of an anaerobic condition despite forced aeration. Which

suggests that the wet feedstock was sufficiently moist to prohibit air flow despite forced aeration and maintain anaerobic conditions in the pile.

In another study, which was done using animal manure in Canada, with a turn windrow there were censors placed through the depth of the pile. And methane and nitric oxide concentrations through the depth of the pile were monitored. What was seen is that methane concentrations tend to be centered in the bottom center of the pile. And through the surface they decreased.

So what the point of this literature review, if you will, is is that in all compost systems you will have anaerobic sites. The extent and impact of the anaerobic sites -- the easiest way to control these and reduce the importance of these anaerobic sites or the occurrence of these anaerobic sites is by mixing high carbon materials, bulky materials, with a low moisture content into the feedstock. This is also in a basic textbook on composting by H-A-U-G, is the author's name, that specifies use of high carbonaceous larger materials as a way to maintain aerobic conditions whatever type of composting system you use.

Q (By Ms. Koler) So are you telling us that you could have aerobic -- primarily aerobic conditions in a static pile with some anaerobic places if you had the correct feedstocks?

A I'm saying that by controlling your feedstocks and monitoring

the moisture content and the C to N ratio, you can maintain a highly aerobic system even within a static pile system.

Q And you've heard today testimony about Dr. Henry's observations about Pacific Topsoils composting method and -- is that correct?

A What he said?

Q Yes.

A Yes.

Q And you --

A To my knowledge, yes.

Q -- reviewed their plan of operations?

A I -- yes. I have not been to the site. I skimmed through their plan. It seems to place an emphasis on moisture content and use of carbonaceous materials.

Q And have you had an opportunity to review Ecology's regulations that -- that --

A Pertain to this --

Q -- that pertain to composting facilities? Specifically I'm referring to WAC 173.350.320, little 3, D.

A Composting facilities shall be designed with process parameters and management consideration that promote aerobic composting processes. This requirement is not intended to mandate first aeration or any other specific composting technology. The measurement is meant to ensure that compost facility designers take into account porosity and nutrient balance, pile oxygen,

pile moisture, pile temperature, and retention time of composting when designing a facility, yes.

And Pacific Topsoils seems to be in line from my familiarity with their operation with this component of the regulation.

Q Thank you. I have no further questions.

Oh, wait. I would like you to just look at the definition in RCW 70 --

A Don't hurt yourself.

Q 70.95.030.

A Organic solid waste that has undergone -- of composted material?

Q Yes. Based on what you've heard about Pacific Topsoils' observations and what you have gleaned from their plan of operations, do you believe that uncontrolled degradation --

A One thing in going over the literature on gas emissions, methane emissions -- and this was also in Dr. Henry's talk. The -- the --

MR. UBERTI: Excuse me. I'm going to have to object. I notice she's reading from a document. I thought she was reading from the -- I thought she was reading from a copy of the RCW.

THE WITNESS: No. I can. Organ ice -- composting material is organic solid waste -- and I'll read from the document directly.

HEARING EXAMINER: I think -- are you -- is that your appeal? It's on legal paper.

MS. KOLER: It was just -- it's an excerpt -- it's just the excerpt --

THE WITNESS: Do I need to read it out loud?

HEARING EXAMINER: She's reading from --

MS. KOLER: The statute.

HEARING EXAMINER: Remember in her appeal she quoted the statutes. I think that's what she's giving the witnesses as a quick way to get them the statute to read.

THE WITNESS: Would you like me to read it out loud, sir?

HEARING EXAMINER: I don't need to have them read the statute anyway, because I can read it.

MS. KOLER: I can give it to you after -- out of the various materials if that would make you feel better.

HEARING EXAMINER: That's fine if that's what your -- I don't know what she -- why does she have to read the statute to us?

THE WITNESS: Okay.

MS. KOLER: She's reading the statute -- she's looking at the statutory definition of composting in --

HEARING EXAMINER: Okay. But she doesn't -- as far as I'm concerned, she does not have to read it out loud to us.

THE WITNESS: Then I won't read it out loud.

HEARING EXAMINER: Because she can read it to herself a lot quicker and then answer your question.

THE WITNESS: Okay. The primary emphasis of this statement from the regulation is that composting is a controlled process. It has been the death now, as Dr. Henry has brought out, of so many composting operations to have processes that are insufficiently controlled that malodorous compounds are emitted from the piles. The fact that Pacific Topsoils has been able to stay in business using their composting process in an area which has neighbors suggests that it is a controlled process, not an uncontrolled process, because malodorous compounds are not emitted.

MS. KOLER: Thank you. I have no further questions.

HEARING EXAMINER: Cross examination.

MR. UBERTI: Thank you.

CROSS EXAMINATION

BY MR. UBERTI:

Q Dr. Brown --

A Yes.

Q -- how long has Pacific Topsoils at the Maltby site been composting?

A I have no idea.

Q You have no idea. And what plan of operations did you review?

A One that was handed to me. I don't know which specific plan it was. I can ask for a reference. Revised plan of operation

CURRICULUM VITAE

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College of Forest Resources
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203 Bloedel Hall Box 352100
University of Washington
Seattle, WA 98195
206 616 1299 (wk) 206 675 1870 (hm)

EDUCATION: BA Political Science, 1980, Williams College, Williamstown, MA.
MS Agronomy (soil science), 1993, University of Maryland, College Park, MD. *Use of hyperaccumulator species to remediate metal contaminated soils*
Ph.D. Agronomy (soil science), 1996, University of Maryland, College Park, MD. *Long-term effects of biosolids application on agricultural soils*

PROFESSIONAL POSITIONS HELD

Research Associate Professor, Ecosystem Science Division, College of Forest Resources, University of Washington, Seattle, WA. 2005- present

Research Assistant Professor, Ecosystem Science Division, College of Forest Resources, University of Washington, Seattle, WA. 1999-.2005.

Post Doctoral Associate, Ecosystem Science Division, College of Forest Resources, University of Washington, Seattle, WA. 1998-99

Post Doctoral Associate, Environmental Chemistry Laboratory, USDA ARS Beltsville, MD. 1996-1998. GS 11

Technician, Department of Agronomy, University of Maryland. 1990 - 1996.

Founder, Long Island Produce. 1985-1989. Wholesale company distributing local produce to restaurants and supermarkets in the New York area.

Awards

King County Green Globe Award 2005- outstanding achievement in environmental stewardship for use of biosolids to grow canola for biodiesel production

US EPA – 2004 National first place Clean Water Act recognition award biosolids exemplary management- Research Activities for lab and field-scale research demonstrating the effective use of biosolids to reduce metal toxicity on severely contaminated soils.

Biocycle. Passion Vision and Grit award for research in biosolids. 2004.

2001 Association of Washington Business – Cleanup award in cooperation with Avista Utilities for beneficial use of wood ash

EXHIBIT: 7
CASE:

2001 Discovery Magazine Technology Awards Program, semifinalist for "Tailor-Made Remediation mixtures and composts for metal toxic mine and smelter waste restoration."

1995- Graduate Student of the Year Agronomy Department, University of Maryland, College Park

Professional Societies, Committees,

National Academy of Science- Standing committee on soil science- member. Appointed for 3 year term beginning 2005.

W-170 USDA CSREES Regional Research Committee 'Chemistry and Bioavailability of Waste Constituents in Soils' – co-chair

National Biosolids Partnership Advisory Committee- member

National Research Council Water Science and Technology board, Committee on the Bioavailability of Contaminants in Soils and Sediments, member 2000-2003.

Soil Science Society of America, Chair S-11 (Soils and Environmental Quality) Division, 2003, member Women in Agronomy

US EPA Remediation Technologies Development Forum (RTDF) In-place Inactivation and Ecosystem Restoration Technologies (IINERT) soil metals group -- member

Panels, reviews, editor responsibilities

Journal of Environmental Quality, associate editor 2003-present

Biogeochemistry of Trace Elements, 2001-present invited co-editor of abstracts.

USDA Small Business and Innovative Research Air Water and Soils committee, Panel chair 2002, panel member 2000, 2001

Co-editor, proceedings of the 1997 BARC Symposium, " Beneficial Co-Utilization of Agricultural, Municipal, and Industrial By-Products".

Reviewer for scientific journals and proposals including Environmental Science and Technology, Journal of Environmental Quality, Journal of Phytoremediation, Plant and Soil, Soil Science, USDA SBIR, BARD and NRICGP, EPA EPSCOR, NSF, US DOE, U MD, U FL, State of ME, Environment Canada, State of ID, SERDP

Grant History

Agency	Topic	Period	Co-PIs
Weyerhauser	Decomposition of LDPE cartons during composting	2006	None
FDI-CORFO	Uso de recursos fitogenticos natives para la fitoestabilizacion de relaveds mineros en la region de Coquimbo	2005-2007	Rosanna Gin
USEPA OSWER	Pb and As availability	2005-6	None
US EPA	Follow up on Leadville mine restoration	2005-6	None
USDA SBIR (through Emerald Ranches)	Biosolids for Biodiesel	2003-2004 2005-2007	Chuck Henry
Northwest Biosolids Management Association	Lead and Arsenic Availability Ecological Assessment Nonylphenol degradation in biosolids amended soils	1987-present (renewed annually)	None
Mountains to Sound Greenway-King County	Gravel mine restoration Carbon Sequestration	1995-2045 (renewed annually)	Chuck Henry
International Lead Zinc Research Organization	In situ amendments to reduce metal availability	2000-present	McLaughlin, McGrath, an Vangronsvel
US EPA ERT	Use of residuals to restore Superfund sites	1997-2002	Chuck Henry

Service Activities

Classes Taught

EPA OSWER Remedial Project Manager and On Scene Coordinator training- Beyond Hydroseeding- use of amendments in restoration. Presented at RPM and OSC training sessions twice each year since 2001. A webcast version of the class was developed in 2005 and will also be presented in 2006

University of Washington
Water Quality BES 460 winter 2006 Instructor overall 3.8
Sustainable practices- ENV S 203 winter 2005 Instructor overall 4.8
Bioremediation ESC 416 winter 2000 Instructor overall 4.56
Introductory soil science ESC 210 Fall 1999, Spring 2000 Instructor overall 4.04, 4.41

Graduate Students
Past- Chair 6 MS
Pam Devolder: *Effects of a biosolids compost and wood ash amendment on metal bioavailability in a wetland contaminated with mine tailings.* 2001
Barbara Rae Christensen: *The use of amendments to reduce the bioavailability of trace metals in contaminated soil.* 2002
Alex Svendson: *The use of biosolids in combination with lime to ameliorate subsoil acidity in mine tailings.* 2002
Peter Severtson: *Effects of biosolids and gypsum amendments on metal bioavailability and plant growth when added to mine tailings.* 2003
Linda Gaulke: *The effects of soil amendments on the symbiotic nitrogen-fixing relationship of alnus rubra (red alder) and frankia.* 2004
Ingrid Clausen: *Potential for high iron biosolids compost to reduce the bioavailability of lead and arsenic contaminated soils in situ.* 2006

Current –Chair 1 MS 2 PhD
Dana Devin-Clarke: *Degradation of nonylphenol in biosolids amended soils* (MS expected 2007)
Kristen McIvor: Integration of Class A biosolids in urban areas (PhD expected 2009)

Committee member 4 MS, 1 PhD

Media Recognition

Featured on National Public Radio Tacoma Affiliate
Featured in University of Washington University Week as well as on home web page of the University
Focus of feature for NBC and ABC news affiliates
Research reported in local news papers in Leadville, CO, Miami, OK, Prescott, AZ, and Spokane, WA.
Research subject for 4 features in EPA Tech Trends publication
Research subject of feature in NIEHS newsletter

Research subject of 2 features in Water Environment Federation Newsletter
Research subject of feature in Science Daily
Research included in US EPA ERT video on remediation.

Science citation index
567 citations for all work in peer reviewed journals

PUBLICATIONS

Peer Review Journals

Brown, S. and S. Subler.. 2007 Carbon Balance for Composting Operations. Water Environ & Tech. In review.

Svendson, A., C. Henry, and S. Brown. 2007. Restoration of high zinc and lead tailings with municipal biosolids and lime: field study. Environ. Pollut. In review

Brown, S. and K. Scheckel. 2007. Impact of a Barrier Compost Cap on Pb Speciation and Bioaccessibility in Wetland Impounded Mine Tailings Environmental Chemistry. In review.

Svendson, A., C. Henry, and S. Brown. 2007. Restoration of high zinc and lead tailings with municipal biosolids and lime: greenhouse study. J. Environ. Qual. In press.

Brown, S. and N. Basta. 2007. Field Test of In Situ Soil Amendments at the Tar Creek National Priorities List Superfund Site. J. Environ. Qual. In press.

Brown, S., P. DeVolder, and C. Henry. 2007. Effect of amendment C:N ratio on plant diversity, cover and metal content for acidic Pb and Zn mine tailings in Leadville, CO. Environ. Pollution. In Press.

Chaney, R.L.; E. Filcheva, C.E. Green and S. L. Brown. 2006. Zn Deficiency Promotes Cd Accumulation by Lettuce from Biosolids Amended Soils with High Cd:Zn Ratio. J. Residuals Sci. Tech V3:2

Gaulke, L. S., C.L. Henry, and S. L. Brown. 2006. Nitrogen fixation and growth response of Alnus Rubra following fertiliztion with urea or biosolids. Sci. agric. (Piracicaba, Braz.), 63, 4:.361-369. ISSN 0103-9016.

Gaulke, L. S., C.L. Henry, and S. L. Brown. 2006. Nitrogen fixation and growth response of Alnus rubra amended with low and high metal content biosolids. Sci. agric. (Piracicaba, Braz.), 63, 4:351-360. ISSN 0103-9016.

Brown, S., B. Christensen, E. Lombi, M. McLaughlin, S. McGrath, J. Colpaert, and J. Vangronsveld. 2005. An Inter-laboratory study to test the ability of amendments to reduce the availability of Cd, Pb, and Zn in-situ. Environmental Pollution, 138:34-45

Brown, S., M. Sprenger, A. Maxemchuk and H. Compton. 2005. An evaluation of ecosystem function following restoration with biosolids and lime addition to alluvial tailings deposits in Leadville, CO. J. Environ. Qual. 34:139-148.

Brown, S.L., W. Berti, R.L. Chaney J Halfrisch and J Ryan. 2004. In situ use of soil amendments to reduce the bioaccessibility and phytoavailibility of soil lead. J. Environ Qual.33:522-531.

Ryan, J.A., W.R. Berti, S.L. Brown, S.W. Casteel, R.L. Chaney, M. Doolan, P. Grevatt, J. Hallfrisch, M. Maddaloni, D. Moseby, and K. Scheckel. 2004. Reducing children's risk to soil lead: summary of a field experiment. Environ. Sci. and Tech. 38:19a-24a.

DeVolder, P., S.L. Brown, D. Hesterberg and K. Pandya. 2003. Metal bioavailability and speciation in a wetland tailings repository amended with biosolids compost, wood ash, and sulfate. J. Environ. Qual., 32 (3): 851-864.

Brown , S. , R. Chaney J. Halfrisch and Q. Xue. 2003. Effect of Biosolids Processing on Lead Bioavailability in an Urban Soil. J. Environ. Qual. 32:100-108.

Brown, S., C.L. Henry, R.Chaney, H. Compton, and P.S. DeVolder. 2003. Using municipal biosolids in combination with other residuals to restore metal-contaminated mining areas. Plant and Soil, 249: 203-215

Chaney, R.L., S.L. Brown, R. J. Stuczynski, W. L. Daniels, C.L. Henry, Y.M. Li, G. Siebielec, M. Malik, J. S. Angle, J. A. Ryan, and H. Compton. 2000. Risk assessment and remediation of soils contaminated by mining and smelting of lead, zinc and cadmium. Rev. Int. Contam. Ambient. 16:175-192.

Brown, S.L., R.L. Chaney, J.S. Angle and J.A. Ryan. 1998.Organic carbon and the phytoavailability of cadmium to lettuce in long term biosolids amended soils. J. Environ. Qual. V27:1071-1078.

Brown, S.L., R.L. Chaney, and J.S. Angle. 1997. Subsurface liming and metal movement in soils amended with lime stabilized biosolids. J. Environ. Qual. 26 (3) 724-732.

Brown, S.L., J.S. Angle and R.L. Chaney. 1997. Correction of limed-biosolids induced Mn deficiency on long-term field plots. J. Environ. Qual. 26:1375-1384.

Chaney RL; Malik M, Li YM, Brown SL, Brewer EP, Angle JS, Baker AJM. 1997. Phytoremediation of soil metals. Current Opin. In Biotech. 8(3):279-284.

Brown, S.L., R.L. Chaney, C.A. Lloyd, J.S. Angle and J.A. Ryan. 1996. Relative uptake of cadmium by garden vegetables and fruits grown on long-term biosolids-amended soils. Environmental Science and Technology V 30 :3508-3511.

Brown, S.L., R.L. Chaney, J.S. Angle and A.J.M. Baker. 1995a. Zinc and cadmium uptake of Thlaspi caerulescens grown in nutrient solution. Soil Sci. Soc. Am. J. 59:125-133.

Brown, S.L., J.S. Angle, R.L. Chaney and A.J.M. Baker. 1995b. Zinc and cadmium uptake by Thlaspi caerulescens and Silene cucubalis grown on sludge-amended soils in relation to total soil metals and soil pH. Environ. Sci. Technol. 29:1581-1585.

Brown, S.L., R.L. Chaney, J.S. Angle and A.J.M. Baker. 1994. Zinc and cadmium uptake by Thlaspi caerulescens and Silene cucubalis in relation to soil metals and soil pH. J. Environ. Qual. 23:1151-1157.

Books and book chapters

National Research Council. 2003. R. Luthy (chair), R. Allen-King, S. Brown, D. Dzombak, S. Fendorf, J. Geisy, J. Hughes, S. Luoma, L. Malone, C. Menzie, S. Roberts, M. Ruby, T.

Schultz, and B. Smets. Bioavailability of Contaminants in Soils and Sediments. National Academy of Sciences. National Academy of Sciences, Washington, DC. 420 p.

Chaney, R.L., J.A. Ryan, U. Kukier, S. L. Brown, G. Siebielec, M. Malik, and J. Angle. 2001. Heavy Metal aspects of compost use. In P. Stoffella and B. Kahn (eds.) Compost Utilization in horticultural cropping systems.Lewis Publishers, Boca Raton, FA pp 323 – 360.

Brown, S.L. and R.L. Chaney.2000. Combining residuals to achieve specific soil amendment objectives. In J.F. Power (ed.). Beneficial Uses of Agricultural, Industrial, and Municipal By-Products. Soil Sci. Soc. America, Madison, WI. pp. 343-360.

Chaney, R.L., Y.-M. Li, J.S. Angle, A.J.M. Baker, R.D. Reeves, S.L. Brown, F.A. Homer, M. Malik and M. Chin. 2000. Improving metal hyperaccumulator wild plants to develop commercial phytoextraction systems: Approaches and progress. pp. 131-160. In N Terry and G.S. Banuelos (eds.) Phytoremediation of Contaminated Soil and Water. CRC Press. Boca Raton, FL.

Chaney, R.L., J.A. Ryan, Y.-M. Li and S.L. Brown. 1999. Soil cadmium as a threat to human health. pp. 219-256 . In M.J. McLaughlin and B.R. Singh (eds.) Cadmium in Soils and Plants. Kluwer, Dordrecht.

Brown, S. Manganese deficiency induced by lime rich co-utilization products.1998.In S. Brown, J.S. Angle, and L. Jacobs (eds.) Beneficial Co-Utilization of Agricultural, Municipal, and Industrial By-Products, proceedings of the XXII Beltsville Symposium. pp 289-298.Kluwer Academic Publishers, The Netherlands.

Brown, S, J.S. Angle and L. Jacobs (eds.) 1998 Beneficial Co-Utilization of Agricultural, Municipal, and Industrial By-Products, proceedings of the XXII Beltsville Symposium. Kluwer Academic Publishers, The Netherlands

Chaney, R.L., S. L. Brown, and J.S. Angle. 1998 Soil-Root Interface: Ecosystem Health and Human Food-Chain Protection. In P.M. Huang (ed) Soil Chemistry and Ecosystem Health Soil Science Society of America Special Publication # 52, SSSA, Madison WI. pp. 279-312.

Chaney, R.L., J.A. Ryan, and S.L. Brown. 1997. Development of the US-EPA limits for chromium in land-applied biosolids and application of these limits to tannery by-product derived fertilizers and other Cr-rich soil amendments. In S. Canali, F. Tittarelli, and P. Sequi (eds.) Chromium Environmental Issues. Franco Angleli, Milano, Italia.

Trade Journals

Brown, S. and S. Subler. 2007. Composting and greenhouse gas emissions: a producers perspective. Biocycle March 2007 37-41.

Brown, S. 2005. Evaluating benefits of class A biosolids cake production Part I. Biocycle, March 41-44.

Brown, S. 2005. Evaluating benefits of class A biosolids cake production Part II. Biocycle, April.

Brown, S. and P. Leonard. 2004. Biosolids and global warming: Evaluating the management impacts. Biocycle August:

Brown, S., and P. Leonard. 2004. Building carbon credits with biosolids recycling: Part II Biocycle September :25-29

Brown, S. L., Chaney, R. L. and Hill, D. M. Biosolids compost reduces lead bioavailability in urban soils. BioCycle 44(6):20-24. 2003.

Brown, S.L., R. Chaney, M. Sprenger, and H. Compton. 2002. Soil remediation using biosolids. Biocycle June: 40-44

Brown, S.L., R. Chaney, M. Sprenger, and H. Compton. 2002. Assessing impact to wildlife at biosolids remediated sites. Biocycle August: 51-58.

Henry, C., and S. Brown. 1997. Restoring a superfund site with biosolids and fly ash. Biocycle. 38(11):79-83.

Proceedings

Brown, S. and N. Basta. 2004. Use of an in vitro extract to measure reductions in bioavailability of soil lead. SoilRem 2004. Nanjing, China Nov 11-14.

Brown, S. L., C. L. Henry, H. Compton, R.L. Chaney, and P. DeVolder. 2000. Using municipal biosolids in combination with other residuals to restore metal-contaminated mining areas. Chap 1. In Proc. Symp. Mining, forest and Land Restoration: The Successful Use of Residuals/ Biosolids/Organic Matter for Reclamation Activities (Denver, CO, July 17-20, 2000). Rocky Mountain Water Environment Association, Denver, CO.

Brown, S.L C. L. Henry, H. Compton, R. L. Chaney and P. DeVolder[1]. 2000 Using municipal biosolids in combination with other residuals to restore zinc and lead contaminated mining areas. In Y. M. Luo et al.(eds), Proceedings of SOILREM 2000, Hangzhou, China Oct 9-12, 2000

Brown, S. L., C. L. Henry, H. Compton, R.L. Chaney, and P. DeVolder. 2000. Using municipal biosolids in combination with other residuals to restore a vegetative cover on heavy metal mine tailings. In Proceedings of the 17th National Meeting of the American Society for Surface Mining and Reclamation. June 11-15, 2000 Tampa, FL pp. 665-670.

Chaney, R.L., S.L. Brown, J.S. Angle, T.I. Stuczynski, W.L. Daniels, C.L. Henry, G. Siebielec, Y.-M. Li, M. Malik, J.A. Ryan and H. Compton. 2000. In situ Remediation/ReeLamation/Restoration of Metals Contaminated Soils using Tailor-Made Biosolids Mixtures. Chapter 2; 24 pp. In Proe. Symp. Mining, Forest and Land Restoration: The Successful Use of Residuals/Biosolids/Organic Matter for Reclamation Activities (Denver, CO, July 17-20, 2000). Rocky Mountain Water Environment Association, Denver, CO.

Chaney, R.L., S.L. Brown, Y.-M. Li, J.S. Angle, T.I. Stuczynski, W.L. Daniels, C.L. Henry, G. Siebielec, M. Malik, James A. Ryan and Harry Compton. 2000. Progress in Risk Assessment for Soil Metals, and In-situ Remediation and Phytoextraction of Metals from Hazardous Contaminated Soils. Proc. US-EPA Conf. "Phytoremediation: State of the Science." May 1-2, 2000, Boston, MA. In press.

Chaney, R.L., S.L. Brown, J.A. Ryan, J.G. Hallfrisch, Q. Xue, T.I. Stuczynski and H. Compton. 2001. Using Biosolids, Composts, and Tailor-Made Biosolids Mixtures in Remediating

Urban and Brownfield Sites and Other Metal-Contaminated Soils. pp. . In Proc. Innovative Uses of Biosolids Symposium, Sept. 17-19, 2000. Chicago, IL. Water Environment Federation, Arlington, VA.

Brown, S. and C.L. Henry. 1999. Building Partnerships with EPA Superfund. Proceedings Water Environment Federation Residuals Conference, Charlotte, NC January 20-23.

Chaney, R.L., S.L. Brown, T.I. Stuczynski, W.L. Daniels, C.L. Henry, Y.-M. Li, G. Siebielec, M. Malik, J. S. Angle, J.A. Ryan and H. Compton. 1999. In-situ remediation and phytoextraction of metals from hazardous contaminated soils. Proc. US-EPA's Conference on "Innovative Clean-Up Approaches: Investments in Technology Development, Results & Outlook for the Future.", Nov. 2-4, 1999, Bloomingdale, IL.

Brown, S. L. and C.L. Henry. 1999. Use of biosolids and other residuals for restoration of metal-effected ecosystems. Manual prepared for US EPA Office of Environmental Response.

Brown, S. 1998. Biosolids and fly ash used to restore the Bunker Hill Superfund site. EPA Tech Trends. EPA 542-N-98-005 Issue No. 29.

Brown, S. L., C. Henry, R. L. Chaney, and H. Compton. 1998. Bunker Hill Superfund site: ecological restoration program. In Proceedings of the 15th National Meeting of the American Society for Surface Mining and Reclamation. May 17-22, 1998. St. Louis, MO. pp 388-393.

Henry, C.L. and S. Brown. 1997. Restoring a Superfund site with biosolids and fly ash. BioCycle 38:79-83.

Brown, S., R.L. Chaney, J. Halifrisch and Q. Xue. 1997. Effect of biosolids processing on the bioavailability of Pb in urban soils. In Biosolids Management Innovative Treatment Technologies and Processes, Water Environment Research Federation Workshop Proceedings # 104. October 18, 1997. Chicago, IL.

Chaney, R.L., M. Malik, Y.M. Li, S.L. Brown, E.P. Brewer, J.S. Angle and A.J.M. Baker. 1997. Phytoremediation of soil metals. Current Opinions in Biotechnology 8:279-284.]

Chaney, R.L., J.A. Ryan, Y.-M. Li, R.M. Welch, P.G. Reeves, S.L. Brown and C.E. Green. 1996. Phyto-availability and bio-availability in risk assessment of Cd in agricultural environments. pp. 49-78. In OECD Proc. Sources of Cadmium in the Environment (Stockholm, Sweden, Oct. 15-22, 1995). OECD, Paris, France.

Chaney, R.L., S. Brown, Y.-M. Li, J.S. Angle, F. Homer and C. Green. 1995. Potential use of metal hyperaccumulators. Mining Environment Magazine 3(3):9-11.

Filcheva, E. and S.L. Brown. 1994. Effect of Fe, Mn, and Zn enriched biosolids compost on uptake of Cd by lettuce from Cd-contaminated soils. pp. 205-207. In C.E. Clapp, W.E. Larson and R.H. Dowdy (eds.) Sewage Sludge: Land Utilization and the Environment. American Society of Agronomy, Madison, WI.

Abstracts/presentations

2006

Brown, S. Biosolids as a tool for carbon sequestration. Water Environment Research Federation/ EPA Workshop. Sacramento, CA July 10-12, 2006

Brown, S. Biosolids and global warming, an introduction. Montana State Department of Ecology training session. Missoula, MT June 7, 2006

Brown, S. Composting and greenhouse gas accounting. US Composting Council, Annual meeting, Keynote address. Albuquerque NM, February

Brown, S. Understanding and developing quantitative measures for metal bioavailability. Encuentro de Quimica Analitica y Ambiental. Universidad Arturo Prat, Iquique, Chile, Oct 16-19. 2006. Keynote address

Brown, S. and J. Clausen. Use of high Fe composts to reduce Pb and As availability. Soil Science Society of America Annual Meetings. Indianapolis, IN Nov 2006

Devin-Clarke, D., M. Doubrava, and S. Brown. Fate of 4 nonlyphenol in applied biosolids. Soil Science Society of America Annual Meetings. Indianapolis, IN Nov 2006

Schmidt, R., S Brown and R. Rodriguez. Fungal Endophytes Associated with Plants on Remediated Mine Tailings and Uncontaminated Soils. Soil Science Society of America Annual Meetings. Indianapolis, IN Nov 2006

2005

Brown, S. , C. Henry, and T. Durfey. Biosolids for Biodiesel. Water Environment Research Federation Innovative Uses of Biosolids and Animal and Industrial Residuals. Chicago, IL June 29-July 2.

Brown, S. and N. Basta. Field test of in situ soil amendments at the Tar Creek National Priorities List Superfund Site. International Conference on the Biogeochemistry of Trace Elements. Adelaide, Australia. April 3-7, 2005.

Sprenger, M, S. Brown, S. Fredericks, and H. Compton. Assessment of the Residual Terrestrial Bioaccumulation and Risk from Cd, Pb, and Zn to Small Mammals Colonizing a Biosolids Treated Mining Waste Material in Joplin MO, USA. International Conference on the Biogeochemistry of Trace Elements. Adelaide, Australia. April 3-7, 2005.

2004

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Compton, H., M. Sprenger, S. Brown, and C. Henry. 2004. Evaluating the success of in situ amendments to reduce metal bioavailability by accessing ecosystem function. Sustainable Land Application Conference. Lake Buena Vista, FL Jan 4-8. p. 91.

2003

Brown, S., C.L. Henry, A. Svendson, and P. DeVolder. 2003. Use of biosolids and lime to restore a native plant cover on metal mine tailings. Soil Science Society of America annual meetings, Denver, CO Nov 2-6.

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Sprenger, M., H. Compton, A. Maxemchuk, and S. Brown. 2003. An evaluation of ecosystem restoration following biosolids application in Leadville, CO. Soil Science Society of America annual meetings, Denver, CO Nov 2-6.

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Brown, S.L., R.L. Chaney and J.S. Angle. 1993. Uptake of Zn and Cd by Thlaspi caerulescens and Silene cucubalis as affected by total soil metals and pH. Agronomy Abstr. 1993:242.

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INVITED TALKS/ SEMINARS

2006

US Composting Council, Albuquerque. NM. Keynote speaker 'Use of Compost for Carbon Sequestration

US EPA New Orleans- Remedial Project Managers Training Program – Jumpstarting Ecological Restoration

2005

International Conference on the Biogeochemistry of Trace Elements, Adelaide. Aus Symposium organizer and presenter on 'Tools to evaluate changes in metal availability'

Soil Science Society of America- Symposium organizer- Metal availability in biosolids amended soils

Purdue University, West Lafayette, IN Guest Lecturer, Using residuals to accrue carbon credits

Greater Vancouver Regional District- Potential for biosolids and regulatory progress

US EPA Internet Seminar – Jumpstarting Ecological Restoration

US EPA Phoenix- Remedial Project Managers Training Program – Workshop on Ecological Restoration, 'Using residuals as a tool for Restoration

2004

Land Applications of Residuals Conference, Orlando FL Use of Residuals to reduce metal toxicity on contaminated soils

Biocycle West Coast Conference-Portland, OR. Carbon sequestration in the King County Biosolids Program

US EPA MIAMI- Remedial Project Managers Training Program – Workshop on Ecological Restoration, 'Using residuals as a tool for Restoration

Water Environment Research Federation- Chicago, IL- Innovative uses of Manures and Biosolids Conference 'Use of Residuals for Restoration of Contaminated Sites

SOIL REM- 2nd International Conference on Soil Remediation, Nanjing, China 'Evaluation of Soil Amendments to reduce lead and arsenic bioavailabiliyt'

Soil Science Society of America National meeting, Seattle, WA Evaluation of bioavailability of soil lead and arsenic following amendment addition.

Biofest Northwest Biosolids Management Association annual meeting presentation 'Class A biosolids, what does Class A get you?'

