

**BEFORE THE MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS**
100 Washington Square, Suite 1700
Minneapolis, Minnesota 55401-2138

FOR THE PUBLIC UTILITIES COMMISSION
121 Seventh Place East Suite 350
St. Paul, Minnesota 55101-2147

DIRECT TESTIMONY OF DEBORAH L. ALLAN

**In the Matter of the Application of Minnesota Pipe Line Company
for a Routing Permit for a Crude Oil Pipeline**

MPUC Docket No. PL-5/PPL-05-2003
OAH Docket No. 15-2500-17136-2

**Submitted on behalf of
Atina and Martin Diffley as
Gardens of Eagan**

August 7, 2006

1 INTRODUCTION

2 **Q. Please state your name and address.**

3 A. My name is Deborah L. Allan and my address is 1575 Merrill St
4 Saint Paul, MN 55108-2243

5 **Q. What is your primary work and what is your business address?**

6 A. I am a Professor in the Department of Soil, Water and Climate at the University of
7 Minnesota in St. Paul, Minnesota. I teach Soil and Environmental Biology, Soil Biology
8 and Fertility and conduct research focused on soils and the interaction of plants and soils.
9 One of my areas of focus is soil quality in alternative cropping systems. My department
10 address is 439 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, Minnesota 55108.

11 **Q. Who are you representing in this proceeding?**

12 A. In this proceeding, I am offering my testimony on behalf of the Gardens of Eagan
13 certified organic farm owned by Atina and Martin Diffley. Based on my knowledge of
14 soils and the impacts of pipeline construction on organic soils and agriculture, I am
15 recommending that any crude oil pipeline approved by the Minnesota Public Utilities
16 Commission as a result of the Minnesota Pipe Line Company (MPL) application should
17 avoid the Gardens of Eagan organic farm. My testimony also supports recommendations
18 for amendments to the Agriculture Impact Mitigation Plan (AIMP) filed by MPL. The
19 AIMP should include specific provisions to protect and restore organic soils and should
20 provide compensation for production losses and scientific testing to verify the parameters
21 of soil restoration.

22 **Q. Please state your qualifications to render an expert opinion in this matter.**

23 A. I received a B.A. in Anthropology from Grinnell College in Iowa in 1973, an M.A. in
24 Anthropology from the University of Pennsylvania in 1976, an M.S. in Agriculture from
25 California Polytechnic State University in San Luis Obispo in 1983 and a Ph.D. in Soil
26 Science from the University of California in Riverside, California in 1987.

27 I began working at the University of Minnesota in 1987 as an Assistant Professor
28 in the Soil Science Department, became an Associate Professor in the Department of
29 Soil, Water and Climate at the U. of M. in 1993 and was appointed a Full Professor in the
30 Department of Soil, Water and Climate in 1999. From 2001-2005, I was the Director of
31 Graduate Studies for the University's Soil Science Graduate Program.

1 I am a member of many professional associations and honorary societies,
2 including the American Society of Agronomy, the American Society of Plant Biologists,
3 the Institute for Alternative Agriculture, the Soil Science Society of America, Phi Beta
4 Kappa, Gamma Sigma Delta (an organization supporting agriculture) and Sigma Xi (a
5 scientific research society). I have received numerous professional awards, including
6 recognition as Fellow of the American Society of Agronomy and Fellow of the Soil
7 Science Society in 2004.

8 I have received more than 40 grants for study and research related to plant
9 nutrition and soil fertility. These have included grants for modeling the root-soil
10 interface, for improving productivity of crops, for analyzing soil characteristics, for
11 development and application of soil quality indicators, for biological, social and financial
12 monitoring to develop highly sustainable farming systems, for developing a soil
13 management guidebook, for assessing soil quality changes in alternative and
14 conventional cropping systems and for developing weed, pest and soil management tools
15 for organic crop systems.

16 I have authored or co-authored approximately 45 publications in refereed journals
17 and proceedings and dozens of abstracts, research presentations, invited proceedings and
18 book chapters. Many of my publications have focused on plant root development and
19 biochemistry, including interactions with chemicals in soils and solutions. I have also
20 written and presented materials relating to soil quality assessment, soil management for
21 sustainable agriculture, and improving production of crops. My research presentations
22 have addressed environmental effects of conventional and alternative farming and soil
23 quality, profitability and risk of conventional and organic cropping as well as the biology
24 and chemistry of plant and soil systems. My curriculum vitae, provided as Gardens of
25 Eagan (GOE) Exhibit 8 details these publications.

