PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

**Bull Run TREATMENT PROJECTS**

# Memorandum

| | | | |
|---|---|---|---|
| **Subject:** | Response to Exhibit I.11 Testimony on Agricultural Soils Impact | | |
| **Project #s:** | PWB: W02563 | BC: 152606 | Designer: D3460500 |
| **Date:** | August 31, 2023 | | |

| | |
|---|---|
| **To:** | Dan Hogan, Project Manager / Portland Water Bureau |
| **From:** | Brad Phelps, P.E. Project Manager / Jacobs |
| **Prepared by:** | Denny Mengel, Ph.D. Certified Professional Soil Scientist / Jacobs |
| **Reviewed by:** | Spencer Adams, P.E., Jacobs |

JACOBS

Exhibit J.77

This memorandum responds to Multnomah County land use review public comment: **Exhibit I.11: Ekstrom, dated August 3, 2023.**

Jacobs previously provided a report, "Agricultural Soil Restoration Plan" prepared by Dr. Denny Mengel, Certified Professional Soil Scientist, dated September 21, 2022, which was included in the land use record as staff's Exhibit A.35 (referred to herein as the "Agricultural Soil Restoration Plan"). Jacobs also provided the "Response to Testimony of Agricultural Soils Impact" dated July 27, 2023, which was included in the land use record as staff's Exhibit I.81 (the "Previous Response Memorandum").

This memorandum builds on the Previous Response Memorandum and the Agricultural Soil Restoration Plan and uses defined terms and other concepts from those documents.

The responses below are intended to broadly address the themes and concepts in this selection of public comments. For that reason, these responses are likely to also be applicable to other public comments now in the record or that are placed in the record after the date of this response.

Comment 1:

> "Soil compaction and soil mixing are always a problem after digging a ditch of any size. This is a mega ditch measuring 2400' long by 30+ feet wide by 10-25' deep.
>
> Dr. Mengel stated that there will be little impact on soil productivity due to modern construction methods. This is just plain false. Here are 3 very recent publications that have very different data and findings from study's done around the world."

Response to Comment 1: As detailed in the Previous Response Memorandum, the most basic difference between the methods to be used by the Water Bureau and the typical methods used for typical ditch-digging and pipeline installation is that the Water Bureau will use "two lift" excavation methods (here referred to as a "double lift") that separate and store topsoil to be placed back on top of the pipeline fill. In the "double lift" method, native topsoil will be kept separate from other sub-soil and returned over the pipeline construction zone where nursery plants can again be grown. A "one-lift" method (here referred to as a "single lift")– as is apparent on local farms where farmers have installed culverts or buried pipelines without properly replacing topsoil – can create the problems of soil mixing. Soil mixing can affect crop yields by combining subsoil having lower nutrient content with more productive topsoil. The "single lift" method can also exacerbate the soil mixing issue if compaction is not addressed. Subsoil ripping prior to topsoil replacement, as is required by the Water Bureau's Agricultural Soil Restoration Plan, will provide additional benefits by reducing compaction. The Agricultural Soil Restoration Plan also requires the use of a conservative topsoil stripping depth to reduce the possibility of soil mixing. The topsoil stripping operation will additionally be monitored to ensure no mixing of subsoil – if, during topsoil stripping, the soil construction monitor observes subsoil is being removed, the depth of stripping will be reduced to avoid the subsoil.

The trench width in the comment is not correct. The actual trench width will be limited to 9 to 10 feet. A wider area will be disturbed around the trench by equipment, but much of the 100 ft wide construction easement will be used for storage of topsoil and subsoil, materials, and machine access – activities which will not require any digging, removal of topsoil, nor create any risk of soil mixing.

These areas of temporary construction impacts will be exposed to compaction and will be ripped and plowed to restore soil tilth and infiltration capacity as part of the site remediation.

It is important to keep in mind that at the Ekstrom property described in this comment the Water Bureau chose a farm road for pipeline placement, rather than farm fields, in order to avoid impacts in the first place. The pipeline trenching itself will occur completely in an area that is currently, and will continue to be, a graveled farm road. This dramatically reduces the potential for significant impacts on yield, as the road area is not farmed and the actual trenched area is the most disturbed part of the pipeline construction.

Comment 2 (Also Exhibit I.11.a):

> "'Pipeline Installation Effects on Soils and Plants: A Review and Quantitative Synthesis' by Theresa Brehm and Steve Culman published in December 2022.
> https://acsess.onlinelibrary.wiley.com/doi/full/10.1002/agg2.20312
> (B. See attached PDF)
> This is a systematic review of 34 studies from 8 countries regarding the impact of pipeline installation on agricultural and natural ecosystems. In summary they stated, 'We conclude from our quantitative synthesis that pipeline installation typically results in degraded soil and vegetation resources, and this can persist for many years following installation.'"