2003

International Conference on the Biogeochemistry of Trace Elements, Uppsala Sweden, June, 2003. Two invited platform presentations on 'Measures to assess ecosystem restoration' and 'Use of soil amendments to reduce the bioavailability of soil Cd, Pb, and Zn'.

EPA Brownsfields –Washington, DC. Invited presentation with head of US EPA Brownsfields program on the potential to use residuals to restore Brownsfields sites

King County, WA- Toxic Waste Division- Toxicity and bioavailability of mercury in biosolids

King County, WA- Wastewater Treatment Division- Use of biosolids to reduce metal availability

Oregon Association of Clean Water Agencies, Portland OR 'Recent advances on the behavior of metals in biosolids' as part of a one day workshop on Metals in Biosolids

EPA Brownsfields National conference, Portland, OR. Two invited talks ''Bioavailability of Lead in Soils' and ' Use of Residuals for Ecosystem Restoration'

EPA Superfund Program, Prescott, AZ Presentation to stakeholders and regulators involved in the McCleur tailings site on 'Lead and arsenic availability following amendment addition'

Soil Science Society of America Annual Meeting, Denver, CO. Organized symposium on Ecological Restoration in Leadville, CO and gave a presentation on ' Efficacy of different lime sources for reducing metal availability'

US EPA Remedial Project Managers Training Colorado Springs, CO Workshop on ecosystem restoration 'Role of soils in restoration' and 'Using residuals to restore metal contaminated ecosystems'.

Biofest Northwest Biosolids Management Association annual meeting presentation 'Lead and arsenic reduction with biosolids compost'

2002

Society of Environmental Toxicology and Chemistry – invited platform presentation on symposium on in situ restoration of metal contaminated soils, Salt Lake City, Nov 16-20. Co author on 8 platform presentations

Soil Science Society of America Annual Meeting, Indianapolis, IN. Invited presentations in symposium on Joplin, MO field test of amendments to reduce lead availability on '

PBET procedure to evaluate changes in lead availability' and 'Field plot treatment selection and installation at Joplin'

UKWIR/WERF Bath, England. 'Biosolids and metal availability'

US EPA Leadville, CO. Presentation to stakeholders and regulators involved in the Leadville Alluvial Tailings project site on 'Research results to date'

USEPA Office of Solid Waste and Emergency Response- On Scene Coordinators Training Orlando FL 'Role of soils in restoration'

USEPA Office of Solid Waste and Emergency Response- Remedial Project Managers training – 'Use of residuals as an alternative remedial option'

Lewis and Clark College, Portland, OR 'Role of science within the decision making process in EPA's Superfund program'

Biofest Northwest Biosolids Management Association annual meeting presentation 'National Research Council report on biosolids'

2001 USEPA, OSWER Implementing Ecological Revegetation/Restoration at Superfund and RCRA Sites Workshop, invited speaker Argonne National Laboratory, April and May, 2001

Department of Energy, Savannah River Ecology Laboratory Savannah, GA. Invited Seminar 'Evaluating metal bioavailability'

Ohio State University, Columbus, OH. Invited seminars ' Soil amendments to reduce Pb availability' and 'Using biosolids to restore ecosystems'

UC Riverside Soil and Water Sciences Department, Invited seminar. Use of soil amendments to restore functional ecosystems on metal contaminated mine wastes. May, 2001

Soil Science Society of America, annual meetings Symposium on the field evaluation of in situ treatments to reduce soil-lead bioavailability, invited speaker Charlotte, NC November, 2001

Sixth Annual Conference on the Biogeochemistry of Trace Elements: Phyto-, microbial and chemical remediation tools for metal contaminated soils and groundwater", invited speaker Guelph, Ontario, July, 2001

Forest Research, Rotorura, New Zealand invited seminar on 'Altering wetlands chemistry to reduce metal availability in situ'

Biofest Northwest Biosolids Management Association annual meeting presentation 'Lead availability in compost amended soils'

Biocycle West Coast conference, Portland OR. 'Use of biosolids at Superfund sites'

US EPA OSWER Kansas City MO. 'Ecological risk assessment at in situ remediated hard rock mining sites' presentation for regional project managers, industry and stakeholders.

2000

USEPA, OSWER, On Scene Coordinator training. Phoenix, AZ. Presentation on use of residuals for restoration for Hard Rock Mining session.

Soil Science Society of America, annual meetings Minneapolis, MN Special symposium on Soil Quality, invited presentation 'Restoration of Self-Sustaining Ecosystems on Metal Affected Soils' November, 2000

SoilRem 2000 – Hangzhou, China international workshop on remediation of organic and metal contaminated soils, invited presentation on remediation of metal contaminated soils

Biofest Northwest Biosolids Management Association annual meeting presentation on potential ecosystem impacts associated with soils restoration.September, 2000

Land, mining, and forest restoration symposium/workshop – the successful use of residuals/ biosolids/organic matter for reclamation activities. Sponsored by US EPA Office of Water Workshop held in Denver, CO July, 2000. Co-organizer, workshop and symposium

Biocycle, Southwest annual conference. San Diego, CA. Invited presentation 'Using biosolids to remediate metal contaminated soils at Superfund sites'

US EPA Region 10 Invited presentations for Leadville Memorandum of Understanding group and CORE group on initial results of Biosolids restoration projects

EPA OSWER (superfund) Technical support project general meeting with head officials of Superfund program Washington, DC. ' 'Role of soils in Restoration'

US EPA WERF Golden CO, organized two sessions for conference on soil remediation.

1999

Invited Faculty lecture for visiting committee, College of Forest Resources, University of Washington

Invited to organize a one day workshop on the use of biosolids for restoration of disturbed soils at the annual meeting of the American Society for Surface Mining and Restoration. Scottsdale, AZ August 15-18, 1999

Invited to organize a meeting of the EPA Inplace Inactivation and Natural Ecosystem Restoration Team to discuss indices of ecological restoration. Coeur d'Alene, ID June, 1999.

Invited to present keynote address on in situ restoration of Pb contaminated soils for special session on remediation of metal contaminated soils, Fifth Annual Conference on the Biogeochemistry of Trace Elements, Vienna Austria, July, 1999.

Presented 2 platform presentations and co-authored 3 platform presentions. Fifth Annual Conference on the Biogeochemistry of Trace Elements, Vienna Austria, July, 1999.

Invited to present a lecture on soil factors in ecological restoration for a workshop on Ecosystem Restoration hosted by the Environmental Response Team of US EPA OERR Edison, NJ, June, 1999.

Invited to present a lecture to the Senior Management Team of USEPA OERR on the potential for the use of biosolids to restore metal impacted sites Washington, DC April, 1999.

Invited seminar "Scientific basis for the 503 biosolids regulations", Water Environment Federation, Technical Meeting Charlotte, NC January, 1999.

Presented a platform presentation "Building Partnerships with EPA Superfund" at the Water Environment Federation Residuals conference, Charlotte, NC January 1999.

Invited by US EPA Region 8 to present a seminar on the scientific basis for the biosolids amendment on the Leadville, CO alluvial tailings to the Upper Arkansas CORE group Denver, CO, March, 1999.

Presented a platform presentation on the use of residuals for restoration of metal contaminated soils in Bunker Hill, ID at PNPCA conference Portland, OR October, 1999.

Presented a platform presentation on the Bunker Hill, ID restoration projects for the Society of Ecological Restoration conference in Tacoma, WA October, 1999.

1998

Invited by the International Lead and Zinc Research Organization to participate in the work group on remediation of metals in soils, Montpelier, FR August, 1998. Presented information on the Bunker Hill, ID and Joplin, MO projects.

Invited by USEPA to participate in conference on the use of residuals for mine land reclamation, Chicago, IL September, 1998. Presented talks on the scientific basis for use of biosolids to limit metal availability and the Leadville, CO restoration project

Invited by New South Wales Forestry to advise on use of residuals for restoration of disturbed soils Sydney, Australia June 1998.

Presented a platform presentation "Bunker Hill Superfund site: ecological restoration program". Meeting of the American Society for Surface Mining and Reclamation. May 1998. St. Louis, MO.

1997

Presented a platform presentation and co-authored two platform presentations at the Biogeochemistry of Trace Elements meeting in Berkeley, CA , June, 1997.

Invited by the MD Department of Agriculture to lecture on microelement concerns in relation to the agricultural use of biosolids for the Nutrient Management Certification program

Invited to prepare a book chapter with Dr. Rufus Chaney entitled 'Use of by-products for creation of value-added products for land application or environmental remediation' for the forthcoming ASA publication "Beneficial Uses of Agricultural, Industrial, and Municipal By-Products.

Invited by the International Lead Zinc Research Organization to participate in the In Situ Soil Remediation Technology Workshop, Berkeley CA June, 1997, presented information on the Joplin, MO in situ Pb inactivation study as well as the Bunker Hill Ecosystem Restoration Project.

Invited seminar "Forming Alliances for Long-Term Success at Bunker Hill" at the Northwest Biosolids Management Association 1997 "Illuminating the Future: Building Alliances and Markets" meeting, September 14-16, 1997.

Invited seminar "Manganese Deficiency Induced by Lime-rich Co-utilization Products' presented at the 1997 BARC Symposium: "Beneficial Co-utilization of Agricultural, Municipal, and Industrial By-products", May 4-8, 1997.

Invited seminar "Approaches to Ecosystem Restoration" presented at BHP Copper meeting of mine reclamation managers. Report prepared that included an evaluation of the ongoing reclamation efforts at several BHP mine facilities, August 17-21, 1997.

Invited by the Maryland Department of the Environment to present results of several field studies on biosolids induced Mn deficiency to the Sewage Sludge Task Force.

Invited by BioCycle to present a talk on the Bunker Hill Ecosystem Restoration research at the West Coast BioCycle conference.

APPENDIX 3

two and let's get the mechanics and electronics taken care of.

DIRECT EXAMINATION

BY MS. KOLER:

Q Mr. Henry -- or Dr. Henry, could you describe your educational background, please?

A I have a bachelor of science degree in civil engineering from Oregon State University, I have a master's in environmental engineering from Oregon State University, and I have a Ph.D. in soils and waste management from the University of Washington.

Q And can you tell us where you work?

A I am a full-time employee of Eastside Prep Private High School right now, as well I am the senior lecturer of the University of Washington, Bothell.

Q And what courses do you teach at the University of Washington?

A I teach no courses at this time at the University of Washington. Over the course of the 25 years that I was at the University of Washington I taught probably 15 different courses.

Q Have you taught any courses that address soils and composting?

A I taught a class in composting for at least ten years. And I taught a number of soils classes, as well as a number of other organic waste management classes.

Q And what professional memberships do you have?

A At this point I think I've dropped most of my professional memberships being a high school teacher. At one time not too

long in the past I was a member of the Soil Science Society of America, Compost Council. That's the U.S. Compost Council.

Q Were you a member of the Washington State Recycling Association?

A I was at a time, that's true.

Q Were you a member of the Water Environment Federation?

A Yes I was.

Q Were you a member of the Soil Science Society of America?

A Yes, I was. I stated that.

Q And were you a member of the W-170 Technical Committee?

A And I still am, yes.

Q And have you been paid to do projects in foreign countries?

A I have extensive foreign experience doing projects, as well as taking classes for visiting, yes.

Q And what countries have you been hired to do projects in?

A My latest was Equator just a couple of weeks ago. I've done projects in Costa Rica, in Mexico, in India, in China, in New Zealand, in Australia, Spain.

Q China?

A Yes.

Q And do you do -- do you have any publications, Dr. Henry?

A Yes. I have a number of publications.

Q Could you -- I can give you your CV if you want it to provide those publications.

A Most of my publications have to do with organic waste

management, and particularly biosolids management. And I have a number of --

HEARING EXAMINER: Excuse me. Is the District familiar with Dr. Henry's qualification?

MR. UBERTI: We've seen a Website, yes. His qualifications is not an issue.

HEARING EXAMINER: It's not an issue. Do we need to go through this?

MR. UBERTI: Not for the sake of the Snohomish Health District.

HEARING EXAMINER: You don't for my sake either.

MS. KOLER: Could we -- if we're not going to go through it, simply because we could have a writ of review proceeding, could we make his CV an exhibit?

HEARING EXAMINER: Any objection to that?

MR. UBERTI: Presumably not. I haven't necessarily seen what he has in front of him, but if I could have a chance to peruse it ever so quickly.

HEARING EXAMINER: It's about 13 pages long, so ever so quickly is going to take a little longer.

MR. UBERTI: I'm more interested in the dates.

HEARING EXAMINER: October of 2006 is the date.

MR. UBERTI: No objection.

HEARING EXAMINER: No objection. We will enter Mr. Henry's CV as Exhibit No. 5, I believe. Go ahead.

Q (By Ms. Koler) Dr. Henry, have you had occasion to study Pacific Topsoils' composting operation?
A We have done some just like preliminary studies starting about two weeks ago. So in those studies so far we've looked at some temperature, bulk density, porosity, and that's basically been it at this point.

MR. UBERTI: Mr. Galt, I have an objection at this point in time. If we're going to talk about studies that happened two weeks ago, I object to the relevancy. We're dealing with a permit that was issued in August of 2006 with the information in the record as established for the sake of that period of time.

HEARING EXAMINER: I appreciate your objection. But if I have to overrule it in order to find out what they're doing now on this issue, I will do so. So if you want to consider that being overruled, so be it. I recognize that the decision I have to make relates to last year's permit.

MR. UBERTI: Fair enough.

Q (By Ms. Koler) Dr. Henry, do you want to describe the compost pile?
A Do I get into my PowerPoint now?
Q Yeah. Sure.
A Okay. Are we all set?

MR. UBERTI: I didn't hear the question or the answer talking about composting in general or composting at this site.

HEARING EXAMINER: I don't know. She just said do you want to describe the compost pile, and that's what I heard. I don't know whether you mean a generic compost pile or this one. And I don't know how that segues into his presentation, whatever his presentation is.

MS. KOLER: He's going to discuss composting in general. Specifically because I think that that's the necessary foundation for any further discussion of Pacific Topsoils.

HEARING EXAMINER: Okay. Is this what I'm looking at here the paper copy? Okay. Thank you. We will enter for record purposes a paper copy of the slides which are going to be shown here as soon as the electronics are taken care of. They will become Exhibit 6.

MS. KOLER: Do you want us to move so that we (inaudible) --

THE WITNESS: It might help to turn the lights down.

HEARING EXAMINER: If the mechanics of getting the lights down is a real problem, frankly, with all do respect to everybody that's here, the parties have to communicate with me and I've got a paper copy of everything he's going to show. So I don't need the room pitch black to understand what's going on.

MR. UBERTI: We may have some rebuttal testimony, some (inaudible) statements, so if we could see, that's great.

HEARING EXAMINER: Okay. We'll do the best we can to make it visible. That looks pretty decent. It did. Now it does. That looks pretty good.

THE WITNESS: So I have done a lot of --

MR. UBERTI: I'm sorry. Can we have the question? What's the question now that --

HEARING EXAMINER: Let's make this simple. Dr. Henry, give us your PowerPoint presentation. Okay?

THE WITNESS: Thank you. I would be happy to.

HEARING EXAMINER: Thank you.

THE WITNESS: I've done a lot of work in compost over the last 25 years, and this is the slide that I typically start a lot of my presentations with. And it's just generally I think most people agree that it is the controlled biological degradation of organic material. And the goal is to produce a stable soil amendment in an environmental friendly way.

So as I mentioned, I've done this in classes for many, many years. I've given a lot of talks. And I've used this concept in a couple of composting systems that I've actually invented over the last years.

So if I look at Pacific Topsoils, it fits my definition of composting. They produce a stable product. And if I look at it, it has -- it's free of an unpleasant odor. So I guess the question is does it fit DOE's definition. So what I'm going to do is present some of my thoughts on it. And whether

or not that leads into the last question is I guess what this is all about. Okay.

So I have opinions on what composting should be. I think there's primary objectives of low environmental impacts, high quality product. And cost is a consideration because if the cost is too expensive, then it decreases our desire to recycle. So it's always an objective if you're in private enterprise.

There are secondary objectives. And that is that today energy is not free, so it is a consideration, as are greenhouse emissions. So these are very important when you look at composting as a holistic enterprise. Okay.

What I'm going to do is talk about some composting basics, some concepts, key operation parameters, and relate these all to Pacific Topsoils. I'm going to talk about what aerobic and anaerobic mean in terms of composting, show some typical compost systems that have been accepted in composting, and why I think Pacific Topsoils' pile meets my definition of composting. And also some environmental considerations that I'll talk about throughout -- as well as Dr. Brown, I think it going to talk about them -- energy use and greenhouse gases.

Now, I'm also going to finish up with what I consider a very, very important aspect, and that's using the right tool. So composting takes place in stages basically. Things that rot quickly will do so and that's done by microorganisms called

bacteria. They multiply extraordinarily quickly. 20 minutes they double if substrate is not limited.

The second stage of composting is a curing where you have hemicellulose and cellulose broken down. That is done in aerobic conditions by an aerobic microorganism called actinomycetes. And then we have long-lasting decomposition by a lignin and lignocellulose by fungi. So this is the stage that odors are produced. Bacteria break down things very rapidly and produce bad odors.

Earthy smell happens during the curing stage of composting where hemicellulose and cellulose is broken down. You can see it's done by actinomycetes and fungi. These microorganisms only operate under aerobic conditions. They do not operate under anaerobic conditions. If you smell Pacific Topsoils' finished product, it has an earthy smell. That earthy smell is done by a specific microorganism of actinomycetes, streptomyces, and they admit the odor that you associate with good earthy soil.

So general concepts. The more energy you put into composting, the faster it composts. And it affects process, variables, nutrient, balance, moisture, aeration, porosity, temperature, time. And what you do when you choose a composting system is you trade off cost and energy consumption with time, which is essentially how much land it takes you to compost.

So the very simple type of composting is backyard composting. You can make it with kits or simple piles. If you look at a simple pile such as some of the sustainability places around the northwest, then it looks like a big static pile. There are recipes for doing this correctly. And these are some that Ecology, as well as Seattle Tilth and other people, believe in and use. One part green, which is your grassy leafy materials. One part brown. The idea is to alternate this. And green has nitrogen in it, and the brown has carbon, little nitrogen, adds porosity, etc. It works.

Okay. Now, large static -- or excuse me, large scale composting also uses a recipe. And they balance the carbon and nitrogen in these. Pacific Topsoils controls carbon and nitrogen by adding varying amounts of hog fuel, which is essentially the ground up woody material that is low in nitrogen. They balance that with the grassy green material that comes in. So if you got a lot of grass coming in, you put more hog fuel in. And this is really the process variable that makes composting happen the way you want. Too much nitrogen you have odors, ammonia. Too little nitrogen you have a reduction in decomposition.

How moisture is important. When it gets above 60 percent then it goes anaerobic. When it's below 40 percent the microbes don't like it. They stop working. Pacific Topsoils is about 58 percent -- 57, 58 percent -- from some of the tests

that we just took about a week and a half ago. And those were taken at depths of 6 inches, 3 feet, and 6 feet. These were just some grab samples that we did at various parts around the pile just to get an idea. That's actually fairly good when you consider we're in a wet season, coming off a wet season. And so presumably that will be where you have your most moist conditions.

Changing porosity. Porosity is really important because if you keep your moisture down and if you kept your moisture within the zone that you like it, you also have to have space for the air to get in. So typical porosity starts off fairly high, and you can see it drops to maybe 35 percent in an ideal situation. Pacific Topsoils in their own material from the samples we took -- our grab samples at 6 inches, 3 feet, and 6 feet -- are right in the range that you would expect them and want them.

HEARING EXAMINER: May I ask a question on that slide?

THE WITNESS: Certainly.

HEARING EXAMINER: Pacific Topsoils is controlled by hog fuel, comma, course fraction. C-o-u-r-s-e. Is it supposed to be the other coarse?

THE WITNESS: Yes, it is.

HEARING EXAMINER: C-o-a-r-s-e?

THE WITNESS: I didn't catch that. What a surprise. C-o-a-r-s-e.

HEARING EXAMINER: That means what?

THE WITNESS: Big woody material. Bigger woody material.

HEARING EXAMINER: By controlling the percentage of big material that goes into the pile?

THE WITNESS: The larger material will aid in porosity, so it gives air space. Space for the air to travel through.

HEARING EXAMINER: I'm going to -- this is the original -- well, the official copy of Exhibit 6. And unless there's an objection, I'm going to cross out the word "course" and put the other spelling in.

THE WITNESS: Very good. Thank you. If that's the only one, I'll feel very good.

HEARING EXAMINER: Thank you. Go ahead.

THE WITNESS: Okay. Temperature is very important for a couple different reasons. Temperature tells you if you're composting aerobically.

HEARING EXAMINER: That page didn't copy. I have a blank sheet. Probably the next two slides are missing then.

THE WITNESS: Then we will get those to you.

HEARING EXAMINER: Okay.

THE WITNESS: The temperature impact is important. When things decompose anaerobically at low oxygen, temperature does not rise. Temperature only increases when you have fairly

rapid decomposition by bacteria. And so if you have a rise in temperature, it's indicative of aerobic decomposition. That's one aspect.

The second aspect is we like to have composting happen for a specific period of time above 55 degrees centigrade for pathogen kill-off. And we have had probes in the last few weeks looking at temperature. And you can see here the excavator making a hole where we put some of the probes. And that steam is indicative of temperature. If you look at these different temperatures, then we have one set where we had older material, 6 inch old, and that is at a temperature about 37 degrees at 6 inches deep. At 3 feet deep it's a little above 55 degrees centigrade. At 6 feet deep in the older material you can see it's about 70. And then all of the depths in recently placed material are above the 55-degrees centigrade. And we also put a pipe down into relatively fresh material at 20 feet deep, and it was at about 70 degrees centigrade.

So the high temperatures here are indicative of aerobic conditions. Without aerobic conditions those would not exist.

HEARING EXAMINER: Before you hit the bottom, what's the entasis on this?

THE WITNESS: The entasis is hours.

HEARING EXAMINER: Oh, hours. Okay.

THE WITNESS: Yes. I'm sorry. It's about a one-week period of -- a little over a one-week period.

UNKNOWN SPEAKER: (Inaudible).

THE WITNESS: Another one? Decrees. Oh my gosh. It was early. Okay. Those were "degrees" and not "decrees."

Okay. Now, I want to talk a little bit about oxygen, because this is a really critical point for whether you're aerobic and whether you're anaerobic and what that means.

We have about 18 -- excuse me, about 21 percent oxygen in our atmosphere. And when you get to about 16 percent oxygen, you start producing compounds that can be odorous. When we get to about 6 percent oxygen, we consider that anaerobic and we have a lot of odors produced. So that's a key parameter when we get to anaerobic and aerobic conditions.

That changes during the compost period. When you start out, new material doesn't have the microbes in it. They have to build up their populations. So as they build up their populations, the temperature rises and the oxygen requirements by those bacteria increases. That decreases during composting periods and it makes a difference how you compost, how fast it decreases. Some composting operations claim that they can do this rapid composting in weeks. Others take longer. Then it continues to decrease in terms of the oxygen until you would screen and cure, and then you see another blip where you have oxygen requirements because you had some agitation in the material.

If you look at a typical aerated system that has

aeration for a specific portion of time and then the aeration is turned off, this is how these are normally operated so you're not blowing all the time. Then what happens is as you have the blowers on, you reach high oxygen levels. When you turn the blowers off, the microbes use that oxygen and it decreases quite rapidly. And in most cases you'll grow into an aerobic condition. In fact, in very very few compost piles is aeration on and off that don't have periods where they don't go anaerobic. So in this case this is just an example showing nine minutes of the whole 25 in which it's anaerobic.

Now, other types of systems that are acceptable systems like windrows, then one would assume that those -- the cores of windrows grow anaerobic for a day or more depending on how frequently these windrows are turned. Because as you can see here, anaerobic conditions are reached very quickly. If you turn a windrow once a day, the majority of the time of that core is anaerobic.

Now, let's go a little more into our compost pile and back into my -- my waste water engineering classes and biofilm theory. All particles are encapsulated with a certain amount of water. They are organic. There are microbes that live in the water. There are zones within that particle that are aerobic, and then as you go towards the center of the particle there are anaerobic zones.

That alone suggests that composting is not a totally

aerobic process on a small basis. On a larger basis then one could argue most systems. And I know few systems that maintain aerobic conditions all the time in all places.

So one could ask if this is true for all composting systems, why aren't odors present? Well, they are in most cases. And as many of us who are familiar with composting can agree with, that more composting operations are shut down because of odors than any other reason. So why aren't there significant odors at Pacific Topsoils? And correct me if I'm wrong, but I don't know that there's been an odor complaint.

UNKNOWN SPEAKER: In 2006 I believe we had one or two.

THE WITNESS: Which is fairly good. If you look at a big pile, then you have two areas. Odors are produced presumably in the core of that pile and then the outer shell which is aerobic is essentially its own biofilter. Now, this is a phenomena that is unique to big pile -- big static piles that over a long period of time they develop this biofilter, which is exceptional in reducing. What that means is odors are produced in the anaerobic portion. As they migrate through the aerobic portions, they have energy. Bacteria take those molecules and use those as an energy source and change those so that they are no longer odor producing. They're oxidized.

So what's the difference between the aerobic and anaerobic decomposition and why are we so interested in aerobic? Well, composting is faster done aerobically. The

temperature is elevated aerobically. Odor production is less aerobically. And something that Dr. Brown, I assume, is going to talk about is methane production is less aerobically. Methane is a greenhouse gas. It's about 20 times greater than carbon dioxide. Okay.

HEARING EXAMINER: Stop.

(End of tape 1)

HEARING EXAMINER: Thank you. Continue.

MR. UBERTI: So the question would be how do we know we're composting aerobically? And one way, you can measure oxygen in the pile. Second way is, as I mentioned previously, if you have heat production, if the -- if the temperature is elevated, you do have anaerob -- or excuse me, aerobic decomposition. If there is odor production, that means it's anaerobic decomposition at least in some places. And one good indication of this is the smell of the final product.

You can also look for more sophisticated methods in testing such as existence of reduced compounds. That means those compounds form without oxygen. So those are always testing things that can be done in the future.

Now, very quickly I'm going to look at what we consider accepted large scale composting systems. Static pile, area static pile windrow, agitated bay, in-vessel, and so forth. Generally speaking, if you -- as4 you go down this pile -- excuse me, down this list, as the composting time goes down, complexity and energy input has to go up.

So if you want to do it, then you can do it. There's no secret. Engineers have been doing these for many, many years. Static pile air comes from the outside. And depending how your porosity and other characteristics, it will go into your pile only a certain distance. 3 feet, 6 feet, we don't know. It kind of depends on your material.

There is an excellent large scale composting facility GroCo, which composts biosolids with sawdust. Up until I think it was a year or so ago they had very big pile composting. They had a tremendous product that was used in the garden show every year. So good smelling, good looking product. They continue to compost in big piles for their manures that have been -- because of the biosolids, they have been changed to windrowing for the biosolids material.

Varying static pile simply uses mechanical fans and so forth, pumps, to either blow air into a pile or suck air. And basically this just increases the amount that's aerobic. Windrow, as I mentioned, this goes through, and an agitator comes through maybe once a day and turns the material.

Agitated bay is kind of combination. This is one that I invented and that we have used for national research producing compost for a contaminant study. And there are systems like the Ag-Bag compost system where you can blow air into a facility like this.

Okay. So how does that work with big pile composting? Where does it fit in? We don't know. We have not studied them. There are very few out there. It doesn't require extensive engineering because it's just a simple process. And so if it's not hugely engineered, then engineers generally stay away from it believe it or not. And I speak as an engineer. And one of the things that we want to do is study it. Because

in our conversation with Ecology it was -- was it last summer?

MS. KOLER: July 17, 2006.

THE WITNESS: Then one of the things that I asked pointedly is if static piles was an accepted method, would this be accepted by Ecology? And the answer was yes. So one of the things that we want to do, and we put a proposal together at that time, was to study it and document it as an acceptable method for composting. Okay.

So this is how we think Pacific Topsoils pile works, and the measurements here are just kind of a general reference. So at one end of 120-by-40 feet wide pad -- and this is working in an elevation 12 feet high. So material is brought in, you continue to work on that material until you fill that up, and then you start working on a second level. But each particular deposit, so to speak, goes about two to three weeks of anaerobic composting before the next layer.

HEARING EXAMINER: What you said is not what's on your screen. Which is right? Two or three weeks of aerobic?

THE WITNESS: Did I say anaerobic?

HEARING EXAMINER: You said anaerobic.

THE WITNESS: Okay. Sorry. Thank you for correcting me.

HEARING EXAMINER: I wouldn't have interrupted but after two little spelling glitches, I thought maybe this was a spelling glitch.

THE WITNESS: No. This is correct and I spoke wrong. Anyhow, when you put this down, before an additional layer is put on it, you have a two to three week interval where you have essentially aerobic composting. And then more piles are added until we get up to whatever height that is desirable.

And my understanding is that this is kind of the start of it and then another pad right next to it is added until it reaches its final dimensions. Essentially, this is the system.

Now, with that said, then one could argue that aerobic decomposition occurs for as long as many systems operate on a regular basis. So if you look at the trade-off between intensive and extensive composting, intensive is one that has a lot of energy input and is relatively fast. So it is fast, it has low land requirements, and it's accepted. And being accepted, it's accepted by the regulatory community, as well as the engineering community. That's as opposed to extensive or a large land requiring facility that has lower energy input. And if this is not a state -- of interest in our state these days, I'm not sure what is. It has less carbon dioxide emissions because you use a lot less equipment. It is potentially less methane production due to less pile disturbance and less operating costs. With all those -- as a biofilter it appeared that there is potentially less odor production as well.

Okay. So I'm going to go through some of these processed variables. Nutrient balance is done during pile

construction, moisture is done during pile construction, aeration oxygen happens during the two to three initial weeks during pile construction. It also occurs after screening because windrows are made after screening that are there for quite a while. It has porosity and particle size control in the construction of the pile. You saw data on that. The temperature is consistently in a long time above 55 degrees centigrade and it certainly has the time requirement. So if you were to look at Pacific Topsoils, I'm not sure which one of these process variables that it doesn't do.

Okay. I believe in using the right tool. I drive a scooter to work. I could drive a Hummer, bus, or Ferrari, but I'm concerned about costs. And it costs a lot less to drive a scooter and it costs a lot less to buy one. I don't need a Hummer, bus, or Ferrari and I think the scooter is far better for the environment.

So I have to ask the question. If you accomplish something with a Type 1 that doesn't require windrowing like a biosolids compost or some other type of growth control because it's got food waste in it, isn't it better to do things simply and save energy and save costs and save emissions to the atmosphere? And I am going to end with that.

HEARING EXAMINER: Thank you. Questions your witness, Ms. Koler?

MS. KOLER: I have no further questions.

MS. KOLER: No further questions. I'd like to call Dr. Henry.

THE COURT: Thank you, Mrs. Forman.

THE COURT: I think this belongs to Mr. Uberti. It at least came from him.

Mr. Henry you're still under oath. This is just a continuation of our session a couple weeks ago. Welcome back.

Your witness, Ms. Koler.

DIRECT EXAMINATION

BY MS. KOLER:

Q. Good morning, Dr. Henry's. Thank you for coming today.

You heard testimony last week from Health District officials and Ecology officials about Pacific Topsoils' method of composting. Do you have any comments on observations that you'd like to clarify about such --

MR. UBERTI: I'm going to object. It's a generalized open ended invitation to talk about anything.

THE COURT: It's generalized. It's open ended, but not to talk about anything. Okay. Because she specifically said that he is to offer comments regarding statements made by DOE and Health District witnesses. And I, frankly, think that, especially since our witness at this point is an academic, I think

he can probably better make his responses if he can do it in an open-ended fashion than if we try to have counsel lead him down the path one question at a time.

So as long as it doesn't get out of hand --

I remember you telling us early on in your comments last time that you could speak for hours if you wanted to or if we wanted you to, etcetera, etcetera. We don't now anymore than we did then.

THE WITNESS: I have to get back to class.

THE COURT: Okay. But I think that's probably the easier thing. Go ahead. If you have response to those particular witnesses on, I presume, technical issues.

THE WITNESS: Yes.

THE COURT: Please share them.

A. There's a number of things that have been said by the Health Department and Ecology that, that don't make a lot of sense from a technical basis.

We were talking about increase in temperature in the pile. And that, in my mind, is a suggestion that we have aerobic conditions.