26 **Q. Are you familiar with the Gardens of Eagan certified organic specialty farm?**

27 A. I know Atina and Martin Diffley through organic farming associations and also by the
28 reputation of their farm. I have talked with Atina Diffley and reviewed the Organic
29 Management Plan for the Gardens of Eagan.

30 **Q. What documents and materials have you reviewed in connection with this**
31 **matter?**

1 A. In addition to the Gardens of Eagan Organic Management Plan, I reviewed the
2 Agricultural Impact Mitigation Plan (AIMP) submitted by the Minnesota Pipe Line
3 Company (MPL) and draft suggestions for amending this AIMP. I reviewed the Gardens
4 of Eagan Proposal for Alternative Route Alignment to Avoid Organic Farm and the
5 Gardens of Eagan Proposal for Modification of Agricultural Impact Plan and
6 Environmental Assessment and various maps that depict pipeline route alternatives in the
7 vicinity of the Gardens of Eagan farm.

8 **Q. What else have you done to become familiar with the pipeline proposal, the**
9 **AIMP and the potential impacts of the pipeline on the Gardens of Eagan organic**
10 **farm?**

11 A. I was first contacted regarding this pipeline project by staff of the Department of
12 Agriculture who asked for information about the impact of pipeline construction on
13 organic farm soils and ways to measure the restoration of soil quality. I learned from Bob
14 Patton and Meg Monahan some of the basic information about the Minnesota Pipe Line
15 Company proposal and the AIMP that the Company had submitted.

16 I met once with Atina Diffley and her lawyer to discuss which subjects I would
17 feel comfortable testifying to. I checked with Martin Diffley to find out what types of soil
18 are present on the Gardens of Eagan farm. I consulted with my colleague Carl Rosen,
19 who is also a Professor in the Department of Soil, Water and Climate at the U. of M. in
20 St. Paul. Dr. Rosen has specific expertise in vegetable production systems, and it is
21 customary in my work to consult with and collaborate with colleagues to develop and
22 verify expert opinions.

23 **PURPOSE AND SCOPE**

24 **Q. Please summarize your testimony.**

- 25 1) Organic crop systems and, particularly organic vegetable crops are highly
26 vulnerable to the impacts of pipeline construction and maintenance. Constructing
27 a crude oil pipeline on an organic vegetable farm like the Gardens of Eagan would
28 be far more detrimental and costly than routing the pipeline on other agricultural
29 land. I would strongly recommend that, if a pipeline is approved, the Public
30 Utilities Commission should designate a route that avoids the Gardens of Eagan
31 organic farm.

1 2) Because of the differences between organic and conventional farming, the
2 Agricultural Impact Mitigation Plan for this project should distinguish between
3 organic and non-organic agricultural lands and require specific practices to
4 minimize the harm to organic soils, restore soil horizons and qualities,
5 scientifically verify soil restoration and provide appropriate compensation when
6 soils and productivity are impaired. I would recommend that the Commission
7 require as a condition of any construction permit that the Minnesota Pipe Line
8 Company follow the practices contained in the August 2006 Amended AIMP
9 attached as GOE Exhibit 5.

10 3) It is clear to me from the documents I've reviewed that Atina and Martin Diffley
11 are good organic farmers and the Gardens of Eagan is a model of sound,
12 sustainable organic practices. As many farmers struggle to make the paradigm
13 shift to organic agriculture, I believe that a farm like Gardens of Eagan should be
14 protected as a model for other farmers.

15 **Q. How is your testimony organized?**

- 16 • First, I discuss the nature of soil stratification and the differences between
17 organic and conventional agricultural systems in terms of their reliance on
18 soil quality. I discuss the way that this difference is heightened in
19 vegetable cropping.
- 20 • Then, based on information in the Gardens of Eagan organic management
21 plan as well as recognized principles of soil science, I explain why the
22 detriment to the Gardens of Eagan from the construction of a crude oil
23 pipeline across their farm would be far greater than for conventional
24 agricultural land and, probably even more severe than for other organic
25 farms.
- 26 • In addition to recommending that the Gardens of Eagan farm be avoided, I
27 offer some suggestions for an alternative pipeline route in the vicinity of
28 the Gardens of Eagan farm.
- 29 • Next, I review the Amended AIMP and explain why specific amendments
30 are needed in light of what we know about the importance of soil quality
31 in organic systems and the way in which soil restoration can be verified.