Mr. Crofoot said that while he believed it was only potentially six inches deep, yet the laws of thermodynamics say that heat does not go from a cold source to a hot source, but rather from a hot source to

a cold source.

The small amount of preliminary monitoring that we have done suggests that the pile gets hotter as it goes in at least to six feet, and when we monitored even into twenty feet the temperature was far greater than it was on the surface. So that suggests that there is aerobic conditionings happening, if I know the science of composting.

There has been some suggestions by Ecology that there are other ways to heat a pile besides having aerobic decomposition. I don't know of those. So it's a science that I am not aware of.

There was -- Ms. Wescott said that, something about not believing my porosity measurements. And they are preliminary, and they went only to six feet deep. She has no information. She said that there was no studies that she had looked at that dealt with large pile composting.

So I'm getting a lot of feeling that the arguments that Ecology and the Health Department are making are non-technical. I haven't heard good science presented by them that say anything about how temperature can increase without being aerobic.

Now, we have an aerobic product. Now, if something decomposes anaerobically, you do not end up

with an aerobic process.

I believe firmly that it has an anaerobic core. How much that core is, I don't know. We haven't studied that yet.

We proposed the study back in early July last year and presented that both to the Health Department and Ecology, and I have gotten no feedback on it in terms of what we could monitor that would help this process of understanding a big pile. That was unfortunate because had we had that, then we could have potentially had some information to show, other than just the preliminary stuff I have.

In terms of a controlled operation, you know we've talked about a variety of things that are controlled, but yet when you look at it, not turning a pile is a way of controlling things that are happening in the pile. Not turning the pile retains a lot more moisture. When you turn a pile you lose a lot of moisture.

You also, as Dr. Brown said, emit other gases, potentially greenhouse gases that are far greater in terms of their impact than carbon dioxide. So -- and in addition odors are released when you turn piles.

So here we have a situation that reduces odor emission by the way that it is controlled, which is not

turning it, and reduces odors because they're oxidized as they go through the aerobic shell.

So I'm looking at that, and what is it here? We have an aerobic product. We have parts of the pile, and all of the pile at times, that are aerobic. And so on a scientific basis it seems strange that this successful operation is being targeted for closure or for some major modifications.

So with the problem about not explaining how heat is produced and not explaining how you get an aerobic product at the end, I have a real problem accepting the arguments from both Ecology and the Health Department.

Do you want to ask me anything else.

THE WITNESS: That wasn't bad, huh?

THE COURT: That was excellent.

MS. KOLER: I have no further questions.

THE COURT: Cross-examination?

MR. UBERTI: Just a few points.

CROSS-EXAMINATION

BY MR. UBERTI:

Q. This release of odor that's the subject matter, okay, PTI tries to capture the odor within the pile, does it not?

A. Tries to?

Q. Yes, or it does?

A. My understanding of big piles, how they operate, is if odors are produced in the interior of the pile, then they will be oxidized as it goes through an aerobic shell. That's -- I believe I have not monitored that. There is just anecdotal evidence that that occurs both at PTI, and this is what was found in the long-term composting process at Growco and SteerCo down in Renton. Same sort of situation. It seems like this is how a large pile operates.

Q. As I understand it, again, we're still talking about odor and odor release because --

A. um-hum.

Q. -- that's what you discussed a moment ago. As I understand it, PTI tends to get the product into the pile right away, one method of minimizing odor, correct?

A. They try to get the --

Q. They try to get it into the main pile when they receive it?

A. My understanding when they get the material it is put on to the pile, yes.

Q. And part of that process is designed so that it gets into the pile, in essence, to capture the odor?

A. From my understanding is they get it into the pile because it's a management problem because if you let a

REDIRECT EXAMINATION

BY MS. KOLER:

Q Dr. Henry, what importance do -- we're talking about smells. Is yard waste potentially a very smelly substance if it weren't managed properly?

A Grasses in particular are very stinky if they're not managed properly. And one of the things that we've had -- I've probably heard of more odor complaints with an operation that frequently windrows grasses. Northwest Cascade had major odor complaints around where they were. There were big composters of yard waste that had a significant amount of grass. I remember early when Cedar Grove was windrowing, they had a lot of odor complaints.

So I know that big scale composting has had, my understanding, far less complaints because of the mechanisms that I've been talking about.

Q And with composting is odor a consideration?

A Well, as I testified last time, probably more composting facilities have been shut down because of odors than for any other reason, so yeah.

Q And -- and it would indicate that Pacific Topsoils big pile is being managed and controlled, would it not, if they're not generating a whole bunch of odor?

A As I mentioned, that not turning a pile is in essence a controlled mechanism. It's not a fancy engineered controlled

mechanism. But it is certainly a way to control odors.
Q Which is a fundamental consideration in making compost, is it not?
A That's just what I said.
Q Okay. And -- and what about the fact -- what importance, if any, do you attribute to the fact that Pacific Topsoils' end product has an earthy smell?
A We covered that before. Can I object to that?
HEARING EXAMINER: The witness is not supposed to object to questions.
MR. UBERTI: I'll take his lead and I'll do it.
HEARING EXAMINER: That's why attorneys are --
MS. KOLER: Okay. Let me clarify it -- let me clarify --
THE WITNESS: Aerobic conditions by aerobic --
HEARING EXAMINER: Wait until she asks you a question.
Q (By Ms. Koler) Dr. Henry, it's my understanding that the earthy smell indicates the present action of some sort of --
A Streptomycetes.
Q -- aerobic -- aerobic bacteria. Can you elaborate on that if that's true?
MR. UBERTI: I'm going to object. Dr. Henry testified in his case in chief, so to speak, on the subject matter of earthy smell. I did not raise the question of earthy smell for end product.

MS. KOLER: However, there was a lot of testimony that a static pile composting system does not -- is not an -- is not an aerobic method. So I think that to the extent --

HEARING EXAMINER: Objection overruled. Do you remember the question?

THE WITNESS: Yes. My understanding of science is that the microbes responsible for the earthy smell is streptomycetes, which is a type of actinomycetes, which is something between fungi and bacteria. And they operate only in aerobic conditions.

So it is typically an anecdotal test for compost maturity. When you smell the earthy smell, that's a suggestion that these actinomycetes have been working and it is a breakdown of cellulose, which is done aerobically and not anaerobically. I know no other way to get that earthy smell.

MS. KOLER: I have no further questions. Thank you very much.

HEARING EXAMINER: I have a question I'd like to ask.

EXAMINATION

BY HEARING EXAMINER:

Q You said just a little while ago this morning that -- and I'm going to leave out the adjectives, because I don't remember the adjectives -- but that you believe there is an anaerobic core --

A Yes.

Q -- in the large static pile compost.
A Yes.
Q Technically if the core of my pile is anaerobic, how does it become aerobic? How does the product that is obtained from that part of the pile become aerobic? Does the anaerobic -- I'm just trying to think. If the materials have collapsed to the point where the porosity is so bad, etc., etc., that you get developing anaerobic conditions, then I'm having a hard time imagining that part of the pile fluffing up, if you will, to become aerobic as the decomposition winds down and we get to the finished product stage. So what happens there?
A From the start I mentioned that we don't know the science on big scale composting. What I know is I can see temperatures and I can see end product. Why we have an aerobic end product if it's been screened from the inside of the pile suggest either that during the pile building process, which may be three or four weeks before it is layered on again, may be enough to decompose the material to the point that the rapidly decomposing material that would potentially form anaerobic conditions have been decomposed.

That is one potential. That in the building of the pile itself that that time sequence is enough to have -- decompose the material that would force it to go anaerobic. That's a potential. I don't know that. I'm guessing. I'm surmising on science.

There's also the potential that as you screen this and there is a -- after the screening it's allowed to sit for -- is it one week? Two weeks?

UNKNOWN SPEAKER: Two weeks.

THE WITNESS: Two weeks -- then that is another time that potentially some composting happens, as well as stabilization. So that could be -- that is another mechanism of continuing the composting.

However, my understanding is that when the pile is broken down -- and I've been there while one pile is being broken down -- it's not odorous. Now, that suggests that if there were odorous compounds happening at one time, then they would be metabolized as I mentioned.

So things are happening that I can't -- that I don't know scientifically why they're happening, but they are happening. And it's done in a way -- whether it's engineered to do that or the fact that it has happened from experience in trial and error over a number of years, it works. And if something works, I've always believed you don't have to fix something that's not broken. And if you have an operation that not only is not broken but it reduces odors --

MR. UBERTI: I'm going to have to object. That doesn't answer the question.

HEARING EXAMINER: It doesn't.

Q (By Hearing Examiner) So the answer to my question is we

really don't know how the anaerobic core ends up as an aerobic product. It apparently does but you don't really know -- at this point you can't say with any scientific certainty that you understand how it gets there. But it apparently does somehow or other?

A And I'm also surmising that we do have the anaerobic core. In my mind I can't imagine that air from the outside which has 18 percent oxygen, that oxygen isn't used up as to goes into the core. And if you continue to have decomposition in the core, then it would continue to use oxygen and further reduce the oxygen concentration.

Q The core -- if I remember the testimony I think principally of Mr. Malins last time. The core of this, depending on how you want to look at it, it's a linear pile. It's 40 feet tall, 150 feet wide, and 3 or 400 hundred feet long or something like that in that order of magnitude. The bottom center at best is going to be 40 feet away from any outside source of atmosphere. And if we look at it horizontally, it's 75 or 80 feet away from it.

A Yeah, exactly. So that would suggest that it should be anaerobic. And if it's decomposing material that would cause odors, then you should have smells. If those materials have already been decomposed, the ones that would be odorous, then what you're doing is you're stabilizing things anaerobically, but that it doesn't cause problems. And it further leads to

stabilization of your product.

Q Is there -- is there a stable end product -- and by stable I'm using the word, at least for this question, to mean where there will be no further decomposition. Is there a stable end product that results from composting? If I leave the pile there, will it just keep on composting and degrading and degrading and degrading and degrading to something? Or does it reach a point where it becomes this earthy material and it's never going to change?

A Organic material will always decompose. Rapidly decomposing carbohydrates take in the neighborhood, depending on the conditions, days to weeks to decompose.

Cellulose and hemicellulose is the next category of organic substances that have to decompose aerobically unless there's a special enzyme that's put to them. And that is a process that takes weeks to months.

Q But at the end of that process --

A At the end of that process you're left -- you're left with lignocellulose and lignin that are a very large chain of organic compounds that are very difficult to decompose.

Q So you did come to essentially a stable point where it won't decompose further?

A It's a point where the remaining organic materials are stable for periods of tens to hundreds of years rather than the month and the days. So if you want to talk days, months, years, lots

and lots of years. Those are kind of the different categories of organic substrates that you have.

Each -- each of those steps require different microbes. And what it requires from those microbes is different enzymes produced by those microbes. The carbohydrates like sugars are very easy to break with amylose --

Q So this process is sort of like -- what's it called. An asymptotic curve. Something that's approaching infinity but goes up very fast at first --

A Like a logarithmic curve.

Q -- and then takes forever to get to the end?

A Yeah. It's like a logarithmic curve.

HEARING EXAMINER: Because of the questions I asked, Ms. Koler, anything further?

MS. KOLER: Okay.

HEARING EXAMINER: Just because of the questions I asked.

REDIRECT EXAMINATION

BY MS. KOLER:

Q Just to clarify. There's no totally aerobic method of composting, is there?

A I don't know of any --

MR. UBERTI: Objection. Asked and answered in direct.

HEARING EXAMINER: I think that was. I recall it was, yes. Objection sustained.

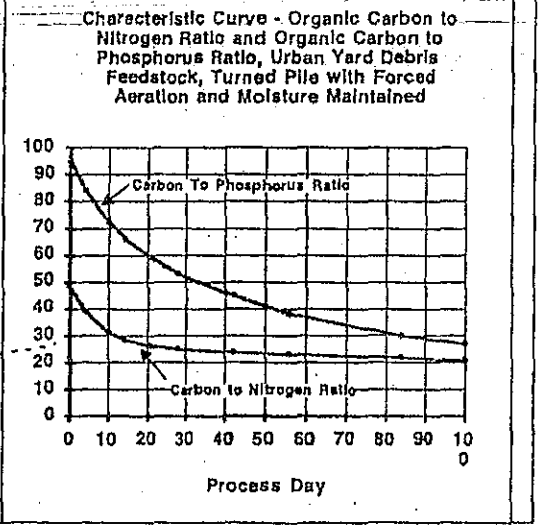
Backyard composting has a recipe

- One part green (2-4" deep)
- One part brown (2-4" deep)
- Alternate; the idea is that
  - the green has the nitrogen (like grass, food scraps, garden trimmings, leaves)
  - The brown has the carbon and little nitrogen (like branches, sawdust, paper, straw, fall leaves)

Chuck Henry,

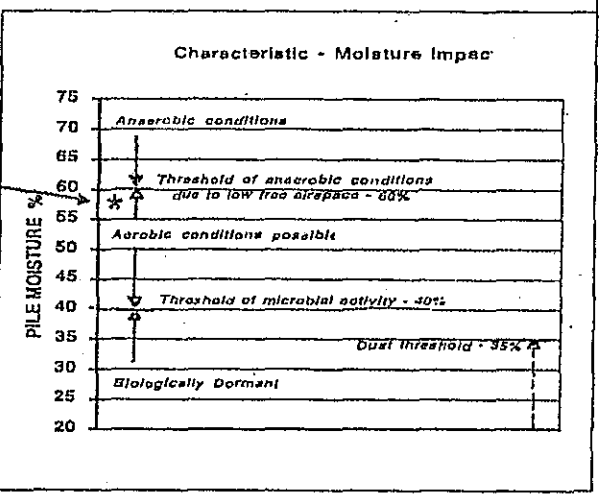
Larger scale composting also uses a recipe

Pacific Topsoils controls C:N by adding varying amounts of hog fuel depending upon amount of n-rich material (grasses)



Chuck Henry,

Pile Moisture Percent



Pacific Topsoils controlled by adding water during the mix

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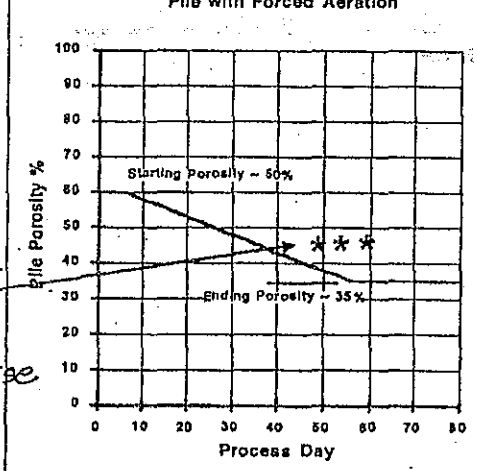
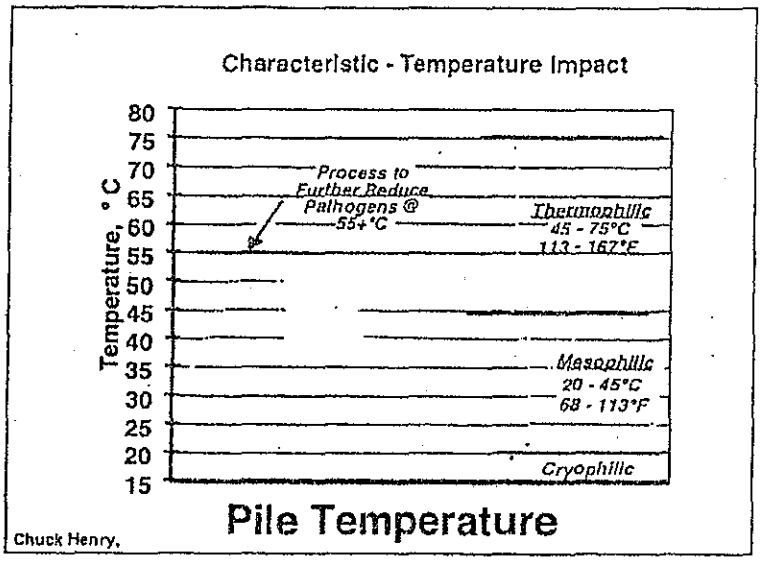
Change in porosity

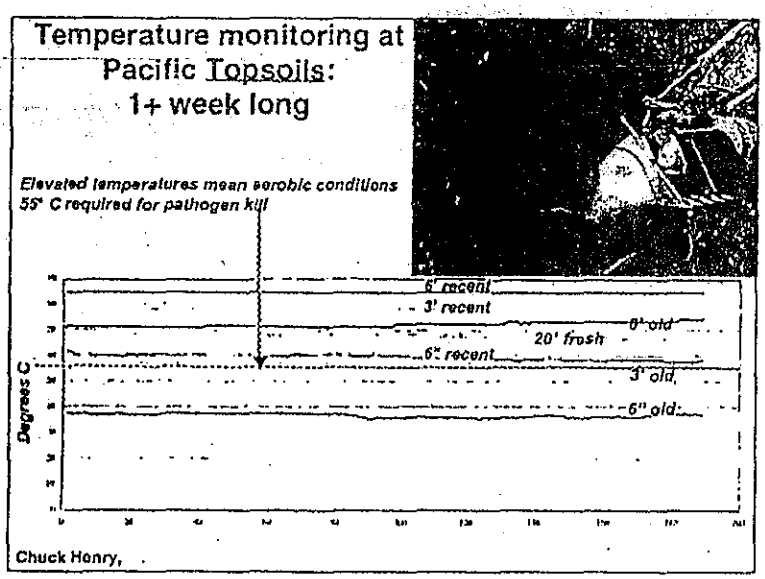


At 6", 3' & 6' older materials. Pacific Topsoils controls by hog fuel, ~~course~~ coarse fraction

Chuck Henry,

2034


Characteristic - Temperature Impact
Temperature, °C
80
75
70
65
60
55
50
45
40
35
30
25
20
15
Process to Further Reduce Pathogens @ 55+ °C
Thermophilic
45 - 75°C
113 - 167°F
Mesophilic
20 - 45°C
68 - 113°F
Cryophilic
Pile Temperature
Chuck Henry,


Temperature monitoring at Pacific Topsoils: 1+ week long
Elevated temperatures mean aerobic conditions
55° C required for pathogen kill
6" recent
3' recent
8' old
20' fresh
6" recent
3' old
6" old
Degrees C
Chuck Henry,

CURRICULUM VITAE

October, 2006

NAME: CHARLES L. HENRY, P.E., Ph.D.
Senior Lecturer, University of Washington, Bothell
Science Faculty, Eastside Preparatory School, Kirkland

ADDRESS: University of Washington, Bothell
Interdisciplinary Arts & Sciences
18115 Campus Way NE, Box 358530
Bothell, WA 98011-8246
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REGISTRATION: Registered Professional Engineer in Washington since 1979

EDUCATION: Ph.D. in Soils/Organics Management, 1989, Univ. of Washington.
M.S. in Environmental Engineering, 1977, Oregon State University.
B.S. in Civil Engineering, 1975, Oregon State University

PROFESSIONAL MEMBERSHIPS

Water Environment Federation
Soil Science Society of America
W-170 Technical Committee
The Compost Council
Washington State Recycling Association

PROFESSIONAL EXPERIENCE

Sustainable Practices

Composting. Design and construction of three home-scale composting systems: a combination composting toilet and home food waste system, a backyard rotating drum, and a simple box system. Responsible for oversight of design/build barrel composting toilet system for a dormitory in India, a vault system in Costa Rica. Designed and built large-scale University of Washington Demonstration Compost Facility, and associated compost gardens. Developed and taught class in composting, including operation of compost facility. Experience in food waste, manures, paper waste, septage and biosolids, County fair waste, latex paint, and assorted other organics.

Wastewater reuse. Responsible for design/build of a mulch bed reuse system in Mexico, oversight of design/build greywater system for a dormitory in India for banana plantation irrigation. Evaluation of small wetland treatment system and forest application system for campground. Evaluation of wastewater application to forested sites for small towns. Conceptual design for pilot biomass project for Vernon, BC.

Wastewater treatment. Produced alternatives and preliminary design, cost estimate and schedule for a 5000 person wastewater treatment plant in Mexico, designed on-site black and greywater treatment system for a rehabilitation center in Mexico, and responsible for oversight of design/build reedbed wastewater treatment system for a dormitory in India. Feasibility studies and design of sewage lagoons; on-site sewage facilities design; computer

EXHIBIT: 5
CASE:

modeling of sewer systems; field data collection, evaluation and preparation of Facilities Plans.

Renewable Energy. Biodiesel production and analysis: project with Emerald Ranches and USDA SBIR. Installation of wind monitoring equipment for public and private wind generator systems. Responsible for oversight of design/build solar PV system for dormitory in India, and solar hot water system for facility in Mexico.

Water systems. Efficiency analysis using computer modeling, and design of water systems; field data collection and evaluation of complete water system for Keyport Naval Base, including computer simulation analysis, field verification and inspection of all water system components. Design of water distribution systems. Responsible for oversight of design/build roof rainwater collection system for a dormitory in India and rehabilitation center in Mexico.

Organic Soil Amendments

Planning, design and implementation. Designed and permited septage land application demonstration, Pack Forest. Preliminary and detailed site evaluations for biosolids applications to forest and agricultural lands for King County DNR (metropolitan Seattle area), Pierce County Utilities, and other small communities. Installation of forest sites, powerline right of way and cottonwood plantations. Development of biosolids transfer and storage facilities. Program promotion including tours, presentations, brochure development, symposium and workshop organization. Design of composted biosolids application sites. Design, review or installation of numerous projects with compost and other organic residuals. Planning and design of animal waste management facilities for individual farmers under a program promoted by the Soil Conservation Service.

Evaluation. Evaluation of a number of composted biosolids, yard waste compost, and municipal solid waste compost. Studies included plant germination tests, decomposition/ mineralization, leachate analysis, growth response and plant uptake. Evaluation of use of septage as a forest and ag amendment; N mineralization, pathogen survival, nitrate leaching.

Regulations and guidance. Contributing author and technical reviewer of EPA Process Design Manual for Land Application of Municipal Sludge. Technical reviewer of EPA Guidance for Writing Case-by-Case Permit Requirements for Municipal Sewage Sludge. Author of Pierce County Sludge Utilization Policy. Contributing author of Seattle Metro Silvigrow Design and Operations and Maintenance Manual. Member of peer review committee for EPA's 503 Technical Sludge Regulations. Member of EPA's Sludge Task Force developing national contaminant limits for biosolids application.

Restoration and Remediation

Use of compost in restoration of mountain logging roads. Authored "Guidelines for use of composted biosolids in the Greenway". Installation of research and demonstration plots to restore productivity in gravel pits near Tacoma, WA; and near Eatonville, WA. Installation of research and demonstration plots for evaluation of bioremediation mixes in highly contaminated tailings and hillslopes at Bunker Hill Superfund Site, ID; in tailings in Joplin, MO; in alluvial tailings, Leadville, CO; and contaminated wetlands in the Coeur d'Alene River Basin, ID.

Nutrient and Carbon Cycling

Nitrogen cycling: mineralization, ammonia volatilization, denitrification, plant uptake and nitrate leaching of biosolids, pulp and paper sludges, septage and other residuals. Developed

new field technique for N mineralization. Field measurements of ammonia volatilization and denitrification from food processing wastewater and animal waste applications to agricultural lands. Primary author and editor for "Managing Nitrogen from Biosolids". Conducted a number of projects investigating N dynamics as a function of C:N ratio.

Fate of Contaminants

Produced four MSW composts for national study on the fate and uptake of contaminants from compost; evaluated trace metal uptake and phytotoxicity study for crops grown in these composts. Growth response and trace element uptake from various biosolids products. Managed relative trace metal uptake study (in coordination with W-170 Technical Committee) for crops grown in biosolids. Evaluated soil amendments for reduction of zinc and cadmium availability of tire fire ash for Everett, WA.

Literature Reviews. Completed technical literature review of compost quality (published by The Compost Council). Also produced literature review on MSW compost. Worked on approaches for compost classification system for Washington State. Completed comprehensive literature reviews on environmental effects of biosolids management: Trace Metals, Effects on Wildlife and Domestic Animals, Incinerator Emissions and Ash, Nitrogen, Pathogens, and Trace Synthetic Organics.

Presentations

Have given over 200 presentations and tours on land application of residuals and compost. Expert witness for lawsuit in New Hampshire and for a trial in Oregon on biosolids utilization, expert witness in arbitration in Washington, prepared deposition for court case in Washington, and presented technical information at public hearings for biosolids utilization projects.

Foreign Work Experience

2006	Faculty lead for student program of design/build of composting toilet in rural Costa Rica.
	Led Sustainable Practices Program for K-12 Teachers in Costa Rica.
2005	Faculty lead for student program of design/build of sustainable systems in rural Costa Rica.
2005	Review and design assistance for Use of Native Phytogenetic Resources for Phytostabilization of Abandoned & Post-Operative Mine Tailings at the Coquimbo Region, Chile.
2004	Design/build assistance for bamboo bus stop in rural Costa Rica.
2003	Design/build sustainable systems for children's rehabilitation center in Xochitepec, Mexico.
2003	Design/build composting toilet for sustainable development in Costa Rica.
2002	Design/build sustainable systems for a dormitory in India, including teaching technology.
2001	Evaluation of remedial techniques for contaminated smelter sites in Mexico.
2001	Evaluation of sustainable infrastructure and wastewater treatment facilities. Auroville, India.
1998	Long range plan for sustainable forestry using residuals. The Muswellbrook Shire, NSW, Australia.
1997	Lecturer, "Use of organic residuals in forest landscapes", Bodenkultur Universitat, Vienna, Austria.
1994	Nitrogen dynamics following land application of biosolids. Greater Vancouver Regional District, Canada.
1993	Use of woodwaste to reduce nitrate leaching. Design assistance and review. Universitat de Alicante, Spain.
1993	Assessment of water quality impacts of mining activities in the Hei watershed, China.
1991	Technical Evaluation of NUTRIFOR Demonstration Sites for Greater Vancouver Regional District, Canada.

PUBLICATIONS

Thesis and Dissertation

Henry, C.L. 1989. Nitrogen dynamics of pulp and paper sludge amendment to forest soils. Ph.D. dissertation.

Henry, C.L. 1976. Losses of nutrient nitrogen from animal wastes through volatilization of ammonia. M.S. Project Report, Oregon State University, Corvallis. 34 p.

Peer Reviewed Publications

Henry, C., C. Kubota, M Groom, J. Eisele, W. Gold, and T. Clay. 2006. Bridging K-12/13-20 Science Education in Washington: Summer Environmental Education Days (SEED). WSTA Journal.

Henry, C.L., and K. Bergeron. 2005. Compost Use in Forest Land Restoration. EPA number: EPA832-R-05-004. July 2005

Brown, S., C.L. Henry, R.Chaney, H. Compton, and P.S. DeVolder. 2003. Using municipal biosolids in combination with other residuals to restore metal-contaminated mining areas. Plant and Soil, 249: 203-215

Harrison, R.B., E.C. Turnblom, C.L. Henry, P. Leonard, R. King, and R. Gonyea. 2002. Response of three young Douglas-fir plantations to forest fertilization with low rates of municipal biosolids. Journal of Sustainable Forestry 14:21-30.

Grey, M., and C. Henry. 2002. Phosphorus and nitrogen runoff from a forested watershed fertilized with biosolids. J. Environ. Qual. 31:926-936.

Rosenfeld, P.E., and C.L. Henry. 2002. Activated Carbon and Wood Ash Sorption of Wastewater, Compost, and Biosolids Odorants. Water Environment Research.

Harrison, R.B., J. Krejsl, N.S. Turner, J.A. Hoyle and C.L. Henry. 2001. Treatment of septic effluent for fecal coliform and nitrogen in coarse-textured soils: use of soil-only and sand filter systems. Water, Air and Soil Pollution 124:205-215.

Rosenfeld, P.E., C.L. Henry, R.L. Dills and R.B. Harrison. 2001. Comparison of odor emissions from three different biosolids applied to forest soil. Water, Air and Soil Pollution 127:173-191.

Rosenfeld, P.E., Henry, C. L. and Bennett, D. 2001. Wastewater dewatering polymer affect on biosolids odor emissions and microbial activity. Water Environment Research.

Zabowski, D., C. Henry, Zheng, and Zhang. 2001. Mining impacts of trace metal content of water soil, and stream sediments in the Hei River basin, China. Water, Air and Soil Pollution.

Rosenfeld, P.E., and C.L. Henry. 2000. Wood ash incorporation with biosolids for odor reduction. Journal of Environmental Quality.

Rosenfeld, P.E., C.L. Henry, R. B. Harrison, and R. Dills. 2000. Comparison of Odor Emissions From Three Different Biosolids Applied to Forest Soil. Water, Air, and Soil Pollution.

Chaney, R., S. Brown, T. Stuczynski, W. Daniels, C. Henry, Y. Li, G. Siebielec, M. Malik, S. Angle, J. Ryan, and C. Compton. 2000. Risk assessment and remediation of soils contaminated by mining and smelting of lead, zinc and cadmium. Rev. Int. Contam. Ambient. 16(4)175-192.

Henry, C., M. Van Ham., M. Grey, N. Cowley, & R. Harrison. 1999. Field Method for N Mineralization Using Porous Ceramic Cups. Water, Air, & Soil Pollution.

Grey, M.A. and C.L. Henry. 1999. Nutrient retention and release characteristics from two municipal solid waste composts. Compost Science and Utilization. 7(1):42-50.

Yang, L., D. Xue, C.L. Henry and R.B. Harrison. 1998. Biosolids application and the effect on heavy metals. Agro-Environmental Protection 16:227-231.

Yang, L., D. Xue, C.L. Henry and R.B. Harrison. 1998. Effects of biosolids on the nitrogen cycle and nitrate leaching. Agro-Environmental Protection 16:182-186.

Henry, C., and D. Cole. 1998. Use of biosolids in the forest: Technology, economics and regulations. Biomass and Bioenergy.

Harrison, R.B., D.W. Cole, C.L. Henry. 1997. Secondary impacts of ameliorative practices on nutrient retention and availability in forest soils. Forest Ecology and Management.

Zabowski, D., and C. Henry. 1997. Soil and foliar nitrogen following fertilization of ponderosa pine. New Zealand J. of Forestry Science.

Brallier, S., R.B. Harrison and C.L. Henry. 1996. Long-term trace metal plant availability after liming soils amended with high rates of sewage sludge. Water, Air and Soil Pollution 86:195-206.

Harrison, R.B., S.P. Gessel, D. Zabowski, C.L. Henry, D. Xue, D.W. Cole and J.E. Compton. 1996. Mechanisms of negative impacts of three forest treatments on nutrient availability. Soil Sci. Soc. Am. J. 60:1622-1628.

Henry, C., and R. Harrison. 1996. Carbon fractions in compost and compost maturity tests. SSSA Special Publication No. 46.

Krejsl, J., R.B. Harrison, N. Turner, J. Hoyle and C.L. Henry. 1994. Methods for measuring deep leaching of chemical and microbiological constituents of effluent from septic systems. Soil Sci. Soc. Am. J. 58:131-133.

Harrison, R.B., X. Dongsen, C.L. Henry and Dale W. Cole. 1994. Long-term effects of heavy applications of biosolids on organic matter and nutrient content of a coarse-textured forest soil. Forest Ecology and Mgmt, 66:165-177.

Harrison, R.B., X. Dongsen and C.L. Henry. 1994. Magnesium deficiency in Douglas-fir and Grand fir growing on a sandy outwash soil amended with sewage sludge. Water, Air and Soil Pollution 74:1-14.

Henry, C., D. Cole, and R. Harrison. 1994. Use of Municipal Sludge to Restore and Improve Site Productivity in Forestry: The Pack Forest Sludge Research Program. Forest Ecology and Management, 60:137-149.

Henry, C., and D. Cole. 1994. Biosolids Utilization in Forest Lands. IN Sewage sludge: Land Utilization and the Environment. ASA-CSSA-SSSA, Madison, WI.

Kissel, J.C., C.L. Henry and R.B. Harrison. 1993. Potential emissions of synthetic VOCs from MSW composting. Biocycle 34:76-78.

Henry, C., D. Cole, T. Hinckley, and R. Harrison. 1993. The Use of Municipal and Pulp and Paper Sludges to Increase Production in Forestry. J. Sustain. For. 1:41-55.

Dongsen, X., R.B. Harrison and C.L. Henry. 1992. Research on the Distribution of Nutrients and Heavy Metals in forest soil amended with municipal sewage sludge after 15 years. Acta Univ. Agric. Boreali-occidentalis 20:20-27.

Epstein, E., R.L. Chaney, C.L. Henry, and T.J. Logan. 1992. Trace elements in municipal solid waste compost. Biomass and Bioenergy 3:3/4, p.227-238.

Kissel, J., C. Henry, and R. Harrison. 1992. Emissions of volatile and odorous organic compounds from municipal waste composting facilities. Biomass and Bioenergy 3:3/4, p. 181-194.

Henry, C. 1991. Nitrogen dynamics of pulp and paper sludge to forest soils. Wat. Sci. Tech. 24:3/4, pp. 417-425.

Zasoski, R., R. Edmonds, C. Bledsoe, C. Henry, D. Vogt, K. Vogt, and D. Cole. 1984. Municipal sewage sludge use in forests of the Pacific Northwest, U.S.A.: Environmental concerns. Waste Management & Research.

Book/Proceedings Chapters

Henry, C.L. , D.W. Cole and R.B. Harrison. 2000. Nitrate Leaching from Fertilization of Three Douglas-fir Stands with Biosolids. The Forest Alternative Symposium Proceedings.

Henry, C.L. 2000. The Role of Nitrogen in Residuals Management. The Forest Alternative Symposium Proceedings.

Harrison, R., C. Henry, D. Xue, J. Canary, P. Leonard, and R. King. 2000. The fate of metals in land application systems. The Forest Alternative Symposium Proceedings.

Bennett, D., and C. Henry. 2000. Monitoring water quality in watersheds following biosolids application. The Forest Alternative Symposium Proceedings.

Brown,S.,C. Henry, H.Compton, R. Chaney and P. DeVolder. 2000. Using municipal biosolids in combination with other residuals to restore a vegetative cover on heavy metal mine tailings. pp. 665-670. In W. Daniels and S. Richardson (eds.) Proc. 17th Nat. Mtg. Amer. Soc. Surface Mining and Reclamation (June 11-15, Tampa, FA).

Brown, S., C. Henry, H. Compton, R. Chaney and P. DeVolder. 2000. Using municipal biosolids in combination with other residuals to restore metal-contaminated mining areas. Chapter 1; 12 pp. Proc. Symp. Mining, Forest and Land Restoration: The Successful Use of Residuals/Biosolids/Organic Matter for Reclamation Activities (Denver, CO, July 17-20, 2000). Rocky Mountain Water Environment Association, Denver, CO.

Chaney, R.L., S.L. Brown, J.S. Angle, T.I. Stuczynski, W.L. Daniels, C.L. Henry, G. Siebielec, Y.-M. Li,œM. Malik, J.A. Ryan and H. Compton. 2000. In situ Remediation/Reclamation/Restoration of Metals-Contaminated Soils using Tailor-Made Biosolids Mixtures. Chapter 2; 24 pp. Symp. Mining, Forest and Land Restoration: The Successful Use of Residuals/Biosolids/Organic Matter for Reclamation Activities (Denver, CO, July 17-20, 2000). Rocky Mountain Water Environment Association, Denver, CO.

Brown, S. and C.L. Henry. 1999. Using Biosolids for Reclamation/Remediation of Disturbed Soils. US EPA Special Publication.

Brown, S. and C.L. Henry. 1999. Building Partnerships with EPA Superfund. Proceedings Water Environment Federation Residuals Conference, Charlotte, NC January 20-23.

Henry, C., D. Sullivan, R. Rynk, K. Dorsey, and C. Cogger. 1999. Managing Nitrogen from Biosolids. WDOE Pub. No. 99-508. Olympia, WA. I was primary author on the following chapters:

Chapter 1: Introduction

Chapter 2: The Nitrogen Cycle

Chapter 3: Overview of the Nitrogen Balance Approach and Guidelines for Reducing Risks of Nitrate Leaching

Chapter 4: Using the Nitrogen Balance Approach for Estimating Net Plant-Available Nitrogen from Biosolids

Chapter 6: Using the Nitrogen Balance Approach for Forest Systems

Chapter 8: Overview of the Balanced Soil Amendment Approach for Mixtures of Biosolids and Carbon-Rich Residuals

Leonard, P., and C. Henry. 1999. Success story: The Mountains to Sound Greenway Biosolids Forestry Program. US EPA Special Publication.

Henry, C., and P. Leonard. 1998. A New Paradigm to Tailoring Compost Standards. Proceedings, Beltsville Symposium on Co-Utilization of Residuals.

S. Brown, C. Henry, R. Chaney, and H. Compton. 1998. Bunker Hill Superfund Site: Ecological Restoration Program. Proceedings ASME Annual Meeting, May 1998.

S. Brown, C. Henry, and R. Chaney. 1998. Biosolids and Fly Ash Used to Restore the Bunker Hill Superfund Site. US EPA Tech Trends, May issue.

Henry, C. 1998. Why the universities are involved in biosolids management. Proceedings Water Environment Federation Residuals Conference, Bellevue, WA, July, 1998.

Henry, C., and M. Van Ham. 1996. Biosolids Management in the Pacific Northwest: an Overview of Land Application Programs. Proceedings of Land Application of Wastes in Australia and New Zealand: Research and Practice. 29 Sept - 4 Oct.

Henry, C. 1996. The new book of biosolids management and roles of sustainability. Proceedings of Land Application of Wastes in Australia and New Zealand: Research and Practice. 29 Sept - 4 Oct.

Henry, C. 1996. Biosolids and nitrogen management in forest ecosystems. Proceedings of Land Application of Wastes in Australia and New Zealand: Research and Practice. 29 Sept - 4 Oct.

Henry, C., M. Van Ham, R. King, and P. Leonard. 1994. Fertilizing forests with biosolids: Experiences in the Pacific Northwest. Water Environment Specialty Conference Proceedings. Washington D.C. June 1994.

Harrison, R.B., C.L. Henry and D.W. Cole. 1993. Long-term changes in carbon content and chemistry of forest soils receiving high rates of organic matter amendments. Proceedings of the Sixth North American Forest Soils Conference. University of Florida, Gainesville, Florida.

Harrison, R.B., C.L. Henry, D. Xue and D.W. Cole. 1993. Reciclagem de residuos industriais e florestais em árens de reflorestamento. Presented at the First Symposium on Brasilian Forest Research. May 10-14, 1993. Belo Horizonte, Minas Gerais, BRAZIL.

Henry, C., R. Harrison, and D. Cole. 1993. Effect of use of organic residuals on forest ecosystems. In Environmental Influence of Soil Amendments on Biotic Systems. Lewis Publishers.

Henry, C. 1993. Fundamentals of land application of biosolids. Proceedings of the 1993 BCWWA Conference, Vernon, B.C.

Henry, C., and R. Harrison. 1992. Fate of trace metals in sewage sludge compost. Biochemistry of Trace Metals. CRC Press, Inc.

Henry, C.L. 1990. Nitrogen dynamics of pulp and paper sludge to forest soils. Proceedings of the Third IAWPRC Symposium on Forest Industry Wastewaters, Tampere, Finland.

Henry, C., and D. Cole. 1986. Puck Forest Sludge Demonstration Program: history and current activities. pp. 461-471 IN Cole, D., C. Henry and W. Nutter, eds. The Forest Alternative for Treatment and Utilization of Municipal and Industrial Wastewater and Sludge.

Henry, C., C. Nichols and T. Chang. 1986. Technology of forest sludge applications. pp. 356-366 IN Cole, D., C. Henry and W. Nutter, eds. The Forest Alternative for Treatment and Utilization of Municipal and Industrial Wastewater and Sludge.

Henry, C.L. 1986. Growth response, mortality and foliar nitrogen concentrations of four tree species treated with pulp and paper and municipal sludges. pp. 258-265 IN Cole, D., C. Henry and W. Nutter, eds. The Forest Alternative for Treatment and Utilization of Municipal and Industrial Wastewater and Sludge.

Cole, D., and C. Henry. 1986. Future directions and needs: sludge applications. pp. 62-69 IN Cole, D., C. Henry and W. Nutter, eds. The Forest Alternative for Treatment and Utilization of Municipal and Industrial Wastewater and Sludge. University of Washington Press, Seattle, WA.

Henry, C., and D. Cole. 1985. Pack Forest sludge and wastewater utilization programs. Proceedings NCASI Regional Meeting, May 1985, Portland, OR.

Henry, C.L. 1985. The use of sludge as a soil amendment. Proceedings Western Washington Horticulture Assn. 75th Annual Meeting, January 1985, Olympia, WA.

Cole, D., M. Rinehart, D. Briggs, C. Henry, and F. Mecifi. 1984. Response of Douglas-fir to sludge application: volume growth and specific gravity. pp. 77-84 in TAPPI Proceedings, 1984 Research and Development Conference.

Cole, D., C. Henry, P. Schiess, and R. Zasoski. 1984. The role of forests in sludge and wastewater utilization programs. IN A. Page, et al., eds., Workshop on Utilization of Municipal Wastewater and Sludge on Land.

C. Henry. 1983. Sludge stability, erosion and runoff. pp. 76-81 IN C. Henry and D. Cole, eds., Use of Dewatered Sludge as an Amendment for Forest Growth.

Cole, D., and C. Henry. 1983. Leaching and uptake of nitrogen applied as dewatered sludge. pp. 57-66 IN C. Henry and D. Cole, eds., Use of Dewatered Sludge as an Amendment for Forest Growth. Vol. IV. Inst. For. Resources, Univ. Washington, Seattle.

Books/Publications Edited

Henry, C.L., R. Harrison and R. Bastian (eds). 2000. The Forest Alternative: Principles and Practice of Residuals Use. Col. Forest Res. Publication, Seattle, WA.

Henry, C. (ed). 1999. Nitrogen Management Guidance Manual for Washington. WDOE and NBMA publication.

Henry, C., and R. Harrison. 1998. Environmental Effects of Biosolids Management. Trace Metals: Potential for Movement and Toxicity from Biosolids Application, Effects on Wildlife and Domestic Animals from Biosolids Application, Air Emissions and Ash Resulting from Incineration of Biosolids, Nitrogen Cycle and Nitrate Leaching from Biosolids Application, Microbial Activity, Survival and Transport in Soils Amended with Biosolids, The Fate of Trace Synthetic

Organics in Biosolids Applied to Soil, Runoff Water Quality from Biosolids Application, Effects of Organic Residuals on Poplars. Northwest Biosolids Management Association.

Henry, C. (ed). 1991. Technical Information on the Use of Organic Materials as Soil Amendments. The Compost Council.

Henry, C., and R. Harrison. 1989. Literature reviews on environmental effects of sludge management: Trace Metals, Effects on Wildlife and Domestic Animals, Incinerator Emissions and Ash, Nitrogen, Pathogens, and Trace Synthetic Organics. Regional Sludge Management Committee.

Cole, D., C. Henry and W. Nutter, eds. 1986. The Forest Alternative for Treatment and Utilization of Municipal and Industrial Wastewater and Sludge. University of Washington Press, Seattle, WA.

Henry, C., R. Chapman-King, and D. Cole, eds.. 1983-5. Silvicycle: Information Network of Waste Utilization in Forest Lands. Inst. For. Resources, Univ. Washington, Seattle.

Henry, C., and D. Cole (eds.) 1983. Use of Dewatered Sludge as an Amendment for Forest Growth. Vol. IV. Inst. For. Resources, Univ. Washington, Seattle.

Other Miscellaneous Papers

Henry, C., and S. Palleroni. 2002. Design/construct program for wastewater treatment in rural Southeast India. p. 2. In Biosolids Bulletin. Feb.2002.

Henry, C., and S. Palleroni. 2002. Design/construct program for wastewater treatment in rural Southeast India – Part 2. p. 2. In Biosolids Bulletin. Mar.2002.

Henry, C. 2000. Best Management Guidelines for Application of Biosolids to Forest Lands. Washington Department of Ecology.

Harrison, R.B. and C.L. Henry. 1994. Judging Compost. Grounds Maintenance Magazine page 12-16, March 1994.

Henry, C. 1994. Best Management Guidelines for Application of Biosolids to Forest Lands. Washington Department of Ecology.

Henry, C., and R. Harrison. 1992. Evaluation of yard waste and sludge compost as soil amendments. Biocycle.

Henry, C. 1990. Evaluation of comments on the Proposed Standards for Management of Sewage Sludge: Non-agricultural land Application. NTIS.

Henry, C., and M. Neuman. 1990. Literature review on nitrogen cycle and nitrate leaching from sludge application. Col. For. Res. Pub., Univ. Washington, Seattle.

Neuman, M., and C. Henry. 1990. Summary of effects of sludge on wildlife and domestic animals from sludge application to forage. Col. For. Res. Pub., Univ. Washington, Seattle.

Haub, A., R. Harrison, and C. Henry. 1989. Heavy metal immobilization in sewage sludge amended soils: annotated bibliography. Col. For. Res. Pub., Univ. Washington, Seattle.

Haub, A., C. Henry, and R. Harrison. 1988. Municipal refuse composting: a literature review. Col. For. Res. Pub., Univ. Washington, Seattle.

Recent presentations at national/international/local meetings

Invited speaker, Centro de Investigación Minera y Metalúrgica, Chile (Jun 05)
Invited speaker at BioCycle West Coast Conference. San Francisco (Mar 05)
W-170 Annual meeting - Las Vegas (Jan 05)
Invited speaker, US EPA On-Site Coordinators Conference, Phoenix, AZ (Nov 04)
Sustainable Campuses Conference, Portland, OR (Oct 04)
Northwest Biosolids Management Annual Conference, Mt. Hood, OR (Sep 04)
Invited speaker at BioCycle West Coast Conference. Portland (Mar 04)
Northwest Biosolids Management Annual Conference, Chelan, WA (Sep 03)
Invited speaker at national SSSA meeting, Denver, CO. (Nov. 03)
Invited speaker at WERFConference, Bath, England (Jun 02)
Northwest Biosolids Management Annual Conference, Harrison Hot Sp., Canada (Sep 02)
W-170 Annual meeting - Las Vegas (Jan 01)
BioCycle West Coast Conference. Portland (Mar 01)
Society of Ecological Restoration (Apr 01)
Northwest Biosolids Management Annual Conference, Chelan, WA, WA (Sep 01)
Sunnyside Rotary Club – Sunnyside, WA (12/01)

RESEARCH GRANTS

Current

2005-7	Operational Aspects of Septage application to Forest Land. Northwest Cascade$120,000 (with S. Brown, in process).
2005-6	Biosolids for Biodiesel: Phase 2 Grant. USDA-SBIR. (with S. Brown, through Emerald Ranches) $25,000
2005	Mountains to Sound Greenway Program. King County Department of Natural Resources. $40,000.
2005-6	Biosolids Information and Education Program. Northwest Biosolids Management Association (with S. Brown) $45,000.
2005	Biosolids research on various issues regarding land application. King County Department of Natural Resources (with S. Brown, through NBMA). $62,000.
Past	
2004-5	Septage Application Research and Demonstration. WA Dept. of Ecology. $28,000
2004-5	Evaluation of Septage as a Soil Amendment/ Northwest Cascade. $25,000
2003-4	Investigation of Farming Practices on Canola for Use in Making Biodiesel. USDA-SBIR. (with S. Brown, through Emerald Ranches) $25,000
2003	Evaluation of Alternative Road Obliteration Soil Amendment Treatments using Biosolids Compost and Mill Residuals for Watershed Improvement. USFS. $18,470.
2003	Handbook on the Use of Compost in Watershed Restoration. US EPA. $9,200.
2001-02	Goodell Creek Gravel Mine Restoration. National Park Service. (with K. Ewing) $43,000.
2000-01	Production of a position paper on biosolids use. Henry M. Jackson Foundation & King County. $40,000.
2000-04	Mountains to Sound Greenway Program. King County Department of Natural Resources. $275,000.
2000-04	Biosolids Information and Education Program. Northwest Biosolids Management Association (with S. Brown and R. Harrison) $200,000.
2000-04	Biosolids Research on Various Issues Regarding Land Application. King County Department of Metropolitan Services (through Northwest Biosolids Management Association). $320,000.
2000-03	Remediation of contaminated sites. USDA-Agricultural Research Service (Passed through by US EPA)(with Sally Brown). $975,000.
2000-02	Development of a Position Paper on the Science and Efficacy of Recycling Biosolids. The Jackson Foundation $20,000 and King County $20,000.
1999-00	Compost and soil amendment potential of waste latex paint. King County Solid Waste Division $5,000
1998-99	Remediation of contaminated sites. USDA-Agricultural Research Service (Passed through by US EPA)(with Sally Brown). $225,000.
1998-00	Sustainable Resource Sciences and Compost facility.
	Tools for Transformation $130,000
	King County Solid Waste Division 10,000
	City of Seattle 1,000
	UW Physical Plant 20,000
1997	Technical resource center. US EPA (through Northwest Biosolids Management Association). $37,000.
1997-8	The effect of biosolids on watersheds. Mountains To Sound Greenway Trust. $36,000.
1996 -00	Mountains to Sound Greenway Program. King County Department of Metropolitan Services. $255,000.
1994-98	Biosolids Information and Education Program. Northwest Biosolids Management Association (with R. Harrison) $225,000.
1994-8	Biosolids Research on Various Issues Regarding Land Application. King County Department of Metropolitan Services (through Northwest Biosolids Management Association). $364,000.
1994	Assessment of the Use of Biosolids to Immobilize Trace Metals in Tire Ash. City of Everett (through Northwest Biosolids Management Association). $11,175.
1994	Investigation of Changes in Compost Production to Decrease Mushroom Occurrence. Northwest Cascade. $4654.
1993	Lone Star Northwest Biosolids Demonstration Program. Pierce County Department of Utilities. (with R. Harrison) $102,857.

1991-94 Assessing the toxicity and uptake of trace metals by plants grown in compost-amended soil. Procter and Gamble Corporation. (with R. Harrison). $153,939.

1991-94 Production of technical issue papers and evaluation of composts as soil amendments. Recomp of Washington, Inc. (with R. Harrison). $113,563

1991-94 Determination of Market Value and Market Capacity Assessment for Compost Derived from Mixed Organic Material. Procter and Gamble Corporation. (with R. Harrison). $293,222

1991-92 Estuary Contamination. Tacoma-Pierce County Health Department/Washington Department of Ecology (Co-PI with R. Harrison). $5,520.

1991 King County Fair Demonstration Project. King County Solid Waste Department. (Co-PI with R. Harrison) $16,370.

1991 Septic Leaching. Tacoma-Pierce County Health Department/Washington Department of Ecology. (Co-PI with R. Harrison) $7,980.

1991 Deep leaching of septage constituents in coarse textured soils. Pierce Co/Washington State DOE. (Co-PI with R. Harrison). $9,800.

1990-91 Sludge Nitrogen Mineralization Study (with R. Harrison). Eight Cities in Oregon. $33,750.

1990 Technical information gathering on compost. Washington Department of Ecology. $34,500.

1990-91 Risk assessment for non-agricultural sludge applications. U.S. EPA. $39,500.

1989-93 Cooperative Agreement - Sludge Information and Education Program. Regional Sludge Management Committee. $873,694.

1989 Pierce County Utilities Sludge Management Program. Pierce County Utilities. $9,850.

1989 Comments on the Proposed Rule to Regulate the Disposal and Use of Sewage Sludge. U.S. EPA - NNEMS Fellowship Award. $7,500.

1989-90 Island County Solid Waste Compost Evaluation (with R. Harrison). Island County/WDOE. $39,792.

1987-88 Evaluation of DelChem Treatment Sludge as a Soil Amendment. Seattle, Metro. $24,889.

1987-89 Evaluation of GroCo as a Soil Amendment (with R. Harrison). GroCo, Inc. $19,950.

1985-86 Pack Forest Sludge Management Program. Washington Department of Ecology. $158,479.

1985-87 Use of Pulp and Paper Sludge as a Forest Soil Amendment. Washington Department of Ecology. $25,935.

1985-87 Use of Pulp and Paper Sludge as a Forest Soil Amendment. Crown Zellerbach. $31,962.

1984-92 Pack Forest Sludge Demonstration Program - Design, Construction and Operations. Seattle Metro. $860,534.

1984-90 Pack Forest Sludge Demonstration Program - Monitoring and Evaluation. Seattle Metro. $262,280.

1984-85 Pulp and Paper/Municipal Sludge Nursery Bed Growth Study. City of Tacoma. $1,000. Boise Cascade. $1,000.

1983 Pack Forest Sludge Demonstration Program - Planning. Seattle Metro. $65,340.

AWARDS RECEIVED FOR RESEARCH PROGRAMS:

2005 Green Globe Award from King County (w. S. Brown)

2004 Passion, Vision and Grit National Award from BioCycle Magazine.

2003 National Council of Architectural Registration Boards' 2003 competition for Creative Integration of Practice and Education (w/ S Palleroni, UW and D Reilly, Penn. State U.)

2001 Association of Washington Business Environmental Award – Clean-up (w/ S Brown, UW and C. Robertson, Avista Corp.)

2001 Co-semi finalist 2001 DISCOVER Magazine Awards for Technological Innovation

1999 Green Globe Environmental Award from King County

1999 Best Educational Exhibit - WSRA Annual Convention, Ocean Shores.

1996 Mountains to Sound Greenway Trust, King County, Weyerhaeuser, Washington Department of Natural Resources, and the University of Washington for excellence in the Mountains to Sound Greenway Biosolids Program, from US EPA

1992 Special award presented to W-170 (Western regional, USDA) Committee for contributions in developing scientifically-based CFR503 national regulations for utilization of sewage sludge as a soil amendment, from Association of Metropolitan Sewerage Agencies

1992 Organic Waste Beneficial Use Program at the College of Forest Resources, University of Washington for excellence in research in utilization of biosolids as a soil amendment, from US EPA.

1991 W-170 (Western Regional, CREES) Research Committee for excellence in research program on beneficial utilization of sewage sludge, from US EPA

Feature Articles at University of Washington

Motor Pool Spring (06) "Spotlight on Clients Interview with Chuck Henry By L. Austin"
NewsletterUW Daily (02) "Do the Right Thing"
UW Renews Letter (compost facility) (99)
Windows on Computing "Connecting, Including and Preparing: the SRS Approach" (Sp 99)
UWired website (SRS program and interaction with UWired) (98)
University Week "Not your average pile of trash" (5/4/00) "From major headache to boon: Biosolids are in demand" (Jan 29, 98), "Food waste added to the mix for campus sustainable resource studies", "Green Globe Award goes to UW sustainable resource effort" (5/27/99).

CLASSES TEACHING/TAUGHT

2006	Eastside Preparatory School	
	Chemistry	Au '06
	Digital Reality	Au '06
2003-06	University of Washington, Bothell	
	SEED II Teachers in Costa Rica	Au '06
	GIS	W '06
	Water and Sustainability	Sp, Au '04,Au '05
	Environmental Problem Solving	Sp, Au '04,Au '05
	SEED (Env Ed for Teachers; w/Kubota, Groom, Eisele)	Su '05
	Sustainable Practices (UWS & UWB)	W, Sp '05, '06
	Compost and the Use of Organic Amendments	Sp '05, 06
	Recycling: Ethics, Opportunities and Realities	W '04, '05, '06
	Soils Laboratory	Au '03, W '05
	International Sustainable Practices (UWS, UWB)	Sp '04, 05, Au '05
	International Environmental Assessment (w/Brown)	Au '05
	International Cultures (w/Schmidt)	Au '05
	Exploring Energy Solutions for Planet Earth (UWS)	W '04
	Water Quality	W '04
	Wildland Soils and Plants (w/Gold)	Su '04
	Environmental Chemistry	Au '03
	Engineering Economy	Au '03
1984-03	University of Washington:	
	Sustainable Practices (in India, Mexico, Montana)	'02-03
	Compost and the Use of Organic Amendments	'95-03
	Introduction to Sustainable Resource Sciences	'00-2

Integrating Renewable Energy into Society	'01-3
Survey of Soil Restoration (in Colorado)	'00
Wildland Soils	'94-02
Building a Sustainable Campus	'00
Soils for Salmon	'00
Recycling: Ethics, Opportunities and Realities	'97-00
Tools for the Environmental Scientist	99
Soils and Land Use	'84-6, '97
Introduction to Soils	'91-2

1997 Bodenkultur Universitat, Forest Institute, Vienna, Austria.
Use of Organic Residuals in Forest Landscapes.

1982-4 Highline Community College: Mechanics of Materials, Civil Engineering Drafting.

1979-80 Olympia Technical Community College: All engineering classes required for Civil Engineering Technology Associate Degree, including engineering orientation, statics, dynamics, mechanics of materials, fluid mechanics, hydrology, drafting, construction materials, soil mechanics, surveying.

1975-76 Oregon State University: Teaching assistant for Sanitary Engineering classes.

GRADUATE STUDENT COMMITTEES

Chair of committees:		
Rhonda Schmidt	Ph.D. (in progress)	Soils
Linda Gaulke	M.S. 2004	CEE
Sean Smuckler	M.S. 2003	Soils
Karen Bergeron	M.S. 2003	Soils
Peter Severtson	M.S. 2003	Soils
Daniel Thompson	M.S. 2000	Soils
Mark Cullington	M.S. 2000	Soils
Isabel McClure	M.S. 2000	Soils
Mark Grey	Ph.D. 1999	Soils
Dan Bennett	M.S.1999	Soils
Paul Rosenfeld	Ph.D.1999	Soils
Neil Cowley	M.S. 1998	Soils
Mark Grey	M.S. 1994	Ecosystems
Served on committees:		
Ingrid Clausen	M.S. 2006	Soils
Dana Devin-Clarke	M.S. (in progress)	Soils
Mark Merkelbach	M.S. (in progress)	CEE
Gemma Alexander	M.S. 2003	UH
Barbara Christensen	M.S. 2002	Soils
Alex Svendsen	M.S. 2002	Soils
Gage Wagonner	M.S. 2002	Soils
Barry Flaming	M.S. 2001	Soils
Pam DeVolder	M.S. 2000	Soils
Amy Sidell	M.S.2000	Soils
Janita Gurung	M.S.1999	Soils
Doug Rowell	PhD.1999	Forest Ecology - UBC
Paul Kramer	M.S. 1998	Soils
Barbara Deutsch	M.S. 1997	Landscape Arch.
John Bagbe	M.S. 1995	Ecosystems

Stacey Wenger	M.S. 1995	Urban Horticulture
Sara A. Brallier	M.S. 1992	Forest Resources
Jana Krejsl	M.S. 1992	Forest Resources
Andy Haub	M.S. 1992	Civil Engineering

WORK EXPERIENCE

2006-Pres.	Science Faculty, Eastside Preparatory School, Kirkland WA.
2003-Pres.	Senior Lecturer, Environmental Science, University of Washington Bothell, Bothell, WA.
1995-2003	Research Associate Professor, Sustainable Practices, Forest Soils and Organic Residuals Management. University of Washington College of Forest Resources, Seattle, WA.
1990-94	Research Assistant Professor, Forest Soils and Organic Waste Management. University of Washington College of Forest Resources, Seattle, WA.
1983-90	Associate Program Director, Organic Waste Management Program. University of Washington College of Forest Resources, Eatonville, WA.
1982-83	Research Assistant, Sludge Management Research. University of Washington College of Forest Resources, Seattle, WA.
1979-82	Project Engineer and Vice President. Sigma Engineers, Inc., Olympia, WA.
1979-80	Civil Engineering Technology Instructor. Olympia Technical Community College, Olympia, WA.
1976-79	Project Engineer, Sanitary and Hydraulic Systems. Arvid Grant and Associates, Inc., Olympia, WA.

CONSULTING PROJECTS (1988-2005)

2003	Expert witness, biosolids lawsuit. Eagle North America.
2001	Remedial techniques for contaminated smelter sites in Mexico. Veridian Environmental.
	Evaluation of Alder Lake Park Effluent System. City of Tacoma.
2000	Evaluation of the nitrogen balance of effluent from a wetland treatment system applied to forests. Tacoma City Light.
	Development of a white paper on ammonia volatilization/expert witness for biosolids application lawsuit. Synagro.
	Alternatives for industrial biosolids management. DuPont – Victoria, Texas.
1998	Long range plan for sustainable forestry using residuals. The Muswellbrook Shire, NSW, Australia.
1996	Assistance in research project design for land application of pulp and paper residuals. Weyerhaeuser Co., $1000.
1995	Technical review of Ecological Risk Assessment for Land Application of Biosolids for EPA (subcontract with Oakridge National Laboratories). $500.
	Technical input on EPA Process Design Manual for Land Application of Biosolids (subcontract with Eastern Research Group). $500.
1994	Nitrogen dynamics studies following application of combinations of municipal biosolids and pulp and paper biosolids for the Greater Vancouver Regional District. Studies included lab and field mineralization studies, field volatilization and denitrification studies, and changes in soil nitrogen (subcontract of Silva Environmental).
	Expert witness for trial in California regarding land application of biosolids. Wright and Asosciates. $600.
	Review and technical input on EPA Process Design Manual for Land Application of Biosolids (subcontract with Eastern Research Group). $1500.
1993	Basics of biosolids management: Preparation of paper and presentation. British Columbia Water and Wastewater Association. $1500.
	Development of a monitoring plan and installation of monitoring equipment for the City of Spokane, WA for their composting facility. $2750.
	Column leaching study for the Greater Vancouver Regional District to investigate nitrate production from combinations of municipal biosolids and pulp and paper biosolids (subcontract of Silva Environmental).
1992	Literature review of emissions of volatile and odorous organic compounds from municipal waste composting facilities. The Procter & Gamble Company. $26,025.
	Soils consultation, analysis and interpretation for hazardous waste site. Du Pont Engineering. $3,226.
	Preparation of updates to the literature review on technical information on compost quality. The Composting Council. $6,318.
	Assistance in production of 40 CFR 503. US EPA. $2,000.
	Peer review of *Usage and Benefits of MSW Compost*. University of Florida. $1090.
1991	Speaker at Science and Technology of Composting Seminars. The Procter & Gamble Company. $3486.

Participation in the Northeast Regional Solid Waste Composting Conference in Albany, New York. The Procter & Gamble Company. $2212.

Review of proposed olestra soil effects study by Dr. Terry Logan, and participation in review meeting in Denver. The Procter & Gamble Company. $748.

Sludge management plan and site demonstration evaluation and design for Greater Vancouver Regional District. ABR. $10,000.

Test project for use of compost in road runoff storm water quality control. W & H Pacific. $10,000.

Peer review of USEPA Pulp and Paper sludge Regulations. US EPA. $1500.

1990 Presentation and attendance at workshops on "Land-based Options for Beneficial Sludge Re-use" in Vancouver and Nanimo. Greater Vancouver Regional District. $900.

Assistance in production of State of Washington Compost Classification/Quality Standards. Cal Recovery Systems, Inc. $1,800.

Site visitation, sludge analysis, site sludge loading analysis and recommendations. City of Oak Harbor. $968.

Review of analysis and recommendations for sludge loading limits. City of Oak Harbor. $250.

Assistance in feasibility study using sludge-amended crops for production of alcohol. Wildman Consulting. $2,000.

Evaluation of Portland composted sludge as a soil amendment. City of Portland. $9850.

1989 Response of second-growth Ponderosa Pine growing on volcanic ash impacted soil to several treatments: volatilization and denitrification measurements. USDA Forest Service Laboratory. $2,000.

Field and laboratory studies of denitrification: Simplot Project. Cascade Earth Sciences, Ltd. $4637.

Kittitas County dryland tree project. O'Neill and Sons. $1,400.

Assistance in Tulalip Tribe sludge management program. Cascade Earth Sciences, Ltd. $2148.

Installation of lysimeters at Bremerton site. CH2M-Hill, Inc. $929.

Planning assistance for Agnew Tree Farm Sludge Applications. Soiganic Services Corp. $515.

Analysis and leaching study on MSW compost. Lonergan & Associates, Inc. $500.

1988 Production of the report entitled *Heavy metal immobilization of sewage sludge amended soils.* Department of Environmental Quality. $2500.

Evaluation of trace metals levels in grasses grown in sludge. City of Tacoma. $500.

Development of technical response to regulations in regards to pH control. City of Tacoma. $8310.

Technical assistance on sludge regulations. Department of Ecology. $2495.