- Finally, I explain some of the practices documented in the Gardens of Eagan organic management plan that demonstrate the degree of care and knowledge reflected in the Diffeleys’ farming practices. Based on my experience and research on sustainable agriculture systems, I offer my opinion that this farm is a unique asset and should be protected.

Nature of Soils and Soil Quality

Q. Could you please explain some of the characteristics of soils that are pertinent to understanding the impacts of pipeline construction and maintenance?

A. To start with, it is important to understand the differences between different layers in agricultural soil. We often use the words “topsoil” and “subsoil,” but these terms aren’t precise. When we talk about agricultural soils, we need to think of the horizons of which soil is composed.

The A horizon is the topmost layer of topsoil and can vary in depth—soils at the Gardens of Eagan farm have A horizons that range from 8 to 18 inches deep. This zone is the most biologically active part of the soil and is most vital to crop growth. Even within the A horizon, there is some stratification, with the top few inches the most biologically active.

The B horizon, underneath the A horizon, contains more clays and mineral deposits, a heavier texture, more rocks and much less organic matter. On these soils it often occurs from about 16-18 inches down to about 30-36 inches in depth. This layer is sometimes called the subsoil.

Horizon C is also called the regolith. It is the slightly broken up parent material between the B horizon and the bedrock below. Plant roots generally do not penetrate into this layer and there is very little organic material.

Q. How are these soil horizons important in organic crop production?

A. The most important feature to remember about organic crop production is that an organic farmer relies almost entirely upon the soil’s properties for crop production. The quality of the soil determines whether crops will be healthy and free from disease and building soil quality is the primary strategy that the organic crop farmer uses to protect crops from pests and disease. The level of biological activity in the soil is even a key determinant of nutrient cycling, whereby minerals in the soil can be used effectively by

1 crops. Thus plant health directly depends on the amount and quality of biological life in
2 the A horizon.

3 For any farmer, but particularly for an organic farmer relying on soil quality for
4 crop production, rather than chemical inputs, soil horizons are not interchangeable.
5 Preserving soil horizon stratification with the most biologically rich soils at the surface is
6 essential to crop health and crop production.

7 An organic farmer will work for many years to build the surface horizon of the
8 soil and especially the top few inches that are richest in organic matter. For an organic
9 crop farmer, the A horizon is the bank account. If that bank account is taken away or
10 drastically disturbed, every investment that the farmer has made is placed in jeopardy.

11 **Q. How does an organic crop farmer build up the A horizon soils, particularly the**
12 **top few inches that are richest in organic material?**

13 A. It takes many years to build A horizon soil structure through planting and
14 incorporation of cover crops, crop rotation, sheet composting, application of finished
15 compost and other crop management to develop soil tilth, build soil nutrients, and
16 encourage worms and other biological life in the soil.

17 If one looks at an organic management plan for a farm that uses best practices to
18 build soil quality, you will see repeated plantings with vetch, soy and other crops that are
19 not harvested, but gently incorporated into the surface of the soils. You will also see that
20 more careful and labor-intensive disc and chiseling methods are used to incorporate cover
21 crops into the soil, rather than plowing the crops into the soil. The shallower methods of
22 incorporating cover crops ensure that biological matter is preserved in the top few inches
23 of the A horizon..

24 **Q. Are there differences between soil quality and the reliance on soil quality in**
25 **organic and conventional agricultural systems?**

26 A. The quality of soils on a successful organic farm is usually quite different from that
27 on a conventional farm. This difference can be measured in terms of soil compaction, soil
28 aggregation, organic matter content, particulate organic matter and soil microbial
29 biomass. Generally, if tillage is judiciously applied, amounts of both stable and active
30 organic matter increase, along with more aggregation and microbial biomass.

1 Recent studies of farms transitioning from conventional to organic crops, such as
2 the North Carolina State University study reported in Agriculture, Ecosystems and the
3 Environment in April 2006, have demonstrated that farms making this transition have
4 lower yields and more vulnerability to pests in the earliest stages of the transition. As
5 conventional inputs of synthetic fertilizers, insecticides, fungicides, and herbicides are
6 reduced, transitional lands without fully developed organic soils qualities have lower
7 yields and poorer crop growth. Only when soil microbial biomass and active organic
8 matter (which feeds these organisms) increase as a result of organic soil management
9 practices over time do yields and crop growth increase. Soil microorganisms play a
10 dominant role in nutrient cycling and pest control in organic farming systems.