APPENDIX 4

on them?
A. Correct.
Q. And it says this is a standard operation that is used at the Maltby PTI composting facility. Then you conclude that this action results in compaction.
Now, when you reached that conclusion had you done any studies to support that conclusion?
A. Not specifically, no.
Q. Had you gone out to the Pacific Topsoils' site and interviewed people and found out that they drove in a certain pattern --
A. No.
Q. -- and so on. Now, you've heard testimony of Dr. Henry's about the fact that porosity is maintained in the pile. Does that have any affect on the conclusions that you reach in this letter?
A. I don't know that I -- I'm not sure about the porosity. He stated that, but I'm not sure that that's scientific -- is correct. So at this point I'd need more information from other experts.
Q. And what is your educational background?
A. I have a bachelor's degree in environmental studies.
Q. Where did you get that?
A. Stockton State College, Pomona New Jersey.
Q. And have you had courses in composting?

A. I have.
Q. And what courses were those?
A. We've had internal training, Ecology sponsored training class. I've had soils classes, hydrogeology, you know --
Q. Where did you take your soils classes?
A. Soil class, I took at Evergreen State College in the graduate program.
Q. How many soils classes did you have?
A. Just that one.
Q. And hydrogeology, what hydrogeology course work did you take?
A. I took one also in the graduate class. And, you know, actually I had an undergraduate soils and undergraduate hydrogeology, but that was about 30 years ago. I don't remember exactly my course listing.
Q. And have you had specific graduate level course work in composting?
A. No.
Q. So the information that you have about composting was gleaned at the Department of Ecology training session?
A. Well, that, and we have a bevy of experts that I rely on when we put together a letter like this. It is not my opinion. It is an opinion that's developed across the state.

THE WITNESS: Okay.

Q. Now, just so that I can understand, does Ecology consult with the Health District about Health District determinations?

A. Oh, absolutely. That's one of our primary charges in the rule, is that the State passes a law. The Health Departments implement it. So we are, in essence, their technical assistance because they don't have the same staffing that we do.

Q. And so does the Health District -- Department of Ecology dictate a decision to the Health District or does the Health District simply say let me speak to Ecology and Ecology advises.

A. Okay. We would send recommendations to the Health Department, and it's their option whether to accept those recommendations or not.

Q. In this process was it Ecology's initiative or the Health District's initiative?

A. I would say it was more our initiative.

Q. And how did this initiative come about?

A. In a roundabout way, actually. We'd been working on another facility at Smith Island, Weyerhaeuser. We've been working with them to close that facility. It's an old, old landfill. Pacific Topsoils had bought that property and were starting to come in with a closure

plan.

My radar went up, and I started thinking more about the Maltby site and said, you know, I wasn't -- You know, it's kind of always been in the background that we should look at the Maltby site a little bit closer. And I didn't want the same facility, that's a big pile, going onto Smith Island. You know, we didn't want to have something where we'd have to say, no. That's a big pile technology. Remove it.

We're trying -- it may sound odd to you, but I was trying to get up front of the issue and not have them invest money to make the closure at Smith Island in such a way that could put a big pile on top of it. So we were trying to get out in front.

So based on that, we started looking more at Maltby. You know, saying this is not right. Yeah. I looked at the old application and determined -- you know, looking at the operation, I've been out there a couple of times -- that that's a big pile.

The Organics Group had talked about big piles as not being an aerobic process, and then we started the conversation internally.

Q. Does the regulation prohibit big piles?

A. No.

Q. And so how would you know if you were just an operator

like Pacific Topsoils that big piles were prohibited?
A. I think we've gone over it pretty well. But I mean the definition of having to have controlled aerobic -- being able to manipulation the pile if something changes and being able to -- it's got to be kind of an active -- you have to be able to make changes in the pile when things happen.
Q. Does the regulations say that, 173? That one that we've been talking about, does it say that?
A. Can I get a copy of that? Oh, it's right here.
Specifically -- I mean, it doesn't specifically say that. I mean I'm trying not --
Q. Does 173 --
A. (D). 3(d).
Q. 3(d).
A. "It shall be designed with process parameters and management procedures that promote an aerobic composting process." Requirements 910 of the mandate, you know, forced aeration or other specific composting technology. "This requirement is meant to insure that compost facility designers take into account porosity, nutrient balance, pile oxygen, pile moisture, pile temperature, and retention time of composting when designing the facility."
So I looked at: "The composting facility shall be

designed with process parameters and management procedures --" to me talks to something more active than just building a pile and sitting --

Q. Well, where do you see that active stuff?

A. It's not. There's nothing specifically in there, but I think that within the industry that is a common understanding.

Q. So in order to see that you need to manipulate the pile you'd have to be familiar with industry practices?

A. Yeah.

Q. And common understanding --

A. I think there's.

Q. -- because the regulation doesn't say that?

A. Sure.

Q. And would you have to be familiar with Ecology's interpretation of this regulation to understand what it means?

A. I really don't know how to answer that one. How about asking it again so I can get a better understanding of that question.

Q. Would you have to be familiar with Ecology's interpretation of this regulation to understand that you had to manipulation a pile?

A. Probably. And I would leave the strict interpretation of that to our organic specialist.

Q. And when -- I mean does the regulation anywhere say you can't have big piles?
A. No. We answered that. No.
THE COURT: Asked and answered. You asked him that just a couple minutes ago.
MS. KOLER: Okay. I'm really sorry. I'm just getting tired.
Q. And does the regulation say that you have to have a totally aerobic process?
A. No. It just says, promote an aerobic composting.
Q. What does promote aerobic composting mean?
A. Promote, to me, and I believe with Ecology -- and again, we would ask our compost experts because I base my opinions on what they tell me or my letter based on what they tell me. Promote means to have some way to manipulation that pile should it not be aerobic.
Q. But that's really an Ecology interpretation, isn't it?
A. It is, and that's how -- I'll leave it at that.
Q. But the regulation doesn't say that?
A. No. The regulations doesn't say a lot of things, correct.
Q. And so it's -- this kind of a situation like -- nowhere does the regulation say you've got to have a totally aerobic method of composting, does it?
MR. UBERTI: Objection; asked and answered.

THE COURT: Sustained again.

MS. KOLER: Okay. Sorry. Okay.

Q. The regulation doesn't say that you can't have an anaerobic core of a pile, does it?

A. Specifically, no.

Q. And it doesn't say what percentage of the process has to be aerobic?

A. No.

Q. So these are things you'd have to find out from Ecology?

A. Yeah. We would have to work together with the facility. If they are -- I mean if an operation is meeting, you know, the 3(d) with the nutrient balance, porosity, moving the pile, that sort of thing, then we assume for the most part they're going to have an aerobic process.

If it's not, then we'd have some sort of proof that shows otherwise.

Q. And -- but to understand aerobic composting as it's understood by Ecology you'd have to consult with Ecology, wouldn't you?

MR. UBERTI: Objection; asked and answered.

THE COURT: Sustained.

Q. Okay. Mr. Christiansen, in your letter you talk about composting, and I'm directing you to Page 153, last

paragraph.

A. Okay.

Q. It says that -- third sentence down, you're talking about compaction. Then you say, Ecology does not require specific measures of oxygen levels. Then this is the sentence I want you to focus on.

A. Okay.

Q. It says, Facilities should be operated and maintained with technologies that allow for adjustments to the conditions that support micro-bio growth.

Does any regulations say that?

A. Not directly.

Q. But that certainly is a component of Ecology's interpretation of the regulation?

A. Yeah. And I believe that would be, you know, an interpretation out of the famous 3(d) Section.

Q. Okay. And then the sentence that says, This means that the operator must have the ability to adjust the process parameters that lead to aerobic conditions in the piles.

A. Correct.

Q. And once again, does the regulations say that?

A. I think it does. I think it does. It says, "Where composting facilities shall be designed with process parameters and management procedures." I would believe

conditions.

Now, does the regulations say that?

A. Not directly, no.

Q. So once again, this is a statement that is based on Ecology's interpretation of the regulation?

A. Correct.

Q. Now, you've heard the testimony today of Dr. Henry?

A. Yes.

Q. And you've heard him say that the product that is yielded by this process is a product that reflects an aerobic process because it has an earthy smell instead of a rotten egg smell. Does that, do you think that that conclusion will have any affect on Ecology's perceptions about this process?

A. I couldn't answer that because I don't have that expertise that -- I would rely on my experts.

Q. Okay. Now, it's my understanding -- in this letter you said, in your summary, If PTI disagrees with this assertion. I think the assertion that you're talking about is that if they have an anaerobic method --

A. Correct.

Q. -- it is incumbent upon them to prove it to us. Otherwise, any discussion by PTI on this issue needs to be founded in science and be able to stand up to peer review.

rules were developed in a three year process involving public input, involving input from all the various parties who were involved.

And we try not to be too prescriptive in rules to allow folks to have the opportunity to do things that maybe don't specifically -- if you set a rule specific, you kill innovation. We're not trying to kill innovation.

THE COURT: Are you saying the rule is intended to be more performance based than prescriptive?

THE WITNESS: Yeah.

Q. Can you explain that, what it means to have a rule be more performance based?

A. Well, you want -- It's actually -- I guess I would take that back a little bit. There is a certain amount of prescriptive, too, because we are asking for it to be controlled aerobic degradation. That's prescriptive, but we also want to see in the end a product that's a good product.

So you know I, I withhold judgement on whether it's a good product or not because I haven't looked at the other testing parameters on it, but we believe that the process -- and stand by -- that the process was not aerobic controlled degradation.

Q. Well, if Pacific Topsoils had like an uncontrolled process, don't you think there would be a whole bunch of Clean Air Authority complaints?
A. I will defer that to our compost expert.
Q. Okay. And now I'm getting a little confused here.
A. Okay.
Q. No studies have ever been done of this pile, have they?
A. Of this particular pile?
Q. Yes.
A. I don't believe so.
Q. So all the conclusions about it being anaerobic or aerobic, we don't know with certainly, do we?
A. No. I have just what my experts have --
Q. So if we don't know with certainty, why wouldn't it be good to find out what's going on in that pile?
A. It would be good.

THE COURT: He hasn't said it wouldn't be.

MS. KOLER: Okay. Okay.

Q. Would that then, if it was determined that an aerobic degradation process has occurred within the pile, would that change Ecology's position about the large static pile?

MR. UBERTI: I'm going to object, that that's a question of hypothetical with many other subconsiderations, how the study was done, what it

was primarily aerobic, would that change Ecology's position about Pacific Topsoils' composting method?
A. I don't know that it would. It would be something we would have to look at, yes.
Q. And the reason I'm asking you this, I mean the study would be expensive --
A. Right.
Q. -- if it's futile, Pacific Topsoils doesn't want to spend $50,000 to do it.
A. Right.
Q. So I mean, is it just like set in stone that, no, Ecology doesn't want big piles?
A. I don't think it's set in stone. Again, I would defer to my -- we would have to talk about this internally to figure out whether it's set in stone. Right now -- I mean if someone could come up with an aerobic process in a big pile that follows the conditions that are set in the rules, then we'd have no way to say no.
Q. But you're saying the rule as interpreted by Ecology. So that would have to be manipulating the pile. Because that's what you interpret those regulations to require, right?
A. They'd need to have some sort of -- okay. If they could show that over the course of the period of six to nine months that this pile remained aerobic -- you

know, I don't know. That's a good question. I can't give you a good answer on that one. I would need to talk about that internally.

Q. Okay. How long would the aerobic process have to go on? Isn't it true that the only reason why an aerobic process is to ensure that you have -- (inaudible)

A. I would defer to the experts. I don't know that. I'm not an expert in composting.

Q. So do you know why Ecology wants an aerobic process?

A. I know that we spent three years writing this rule. I know there was a tremendous amount of industry input on it. I know that this is the product that came out of that.

So I base my belief on the assumption that the professionals who are out there know what they are doing, not just within Ecology, but within private industry, within universities, as well -- had ample opportunity to comment on this rule. And if they think that aerobic controlled process is the way to go, then I'd be fully -- obviously fully supportive of it.

Q. And aren't there some components of private industry that strongly oppose Pacific Topsoils' large pile method?

A. I, I would assume probably yes --

Q. And I --

A. -- I don't go out and poll folks to find out what they like and don't.
Q. Are you on any stakeholder committees or anything --
A. I am not. Not in compost, no.
Q. So that would be Holly Wescott?
A. It would be.
Q. Okay. So you can't answer the question, that three weeks of aerobic activity to kill pathogens is sufficient?
A. I don't know if that's sufficient time, no. I don't know that.
Q. And, and you don't know if Ecology would be requiring an aerobic process on time controlled pathogens?
A. I'm sorry.
Q. Well, is it your understanding that you'd want aerobic activity to control pathogens and odor?
A. I think that's part of it, but there may be other reasons for that as well.
Q. Okay. And so if it were aerobic for a sufficient time period to kill pathogens and if bad smells weren't being created, wouldn't that perhaps be an acceptable method to Ecology?
A. Well, I would certainly add into being on the favorable side, but I don't know if that's enough to push it over the hump.

Q. What other factors would --
A. I don't know. That's -- again, I would rely on my compost experts. Managers try to synthesize things and understand everything that's going on. I don't get into all of the details. And at times when I do, I apologize, but I don't remember all of the details.
Q. Okay. All right.
MS. KOLER: Well, thank you very much.
THE WITNESS: Sure.
THE COURT: Cross-examination?
MR. UBERTI: Could I query if there are any other witnesses? I believe Mr. Christiansen is here on my side of the case. If we're at that stage --
THE COURT: If, if who has other witnesses? You mean is she going to call other witnesses?
MR. UBERTI: Right. Yeah. 'Cause I would not, I would just call him as my witness and go through what I was going to attempt to address.
MS. KOLER: One more witness.
The COURT: I was going to guess that there might be one more.
MR. UBERTI: Okay.

CROSS-EXAMINATION

BY MR. UBERTI:
Q. Mr. Christiansen --

Ecology should be considering?
A. It would be a consideration as long as they met the rest of the rule.
Q. But the rule -- a lot of the rule that we're discussing today is Ecology's interpretation, isn't it?
A. Right.
Q. Because the rule is a pretty spare, skimpy rule as it stands, is it not?
A. A spare what?
Q. The rule doesn't --
THE COURT: She said it's pretty skimpy.
THE WITNESS: Oh, I thought she said stupid. I'm sorry. I was going to agree with that.
THE COURT: You might not even want to agree with skimpy, but you wouldn't say the other word.
A. Are there holes in the rules? Yes. I don't consider it to be skimpy. I think it's fairly comprehensive, and it's a balance of being prescriptive versus not prescriptive. I'm sorry, I can't think of the word I wanted to say.
Q. But if you were interpreting methodology in accord with the purpose of the solid waste handling statute, it would seem that you would be needing to encourage composting?
A. Yes, I mean --

THE COURT: Stop with your yes answer.

(End of Side 1, Tape 3.)

(Start of Side 2, Tape 3.)

THE COURT: You may continue.

Q. Certainly recent policy within the state of Washington also encouraged energy conservation, has it not?

A. Yes, it has.

Q. So wouldn't that be a policy that you'd want to consider in evaluating a static pile composting method?

A. That should be part of it. You know, again, after we've reached environmental protections or met the regulations, yeah.

Q. Then there is also a lot of concern to do about greenhouse gases, is there not?

A. Yes, there is.

Q. And you heard Dr. Browne testify that a static pile that is covered with organic overlay emits methane gas --

A. Right.

Q. -- and piles that were constantly turning. So wouldn't that also be a beneficial affect of a static pile that Ecology might want to consider?

A. It could be. I'd also want to hear from our Clean Air Agency and see what their thought about emissions and stuff, whether they've done stack tests.

Again, it's looking at everything as a whole.
Q. And Clean Air Agency and Ecology are certainly concerned about nuisance effects, like bad smells emitted by composting, are they not?
A. Yes.
Q. And the fact that Pacific Topsoils has been operating so many years in making compost without a bunch of Clean Air complaints would suggest that that's, it's not an activity that's hard on the environment?
A. I don't know enough about the location and the claimant conditions at Pacific Topsoils to answer, answer that.
Q. But there's certainly some people in the composting industry that have had tremendous Clean Air problems, are there not?
A. Odor issues? Yeah.
Q. Huge odor issues, like hundreds of complaints a year to the Puget Sound Clean Air Authority?
A. I don't know the number, but a lot of complaints. Yeah.
Q. So it says, doesn't it, something about the efficacy of Pacific Topsoils' method if they haven't had, if they've had three complaints in the entire history of their operations.
MR. UBERTI: Objection -- multiple objections. One, asked and answered. Two, it's -- no

A No.
Q Did -- were they at the Department of Ecology meeting with you because they were indicating they wanted to do studies of the pile?
A Yes.
Q And wasn't this comment of Mr. Bajsarowicz speculative then? He's saying we think the inner core is anaerobic?
A I can't speak for what he was thinking.
Q But you --
A He said it was anaerobic, so I take him at his word. And -- yeah, that's all.
Q But you truly understood that they had not done any studies of the pile, did you not?
A I had no understanding one way or another on that.
Q Well, weren't they there to propose doing a study?
A Correct. But that doesn't preclude that they had done previous studies. I didn't know. I mean, I don't -- I didn't make that assumption.
Q Well, didn't they indicate that the reason they wanted to do a study is because their static pile had never been studied?
A I don't recall that. I know we were there to -- the consideration was, you know, we had claimed, we believed, that it's an anaerobic pile. They came in to talk to us about potentially doing a study to prove otherwise. It didn't -- you know, there was no discussion or we didn't focus on any

previous studies or not. It was, you know, what study do we do now.

Q But presumably if the topic was doing studies, don't you think -- and you're talking about their pile and their method of composting. If they had done a prior study, don't you think they probably would have been mentioning that to Ecology?

A Probably, yeah. If they're on top of it, sure.

Q And yet you say -- you say in your e-mail since PTI would need to prove their pile was aerobic to be considered in compliance with both the law and the rule, they have -- and they have admitted otherwise, there is no reason for them to spend money on a study. There is no other proof that would get past the need to have a controlled aerobic process.

So -- so you pretty much are basing your conclusion that they have an anaerobic method of composting on this speculative statement of Mr. Bajsarowicz's.

A On -- yeah. Based on what was said in that meeting, yes. I would assume that they would come in with different information otherwise.

Q And -- and pretty much you say in that e-mail since PTI would need to prove their pile was aerobic be considered in compliance with the rule.

A Right.

Q And they have admitted otherwise. There's no need to do a study.

So PTI has the obligation to prove that their composting method complies with Ecology standards?

A Correct.

Q And in this -- and is it fair to say that Ecology is primarily relying on the statements made at this meeting about the study in recent -- in telling Pacific Topsoils they need to change their method?

A Well, it was -- it was not just -- it was a conversation that we had. I mean, it was a meeting that went on for, I don't remember, an hour and a half, a couple hours. And so yeah, that statement was there, but it was in context of everything else we were talking about.

And my impression from the meeting is that we left -- we did not dictate to PTI not to do a study. We said it doesn't make sense to do a study if you're saying it's anaerobic. And to me we seemed to have left the room with that agreement.

Q And is it fair to say that it's Ecology's position that Pacific Topsoils, their process is anaerobic unless they -- they prove otherwise?

A Yes.

Q But now you note in the plan of operation they say that they have an aerobic method of composting?

A Right.

Q And Ecology hasn't done any studies of their compost pile, have they?

A No.
Q And the plan of operation -- if there haven't been any studies done, wouldn't the plan of operation be determined?
MR. UBERTI: Objection. Beyond the scope. We're now wandering about plan of operations. We talked about the July meeting.
MS. KOLER: I guess if could I address this, I would like to talk about the study a little bit if we could. Because I'm just baffled that there's just one speculative statement, and that's why we're here. Why in the world they wanted to do a study.
HEARING EXAMINER: You're characterizing it as speculative. You've elicited testimony from Mr. Bajsarowicz today that -- and I think he said it last time too. That his statement was not based on any prior studies.
From what I have heard, I'm not convinced that the other parties who were at that meeting had any reason to expect that the statement was speculative. And in fact, apparently Henry said the same thing at that meeting.
MS. KOLER: But I think Henry prefaced it with the fact that they hadn't done any studies.
HEARING EXAMINER: Well, I'm sorry that he's not here. But if a scientist makes a pronouncement about something without having done studies first, that's not the normal scientific method. So I can imagine that somebody sitting

there listening to a, I believe, tenured professor say that he's quite sure the core is anaerobic, which he also testified again to this morning, you don't come -- you don't expect a scientist to testify definitively on something that he doesn't know about.

So I can appreciate -- I think the problem here is you're describing it as speculative. I don't yet know that we have gotten anything from the other people who were there that would support the notion that they perceive the statement was speculative at all.

MS. KOLER: But -- but there has been testimony that the objective of the meeting was to discuss doing a study of Pacific Topsoils study -- static pile. There had been no study done previously.

HEARING EXAMINER: Let me ask this. Mr. Christiansen, you said just a minute ago that DOE didn't dictate PTI not to do the study. And then you ended a sentence by saying something like in fact I thought that's the way we ended the meeting.

THE WITNESS: Right.

HEARING EXAMINER: What did you mean by that?

THE WITNESS: We were just -- they came in with -- you know, they wanted to come and do a study on their pile to prove that it was aerobic. So we got together, the Health Department, our experts and their experts. We met, we talked

asked before and you didn't raise that objection before, so I'm going --

MR. UBERTI: I wasn't quick enough.

HEARING EXAMINER: I'm going to overrule it.

THE WITNESS: My belief on this is we have a stated set of -- in the compost guidelines -- or in the rule, forget the guidelines. Forget I said guidelines. In the rule 350 states how composting is supposed to happen as an aerobic controlled process.

If someone wants to deviate from that or prove that it's not as we describe in our rule, then yeah, the burden of proof, I believe, is someone coming in with something different. Basically there's -- you know, it's the industry -- okay. I'll stop.

Q (By Ms. Koler) Okay. Well, I guess I'm trying to understand like if the Washington State Bar Association wanted to take away Mr. Uberti's license to practice law, they'd have to show that he had committed a felony or violated the rules of professional responsibility. They'd have to show a violation of regulations.

Does the Health District or Ecology have to present proof that Pacific Topsoils doesn't have an aerobic method of composting?

A Obviously we didn't think that, because, you know, we proceeded with the recommendation to the Health Department that we

believed it was not an aerobic process, you know, based on our collective wisdom. And they would need to prove that it was in order to continue to operate as is.

Q And at this point in time after coming to this hearing do you feel convinced that it would be silly to do a study of this static pile demonstrating whether they have an aerobic method of --

MR. UBERTI: Objection. It's beyond the scope, as well as that question was asked of Mr. Christiansen during his case in chief with Ms. Koler. You've got all those questions about would you consider or would it change your opinion directed to Mr. Christiansen amongst everybody else.

HEARING EXAMINER: Sustained for the latter reason. Further cross examination questions? No.

MS. KOLER: I'm just seeing if I have --

HEARING EXAMINER: Okay.

MS. KOLER: I have no further questions.

HEARING EXAMINER: Any redirect?

MR. UBERTI: I'm sorry, yes. One area.

REDIRECT EXAMINATION

BY MR. UBERTI:

Q Exhibit No. 1, Page 154, is the letter of January 4, 2006, that you wrote to Mr. Hanada.

A Yes.

Q The question was asked by Ms. Koler in essence was the

substantial reason for you to have the attitude that they were non-compliant -- you know, the statements made in July of 2006 about they say it was anaerobic or admitting it was anaerobic. You had already formulated an opinion before that statement was made, had you not, that it was -- it was not in compliance with the regulations, and that's in fact reflected in that letter of January 4, 2006?

A Correct.

MR. UBERTI: Thank you.

HEARING EXAMINER: Further cross? And this time I want it limited to that one letter.

RECROSS EXAMINATION

BY MS. KOLER:

Q And in that one letter that's an opinion that they had an anaerobic method of composting, was it not?

A Yes.

Q No studies supported that opinion?

A Correct. None of our studies.

MS. KOLER: No further questions.

MR. UBERTI: I have no further.

HEARING EXAMINER: At the risk of prolonging this, I want to make sure that I understand -- and I may be asking something that's been asked and answered. And I ask counsel, both counsel, to bear with me.

EXAMINATION

Q Okay. Because the rule says a process which promotes --
A Right.
Q -- aerobic. And as I think about this, the rule doesn't say a process which never has and never may have any anaerobic activity occurring within it.
A Right.
Q I guess I -- to be honest I don't see that rule saying that the entire process areally and temporally must be always and everywhere aerobic. But it says it has to promote aerobic, which would certainly seem to suggest to me that you got to be doing something. If you know there's going to be a time or an area in which you are going to be fighting anaerobic conditions, that you got to do something to try and get rid of them.
A Right. You want to keep moving towards aerobic conditions.
Q Okay. Keep moving towards. Thank you.

HEARING EXAMINER: Any questions following up on that one line that I asked?

MS. KOLER: No further questions.

HEARING EXAMINER: Mr. Uberti?

MR. UBERTI: No.

HEARING EXAMINER: Okay. Thank you, Mr. Christiansen.

THE WITNESS: You're welcome.

MR. UBERTI: We have no further witnesses.

HEARING EXAMINER: No further rebuttal? Thank you.

APPENDIX 5

whole truth, and nothing but the truth?

MS. WESCOTT: I do.

THE COURT: Thank you. Please state your name and spell your last.

THE WITNESS: Holly Wescott, W-E-S-C-O-T-T.

THE COURT: Thank you.

DIRECT EXAMINATION

BY MS. KOLER:

Q. Good afternoon, Ms. Wescott. Am I pronouncing your name correctly?

A. Yes.

Q. Now, you've heard Dr. Henry's testimony today, and you're aware of Dr. Henry's expertise in the field of composting, are you not?

A. Yes.

Q. Did you at one time work with Dr. Henry?

A. Yeah.

Q. Was he at one time your supervisor?

A. Yes.

Q. Where did you work?

A. Pac Forrest Research Station for the University of Washington in Eatonville.

Q. And you've heard testimony about the fact, his conclusion that it seemed that aerobic composting was taking place within Pacific Topsoils' pile, did you

not?
A. I heard his testimony, yes.
Q. And does that change your perceptions in anyway about this large static pile?
A. Change?
Q. Ecology's perception (inaudible) or your perception? I understand you're one of the decision makers -- (inaudible.)
A. Okay. I just want to be clear that I understand what you're assuming that I have as a perception, so...
THE COURT: If she's clear, that's good, 'cause I'm not.
THE WITNESS: Well, she said -- she used the word change, and that assumes that she understands what my perception is. So I just wanted to be clear.
Q. Did you note that he observed that aerobic composting or aerobic degradation was taking place within that static pile?
A. In parts of the pile, yes.
Q. And does Ecology demand that the process be total aerobic --
A. No.
Q. So if aerobic degradation were occurring, might that cause Ecology to reevaluate its conclusions about Pacific Topsoils' static pile?

A. Not necessarily.
Q. And why would that be?
A. It depends on the degree of aerobic activity and where it's happening in the pile.
Q. And what degree of aerobic activity must there be?
A. I don't have any answer to that question.
Q. Who would?
A. You know, work would -- we would consider that question based on literature and what's out there in industry standards.
Q. When you talk about industry standards are you talking about people in the composting industry in Washington?
A. Not just Washington.
Q. And -- so the regulations clearly don't specify what percentage of the process has to be aerobic, do they?
A. No, they don't.
Q. And they don't specify how long the process needs to be aerobic, do they?
A. Not in specific time frames.
Q. And the purpose of having it aerobic for some period of time was for pathogen kill, is it not?
A. That's part of it.
Q. What are other purposes of that aerobic component?
A. For odor control, aerobic processes have benefit composting in not producing organic compounds that are

odorous. (sic.)

Q. And have you understood over the years Pacific Topsoils' piles to be producing odors?

A. I have heard that they have.

Q. Really?

A. Yes.

Q. Are you aware of any Clean Air Violations?

A. By secondhand information, yes.

Q. So you're claiming that Pacific Topsoils has had a lot of Clean Air Violations?

A. That's not what I said.

Q. Okay. Are you -- aren't there some people in the industry that have had many, many, many Clean Air Violations?

A. I'm aware of companies that have had several air violations, yes.

Q. In fact, hasn't one company had hundreds of Clean Air volitions?

A. I don't know how many.

Q. And doesn't that company use an aerobic method of composting?

A. That one particular company, yes.

Q. And have you heard allegations that their final product is smelly?

A. I've heard allegations that every single compost

product produced in Washington State has had smelly product.

Q. And, and so you're saying there is no determination by Ecology about how, how long the aerobic process needs to go on?

A. Not in a specific, some time frame, no.

Q. And the regulation doesn't specify that, does it?

A. No.

Q. And are you on any stakeholder committees that have discussed drafting these regulations and so on?

A. Yes.

Q. And are there people from the industry on those committees?

A. They're past committees. They're not currently...

Q. Okay, past committees.

A. Yes. We had an advisory committee to the Department of Ecology.

Q. And did some of the people on the advisory committee, were they from companies that had embraced particular methods of composting?

A. Yes.

Q. And were you aware that some of those individuals were upset about Pacific Topsoils' large static pile method?

A. Informal conversations, during that process, during the rule development process.

Q. Did those informal conversation cause you to conclude that some people in the composting industry disapproved of Pacific Topsoils' large static piles?
A. I wouldn't say that's a true statement.
Q. So there has been no pressure on Ecology to cause Pacific Topsoils to discontinue their large static pile method by notice of industry?
A. I wouldn't say that's a -- I wouldn't agree with that statement, no.
Q. No, you wouldn't? Okay. And the regulations don't prohibit large static piles, do they?
A. No, they don't.
Q. And would Ecology be interested in finding out exactly how the large static pile methodology works?
A. I would say, yes. I'm in a stack level position. I don't make those decisions.
Q. Who makes that decisions?
A. It would most likely start at my immediate work group that we discussed earlier, the Organics Job Alike Group and our program. The Solid Waste Program Management Team would make that kind of a decision.
Q. But if it were shown that aerobic degradation occurred within the static pile, wouldn't that be a persuasive factor to Ecology?
A. It would be persuasive. It's not the complete picture.

Q. What is the complete picture?
A. A more complete picture would include the degree of control that's happening at the facility for that particular method.
Q. And what the -- certainly the regulation, that WAC 173.350.220 (3)(d), it doesn't specify how the control is to occur, does it?
A. It does not.
Q. So that's really left to the discretion of Ecology?
A. No, actually -- excuse me. The regulation requires that the facility be designed and that it be managed in a manner that promotes aerobic decomposition. It has to take into account the design, and also the operation has to take into contact the different composting parameters that are listed there.
Q. And didn't Dr. Henry's comments about Pacific Topsoils' operation indicate that they took into account all of those parameters?
A. He mentioned each parameter. I don't agree with his assessment.
Q. And why don't you agree with his assessment?
A. Particularly the one about porosity I disagree with. The large pieces of wood do provide pore space within the pile. When a pile is that big it's not just the pore space inside the pile. The aeration that happens in a composting process depends on convection airflow,

convective airflow.

And with a pile that big -- the length of the pile 375, I think, feet long, 150 feet wide, and 40 feet high -- is a pile that far exceeds any of the other operations that I'm aware of, that I would consider to be promoting controlled aerobic degradation.

Q. But you just look at the regulations, and they consider all of those factors. It doesn't even say how those factors have to be considered in the process, does it?

A. No.

Q. So that's a judgment call by Ecology, isn't it, how the factors are implemented?

A. I believe that the composting industry and the manuals and the literature out there really speak to how to get to those parameters.

Q. So you would have to rely on that industry literature in order to understand how those standards work?

A. For an outsider perhaps.

Q. And you heard Dr. Browne and Dr. Henry testify about just the advantages with respect to energy use of a static pile, is that a consideration that interests Ecology at all?

A. Energy interests Ecology. It's not the topic of this particular permit condition.

Q. So that's not something, that's not a factor that

Ecology would consider in evaluating the composting method?

A. No.

Q. And would the -- in evaluating the composting method would Ecology consider the State policy which favors recycling and economical recycling?

A. We promote recycling at the Department of Ecology. I'm not quite sure what -- if you could repeat the question again, maybe I could be more clear.

Q. Would it be a factor, when Ecology considers Pacific Topsoils' method of composting, that it's an economical mode of composting and the state statute discusses economical sound recycling methods?

A. Economics is important. If the process itself and the management and control of the composting in that very large static pile doesn't meet the definition in the statute and in the regulation, then it doesn't meet the definition.

Q. But you'd concede that the regulation doesn't imply controlled aerobic decomposition?

A. In a definition, no. It does not.

Q. So you'd have to depend, would you not, on industry literature in order to understand the meaning of that term?

A. Yes, and perhaps training that is offered.

Q. Through Ecology?
A. No. The Washington Organic Recycling Council.
Q. And does industry literature discuss static piles at all?
A. Yes.
Q. It does?
A. In handbooks I've seen references to large static piles, yes.
Q. And do they categorically say that they're anaerobic?
A. No, not categorically. They do talk about, about the fact that large static piles have anaerobic activity as almost -- the way I've read the reviews and some of these references that I'm referring to are in manuals. So it's not a peer-reviewed literature paper that I'm referring to, but they mention large static piles. And that it is pretty much taken for granted that it's anaerobic in the inside of those piles.
Q. But you heard Dr. Henry testify today that every composting method has anaerobic times, did you not?
A. Yes.
Q. So there's no totally aerobic method, is there?
A. Correct.
Q. And the State doesn't have any standards which define what percentage of the process needs to be aerobic?
A. Correct.

Q. So it becomes largely a judgment call on Ecology, does it not?
A. I disagree with that summary.
Q. So how is it determined what percentage of the process needs to be aerobic?
A. It's not just about the aerobic, meeting the definition includes aerobic, but it also controls -- includes the concept of controlled aerobic degradation. And control means control of each of the different composting parameters.
Q. Does it say control of each composting parameter in the regulation.
A. It refers to in that section that we have been reading --
Q. Well, show me in 173 where it says that.
A. This isn't the right one. It doesn't use the word control in this paragraph.
Q. So that's more of an Ecology interpretation, is it not, or industry interpretation?
A. Both.
Q. So it depends on industry knowledge and Ecology interpretation?
A. Yes.
Q. And your conclusions about porosity -- Dr. Henry testified that there were big air pockets and that

there was aerobic degradation going on 20 feet into the pile. Does that change you conclusion, that if you drive over the pile it compacts it and you don't have aerobic activity going on?

A. Could you repeat the question, please.

Q. I believe there was testimony that there were air pockets in, in -- that there were air -- or that the temperature 20 feet into the pile was sufficiently high to control pathogens, which would indicate aerobic activity, would it not?

A. Initially, yes.

Q. And isn't that the whole point of aerobic activity, is -- (inaudible) pathogens and control odor?

A. Those are two main reasons to want to have aerobic decomposition, yes.

Q. So if those purposes we're being served, wouldn't a system be sufficiently aerobic?

A. No.

Q. Why is that?

A. Because over a six to nine month period the oxygen in those pore spaces, that you just spoke about, is being used by the microorganisms and compaction happens. You've got a 20 foot layer of material. Then a machine, a heavy machine that's going down and packing along the way as it -- okay. So I got the two

what I think I said. That there were -- I have heard conversations that there were, what we call in the industry, odor events at Pacific Topsoils.

Q. And are you aware of many events or very few events?

A. I don't know how many..

Q. Okay. So Pacific Topsoils certainly has not been a composting industry that's had a lot of clean air problems, has it?

A. I'm not aware of very many odor complaints coming from Pacific Topsoils.

Q. And their Mill Creek operation was abutting residential homes, was it not?

A. I believe so.

Q. And it was there for years and years and years, was it not?

A. I don't know how long it was there.

MS. KOLER: I have no further questions.

THE COURT: Cross-examination?

CROSS-EXAMINATION

BY MR. UBERTI:

Q. Ms. Wescott, I'm going to cross-examine you here. Let's go back for a second and talk about odor. You made a comment about not necessarily, depending upon the type of materials at a site, whether or not it's -- sulfate --

that standard for stability. And I suspect it has to do with retention of the material, the time frame. It would need to be longer.

THE COURT: Thank you.

Redirect?

MS. KOLER: A couple of questions.

REDIRECT EXAMINATION

BY MS. KOLER:

Q. Ms. Wescott, I understand that you helped to author this letter, the January 4th, 2006 letter that was sent --

A. Yes.

Q. -- about this matter. And you seem to -- you talk about large static piles do not allow for adjustments in the composting process. That statement is made. Does the, does the regulation require adjustments in the composting process?

A. The regulation requires that the management, the operation of the materials themselves -- and here's what it says: It has to take into account porosity, nutrient balance, pile oxygen, pile moisture, pile temperature, and retention time.

Q. But absent knowing about industry standards, I mean we don't know what -- take into account -- that means think about it, doesn't it?

A. That's not what it means to me.
Q. Okay. But, but strictly -- like thinking that it means that you have to manipulation the pile, that's not a stated requirement in the regulations, is it?
A. To manipulate the pile, no. That's not a stated requirement.
Q. Because you say, facilities should be operated and maintained with technologies that will offer adjustments to the conditions, support micro-bio growth. This means the operator must have the ability to adjust the process parameters that lead to aerobic conditions in the piles. The regulation doesn't say that those adjustments have to be made to the pile, does it?
A. Doesn't say that explicitly.

MS. KOLER: Thank you.

MR. UBERTI: Nothing further.

THE COURT: Thank you, Ms. Wescott. That's your last witness? Quickly, please.

MS. KOLER: Dr. Peckich.

(Conversation had in the background.)

THE COURT: Just so it's on the record, Mr. Uberti must leave at 5:30. I'm having a real quam here, and I shared it with counsel --

Come on and get to your chair.

APPENDIX 6

what kind of aerobic composting methods are available?
A No, it doesn't. I don't really think it's really intended to tell me what kind of composting methods are available. I think it's telling me what they refer to as composting material which is -- I can read it.
Q Why don't you do that.
A Organic solid waste that has undergone biological degradation and transformation under controlled conditions designed to promote aerobic decomposition at a solid waste facility in compliance with the regulation requirements of this chapter. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.
Q Now, at Pacific Topsoils do you just heap up a big pile of yard waste in a pile and let it degrade naturally, or what do you do?
A No, absolutely not. We -- like you were mentioning earlier, it's a very controlled process as far as how the piles are built. They are compost for any -- at least six months. Usually up to eight to nine months. They -- the material that comes in is modified and the ingredients are properly mixed prior to it being finally placed on the compost pile for -- for composting.
Q And do you have employees who are actively overseeing the compost pile?
A We do, yes.

Q So do you have employees whose exclusive responsibility is to manage the pile?
A Yes, we do.
Q And --
HEARING EXAMINER: Excuse me, is there -- I don't know this lady. With all do respect to her, I don't like somebody looking over my shoulder.
UNKNOWN SPEAKER: Oh, okay.
HEARING EXAMINER: There are other chairs around the room. There's one right there and there's two back there. I don't think she really needs to be in a position where she can read the notes that I'm taking during this hearing.
UNKNOWN SPEAKER: I apologize.
MS. KOLER: Dr. Brown would you like to sit here.
UNKNOWN SPEAKER: I certainly didn't mean --
HEARING EXAMINER: I'm sorry to interrupt.
Q (By Ms. Koler) Okay. So -- okay. And so do you understand that that regulation means when you read the statute that says controlled aerobic conditions? Does the statute define those conditions?
A Controlled aerobic conditions. No, it does not. It does not define what controlled aerobic conditions mean.
Q So that kind of leaves you in a quandary about what they mean?
A Sure.
Q And certainly your compost pile is -- is it in your opinion

Q I'm just handing you a copy of that letter to refresh your memory.

What essentially was Cedar Grove urging the Department to do? The District to do?

A My understanding in looking at the letter was that they have appealed our permit and were trying to either have us change our method now or close our facility ensuring that there's plenty of composters in there that could handle our material.

Q And did it surprise you that a composer was urging the Health District to jerk your permit?

A It surprised me, yes.

Q And the letter was on Cedar Grove letterhead?

A Yes.

Q And who was the letter signed by? It was signed by Cedar Grove and who else?

A Signed by Cedar Grove and several additional composters.

Q What were the other ones?

A Bailey Compost; Green Earth Technologies; PCRCD, also known as LLI; and North Mason Fibers.

Q And to our knowledge do any of these companies have difficultly marketing your compost?

MR. UBERTI: Object to the relevancy.

HEARING EXAMINER: Speak up then.

MR. UBERTI: I object to the relevancy. The fact that what other composters are doing or not doing in their market

shares is immaterial in this process.

HEARING EXAMINER: Ms. Koler.

MS. KOLER: The only -- I think it's just a concern that, you know, we have Cedar Grove here today and that Cedar Grove is on committees and so on with Department of Ecology officials. And it appears that they're actively urging the Department to pull Pacific Topsoils' permit.

HEARING EXAMINER: I'm going to sustain the objection insofar as you would seek the carry this line of questioning any further.

MS. KOLER: Okay. I have no further questions of Mr. Bajsarowicz.

HEARING EXAMINER: Thank you. Mr. Uberti, cross examine.

CROSS EXAMINATION

BY MR. UBERTI:

Q Sir, could you first of all tell us the date of the letter that you have in front of you?

A The Cedar Grove letter?

Q Yes.

A January 16, 2007.

Q And the permit that we're talking about today was issued when to Pacific Topsoils.

A The solid waste permit?

Q Yes.

MS. KOLER: I have no further questions. Thank you.

HEARING EXAMINER: Mr. Uberti, any questions?

MR. UBERTI: No questions.

HEARING EXAMINER: No? Thank you.

THE WITNESS: I can continue on your lessons if you'd like.

HEARING EXAMINER: No, that's okay.

THE WITNESS: And I can provide you with excellent composting facilities too for backyard.

HEARING EXAMINER: Thank you. If you need to get back to the U, you're free to go. Or if you want to stay and listen, you're free to stay and listen.

Who would you like to call as your next rebuttal witness?

MS. KOLER: Mr. Bajsarowicz.

HEARING EXAMINER: Mr. Bajsarowicz, you're still under oath, sir.

THE WITNESS: Okay.

HEARING EXAMINER: Go ahead.

DIRECT EXAMINATION

BY MS. KOLER:

Q Mr. Bajsarowicz, you've heard a lot about the fact that Ecology and the Health District put a lot of credence in the statement that you made about the anaerobic inner core of the compost pile, have you not?

A I have, yes.
Q And when you made that statement, did you have any scientific data to support that statement?
A No. The only thing we had was discussions I had with Dr. Henry out on site. It was not based on any studies that we've done.
Q And -- and so you were -- you were speculating when you made that statement?
A Yes. I -- we didn't know.
Q Okay. And you just heard Dr. Henry say that he doesn't have certainty about whether there is indeed anaerobic inner core?
A No. We don't have -- we haven't studied the pile that intensely.
Q Now, you heard a lot of testimony about the fact that Pacific Topsoils did not promptly respond to the January 4, 2006, letter that Mr. Christiansen wrote.

Did Pacific Topsoils just sit back and say we're not going to do anything?
A No. The letters that we received were very much a concern to us. After we received them, we had meetings internally to figure out how we could approach them. And I ended up contacting Dr. Henry sometime I think in April. On May -- beginning of May we met him out on our composting site.

MR. UBERTI: Excuse me, Mr. Examiner, it appears that the witness is reading or at least he keeps glaring down on some document.

THE WITNESS: I'm looking at -- I'm looking at --

MR. UBERTI: And I don't know what he's looking at.

HEARING EXAMINER: I'm going to -- to the extent that he's using some documents to refresh his memory and recollection, I'm going to allow it. We don't have to have the document entered any more than a police report has to be entered when the officer's testifying. In fact, I'm sure you're aware that lots of attorneys would object to the entry of the police report. Let him use it to refresh his memory, but they don't want it in the record.

MR. UBERTI: May I request to have an opportunity to see what he's looking at, however?

HEARING EXAMINER: It's okay with me if it's okay with them. I don't care.

MR. UBERTI: Thank you.

Q (By Ms. Koler) Mr. Bajsarowicz, are those -- are you referring to -- what's the document you're looking at?

A The document I'm looking at are just specific dates that I looked up for the timeline of how we began our conversation with Snohomish Health District/Department of Ecology/University of Washington study.

Going back to what I was saying, the beginning of May 2006 was when we had a meeting out at our Maltby facility to discuss some possible approaches to doing a study that would clarify the big question of how our process works so

effectively.

HEARING EXAMINER: We need to change the tape.

(End of tape 5, side 1)

(Beginning of tape 5, side 2)

HEARING EXAMINER: Okay. Thank you. You may continue.

THE WITNESS: We were primarily operating from Peter Christiansen Department of Ecology's employees letter, which said if Pacific Topsoils disagrees with our assertions with our composting process, it's up to them to prove to us otherwise.

So we took it upon ourselves to do a study and to see if we can present something to both Snohomish Health District and the Department of Ecology that would prove that.

By May 15, 2006, Dr. Henry provided me a scope and budget for performing a composting study. Within the next few days I contacted Snohomish Health District, and I was primarily dealing with Mr. Crofoot to tell him what we're planning on doing. In discussions with Snohomish Health District they said Department of Ecology also would be involved in this process.

We went back and forth a few times. Finally in mid-July we set up a meeting with quite a few different representatives from the Department of Ecology and Snohomish Health District to discuss what we were planning on doing as far as the study is concerned.

The reason for the meeting was No. 1 to tell them here

is how we're planning on approaching this letter that you've written and this -- this question that needs to be answered, and also we wanted their input on what would be necessary for their incorporation. Obviously, we're not going to pay to do a study like this unless we understand it's going to be well taken in and accepted. There's no sense for to us spend that money for no reason.

The following month I had several conversations -- the outcome of this meeting was thank you for presenting what you want to do, we're going to discuss it internally, and we'll get back to you. The following --

HEARING EXAMINER: That would be August?

THE WITNESS: That would be, yes, I think August.

HEARING EXAMINER: Of '06.

THE WITNESS: So during the remainder of July and August Snohomish Health District and Department of Ecology -- I don't know what happened obviously behind the scene -- but they were having internal meetings to find out what they thought of our proposal.

Then on August 29, 2006, we received a correspondence from Snohomish Health District saying that the outcome of the study would not change their opinion on our composting process. And furthermore, they decided what to do with renewing our permit, which was that they were going to put a three-year time frame us to come into compliance. And it's prudent on us to

either No. 1, change the way legislation is written or change our method of composting to be in compliance.

That's when we contacted our attorney. Once we received the new permit, we appealed the condition and here we are today.

Q (By Ms. Koler) And Mr. Bajsarowicz, I'm showing you an e-mail that was obtained through a public records request to Geoffrey Crofoot from Mr. Christiansen.

Was there any statement in that e-mail that surprised you somewhat about your static method of composting?

A Where am I looking?

HEARING EXAMINER: Is this an e-mail that's a record in the proceedings?

MS. KOLER: No. We -- this is a rebuttal document that I'll introduce.

THE WITNESS: It was incumbent upon PTI to prove their pile process was aerobic. We proposed this because we expected PTI would want to argue they met state law. The legislature passed on the amendment of RCW 70-95 on 1998.

And then -- okay. It says, "In our meeting with Janusz Bajsarowicz on July 17th here at Northwest Regional Office;" -- I assume that's what that stands for -- "we heard from Janusz that PTI admits that the center of their pile at Maltby is anaerobic."

The only thing that would concern me with that statement

is I have no idea what the center of our pile is. That's the whole purpose of doing the study to try and find out what it is. So if I made that statement, it might have been a statement that I made in a meeting, but I'm not relying on any data of any kind to prove that that's correct.

MR. UBERTI: For the record, I think that might be -- is that dated August 14, 2006?

MS. KOLER: Yes.

MR. UBERTI: That would be probably 202. Exhibit 1, Page 202.

HEARING EXAMINER: Now, that one is from Christiansen to Crofoot. Is that what you're looking at?

THE WITNESS: Yeah. From Christiansen to Crofoot.

HEARING EXAMINER: I thought it was from Crofoot to somebody the way it was described.

THE WITNESS: This is August 14, 2006.

HEARING EXAMINER: From Christiansen to Crofoot with cc's to Westcott, Sharp, and Mauer; is that correct?

THE WITNESS: Don Mauer, yeah.

HEARING EXAMINER: Okay. That is -- apparently then it is of record. It's Exhibit 1.202.

Q (By Ms. Koler) Did it surprise you that based on that statement of yours that Ecology has decided that it's not necessary to have a study done?

A Yes. If they made their decision based on that statement, I am

surprised.
Q And you don't have any background in composting, do you?
A No.
Q I mean, you are not a composting expert?
A No, I'm not.
Q And so you think it still would be valuable to produce some evidence actually showing how your composting method works that further studies --
A Absolutely. It comes down to the fact that we create a great product, we can't keep it on hand, and we want to demonstrate why it creates that product.
Q Now, you need a permit from the Health Department -- excuse me, from the Puget Sound Air Control Authority to operate your business, do you not?
A Yes, we do.
Q And I'm showing you a copy of that permit. And could you read to us Condition No. 8?
A Sure. "Each compost pile shall remain in place for at least six months undisturbed. Reclamation shall only occur after six months and only when both the internal temperature of the compost pile drops to 20 degrees Celsius, 68 degrees Farenheit, above ambient. And a Solvita test shows that the compost has decomposed to a finished state. Reclamation shall cease should distinct odors be released when the pile is broken into and shall not take place during temperature inversions or during

periods of calm, less than 4 knot winds.

Site personnel shall use a windsock and weather report to determine when to cease reclamation operations. Temperature readings and samples of Solvita shall be taken at least 9 feet into the pile.

MS. KOLER: Okay. Now, this is by the way Page 109 of the record that's been submitted, and it's Exhibit No. 8. And this is the condition proposed by the Puget Sound Air Pollution Control Authority.

HEARING EXAMINER: Exhibit 109? No. Yes, I see it. I see what it is you're reading. Condition No. 8. Exhibit 1.109.

Q (By Ms. Koler) So does it pose a dilemma for you that -- the Puget Sound Air Pollution Control Authority is telling you you shouldn't move your pile around, isn't it?

A Oh, absolutely. Yes, it does the way we current compost.

Q And their -- the -- one of the concerns that the Puget Sound Air Pollution Control Authority is odor, is it not?

A Yeah. I would guess to say that's their primary concern, but I'm not sure of that.

Q And have you had a good relationship with the Puget Sound air pollution control authority with respect to your composting method?

A Yes, we have.

Q And do you -- how many complaints do you have about your

operation --

MR. UBERTI: I'm going to object.

Q (By Ms. Koler) -- as compared to other people in the --

MS. KOLER: There was some -- there was --

HEARING EXAMINER: There was direct testimony on the history of complaints through Janusz. And he's nodding his head. He knows.

THE WITNESS: Yeah.

HEARING EXAMINER: He can't rebut his own testimony I hope.

MS. KOLER: There was some testimony from Ms. Wescott to the effect -- and unfortunately we don't have the record so I can't point to it -- about the fact that there were odor complaints about this operation. So this would be proper rebuttal testimony.

HEARING EXAMINER: He had previously testified about it before she testified.

MS. KOLER: And then --

HEARING EXAMINER: I'll give you -- again, I'll give you five minutes max since you're probably going to be asking him to say the same thing he said before.

MS. KOLER: Actually I'm not.

HEARING EXAMINER: Okay.

MS. KOLER: So let's go.

Q (By Ms. Koler) So Mr. Bajsarowicz, have you had a relation --

have you had -- have you understood from Puget Sound Air Pollution Control Authority that you have many fewer complaints than other operations?

MR. UBERTI: Objection. Calls for hearsay.

HEARING EXAMINER: Sustained.

Q (By Ms. Koler) Mr. Bajsarowicz, I'm showing you a letter that was written to Daniel Syrdal at Heller, Ehrman, White and McAuliffe, and it's a letter from Claude Williams at the Puget Sound Air Control Authority.

And could you look at that letter?

A Sure.

Q And read Mr. Williams' comment about Pacific Topsoils technology.

A This is I guess the second paragraph. "Pacific Topsoils has demonstrated that its technology is capable of operating with no odor problems. Puget Sound Clean Air Pollution Control Agency has identified the critical work practices and operational controls that Pacific Topsoils has used to achieve this level of control and listed them as an approval -- as approval conditions."

Q And Mr. Claude Williams, who is an Air Pollution Control engineer, was responding --

MR. UBERTI: Objection. She can't testify to what he is or isn't.

HEARING EXAMINER: Sustained.

Q (By Ms. Koler) Mr. Williams was responding to a letter from Mr. Syrdal. And what did the topic of the letter from Mr. Syrdal seem to be if you were to read the summary in the first paragraph?

A "We have reviewed the comments submitted in your April 15, 1998, letter concerning Pacific Topsoils proposed composting facility in Woodinville."

So to me reading this letter it's asking for Puget Sound Clean Air's opinion on us establishing, I assume, our new composting facility at Maltby at the time we were building it, or trying to get approvals for building it.

Q And does he seem to be rebutting allegations that maybe you shouldn't be given a permit?

A Not from what I just read to you earlier.

MS. KOLER: I'd like to ask that this letter be introduced as an exhibit.

HEARING EXAMINER: Any objection?

MS. KOLER: And this letter was obtained through a public records request from the Snohomish Health District, so they had that letter in their possession.

MR. UBERTI: So this letter is a letter apparently dated July 9, two-thousand -- 1998?

MS. KOLER: When -- it's from when the --

MR. UBERTI: I just don't know what that means in terms of a date of the letter.

Why they didn't change -- why they didn't felt they didn't need to or why they didn't change their method immediately.

THE WITNESS: We didn't change our method to begin with because it's obviously No. 1, a very expensive thing that you would have to go through to change your whole composting process and your asphalt pads and how your whole site is situated.

And No. 2, we firmly believe that we create a good product and we don't have data to say that it doesn't meet that definition. We believe that it does meet that definition. And we're trying to prove -- we're trying to do a study to prove that.

Q (By Ms. Koler) And were there any risks posed by changing this method of composting?

A There's some uncertainty. And what would happen, what the product would end up as -- obviously we create a good product. When you have something that's going well, you're reluctant to make changes that would change that good product to be modified.

Q And you heard a lot of testimony on May 10th to the effect that Pacific Topsoils has a large uncontrolled static pile and that it dose not compost in accord with the regulations specified in WAC 173.350.100.

A Mm-hmm.

Q Is that correct?

A I did hear testimony, yeah.
Q And tell us, if you would, if Pacific Topsoils -- if the design of their composting facility considers porosity?
A Yes. We consider porosity by the fact that we add bulking agents. We don't grind our wood prior to it being placed in a compost pile.

MR. UBERTI: I'm going to object to this. This was testified to in direct by both Janusz, as well as Professor Henry. Part of his slides.

MS. KOLER: Now -- given an opportunity to respond?

HEARING EXAMINER: Yes.

MS. KOLER: Well, I think that it's relevant and it's rebuttal testimony because not only did Mr. Uberti, you know, talk about this big uncontrolled pile of solid waste in the response memorandum, but every official who has testified has claimed that Pacific Topsoils has maintained a big uncontrolled pile that does not comply with the specifications in WAC 173.350.100.

HEARING EXAMINER: This witness did testify, and actually Mr. Malins testified more to the point, as to how the process was run. And I can appreciate that there's a fine line between rebuttal and just having the witness say again what they said the first time.

Part of why I'm here is that I have to make judgments between what witnesses say that don't agree with one another.

MS. KOLER: And I think the crucial question before the Examiner today is does this method meet the specifications in WAC 173.350.100. So I think this is very relevant.

HEARING EXAMINER: Okay. I want to hear something that I didn't hear before.

MS. KOLER: Okay.

Q (By Ms. Koler) how do you deal, Mr. Bajsarowicz, with pile moisture?

A In the past I think beginning from some discussions I think back 1998 we started using leachate. We recycled it and started using it on our pile.

HEARING EXAMINER: Started using what?

THE WITNESS: Started using leachate, which is a liquid byproduct --

HEARING EXAMINER: Oh, leachate, yes. I know what leachate is. I just didn't understand what you said. I apologize.

THE WITNESS: So we currently -- to answer your question, currently we use water. We use water on site. In the past we're cutting down our use of leachate, but we moisten the pile --

HEARING EXAMINER: Last time I was told that you -- not only you're cutting down, I was told that you do not use leachate anymore. That you're connected to the sewer system.

THE WITNESS: We are --

HEARING EXAMINER: Are you modifying the testimony that I think Mr. Malins made that says we do not put leachate on the pile anymore? Was his testimony wrong?

THE WITNESS: His -- do you want me to answer that?

MS. KOLER: Yeah.

HEARING EXAMINER: That's a -- she can't testify.

THE WITNESS: He -- yes. We still have leachate storage tanks on site and we still have the ability and may use leachate initially in our compost.

HEARING EXAMINER: Do you?

THE WITNESS: Currently we do not, no.

HEARING EXAMINER: You do not?

THE WITNESS: No.

HEARING EXAMINER: Okay. So what he said is not untrue?

THE WITNESS: No, it's not untrue.

HEARING EXAMINER: Okay.

THE WITNESS: We have -- we have storage tanks there that were fairly -- that we maintain on site, and we've always had a sewer connection to Cross Valley Water District to discharge leachate.

HEARING EXAMINER: So do you currently -- what do you then currently do?

THE WITNESS: We currently use water.

HEARING EXAMINER: You use water.

THE WITNESS: Yes.

HEARING EXAMINER: Okay. Go ahead with your water question.

Q (By Ms. Koler) And does your plan of operations specify that you moisten the pile during dry months?

A Yes. We have to in order for it to -- yes. I mean, over time we've learned how much moisture we need to add to the pile. We spray it normally and we also now incorporate moisture prior to it being built on top of the pile -- or being placed on top of the pile.

Q And do you moisten your pile -- or do you moisten materials when you're mixing them together before you place them in the pile?

A Yes, depending on the condition the material comes in. If it's very dry, we'll moisten it. Then we'll take it up on top of the pile to be composted.

Q And your plan of operation indicates that; is that correct?

A Yes.

Q And how do you consider pile oxygen?

A Through bulking agents. We add material that's large, woody material to the pile. And that's how we consider, you know, making sure that there's pore space in the piles.

Q And you have pore space in the piles to emit oxygen; is that correct?

A We have pore spaces in the pile to -- yeah, to ensure that

there are oxygen pockets in the pile and also as a carbon source to increase our carbon source within the compost pile.

Q And how do you consider nutrient balance in making your compost?

A I think that's something that's been refined over time to a point that we -- it's basically a -- we have it as an art form now. We add a lot of carbon material to our compost. We always -- when we have a load come in, we'll add carbon sources to it prior to taking it up on top. We'll ensure that we have a high carbon ratio in our compost.

Q And so you deliberately structure the ingredients which you put in your pile?

A Yes.

Q And how do you consider pile temperature in your process?

A Pile temperature is really considered mainly by how we build the pile and adding pore space and ensuring that the compost product is a good quality product. We don't -- we don't -- we do temperature, ambient testing temperature, around the perimeters of the pile. Obviously having a pile that big, it's very difficult to monitor temperatures within during the composting process. So we'll monitor temperatures around it to ensure that they're dropping prior to us screening the material.

Q And does your plan of operation indicate that you consider ambient temperatures and temperatures around the compost pile

before you withdraw compost from it?

A Yes.

Q And how long does it take you -- how -- how do you consider the parameter about the retention time of composting?

A We compost for a very long time, from my understanding, with regards to composting time frame. Six to nine months is a very extensive time to keep material in one location.

I test for stability of our product on a monthly basis that I submit to the Snohomish Health District. And then we also have a Type 2 which is a different product that comes from the same compost process that's tested through U.S. Composting Counsel. Just testing for all the parameters that they need.

Q But the composting process we're talking about is dealing solely with Type 1 feedstocks, is it not?

A Yes, it is.

Q Okay. And so you do consider how long you're retaining composting compost mixture in your process?

A Yes, we do.

Q And how many months does it take to structure a pile?

A I think anywhere from -- I think it's fairly equal to the time it takes us to screen another one. Generally the incoming and the outgoing is about the same, so probably six -- anywhere from six to nine months.

Q And during the period that you are forming the pile is someone supervising the pile?

A Yes. We have an employee who does not nothing but manage and build the pile.
Q And if you detect odors coming from a part of the pile, what sort of action do you do?
A They'd be corrected and they'd be covered. The material would be moved depending on what it is. We don't often have that problem. We're -- when we're initially building it, it takes so long to build the pile. Then once you leave it, there's not as much maintenance involved once the pile is composting.
Q And in fact the decision not to manipulate the pile after you have formed the pile is mandated by a Puget Sound Air Control Authority condition, is it not?
A Yes. You cannot -- you cannot disturb the pile for six months.
Q So that is a control that is built into your composting system in order to control odor, is it not?
A I would think that that would be the reason it's in there, yes.
Q And so far as you're aware, there's been no studies whatsoever made of your pile --

MR. UBERTI: Objection.

Q (By Ms. Koler) -- of any agency?

MR. UBERTI: We've testified to that. Several witnesses.

HEARING EXAMINER: Sustained.

MS. KOLER: Okay. And I have no further questions.

HEARING EXAMINER: Cross examination.

Q Or test for carbon nitrogen ratios. You try to assure a certain level of those variables through the way the feedstock is mixed and placed on the pile?
A Correct. And we do test for carbon and nitrogen ratios obviously in our end product.
Q In the end product, yeah.
A When you're going out to a customer. What we do is the material after it sits for that long, we begin screening it. The material that falls through the screen is what we call our Pacific Garden Mulch. I personally don't test for nutrient values and those types of things, because that's -- I deal with regulatory. I test for --
Q Now, the screened material is then put in those windrows that we talk about and sit for a couple of weeks?
A Correct.
Q So the screening comes first. The material that gets through the screen is what's put into the windrow?
A Correct.
Q Okay. And the material that doesn't pass the screens goes back on the pile?
A There's -- we do a number of different things. One of the things we do is we use it as a bulking agent. Obviously it's larger material that didn't pass through the screen. So the next time we compost, a lot of it is actually ground up and it may sit for a little bit longer. And it's sent to large jobs

such as WSDOT and large contractors that have a specification of what kind of carbon to nitrogen ratios they want.

So it's used for a number of different things in our company.

Q Okay. Is -- do you know the particle size of the hog fuel that's mixed in? Are we talking chunks that are --

A We're talking --

Q -- inch or two diameter? Chunks that are several inches in diameter? Chunks that are ground up? Really ground up?

A We're talking about hog fuel and the bulking agents that we use are usually, you know, at least an inch to several inches woody, hard debris. Kind of like what you would characterize as brush material, I suppose. You know, very dense, a lot of hard wood in it. We use finer material depending on what we're adding carbon to. If we get a load of sod, for example, I think they add some kind of a more fine carbon source to it.

Q If you get branches in the feedstock, do I understand correctly that doesn't get ground up and turned into hog fuel? It's just dumped on the pile as branches?

A Yeah. We don't grind it before we compost it.

Q Okay. I remember Mr. Malins telling me about the pile formation and the lifts. What I'm calling lifts. I know that comes from my solid waste landfill days when these different layers were called lifts. And that just makes sense to me, so if you can bear with me, that's what I'm going to call them.

Q Okay.
A We think that the arm can reach about 35 feet.
HEARING EXAMINER: Okay. I don't have any other questions that I wanted to ask Mr. Malins, so thank you for substituting.
MS. KOLER: Mr. Bajsarowicz.
HEARING EXAMINER: I know.
MS. KOLER: Oh, I see.
HEARING EXAMINER: No. Those were questions I wanted to ask Mr. Malins, and I then said thank you for substituting.
Based on the questions I asked, does counsel want to ask any further?
MS. KOLER: Yes.

REDIRECT EXAMINATION

BY MS. KOLER:

Q Why do you not grind the branches (inaudible) that you put on the pile?
MR. UBERTI: It's been asked and answered.
HEARING EXAMINER: Yeah. And I understand it.
MS. KOLER: Hearing Examiner Galt --
HEARING EXAMINER: I'm satisfied with that. I know. Because they want to leave the air pores.
MS. KOLER: Okay.
Q (By Ms. Koler) And do you have like water trucks at the site?
A Mm-hmm, we do.

Q Is that for a purpose of fire control in the pile?
A It serves a lot of different purposes. One is fire control, one is dust control, one is now watering the pile.
Q So you are maintaining control over the site where this composting --
A Sure. You have to.
Q -- process takes place? You have employees that are charged to do that?
A When you're in the topsoil business, we don't have our shortage of sweeper trucks and water trucks, that's correct.
Q Does your plan of operation indicate -- and this is Page 136. 1.136, I believe is the exhibit.

Does your plan of operation indicate how you moisturize the pile?