11 **Q. Are certain types of crops more and less vulnerable to differences in soil quality?**

12 A. Organic field crops are more vulnerable to degradation of soil quality than are
13 conventional field crops, since they do not use synthetic fertilizers, insecticides,
14 fungicides and herbicides to stimulate plant growth and prevent vulnerability to pests and
15 weeds. Conventional row crops are less sensitive to stress because chemical inputs can
16 compensate for poorer soil conditions. Thus these crops will show less loss of health,
17 quality and yield when soil quality is poor.

18 Among organic crops, organic vegetable growth is the most sensitive to soil
19 quality. For example, organic sweet corn is even more vulnerable to soil quality variation
20 than organic field corn. Conventional vegetable seeds are often coated with fungicides
21 and pesticides when they are planted. Organic vegetable seeds, which can use none of
22 these chemical defenses, need optimal soil conditions to germinate and grow.

23 Also, the quality component is so much more important in organic vegetable
24 production systems than in conventional field cropping. Consumers are buying a
25 premium product which must meet their standards for appearance as well as taste and
26 nutritional quality. On an organic vegetable farm, sub-standard soil quality produces
27 substandard products, such as smaller ears of corn, corn not filled out to the tip, lower
28 levels of nutrition, more cosmetic insect damage, more disease, and lower nutrient levels.

29 **Q. What are the economic implications of the loss of soil quality on an organic**
30 **vegetable farm?**

1 A. Based on my research on developing sustainable agriculture and my work with
2 farmers throughout the Midwest, I believe that the losses to an organic vegetable farm
3 from diminished soil quality are of a different character and order of magnitude than on a
4 conventional crop farm. To start with, the value on a per acre basis of conventional field
5 crops is only in the range of two to three hundred dollars per acre. The average value on a
6 per acre basis of organic vegetables is about \$10,000. Atina Diffley has explained that the
7 Garden of Eagan yields per acre range from \$4,000 to \$70,000, with an average of about
8 \$11,500 per acre. This is consistent with a well-run premium organic vegetable farm in
9 the Midwest.

10 However, the market for premium organic products is unforgiving. Sub-standard
11 organic vegetable products cannot be marketed without damaging the relationships and
12 reputations needed with suppliers. If organic sweet corn, vegetables, melons or other
13 crops are below quality standards, the crop will be a total loss.

14 **Q. How would crude oil pipeline construction and maintenance affect an organic**
15 **vegetable farm?**

16 A. First, wherever digging or trenching is done, construction of a crude oil pipeline
17 would remove and disrupt the A horizon soils which are the organic farmer's bank
18 account. Even if this soil was segregated and an effort was made to physically replace
19 this topsoil layer, the stratification of organic soils (with the especially organic matter
20 rich soil in the top several inches) would be destroyed. Organic topsoil health could only
21 be restored over years of rebuilding. If soil horizons were mixed in the construction
22 process, it is not certain that soil quality could ever be effectively restored.

23 In addition to the area trenched by construction, compaction due to pipeline
24 construction would destroy organic soil fertility. Mitigation by tillage, which may be an
25 effective strategy for a conventional crop using chemical inputs, does not restore organic
26 soil quality and biological life.

27 Wherever soil quality and biological life remained impaired, it is likely that an
28 organic vegetable farm would experience considerable, if not total, crop loss.

29 In addition to the area of construction, an organic vegetable farm would be
30 required to establish buffer areas to prevent prohibited substances from entering onto
31 organic fields. Due to the topography and size of vegetable fields, it is possible that entire

1 fields of production would be lost even if the pipeline construction area were only a
2 hundred or a hundred twenty-five feet wide.

3 **Detriment to Gardens of Eagan and Proposed Route Alignments**

4 **Q. Do you have an opinion regarding how the Gardens of Eagan organic vegetable**
5 **farm would be affected if a crude oil pipeline was constructed across the farm in the**
6 **location proposed by the Minnesota Pipe Line Company?**

7 A. Yes. I believe that construction of a crude oil pipeline across the Gardens of Eagan
8 farm in the location proposed by the Minnesota Pipe Line Company would have a highly
9 detrimental affect on soil quality and biological life, organic vegetable crops, habitat and
10 control of run-off from nearby conventional farm lands. I believe that the viability of the
11 farm itself could be jeopardized.