A Mm-hmm.
Q And why don't you just read that for us so that we have --
A "Leachate is reintroduced back into the active stage of the composting pile. Organics in the leachate are broken down and large quantities of water are evaporated. Most composting suffers from water loss. So adding back leachate water aids in the process. Because the pile is porous, the leachate percolates down into the compost pile and does not generate excessive odors."
Q So you now substitute with water for that stage in the process?
A Yeah. We just use a different moisturizer.

APPENDIX 7

improper?
A Well, we looked at the -- composting process is something that is a process that's aerobic -- or actually it's a controlled aerobic process that you can influence in various different factors. And we felt, along with the Department of Ecology, that the process observed at Pacific Topsoils and documented in their plan of operation didn't reflect what we were looking at and the intent of the WAC and RCW.
Q Okay. And what is the intent of the WAC and the RCW?
A I think it's clearly stated that the composting is a -- I'm going to have to paraphrase unless, you know, we can just cite it again. Composting is a process -- let's me see -- a controllable process that you can influence, for instance, porosity, water, content, O2 content, retention time. And those are all things that not only is it a process that has influence over those things, but it's something that the intent is to design, operate -- that that -- those qualities go into the design, the operation, and the product. So it's not just limited to one aspect.
Q Now, are you aware of any specific studies that the Health District has performed of Pacific Topsoils' composting method?
A No.
Q Are you aware of any studies that the Department of Ecology has performed?
A No.

APPENDIX 8

Darst Declaration, Ex A, p 154

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

January 4, 2006

Gary Hanada
Environmental Health Supervisor
Snohomish Health District
3020 Rucker Ave. Suite 104
Everett, WA 98201-3900

Dear Mr. Hanada,

RE: Ecology Position on Large Static Pile Composting

The Snohomish Health District (SHD) has asked the Department of Ecology (Ecology), Solid Waste and Financial Assistance Program, for clarification regarding composting in very large static piles. Specifically, SHD has asked if the large static pile method of composting meets the definition of "composting" under WAC Chapter 173-350, Solid Waste Handling Standards. In addition, SHD has asked whether or not Ecology considers large static pile composting to be an aerobic process. The request for clarification was made specifically with respect to Pacific Topsoils, Inc. (PTI), their Maltby composting facility and a potential proposal for a composting facility on Smith Island in Everett, WA. Pacific Topsoils, Inc. currently uses the large static pile method for composting at their Maltby site, and is expected to propose the same composting methodology for their site on Smith Island.

Statutory Authority

RCW 70.95.030 (4) states that:

> "Composted material" means organic solid waste that has been subjected to **controlled aerobic degradation** at a solid waste facility in compliance with the requirements of this chapter. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.

This is the revised definition that passed out of the 1998 Legislative Session. This session also produced Substitute House Bill 2960 which directed the Department of Ecology to look at three issues of the solid waste permit system, including composting, and report back to the Legislature by December1,1998. Ecology completed the study and recommended developing compost facility standards as part of the MFS Revisions process.

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Health District

WAC 173-350-100 defines composting as:

> "...the biological degradation and transformation of organic solid waste under controlled conditions designed to promote aerobic decomposition. Natural decay of organic solid waste under uncontrolled conditions is not composting."

The current standards for compost facilities are based largely on existing guidance and stakeholder input. The current 350 definition underwent substantial public review during the rule making process including scoping workshops, state SWAC involvement, support of an external Advisory Committee, direct mailings, focus sheets, advertising and public meetings. No one commented on making changes to defining composting as a "controlled aerobic process".

Ecology Response

Ecology's opinion is that using large static piles as a composting process does not promote aerobic decomposition, and thus does not meet the definition of composting. Ecology began to clarify this position in a letter to the Tacoma-Pierce County Health Department in April 1999 (letter from Laurie Davies to Glenn Rollins). In that letter, Ecology states "Composting in large static piles is not generally considered an aerobic composting system." (The correspondence was in reference to a permit application for a composting operation at Wilcox Farm, under the business name South Puget Sound Compost Company.) The adoption of the 350 rule solidifies this position. WAC 350-220(3)(d) states that:

> "Composting facilities **shall be designed** with process parameters and management procedures that promote an aerobic composting process. This requirement is not intended to mandate forced aeration or any other specific composting technology. This requirement is meant to ensure that compost facility designers take into account porosity, nutrient balance, pile oxygen, pile moisture, pile temperature, and retention time of composing when designed a facility".

Depending on the operation, large static piles are often built by driving on them. This is a standard operational procedure that is used at the PTI Maltby composting facility. This action results in compaction, which removes free air space and destroys porosity in the pile. Given that composting is a dynamic process, Ecology does not require specific measurement of oxygen levels in a pile in order to indicate aerobic activity. Facilities should be operated and maintained with technologies that allow for adjustments to the conditions that support microbial growth. This means the operator must have the ability to adjust the process parameters that lead to aerobic conditions in the piles. Large static piles do not allow for adjustments in the composting process. Piling materials in a large static pile and allowing them to compost without any manipulation is essentially "natural

decay of organic solid waste under uncontrolled conditions." Thus, this operational composting process does not meet the current definition in 350.

Summary

Ecology's opinion is that "large static pile technology" is not composting per state regulations, and the PTI Smith Island site should not be permitted as a composting facility using this technology. Further, the facility located in Maltby is also not composting per state regulations. PTI should be put under a compliance schedule at their Maltby site to bring their operation into conformance with the compost requirements in the - 220 section of the rule. The deadline for facilities to come into compliance with the 350 rule is February 10, 2006. It seems reasonable that since no regulatory authority has taken action to force compliance at Maltby (and we previously allowed approval of this operation), a compliance schedule be negotiated with PTI on changing over the Maltby site to make it 350 compliant.

If PTI disagrees with this assertion, it is incumbent upon them to prove to us otherwise. Any discussion by PTI on this issue needs to be founded in science and be able to stand up to peer review.

If you have further questions regarding this issue, please contact me at the phone number listed below.

Sincerely,

Peter Christiansen
Section Manager
Solid Waste and Financial Assistance Program
Northwest Regional Office

Geoffrey Crofoot

out

From: Christiansen, Peter (ECY) [PCHR461@ECY.WA.GOV]
Sent: Monday, August 14, 2006 5:36 PM
To: Geoffrey Crofoot
Cc: Wescott, Holly; Sharp, Marietta (ECY); Maurer, Dawn (ECY)
Subject: PTI

I am following up on our conversation this afternoon regarding the compost operations at Pacific Topsoils (PTI) at Maltby.

After discussions internally with key personnel in the program, Ecology stands by my letter addressed to Gary Hanada on January 4, 2006.

In my letter dated January 4th, I stated that we did not believe the pile to be aerobic, and it was incumbent upon PTI to prove their pile/process was aerobic. We proposed this because we expected PTI would want to argue they met state law the legislature passed as an amendment to RCW 70-95 on 1998:

RCW 70.95.030 (4):

> "Composted material" means organic solid waste that has been subjected to controlled aerobic degradation at a solid waste facility in compliance with the requirements of this chapter. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.

Our rule (WAC 173-350) echoes this. In our meeting with Janusz Bajsarowicz on July 17th here at the NWRO, we heard from Janusz that PTI admits that the center of the pile at Maltby is anaerobic. Since PTI would need to prove their pile was aerobic to be considered in compliance with both the law and the rule, and they have admitted otherwise (unless they want to recant their assertion), there is no reason for them to spend money on a study. There is no other proof that would get past the need to have a controlled aerobic process. The need for a controlled aerobic process is spelled out in the law. Thus they are currently out of compliance with the law.

It is important to emphasize that it is not just Ecology's rule (WAC 173-350) that requires controlled aerobic degradation. Our rule is built on language provided by the State legislature (RCW). Thus, the actual law would need to be changed by the legislature for us to consider a composting process other than controlled aerobic processing to be in compliance.

Because PTI has been operating under what they considered to be a valid permit at PTI since 1998, and they could argue that they had no reason to expect otherwise when 350 passed into rule, it would be fair to give them an adequate amount of time to come into compliance. Since the 350 rule allowed facilities 3 years to meet all performance and design standards, you could use this as a basis for developing a compliance schedule with them. This will allow them time to either come into compliance with the regulations or seek a legislative remedy. The legislative remedy would have to first go through the state legislature who would need to change the definition to include the process that PTI follows. If they were successful at getting the legislative change, Ecology would then, and only then be able to institute a rule change. We cannot institute a rule change that is not supported by state legislation.

There may be other reasons for PTI to continue to study their process. If they are going to propose a change is the legislation as Janusz mentioned at our meeting, they would most likely need to have scientific proof that their method of processing yard and garden debris meet the same standards as an aerobic pile. I cannot counsel you on how the legislative process works, as that is not my expertise. However, I can state confidently that the legislative change would need to be initiated directly by PTI to the legislature through their representative. Ecology is reluctant to question the legislature in the development of the law.

out

Peter D. Christiansen
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HEALTH
DISTRICT

3020 Rucker Avenue, Suite 104
Everett, WA 98201-3900
425.339.5250 FAX: 425.339.5254
Deaf/Hard of Hearing: 425.339.5252 (TTY)

Darst Declaration / Ex A p 203

August 24, 2006

Dave Forman
Janusz Bajsarowicz
Pacific Topsoils Incorporated
805 80th Street SW
Everett, Washington 98203

Subject: Ecology's Position on Large Static Pile Composting

Dear Mr. Forman and Mr. Bajsarowicz:

As you are aware, the Snohomish Health District (Health District) has been waiting for guidance from the Washington State Department of Ecology (Ecology) on how to proceed with a Pacific Topsoils Inc (PTI) Proposed Composting Study. As a result of the meeting hosted at Ecology in Bellevue on July 17, 2006, Ecology has decided to stand by the original position outlined in letters dated January 4, 2006, from Ecology to Gary Hanada and March 10, 2006, from the Health District to PTI.

RCW 70.95.030 (4) states that:

"Composted material" means organic solid waste that has been subjected to controlled aerobic degradation at a solid waste facility in compliance with the requirements of this chapter. Natural decay of organic solid waste under uncontrolled conditions does not result in composted material.

WAC 173-350 echoes the state RCW.

As a result of Ecology's guidance, the Health District finds that the process currently underway at the Maltby location does not meet the aforementioned definitions and can not meet the requirements without either change to the process or change to the RCW and subsequently the WAC.

Due to the lack of clarity in this situation, and because PTI has been operating under an un-challenged permit since 1998, the Health District will grant a three year extension to either come into compliance with the regulations or seek a legislative remedy. The origin of the three year time frame is from the original compliance period outlined in WAC-173-350. PTI's compliance period will begin with the issuance of the 2006-2007 operating permit and end when the 2008-2009 operating permit expires on the 30th of June 2009.

The legislative remedy would have to first go through the state legislature which, would need to change the definition of composting to include the process that PTI currently follows.

The proposed study, regretfully, will not change Ecology's position concerning this matter. However, PTI may still wish to pursue the study to collect data for use in future endeavors.

I have included a permit with conditional language similar to that in this letter.

If you have question or concerns, please contact me at 425.339.5250.

Sincerely,

Geoffrey W. Crofoot, R.S.
Environmental Health Specialist
GWC:jsf

APPENDIX 9

Exhibit 3.1 through 3.16.

The sequence that we take our witnesses is Appellant first, District second, Appellant's rebuttal, District's rebuttal, District closing, Appellant closing. I will at this point recognize Ms. Koler to begin presentation on behalf of Appellant PTI.

MS. KOLER: I have just some preliminary matters, if I could. And once again, Hearing Examiner Galt, I would like to thank you for accommodating Dr. Henry's schedule and scheduling this hearing in a manner that allowed him to participate after returning from their trip to Costa Rica.

One preliminary matter is I believe that the Appellant should go second simply because we have never had an opportunity to know what the Health District's position is about why their composting method is deficient. We have no idea. Because discovery is not allowed in this proceeding, we are absolutely operating in the dark about that. And it would enable us to present our case much more effectively if we were allowed to hear what they have to say about their composting method as a preliminary matter.

HEARING EXAMINER: Okay. Thank you. Mr. Uberti, any comments?

MR. UBERTI: The comments are the local regulations outline that the Appellant is to go first. I don't want to rehash the history of how PTI alleges that they don't have

knowledge of what the position of DOE and SHD is. That was part of the discovery motion, which is part of the record. They're on full notice of the position of Snohomish Health District and the Department of Ecology, and I think we should call the procedures as outlined in the regulations.

HEARING EXAMINER: Your request to alter the sequence of presentation is denied. I would only comment in doing that on your statement that discovery was not allowed, that in my opinion is not a completely accurate statement. The type of discovery that you requested was not allowed. I agree with that. The Health District code does provide for discovery, and that process was available. Motion denied.

MS. KOLER: I have a couple of preliminary objections to this proceeding that I -- you know, I'm not trying to be abrasive, but I just want to note for the purpose of the record.

That the first objection is is that because discovery was not allowed, we wanted to depose a 30(b)6 witness from Ecology and a 30(b)6 witness from the Snohomish Health District to fully understand their claims about the composting method. In this proceeding, although everybody alleges, I guess, Pacific Topsoils has been fully apprised of why their composting methods does not meet Ecology's standards. In fact, they got one -- everybody has been relying from Snohomish Health District on one letter from Mr. Christiansen at the

Department of Ecology and that is the sole explanation of why Ecology and the Snohomish Health District have contended that the method does not comply with Ecology.

HEARING EXAMINER: So what's your objection? I don't want this to be closing argument on your case. I want to know what your objection is.

MS. KOLER: My objection is that we're coming to this hearing with our hands tied. One hand tied behind our back. We have not been able to adequately prepare. And a component of due process is adequately -- is being able to adequately prepare to address allegations at a hearing. I think that it has been a very difficult proceeding to prepare for because really and truly I don't know what the Health District is going say today. We got --

HEARING EXAMINER: So that's your objection?

MS. KOLER: I have a second one.

HEARING EXAMINER: I know you do, but let me -- can we take them one at a time or would you like to put them both on the table?

MS. KOLER: I'll put that on the table.

HEARING EXAMINER: Okay. Mr. Uberti, do you wish to respond?

MR. UBERTI: Other than to say the authority has been addressed by way of Exhibit No. 3, I believe it is No. 10. It's 10. And I (inaudible). It's been discussed in the order

Now, it's disturbing in this process because Mr. Christensen in his January 4th, 2006 letter said that it's Pacific Topsoils' obligation to prove that it's acting in a legal manner. They have to come forward and prove that their method is aerobic. That to me doesn't say that I'm right.

Like, for example, if the Washington State Bar Association pulled -- or wanted to pull Mr. Uberti's business license, they would have to write him a detailed letter explaining how his conduct deviated from the law. They would have to explain, you know, that maybe he had committed a felony or something like that. Now -- and how his contact deviated from the Code of Professional Responsibilities.

Similarly, if the State of Washington wanted to pull Mr. Christensen's driver's license, they would have to show that he had violated the law. They couldn't just come along and say, hey, we want to take your license. Come forward and prove that you're behaving in a legal fashion or we won't take it. And yet that's how we have Ecology and Health District viewing the burden of proof.

Without a doubt, we are the appellant in this proceeding. But what this proceeding is lacking is what was a predicate proceeding in which Ecology and the Health District explained to Pacific Topsoils and produced evidence

showing that their composting method was not in compliance with regulations. That's never happened here.

And any time that a property interest and without a doubt, they're licensed to make compost is a property interest. Any time a property interest is implicated, the government has an obligation to clearly disclose why the conditions of that license are being changed or -- it's important.

If Pacific Topsoils does not change its method, Pacific Topsoils can't make compost anymore. So this is a big deal what's happened here. And Pacific Topsoils isn't certain, you know, if it can make good compost if it changes with its method.

I'm just scratching my head not really understanding how such a serious allegations can be made. How the Health District can come along and say, you Pacific Topsoil, you've got to change your composting business. Or starting 2009, you no longer have the right to make compost. How they can do that without some sort of predicate evidence showing Pacific Topsoils has violated WAC 193.350.100?

Clearly, Mr. Christensen when he wrote his letter dated January 4th, 2006, which great importance has been attributed throughout these proceedings, the Health District testified that that letter was the basis of its decision to impose the condition on Pacific Topsoils.

Now, let's look at that letter a little bit. It concludes that Pacific Topsoils' static method of composting is not an aerobic method. Now, when is the letter was written, Mr. Christensen's testimony was he didn't have any studies in his possession about Pacific Topsoils' static pile. Pacific Topsoils had not produced any studies. The Health District didn't have any studies.

So this letter is -- Mr. Christensen even testifies that this letter was his opinion. It was his opinion that Pacific Topsoils' composting method did not comply with the state law.

Now, because in 2009, Pacific Topsoils, by virtue of the condition that was imposed, will lose its right to make compost and will lose its right to be in the composting business, if it does not make this change that Ecology is demanding.

It seems to me that Ecology and the Health District needed more than Mr. Christensen's opinion. They needed some facts. They needed some studies to demonstrate that Pacific Topsoils' method does not comply. And we're totally in a vacuum. The Health District does, nor does Ecology, have any studies which support Mr. Christensen's opinion.

When I initially asked Ms. Wescott and Mr. Christensen about, you know, whether or not they, you know, provided me with all of the materials that they had considered, they

said yes. And I was given no studies by the Department of Ecology. And I believe that it was Ms. Wescott's testimony that no studies, strict studies, of static pile composting were considered before Ecology arrived at this position.

Now, it's really important to understand that this condition is perspective. So I think that the Health District has tried to make it seem that the preliminary studies that Dr. Henry has done, obvious method and the evidence (phonetic) method which has been produced at this hearing is irrelevant.

The only thing that is relevant is the knowledge which the Health District had back in January or back in -- I guess it was August 2006. But because this condition has perspective operation, the evidence about their composting method, which was produced at this hearing, is highly relevant.

I think that it's highly relevant to consider that the only actual data about the composting method is Pacific Topsoils' plan of operation and Dr. Henry's preliminary study of the method -- of the method.

It's important that the declaration from Dr. Henry that Mr. Uberti had was done before these preliminary studies of Pacific Topsoils' method was done. So there is now -- they've done preliminary studies and I believe that they're going forward with these studies.

Now, it's -- let's look at Page 2 of Mr. Christensen's January 4th, 2006 letter.. It says that in the last paragraph, "Depending on the operation, large static piles are often built by dropping on them. This is a standard operational procedure that is used said at the PTI Maltby composting facility. This results in compaction, which removes free air space and destroys porosity in the pile."

Now, the actual evidence that was produced about driving on the static piles was evidence in their offer and plan of operations as well. It says that no driving on the static piles occurs until the piles are at least 20 feet tall and that pile is carefully structured to preserve porosity by putting big huge pieces of yard waste in. And they don't grind up the materials to preserve porosity.

The letter goes on -- so this is a speculative statement about Pacific Topsoils' methodology, which is not poured out by their actual practices.

Mr. Christensen's letter says, "Facilities should be operated and maintained with technologies that allow for adjustments to the conditions that support micro-bio look."

Now, I've searched and searched in the WACs 173.350. I don't see a statement that is -- I don't see a regulation that imposes this requirement. This is a requirement that Pacific Topsoils' operation is being tested against, but this requirement has not been adopted. It's not been

published. Pacific Topsoils doesn't have any notice of that requirement except in this letter.

The letter further states that this means that, "The operator must have the ability to adjust the process parameters, but lead to aerobic conditions in the piles." Once again, searched through WAC Chapter 173.350. I don't see any standard or regulation which articulates the standard that Mr. Christensen was relying on to judge Pacific Topsoils' composting method.

Then the letter further states, "Hiding materials in large static piles and allowing them to compost without any manipulation is essentially natural decay organic solid waste under uncontrolled conditions.

I've seen no regulation which prohibits placing compost in large static piles. In fact, the regulation at 173.350.100 seems to contemplate that compost is going to be placed in piles because there are three references to piles in that regulation.

So there -- I think that it's very important to understand in this case that there is no published articulated prohibition against static piles. This is subjective opinion, apparently of Ecology's, but they have not yet promulgated the regulation that gives notice to people in the regulated industry that this is an operational standard.

It's important to note that all of these standards have not been adopted -- that Mr. Christensen relies on have not been adopted in the public rule making process. Now, the standard that requires manipulation of the pile -- and over and over again, Ecology and the Health District officials testify that this is anaerobic decomposition. This is an uncontrolled pile because it's not manipulated.

This is, I think an arbitrary standard because here the Puget Sound Air Pollution Control Authority says to Pacific Topsoils in Condition No. 8 of their composting permit, don't manipulate the pile for six months to avoid odor. So we have agencies that certainly have a lot of expertise but, you know, both the agencies have expertise.

Puget Sound Air Pollution Control Authority has been very involved with the composting industry because one of Puget -- Pacific Topsoils' competitors has had literally thousands of complaints. And they say, to avoid odor, do not manipulate the pile.

So you see how conflicts of opinion about manipulating the pile, but the main problem with the pile manipulation requirement is it's not published, it's not adopted.

This is just like or very similar to a situation that arose in a case that I think I cited in my materials. It's called Simpson Tacoma Craft versus Department of Ecology. In that case, Pacific -- the Department of Ecology once

again was required compliance with a non-published, non-adoptive standard.

In that case, they said Simpson Tacoma Craft was in violation of their discharge permit because of the level of dioxants they were discharging into the environment. And the United -- the Washington Supreme Court said, no, no, no, Ecology, you are relying on an unpublished, unadopted standard which needs to be adopted in a public rule making requirement if you're going to use that standard for regulating the industry.

And that's exactly the situation here. We have a rule governing composting. The terms of the rule are clear. They say that you've got to promote aerobic composting. You've got to consider certain parameters.

They don't -- the rules don't say no static piles. They don't say that you've got to manipulate your piles. They don't say any of the things that Mr. Christensen is demanding in this letter, this letter which everybody agrees is the basis of the Health District's opinion. So I think that that is a substantial problem with this process.

Now, Mr. Uberti was saying that we should grant deference to Ecology's conclusion of the statute. But there's no reason to the statutes and to WAC 173.350.100. You only defer to an agency's instruction of a regulatory scheme that's ambiguous.

This regulation is not ambiguous. It doesn't prohibit static piles. It does not require manipulation of the piles. It doesn't say that you've got to, you know, manipulate the pile in order to support micro-bio growth.

None of these standards are articulated in the regulation. You can't get around the fact that these are unadopted unpublished standards by talking about interpretation. These standards just are not stated and they should not be used for the purpose of regulating Pacific Topsoils.

Now, Dr. Brown testified that she had looked at the plan of operation. She had listened to Dr. Henry's testimony about Pacific Topsoils' composting methodology. It appeared to her that Pacific Topsoils' method complies with the standards articulated in WAC 173.350.100.

Dr. Henry testified about each of the parameters that are articulated in WAC 173.350.100 even though he talked about his opinions about composting. When you look at his opinions, he addresses porosity, he addresses pile temperature, he addresses the data that they gathered about pile temperature and he addresses oxygen.

All of these parameters articulated in 173.350.100 were considered in Dr. Henry's testimony and in his evaluation of Pacific Topsoils' and composting method.

Both Dr. Henry and Dr. Brown testified that if aerobic

decomposition were not occurring that the product would smell very very different. That the product would not have an earthy smell, but that the earthy smell denotes that microbes that produce oxygen are present in the compost pile and they're causing a final aerobic product to be created.

Dr. Henry also testified that the temperatures that they measure at different depths in the pile would not be there if this were not an aerobic -- an aerobic method of composting.

Mr. Bajsarowicz in the plan of operation, he testified about how they deal with pile moisture. How they deal with pile oxygen. How they deal with nutrient balance. How they deal with moving their pile.

Why their method is a controlled method of composting. This is not as Ecology and the Health District are claiming, just a big pile of solid waste decaying naturally.

They have one employee, at least, and that's his sole job is to control that pile. They had water trucks outside. They have all kinds of equipment outside to control the pile, to deal with the pile. They carefully structure the pile and their end product is an aerobic product.

When a competitor was commenting on whether Pacific Topsoils was using best available science to control odor in its technology, the Puget Sound Air Pollution Control Authority opined that Pacific Topsoils has demonstrated that

its technology is capable of operating with no odor problem.

So Pacific Topsoils for years and years and years, over 20 years, has been composting using the same method. And one of the agencies that regulates them has found that this method successfully controls odors.

I think that it's very odd here that the Health District, based on a speculative comment Mr. Bajsarowicz made, who is by no means a composting expert, concluded that that's all of the evidence Ecology needs. They don't need to consider anything else. That that's sufficient evidence to show that it is an anaerobic process.

Certainly, the fact that they were at that meeting to discuss doing a study, I think there's a strong inference that there were no studies in place. And there is -- Dr. Henry said he doesn't know with certainty if the core of that pile is anaerobic. And even if it is anaerobic, the regulations do not require a total aerobic of composting. And, in fact, Dr. Henry can testify that all of the other methods at some stages are anaerobic.

So it's hard to understand why Ecology does not want a study. Why they don't want evidence to support the decision that they have made one way or the other and why Pacific Topsoils is not being given the opportunity to present such evidence. Why there is not interest in having an educated decision made about this matter.

APPENDIX 10

Sustainability of Modern Composting

Intensification Versus Costs & Quality

by William F. Brinton, Jr.
Woods End Research Laboratory

Introduction

Composting has traditionally been used as a form of slow rotting of farm-yard manures and vegetative wastes with the resultant humus product useful in agriculture (Balfour; Howard; Wistinghausen & Sattler). However, renewed interest and modern engineering involvement has resulted in an essentially new composting image emphasizing significant technological inputs (Hoitink & Keener, Biocycle; Rynk). A typical example is the use of frequent turning or forced aeration to deliver air constantly to a compost pile. Along with this intensification, there has naturally been a dramatic upturn in commercially available turning machines, in-vessel compost reactors, aeration systems, pile covers, and so on for farms, municipalities and industry. Finally, it is also apparent that there is increased availability to the consumer of a variety of compost-based products.

Despite this impressive record of modern composting, little if any actual studies or data exist comparing technology inputs either on the basis of cost/benefit or quality-of-end products. In contrast, within agriculture in general and specifically in organic and biodynamic farming, numerous comparison studies exist for various alternative management schemes from the viewpoint of cost/benefit, soil-degradation and quality of end-products (Lockeretz). From this point of view, the science of composting appears to lag behind technological developments. Furthermore, the sustainability of intensified composting has never been evaluated. This paper examines certain basic intensification assumptions in modern composting on the basis of economics and process biology. Under consideration is what the effects of varying intensification are in view of nutrient and organic matter retention, end-product quality and overall costs.

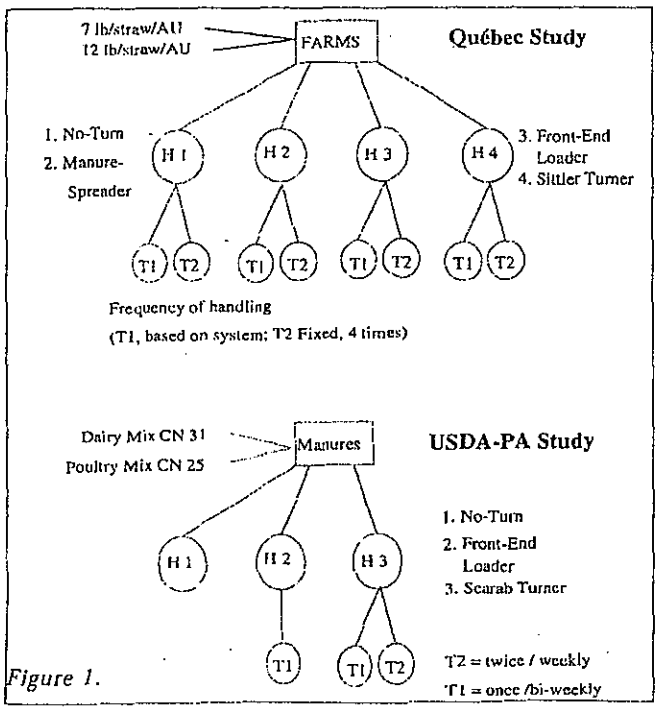

Figure 1.

Background: Sociology of New Technologies

It has been said that composting has achieved *paradigm* status and become a trend. It is suddenly an industry which has attained self-definition, and in this lie certain dangers. Constraining the examination of the merits of high-tech composting are the facts that the economics are curiously skewed, and in many cases waste products involve fees up-front (to the farmers or composters), called tipping-fees, before any actual sales of completed end-product take place. In Switzerland, for example, community tip fees to eligible farmers for contracted leaf and yardwaste composting are about SFr120 per tonne (Oltern Conf), while the potential value to the farmers may be more likely SFr 10-20/tonne (Wädenswil). Similarly, in the US while tip fees are not so high, it is possible to receive on the front end more than twice the value of the actual product. These factors translate into incentives representing society's desire to rid itself of the waste; they say nothing however about the intrinsic merit or sustainability of the current composting technologies chosen. Similarly, environmental pressure which may force growers to adopt composting does not necessarily translate into economical or viable practices.

The Farm View of Composting

Sustainability and quality are the key traits in the acceptance of composting within agriculture. There has been continued hesitancy on the part of farmers to

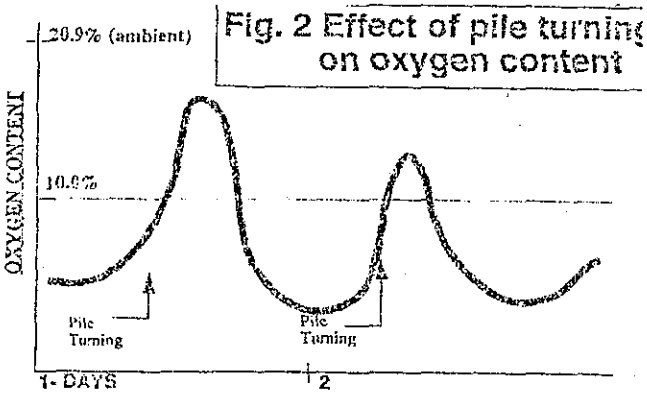

Figure 2.

adopt what appear to be machine-intensive, time-consuming composting practices. Farmers are, however, concerned about soil and water quality, and have demonstrated a commitment to improvements in waste management, with composting high on their list of interesting subjects. Additionally, organic and biodynamic farmers depend largely on recycled and composted local and on-farm resources for a fertilty base. As such, the growers are caught in a unique conflict. On the one hand they have their own needs and capabilities, the latter largely defined by cost and certified or eligible practices. On the other hand, they face a confrontational environmental sector combined with the alluring, high-tech pitch of the composting industry. Thus, a need exists to develop an agriculturally viable form of composting that is consonant with the traditional farm setting without sacrificing quality and viability.

Current Studies

Woods End Research Laboratory has been researching compost biology and use in farming over a period of many years. In this direction two research projects were funded to examine intensification of composting in relation to cost and quality of end-products. The first study was a joint project of Woods End of Maine and CDAQ (Centre de developpement d'agrobiologie du Quebec), funded by Agriculture Canada (Jobin, 1992); the second was conducted by Woods End with assistance of the Erth-Rite Company of Gap, PA and support of the USDA Technical Center in Chester PA (USDA, 1993). These two projects focused in on farm handling and its impact on the composting process.

The overall strategy behind the focus for these studies was examining the premise of intensification, and its impact. To develop composting within agriculture the following goals are seen as operant:

- Limit necessary source material to local or on-farm resources;
- Identify and focus on key traits for composting and eliminate unnecessary technology steps;
- Test approach in varying farm settings including Quebec Dairy Farms (Agriculture Canada) employing varying amounts of straw bedding and on Pennsylvania Dairy and Poultry Operations (U.S.D.A.)

The composting studies assembled two groups of ingredients varying from straw to sawdust for bulking and subjected them to a range of intensification scenarios from no-turning to high-rate Scarab-type turning, as follows:

Table 1: Treatment Structure of Compost Intensification Studies

Quebec Dairy	PA Dairy/Poultry
Bedding Materials Key:	
Low vs. High Straw Farms	Straw vs. Sawdust mixes Dairy + Beef with Straw Poultry with Sawdust
4- handling methods:	3-handling methods
- low-cost Sittler turner - bucket loader - manure spreader - dump-wagon, no turn	- Self-propelled turner - Bucket loader - No turning

Lay-out of Treatments

Figure 1 depicts the structure of treatments and sub-treatments for the studies (previous page). In the first study we varied the frequency of turning based on recommended approaches (T1) versus fixed approaches (T2) with two farms having varied ratios of straw to manure, influencing the porosity of the mix. In the second study, we varied manure type and carbon source with 3 types of turning.