12 **Q. Could you explain some of the factors that lead you to this conclusion?**

13 A. According to the Gardens of Eagan Organic Management Plan (OMP), their crops are
14 wholly organic mixed vegetables -- broccoli, cabbage, kale, cucumbers, cauliflower,
15 peppers, squash, tomatoes and watermelon. These crops are highly sensitive to changes in
16 soil quality and in the organic farm systems that limit pests and disease.

17 As explained in the OMP, the Gardens of Eagan vegetable crops are marketed
18 primarily to cooperatives in the Minneapolis/St. Paul area. This is a market that is highly
19 sensitive to quality of production.

20 The primary soil type in the area proposed for the MPL crude oil pipeline is a
21 Cylinder loam, which formed in loamy alluvium overlying sand and gravel outwash. This
22 loam soil would be susceptible to compaction. When soil is compacted, soil pores that
23 allow water to pass through the soil are crushed, potentially leading to ponded water on
24 the field. Reduction of pore space in compacted soil also reduces the soil's capacity to
25 store plant available water, which can lead to early drought stress on plants. Although
26 Cylinder loam soil is a fertile soil suitable for agriculture, the presence of high levels of
27 organic matter and tilth suitable for organic agriculture on the Gardens of Eagan farm
28 would result from soil building practices over time, not the inherent properties of the soil.

29 Looking at the route map provided in GOE Exhibit 1, the proposed location of the
30 MPL pipeline – the filed route - would interfere with the grassed and trenched waterway.
31 This waterway is part of the Organic Management Plan (Modules 5 and 12) and serves to

1 prevent run-off from adjacent conventional agricultural land from entering organic fields.
2 That proposed pipeline route would also destroy habitat for birds and mammals that is
3 critical to support beneficial insects and control weeds and pests on the Garden of Eagan
4 farm. In addition to conflicting with the Environmental Impact, Soil Conservation and
5 Biodiversity Set-Aside section of the Organic Management Plan, destruction of this
6 habitat would undermine the Weed, Pest and Disease Management strategies in the Plan.

7 The proposed pipeline location would also cut across several small vegetable
8 fields evident on the aerial maps. In addition to the area of trenching and the construction
9 area, the Gardens of Eagan would need to take an organic buffer zone around the
10 construction area out of production for at least three years. Given trenching, removal of
11 soil horizons and compaction, soil quality is likely to be detrimentally impacted for a
12 period of years. With the sensitivity of organic vegetables and the quality requirements of
13 a Twin Cities co-operative market, produce grown on post-pipeline soil is unlikely to be
14 up to shippable standards, causing a 100 percent loss of yield until the soil is brought
15 back to pre-pipeline health and organic certification, which may not ever be possible.

16 If there is contamination from construction activities or run-off containing
17 prohibited materials, additional organic lands will be lost to production.

18 In my opinion, it is likely that Gardens of Eagan would have total crop loss from
19 several organic vegetable fields for a period that could be many years in duration. If the
20 crude oil pipeline were to be constructed where the Minnesota Pipe Line Company
21 proposed, the viability of the Gardens of Eagan farm itself would be placed in jeopardy.

22 **Q. Assuming that there is currently a crude oil pipeline easement across the**
23 **northwest corner of the Gardens of Eagan farm and that Atina and Martin Diffley**
24 **tried to grow crops on that segment of their property, but gave up after several**
25 **years of poor yields and low quality, would that affect your opinion?**

26 A. This information would further confirm my opinion about the risk of permanent loss
27 of soil quality and crop production on an organic vegetable farm from pipeline
28 construction. Although it is possible that construction practices today would be less
29 destructive than the practices used when the prior pipeline was installed, an experience of
30 trying to rebuild soils sufficiently to grow premium organic vegetables and being

1 ultimately unsuccessful in that attempt would be consistent with my prediction of harm
2 due to pipeline construction.