Treatments were replicated twice or three times, each for the USDA and Quebec studies, respectively. The study collected information throughout the process on:

- temperature & oxygen performance
- organic matter and nitrogen loss
- change in humification and respiration rate
- O & M (operations/maintenance costs)

In this report we give data for temperature, oxygen and organic and nitrogen matter losses.

RESULTS

Compost piles are normally turned in order to reintroduce oxygen, which is necessary for aerobic composting. In the first part of these studies, we examine the immediate effects of turning by measuring oxygen content 2.5ft within the compost pile before, during and after turning by a windrow machine. The results of observing these effects over two days are seen in Figure 2.

The effect of pile turning was to refresh oxygen content, on average for 1.5 hours (above the 10% level) after which it dropped to less than 5% and in most cases to 2% during the active phase of composting. No significant differences were observed between windrow turning machines and manure-spreader turning, while bucket loader turned piles depended more on operator efficiency as to how much temporal air was introduced.

We have previously reported temporal oxygen effects of turning. However, we have also shown that they exert little or no negative effects if aerobic activity in the long term is the issue (USAEC, 1994). As later data will show, it depends on pile size and porosity. By introducing more straw which we do in the Quebec study, the effects are similar to introducing more air (Fig.4).

We also observed that self-aeration in these compost trials appeared to exert a significant overall effect. The graph (Figure 3) shows the three USDA turning treatments in relation to the behavior of oxygen content during the course of composting. Even with no turning, all piles eventually resolve their oxygen tension as maturity approaches, indicating self-aeration alone can adequately furnish the composting process.

The data shows that rapid high-rate turning with a turning machine advanced the final rise in oxygen (= stabilization) by a few weeks. However, all piles remained low in oxygen through-out the active composting period, and rose dramatically towards the end of their own accord. Contrary to how some would interpret this data, it proves that the piles are constantly consuming oxygen, and therefore remaining essentially aerobic despite low measured O_2 levels. In other words, turning the piles has a temporal but little sustained influence on oxygen levels. However, turning does re-homogenize the materials leading to an improved appearance.

We examine the length of time to attain stability defined as the point where pile temperature drops below 100F and does not rise even with turning. Figure 4 summarizes the results by presenting the two most extreme treatments for each experimental situation, respectively, for the Turning Intensity trials (PA) and Straw-Bedding Trials (Quebec study).

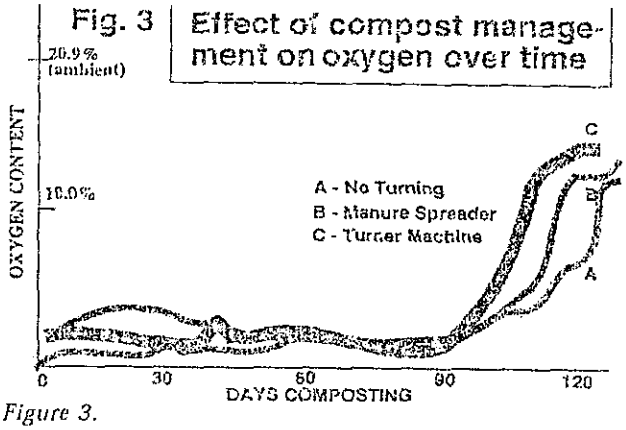

Figure 3.

The results clearly indicate that on the basis of temperature stabilization alone, intensification of the composting process either by more turning or adding more bedding had comparable effects of measurable but slight improvement in the time-efficiency for composting. In both trials, the mean maximum gain in time to stability from intensification was about 20 days; in the dairy manure compost trials, the time to stability of No-turned was 123 days versus 106 days with twice-weekly Scarab[1] -turned piles; and with the poultry manure compost trials the times were, 145 days vs. 130, respectively.

In order to more precisely measure stabilization, we applied the Dewar self-heating test on all piles at 120 days (Brinton et al., 1995). This information is reported in Table 2. We measure self-heating at one point for the dairy and at three points for the poultry which took longer to stabilize. The data show an advantage to intensive Scarab-turning of piles for poultry manure at

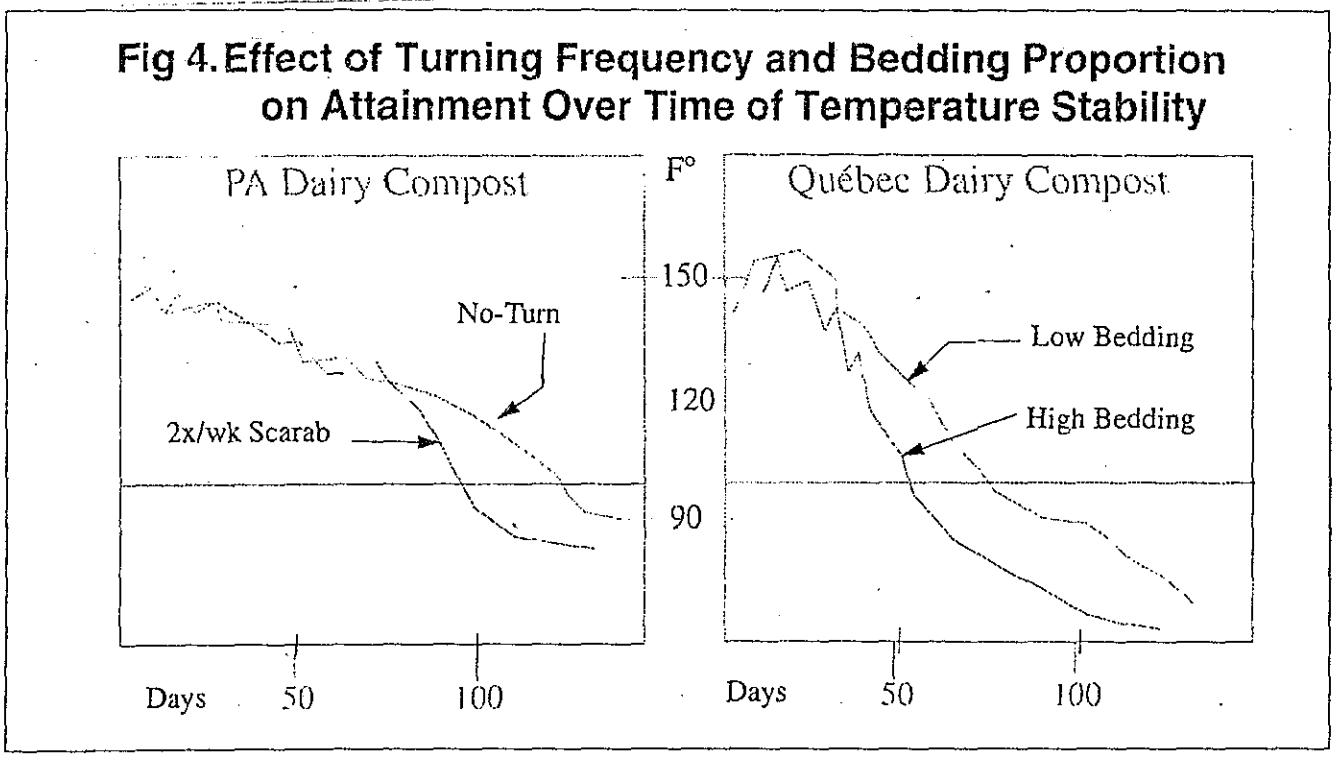

Figure 4.

Dewar Self-Heating (Maturity) of Compost in Relationship to Intensification		
TREATMENT	Age, (Days) Sampled	Temp Rise, C° above Ambient
Cow Manure Composts		
No-Turn	117	2
Bucket-Turned	117	3
Turner 1x/ 2 weeks	117	0
Turner 2x/ week	117	1
Poultry Manure Composts		
No-Turn	108	17
Bucket-Turned	108	16
Turner 1x/ 2 weeks	108	12
Turner 2x/ week	108	2
Poultry Manure Composts		
No-Turn	138	4
Bucket-Turned	138	9
Turner 1x/ 2 weeks	138	—
Turner 2x/ week	138	8
Poultry Manure Composts		
No-Turn	163	0
Bucket-Turned	163	5
Turner 1x/ 2 weeks	163	0
Turner 2x/ week	163	0

Table 2.

108 days. Dewar testing is such that we expect values less than 10°C for stabilized composts.

In a later report, we will show data for the Quebec trials comparing chemical and humic effects of intensification. Analyses of Q4/6 ratios, an index of humic maturity, failed to show any statistically significant advantage of turning to no-turning for all compost treatments (Jobin, 1992).

Microbiochemical results

A number of means exist to evaluate compost quality microbiologically and biochemically. We took samples of the dairy and poultry compost piles between days 66 and 75 prior to final stabilization and evaluated enzymatic and microbiological traits (see Table 3)

The results of the microbiochemical examination show some higher hydrolase enzyme activity in unturned or bucket-turned dairy composts but inconclusive difference among young poultry manure composts. We expect hydrolase activity by this test to drop to less than 10 ug/g/min in completed composts and to be as high as 50 in active piles. Dehydrogenase activity which ranges from under 100 to 10,000 TPF units in mature vs. fresh composts gave little consistent trends in these trials with all results being in the moderately stable range.

Bacteria counts of both groups of composts are moderate to high between both aerobic and facultative anaerobic (= aerobes + anaerobes) groups and there is no hydrogen-sulfide activity in any treatment, evidence of a lack of strict anaerobic activity, and overall no evidence that populations were significantly influenced by turning schemes. There were no surviving E. coli or salmonella strains as measured by DNA-probes with a sensitivity of 1 cell/25gr sample. These data overall do not support a conclusion of significant effects derived from the different intensity-turning schedules. Pooling all biochemical data from replicated treatments between compost types gave no statistically significant effects attributable to turning.

Nitrogen and Organic Matter Losses

An important feature of composting is loss of organic matter, clearly evidenced in loss of pile weight and volume. We measured organic matter and nitrogen during the composting and calculated total losses at the end of the process. The data is summarized in Table 4, and all project data including Quebec are graphed in the following Figure 5.

These data show clearly that as intensification of management increases, so do losses, which are significantly correlated between all the trials and treatments. The least losses observed for organic matter and nitrogen were in the Un-turned dairy manure piles which lost 70 and 51%, respectively, and the highest losses observed were in the poultry compost trials where Scarab-turning twice a week gave 88 and 86% loss, respectively, for organic matter and nitrogen. The correlation between organic and nitrogen losses for both the Pennsylvania and Quebec trials are seen in the following figure (Figure 5).

The data clearly show that nitrogen and organic matter losses are closely tied. We did not observe any improvement of losses from increased bedding in the Quebec trials; since any improvement from added carbon was off-set by increased rate of composting and organic loss associated with better porosity.

Economic Factors of Intensification

We examined the costs of intensification of composting for the Pennsylvania trials. This was conducted by tracking inputs, labor and maintenance dur-

ing operations with the exclusion of equipment capitalization and cost of bulking agents. The following table reproduces the essential features of the study.

In calculating costs, we gave the higher-intensity methods the benefit of the doubt and stopped tabulating costs as soon as stability was indicated by lack of self-heating. We also assigned slightly lower land-area costs to intensive treatment since windrow treatment with straddle-machines required less space. We did not calculate watering/irrigation costs for no-turned piles since they did not have added water. However, irrigation costs were only about 5% of variable costs. Thus, the data clearly indicate that intensive turning brings substantially increased costs which may or may not be off-set by the gain in time or the more homogenous appearance of the final product.

CONCLUSIONS

These findings support the notion that intensification of composting through technology may be unnecessary, certainly if the goal is on-farm nutrient and watershed management and land-application. The needs for pathogen reduction and stabilization are fully met provided the basic requirements for moisture and texture optimization are met. With these results in mind, a low-tech form of composting can be implemented without undue economic or management pressure for farming.

Composting methods that require intensification are a curious result of modern popularity and technological development of composting, as particularly evidenced in popular trade journals. They do not appear to be scientifically supportable based on these studies. Our view of sustainability is analogous to a reduced tillage approach to maximizing soil quality. By carefully managing composting to achieve proper mixes and limited turning, the ideal of a quality product at low economic burden can be achieved.

Within bio-dynamic management, as an example, low-intensive composting has generally been the norm, but has been criticized by modern composters. Based on these studies, it would appear that low-tech composting is more sustainable in view of nutrient and humus-conservation and also costs. Important factors to consider in successfully implementing low-tech minimum turning approaches are correct amount of bedding and moisture control in the compost piles. In view of these results, current approaches to composting must be re-thought in view of modern, sustainable farming practice.

1. The word *Scarab* is used generically to identify a large straddle-type window turing machine and does not imply an endorsement or recommendation of any equipment bearing that name.

Biochemical and Microbiological Traits of Differently-Managed Compost Piles

TREATMENT	Hydrolase Activity @ 30C-ug FDA/g/min	Dehydrogenase Activity ugTTC/g/hr	Aerobic plate Count	Facultative Anaerobic Count	H_2S Activity pos.(+) or minus (-)	E. coli/Salmonella pos or neg
Cow Manure Composts at Day 75						
No-Turn	17	168	10^7	10^6	-	neg
Bucket-Turned	11	222	10^5	10^5	-	neg
Turner 1x/ 2 weeks	0	244	10^5	10^5	-	neg
Turner 2x/ week	2	350	10^5	10^4	-	neg
Poultry Manure Composts at Day 66						
No-Turn	11	188	10^8	10^6	-	neg
Bucket	7	365	10^5	10^5	-	neg
Turner 1x/2 weeks	1	264	10^8	10^7	-	neg
Turner 2x/ week	17	167	10^8	10^6	-	neg

Table 3.

TREATMENT	Organic Matter Loss%	Nitrogen Loss%
Cow Manure Composts @ 120 days		
No-Turn	70	51
Bucket-Turned	78	60
Turner 1x/ 2 weeks	73	53
Turner 2x/ week	80	64
Poultry Manure Composts @ 150 days		
No-Turn	75	72
Bucket-Turned	79	76
Turner 1x/ 2 weeks	79	78
Turner 2x/ week	88	86

Table 4.

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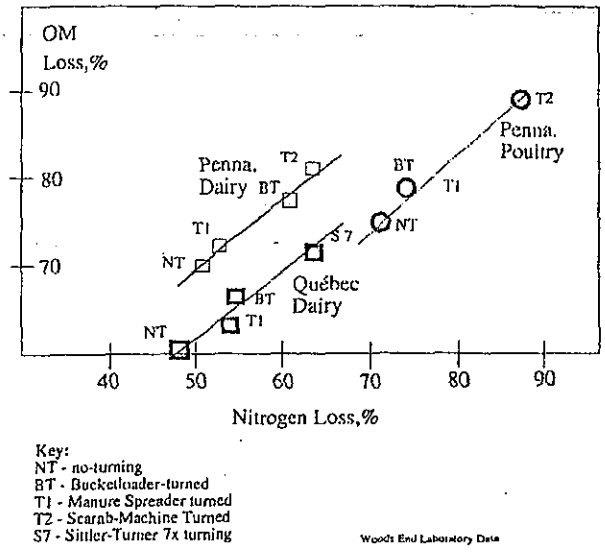
Fig. 5 Effects of Intensification of Composting on Nitrogen and Organic Matter Losses



Costs Associated with Varying Intensity of Compost Turning	
TREATMENT	Cost $/ wet ton
No-Turning	$3.05
Bucket-Loader Turned	$6.74
Turner 1x/ 2 weeks	$14.34
Turner 2x/ week	$41.23

Table 5.

A full copy of Woods End's USDA study is available for $19.95 by writing to Woods End Institute, PO Box 297, Mt Vernon, Maine 04352.

AN URGENT APPEAL...!

Dear BDA Member:

The organic market is developing in leaps and bounds. It has grown to the point that it is already attractive for the "Big Industry," which has already started to get its share. As a result, and to nobody's surprise, signs of decay are starting to show. Certification companies are sprouting everywhere and certification is sometimes being granted based solely on the amount of dollars paid. What is worse, it seems that government regulation is probably going to be established with requirements far from what organic produce should be; thus once more deceiving the uninformed consumer. As consumers, we have had personal experience of this.

This is a very important crossroads for the biodynamic movement. It is going to become more apparent and clear that a solely business oriented operation where the motivation is profit is totally different from a spiritually-based one where values, integrity and true concern for the planet along with respect and love for the soil that nurtures us are the moving forces. The consumers' trust must find an appropriate recipient and that should be the biodynamic farmer.

Unfortunately, in our recent drive for expanding the market of BD produce, we found a lack of availability. This is where our appeal comes into play. We are asking each of you to let us know of any BD farm that you are aware of, Demeter certified or not. We would like to contact them (or they could contact us) to discuss their interest - and how to coordinate supply and demand - i e: the sale of produce nationwide through the Biodynamic Association. This way consumers can speak up by choosing produce where their heart and conscience is.

We have said this is a crossroads because at some point this can become a referendum of planetary proportions - a very appropriate "field" where spirituality and materialism will be facing each other. This appeal is to expand the base of producers and we need your help.

a) Identify and inform us of any existing or potential Biodynamic farms that are not already in the program.
b) Become a user and advocate of Biodynamic produce in your community.
c) Educate consumers based on the principles and teachings of Rudolf Steiner and biodynamics.

You may contact us by phone toll free: 1-888-384-9642; by fax: 1-301-654-2702, or by writing to us at Shanti Yoga, 4217 East-West Highway, Bethesda, MD 20814. Thanking you in advance.

THE HUMANURE HANDBOOK

THIRD EDITION

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by Joseph Jenkins

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Appendix 2

COMPOST MYTHS

TO T'RN OR NOT TO TURN: THAT IS THE QUESTION

What is one of the first things to come to mind when one thinks of compost? Turning the pile. *Turn, turn, turn*, has become the mantra of composters worldwide. Early researchers who wrote seminal works in the composting field, such as Gotaas, Rodale, and many others, emphasize turning compost piles, almost obsessively so.

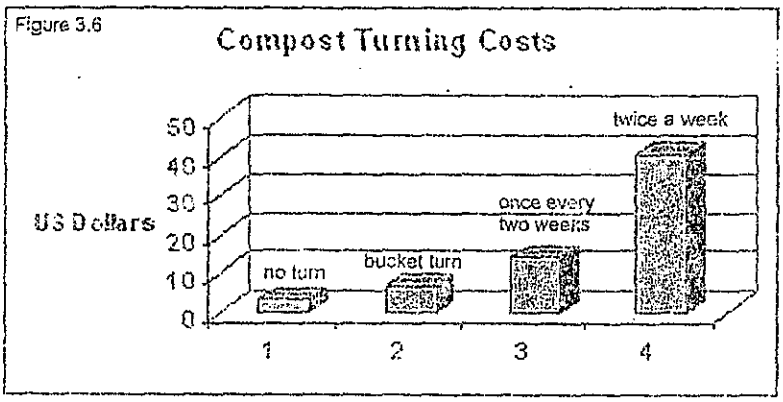
Much of compost's current popularity in the West can be attributed to the work of Sir Albert Howard, who wrote *An Agricultural Testament* in 1943 and several other works on aspects of what has now become known as organic agriculture. Howard's discussions of composting techniques focus on the Indore process of composting, a process developed in Indore, India, between the years of 1924 and 1931. The Indore process was first described in detail in Howard's 1931 work, co-authored with Y. D. Wad, *The Waste Products of Agriculture*. The two main principles underlying the Indore composting process include: 1) mixing animal and vegetable refuse with a neutralizing base, such as agricultural lime; and 2) managing the compost pile by physically turning it. The Indore process subsequently became adopted and espoused by composting enthusiasts in the West, and today one still commonly sees people turning and liming compost piles. For example, Robert Rodale wrote in the February, 1972, issue of *Organic Gardening* concerning composting humanure, "*We recommend turning the pile at least three times in the first few months, and then once every three months thereafter for a year.*"

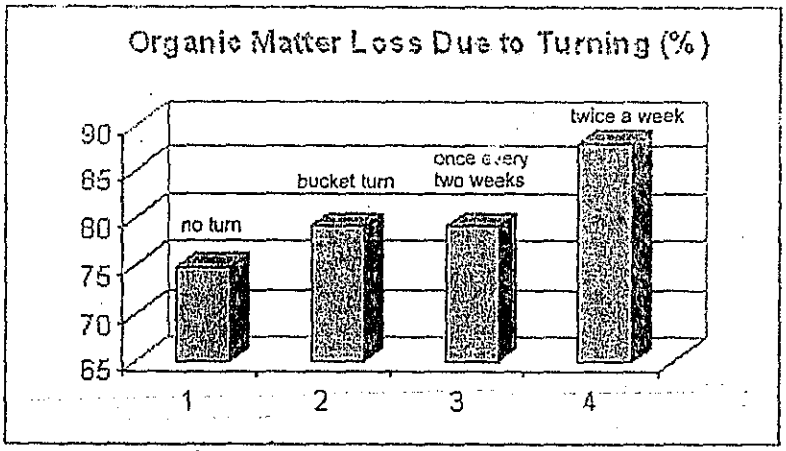
A large industry has emerged from this philosophy, one which manufactures expensive compost turning equipment, and a lot of money, energy and expense go into making sure compost is turned regularly. For some compost professionals, the suggestion that compost doesn't need to be turned at all is utter blasphemy. Of course you have to turn it — it's a compost pile, for heaven's sake.

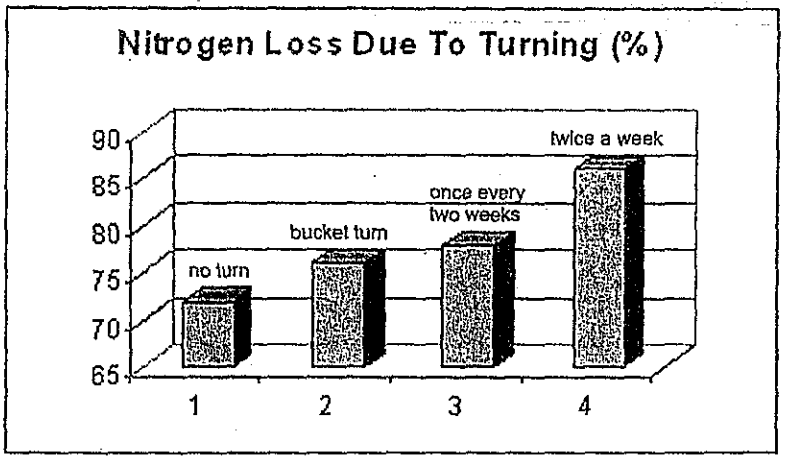
Or do you? Well, in fact, *no*, you don't, especially if you're a backyard composter, and not even if you're a large scale composter. The perceived need to turn compost is one of the myths of composting.

Turning compost potentially serves four basic purposes. First, turning is supposed to add oxygen to the compost pile, which is supposed to be good for the aerobic microorganisms. We are warned that if we do not turn our compost, it will become anaerobic and smell

Figure 3.6







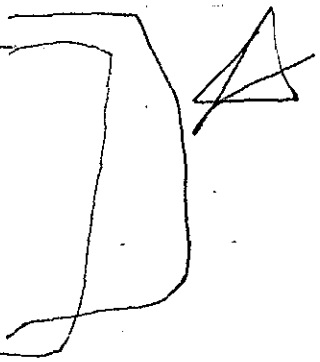
Source: Brinton, William F. Jr. (date unknown). Sustainability of Modern Composting - Intensification Versus Cost and Quality. Woods End Institute, PO Box 297, Mt. Vernon, Maine 04352 USA.

bad, attract rats and flies, and make us into social pariahs in our neighborhoods. Second, turning the compost ensures that all parts of the pile are subjected to the high internal heat, thereby ensuring total pathogen death and yielding a hygienically safe, finished compost. Third, the more we turn the compost, the more it becomes chopped and mixed, and the better it looks when finished, rendering it more marketable. Fourth, frequent turning can speed up the composting process.

Since backyard composters don't actually market their compost, usually don't care if it's finely granulated or somewhat coarse, and usually have no good reason to be in a hurry, we can eliminate the last two reasons for turning compost right off the bat. Let's look at the first two.

Aeration is necessary for aerobic compost, and there are numerous ways to aerate a compost pile. One is to force air into or through the pile using fans, which is common at large-scale composting operations where air is sucked from under the compost piles and out through a biofilter. The suction causes air to seep into the organic mass through the top, thereby keeping it aerated. An accelerated flow of air through a compost mass can cause it to heat up quite drastically; then the air flow also becomes a method for trying to reduce the temperature of the compost because the exhaust air draws quite a bit of heat away from the compost pile. Such mechanical aeration is never a need of the backyard composter and is limited to large scale composting operations where the piles are so big they can smother themselves if not subjected to forced aeration.

Aeration can also be achieved by poking holes in the compost, driving pipes into it and generally impaling it. This seems to be popular among some backyard composters. A third way is to physically turn the pile. A fourth, largely ignored way, however, is to build the pile so that tiny interstitial air spaces are trapped in the compost. This is done by using coarse materials in the compost, such as hay, straw, weeds, and the like. When a compost pile is properly constructed, no additional aeration will be needed. Even the organic gardening pros admit that, *"good compost can be made without turning by hand if the materials are carefully layered in the heap which is well-ventilated and has the right moisture content."* [45]



This is especially true for "continuous compost," which is different from "batch compost." Batch compost is made from a batch of material that is composted all at once. This is what commercial composters do — they get a dump truck load of garbage or sewage sludge

from the municipality and compost it in one big pile. Backyard composters, especially humanure composters, produce organic residues daily, a little at a time and rarely, if ever, in big batches. Therefore, continuous composters add material continuously to a compost pile usually by putting the fresh material on the top. This causes the thermophilic activity to be in the upper part of the pile while the thermophilically "spent" part of the compost sinks lower and lower, to be worked on by fungi, actinomycetes, earthworms and lots of other things. Turning continuous compost dilutes the thermophilic layer with the spent layers and can quite abruptly stop all thermophilic activity.

Researchers have measured oxygen levels in large-scale windrow composting operations (a windrow is a long, narrow pile of compost). One reported, *"Oxygen concentration measurements taken within the windrows during the most active stage of the composting process, showed that within fifteen minutes after turning the windrow — supposedly aerating it — the oxygen content was already depleted."*[46] Other researchers compared the oxygen levels of large, turned and unturned batch compost piles, and have come to the conclusion that compost piles are largely self-aerated. *"The effect of pile turning was to refresh oxygen content, on average for [only] 1.5 hours (above the 10% level), after-which it dropped to less than 5% and in most cases to 2% during the active phase of composting . . . Even with no turning, all piles eventually resolve their oxygen tension as maturity approaches, indicating that self-aeration alone can adequately furnish the composting process . . . In other words, turning the piles has a temporal but little sustained influence on oxygen levels."* These trials compared compost that was not turned, bucket turned, turned once every two weeks and turned twice a week.[47]

Interestingly enough, the same trials indicated that bacterial pathogens were destroyed whether the piles were turned or unturned, stating that there was no evidence that bacterial populations were influenced by turning schemes. There were no surviving *E. coli* or *Salmonella* strains, indicating that there were *"no statistically significant effects attributable to turning."* Unturned piles can benefit by the addition of extra coarse materials such as hay or straw, which trap extra air in the organic material and make additional aeration unnecessary. Furthermore, unturned compost piles can be covered with a thick insulating layer of organic material, such as hay, straw or even finished compost, which can allow the temperatures on the outer edges of the pile to grow warm enough for pathogen destruction.

Not only can turning compost piles be an unnecessary expen-

diture of energy, but the above trials also showed that when batch compost piles are turned frequently, some other disadvantageous effects can result (see Figure 3.6 on page 49). For example, the more frequently compost piles are turned, the more agricultural nutrients they lose. When the finished compost was analyzed for organic matter and nitrogen loss, the unturned compost showed the least loss. The more frequently the compost was turned, the greater was the loss of both nitrogen *and* organic matter. Also, the more the compost was turned, the more it cost. The unturned compost cost $3.05 per wet ton, while the compost turned twice a week cost $41.23 per wet ton, a 1,351% increase. The researchers concluded that "*Composting methods that require intensification [frequent turning] are a curious result of modern popularity and technological development of composting as particularly evidenced in popular trade journals. They do not appear to be scientifically supportable based on these studies . . . By carefully managing composting to achieve proper mixes and limited turning, the ideal of a quality product at low economic burden can be achieved.*"[48]

When large piles of municipal compost are turned, they give off emissions of such things as *Aspergillus fumigatus* fungi which can cause health problems in people. Aerosol concentrations from static (unturned) piles are relatively small when compared to mechanically turned compost. Measurements thirty meters downwind from static piles showed that aerosol concentrations of *A. fumigatus* were not significantly above background levels, and were "33 to 1800 times less" than those from piles that were being moved.[49]

Finally, turning compost piles in cold climates can cause them to lose too much heat. It is recommended that cold climate composters turn less frequently, if at all.[50]

DO YOU NEED TO INOCULATE YOUR COMPOST PILE?

No. This is perhaps one of the most astonishing aspects of composting.

In October of 1998, I took a trip to Nova Scotia, Canada, to observe the municipal composting operations there. The Province had legislated that as of November 30, 1998, no organic materials could be disposed of in landfills. By the end of October, with the "ban date" approaching, virtually all municipal organic garbage was being collected and transported instead to composting facilities, where it was effectively being recycled and converted into humus. The municipal garbage trucks would simply back into the compost facility

building (the composting was done indoors), and then dump the garbage on the floor. The material consisted of the normal household and restaurant food materials such as banana peels, coffee grounds, bones, meat, spoiled milk and paper products such as cereal boxes. The occasional clueless person would contribute a toaster oven, but these were sorted out. The organic material was then checked for other contaminants such as bottles and cans, run through a grinder, and finally shoved into a concrete compost bin. Within 24-48 hours, the temperature of the material would climb to 70°C (158°F). No inoculants were required. Incredibly, the thermophilic bacteria were already there, waiting in the garbage for this moment to arrive.

Researchers have composted materials with and without inocula and found that, *"although rich in bacteria, none of the inocula accelerated the composting process or improved the final product . . . The failure of the inocula to alter the composting cycle is due to the adequacy of the indigenous microbial population already present and to the nature of the process itself . . . The success of composting operations without the use of special inocula in the Netherlands, New Zealand, South Africa, India, China, the U.S.A, and a great many other places, is convincing evidence that inocula and other additives are not essential in the composting of [organic] materials."* [51] Others state, *"No data in the literature indicate that the addition of inoculants, microbes, or enzymes accelerate the compost process."*[52]

Lime

It is not necessary to put lime (ground agricultural limestone) on your compost pile. The belief that compost piles should be limed is a common misconception. Nor are other mineral additives needed on your compost. If your soil needs lime, put the lime on your soil, not your compost. Bacteria don't digest limestone; in fact lime is used to *kill* microorganisms in sewage sludge — it's called *lime-stabilized* sludge.

Aged compost is not acidic, even with the use of sawdust. The pH of finished compost should slightly exceed 7 (neutral). What is pH? It's a measure of acidity and alkalinity which ranges from 1-14. Neutral is 7. Below seven is acidic; above seven is basic or alkaline. If the pH is too acidic or too alkaline, bacterial activity will be hindered or stopped completely. Lime and wood ashes raise the pH, but wood ashes should also go straight on the soil. The compost pile doesn't need them. It may seem logical that one should put into one's com-

R's — Reduce, Reuse, and Recycle — to P2R2 — Preserve, Purify, Restore and Remediate." In E.J. Stentiford (Ed.), Proceedings of the 1997 Organic Recovery and Biological Treatment International Conference. Harrogate, UK, p. 252-253. Available from Stuart Brown, National Compost Development Association, PO Box 4, Grassington, North Yorkshire, BD23 5UR UK (stuartbrown@compuserve.com)

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IN THE COURT OF APPEALS OF THE STATE OF WASHINGTON
DIVISION I

PACIFIC TOPSOILS, INC., Owner of Maltby Composting Operation, Respondent, v. SNOHOMISH HEALTH DISTRICT, a Washington Municipal Corporation, Appellant.	Court of Appeals No. 63526-3-1 CERTIFICATE OF SERVICE

I, Anita Hope, hereby state as follows:

I am over the age of 18 years, competent to testify, and certify to the following based on my own knowledge and belief.

On the date below stated, I caused the Brief of Respondent and Certificate of Service to be sent in the manner noted to the following party:

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