3 **Q. Would other locations proposed for the pipeline alignment in the vicinity of the**
4 **Gardens of Eagan farm have a different level of detriment to agriculture?**

5 A. To the extent that other locations for the proposed pipeline cross conventional field
6 crop land, they would have a far less detrimental impact to agriculture than a route across
7 organic vegetable crop lands. Conventional field crops rely less on soil quality for crop
8 production and rely on chemical inputs such as soluble fertilizers, pesticides, fungicides
9 and herbicides to promote growth and protect crops from pests and disease. Impacts to
10 soils from trenching and compaction are more likely to be mitigable on conventional field
11 crop lands, and concerns about contamination with substances prohibited under National
12 Organic Program regulations would be inapplicable. In addition, markets for
13 conventional field crops are less intolerant of quality variation than the value-added
14 organic vegetable market, so crop losses are likely to be far less substantial.

15 To the extent that other locations for the proposed pipeline cross conservation
16 reserve land, these locations would further minimize the impacts on agricultural soils and
17 production. Conservation reserve lands are usually highly eroded lands that are taken out
18 of production or reserved due to their lower quality for production. If erosion control
19 practices were maintained during pipeline construction and maintenance, location of a
20 crude oil pipeline on these reserve lands would further minimize harm to agricultural
21 soils and crops. If there is conventional agricultural land which has already been used for
22 pipeline construction, this area is also likely to be of lower soil quality than surrounding
23 fields. The route proposed by the Duffleys as Alignment Modification B-5 in GOE
24 Exhibit 1 and the route identified by MPL as Alignments Modification B-6 and B-6a in
25 GOE Exhibits 2 and 3 would both cause less harm to agricultural soils, crops and
26 economies than the proposed route.

27 **Q. Do you have a recommendation as to the pipeline alignment in the vicinity of the**
28 **Gardens of Eagan organic farm?**

29 A. I would strongly recommend to the Public Utilities Commission that the pipeline route
30 proposed by the Minnesota Pipe Line Company through the center of the Gardens of
31 Eagan organic farm be rejected. I would also recommend to the Commission that an

1 alternative alignment be chosen that avoids the Gardens of Eagan organic vegetable fields
2 entirely.

3 **Agricultural Impact Mitigation Plan Amendments**

4 **Q. Have you reviewed the Agricultural Impact Mitigation Plan and the proposed** 5 **Amended Agricultural Impact Mitigation Plan?**

6 A. Yes. Initially, I was contacted by Bob Patton at the Minnesota Department of
7 Agriculture to provide advice on how to measure harm to organic soil quality resulting
8 from pipeline construction and how to restore soil quality. I also received from the
9 Gardens of Eagan lawyer drafts of the Amended Agricultural Impact Mitigation Plan
10 (Amended AIMP). I made comments and proposed additional changes which have been
11 incorporated in the August 2006 Amended AIMP document that is attached as GOE
12 Exhibit 5. Based on my conversations with Bob Patton and my review of the drafts, it is
13 my understanding that the Amended AIMP includes suggestions developed by the
14 Minnesota Department of Agriculture, recommendations from the Gardens of Eagan and
15 amendments based on my comments and advice.

16 **Q. Are there any proposed amendments with which you disagree?**

17 A. No. I have reviewed the entire August 2006 Amended AIMP and I support all of the
18 proposed changes. There are some suggested changes that are more closely related to my
19 areas of expertise, but I am comfortable that all of the amendments suggested for the
20 AIMP reflect prudent and reasonable protections of organic soils and organic agriculture.

21 **Q. Are there specific amendments that you would like to highlight and recommend** 22 **be adopted based on your expertise?**

23 A. Yes. Let me first affirm the importance of the definitions of organic agricultural land,
24 certification issues and organic system planning provided in the Amended AIMP. These
25 definitions reflect the real differences between organic and conventional agriculture.
26 Changing the language of the AIMP is a critical first step to develop rational mitigation
27 practices based on the differences between agricultural systems. The other amendments I
28 would like to highlight focus on preservation and restoration of organic soils and the
29 consequences of soil damage to productivity.

30 **Q. Which amendments to the AIMP would you specifically recommend to address** 31 **issues of organic soil quality?**

1 A. I would recommend the amendments proposed in paragraph E in section 1 (**Pipeline**
2 **Depth of Cover**), Paragraph E of section 2 (**Topsoil Stripping, Storage and**
3 **Replacement**) and in section 14 (**Ingress and Egress**) of the AIMP. These amendments
4 are critical to prevent the loss, through erosion and removal, of organic topsoil and to
5 ensure that soil horizons and surface soils are replaced. Organic crop productivity
6 requires recreating a soil profile similar to that which was removed, with the richness of
7 biological life in the top several inches of soil. For organic crops, it is insufficient to
8 provide that topsoil (roughly 12 to 18 inches) will be replaced without specifying that soil
9 profiles must be recreated. Also the A horizon of organic soils are much too valuable a
10 resource to be used for access ramps. Due to the dependence of organic crop production
11 on the quality of A horizon soils and the certification process, a total crop loss must be
12 provided for until soil restoration and certification are complete.

13 The amendments in section 7 of the AIMP on **Compaction, Rutting,**
14 **Fertilization, Liming and Soil Restoration** reflect some of my most significant
15 recommendations in this document. First, on Organic Agricultural Land, cost of soil
16 restoration should include application of compost, soil building through cover crops, and
17 re-mineralization inputs such as rock phosphate.

18 Next, because of an organic farmer's reliance upon soil properties for production
19 capacity, it should be presumed that any compacted or rutted soils or soils affected by
20 construction activities will result in damage to the future production capacity of the land.
21 It is reasonable to presume productivity losses for ten years unless the restoration of soil
22 quality can be scientifically established and to place the burden on the pipeline company
23 to demonstrate when organic soil quality has been restored. The proposed tests for soil
24 compaction, soil aggregation, organic matter content, particulate organic matter and
25 microbial biomass are the tests for organic soil quality that I have recommended.

26 **Q. How are you recommending that these tests for soil quality be done?**

27 A. The Amended AIMP reflects my opinion about how soil quality restoration should be
28 conducted. Although some farmers may prefer that soil quality tests match precisely with
29 pre-construction soil quality results, I have recommended that the comparison be a
30 statistical one, since there is some natural variability in results. It is not realistic to expect
31 that post-construction tests would be identical to prior tests of soil quality.

1 **Q. What methodology would be used to conduct these tests?**

2 A. The appropriate methodology would require sampling at several locations.
3 Measurements would be made at several sites, including paired comparisons to adjacent
4 conventional cropland and unfarmed land on the organic farm property to determine
5 baseline values and their variation. After construction, similar measurements would be
6 taken and statistical tests applied.

7 **Q. Are there other amendments to the AIMP that you would specifically**
8 **recommend in order to protect organic soil quality?**

9 A. Yes. I believe that the amendments to section 18 of the AIMP **Construction in Wet**
10 **Conditions** are important to maintain soil structure. The Gardens of Eagan Organic
11 Management Plan is a good example of the care that organic farmers take to prevent
12 destruction of soil structure by working in wet conditions. Soil is not worked in wet
13 conditions or even right before rain. It is completely appropriate to presume that
14 construction in wet conditions will result in damage to the future production capability of
15 organic lands.

16 **Preservation of Gardens of Eagan Organic Farm**

17 **Q. In your conversations and review of materials connected with this case, have you**
18 **had a chance to form an opinion about the importance of preserving the Gardens of**
19 **Eagan certified organic farm?**

20 A. Yes, I have.

21 **Q. And what is that opinion?**

22 A. The Gardens of Eagan organic should be protected. It is very difficult to grow
23 premium quality organic vegetables. That Atina and Martin Diffley can grow organic
24 vegetables and meet the demand of a premium market demonstrates that they have a high
25 level of knowledge and sophistication. Their Organic Management Plan reflects care,
26 environmental understanding and a commitment to preserve their farm as an organic land
27 use in perpetuity.

28 In my experience, the transition from conventional to organic agriculture is
29 difficult. It requires a paradigm shift from using chemical inputs to developing a farm
30 ecology. A farm like the Gardens of Eagan that not only provides a role model, but
31 mentors and teaches other farmers is an important agricultural and cultural resource for

1 our region. It is worth protecting.

2 **Q. Could you summarize your recommendations to the Commission?**

3 A. 1) I recommend that, if the Commission approves a pipeline project, the
4 Commission should reject the route proposed by the Minnesota Pipe Line Company and
5 select a route for that pipeline which avoids the Gardens of Eagan organic vegetable
6 farm. This farm is uniquely vulnerable and is worth preserving.

7 2) If the Commission approves a crude oil pipeline through this process, I would
8 also recommend that the Commission require as a condition of any construction permit
9 that the Minnesota Pipe Line Company follow the practices contained in the August 2006
10 Amended AIMP.

11 **Q. Does this conclude your testimony?**

12 Yes.