Response to Comment 2 and Exhibit I.11.a:

This Brehm & Culman study is well known to soil scientists and was previously evaluated as part of the review of the specifications for soil restoration over the Water Bureau pipeline in the Agricultural Soil Restoration Plan. The Brehm & Culman study supports that the double lift method of soil management to be used by the Water Bureau is not common but, when used, results in no significant impacts to soil over time.

The summary statement quoted in Comment 2 ("We conclude … many years following installation.") is taken out of context because the study lumps together the evaluation of both single and double lift installations. The referenced report states (exhibit I.11.a, Section 3.1):

> "Both single (n=7) and double lift (n=10) excavations were reported in the construction processes, though some studies (n=3) included multiple pipelines which used different lift techniques and others (n=14) did not specify type of lift used."

The double lift excavation method to be used by the Water Bureau is more expensive than the older method of single lift excavations and is a state-of-the art method that is not required in many places (it is being implemented voluntarily by the Water Bureau). While pipeline excavation methods reported in the Brehm & Culman study may have typically resulted in degraded soil and vegetation resources, not all the pipelines studied are representative of the methods to be implemented for the Water Bureau pipeline and the reported results are based on combined results from single and double lift methods. In some cases, crop yields improved after construction, but it is not clear which methods were used in all results. Similar mixed results were observed for other measured variables. For example, 5 of the 8 soil nutrients measured increased following installation, as did electrical

conductivity. Many studies found no change in a measured variable after installation. In their conclusions, the authors state that "However, remediation measures are major factors in the extent of disturbance and recovery potential." Overall, as mentioned above, the Brehm & Culman study supports that the double lift method of soil management to be used by the Water Bureau is not common but, when used, results in no significant impacts to soil.

Comment 3 (Also Exhibit I.11.d):

> "'Pipelines keep robbing the land long after the bulldozers leave' Grist Publications, Jan 07, 2022. This paper talks about the promises made by Dakota Pipeline Company to restore the land to it's previous condition when construction was finished which is similar to the promises that the PWB engineers have made to us. The facts show that these promises cannot be kept. https://grist.org/energy/new-research-shows-sustained-damage-to-agricultural-land-near-pipelines/
> (C. See attached PDF)"

Response to Comment 3 and Exhibit I.11.d:

This article came from a small magazine and not a peer reviewed science journal. According to their website, Grist is an American non-profit online magazine founded in 1999 that publishes environmental news and commentary. Grist's tagline is "Climate. Justice. Solutions."

The magazine article does not clearly state the specifications for the pipeline installation method but the statement in the article by the farmer being interviewed represents one lift excavation:

> "Sautter told Grist the impact of the pipeline's destruction on his land has been emotional. 'Here's something that happened to your land that you would never think about doing yourself – taking a 150-foot swath, turning the soil upside down, **mixing it together with rocks and subsoil**, and laying it back down to try to grow something,' he said."

As noted above, this type of one lift excavation is not representative of the modern, more expensive methods to be implemented for the Water Bureau pipeline. The Agricultural Soil Restoration Plan requires the use of a double lift method combined with conservative topsoil stripping depth to reduce the possibility of soil mixing. The topsoil stripping operation will additionally be monitored to ensure no mixing of subsoil – if, during topsoil stripping, the soil construction monitor observes subsoil is being removed, the depth of stripping will be reduced to avoid the subsoil.

In addition to the farmer interview discussed above, the Grist article refers to the same study referenced in Comment 4 – addressed immediately below.

Comment 4 (Also Exhibit I.11.c):

> "'Pipeline Study Shows Soil Compaction and Crop Yield Impact in Construction Right-of-Ways' by Iowa State University Extension and Outreach dated November 17, 2021 https://www.extension.iastate.edu/news/pipeline-study-shows-soil-compaction-and-crop-yield-impact-construction-right-ways
> (D. See attached PDF)

> This study states, 'Our findings show extensive soil disturbance from construction activities had adverse effects on soil physical properties, which come from mixing of topsoil and subsoil, as well as soil compaction from heavy machinery,'."

Response to Comment 4 and Exhibit I.11.c:

This website references the same Tekeste 2020 study referenced in the Grist article, "Effect of subsoil tillage during pipeline construction activities on near-term soil physical properties and crop yields in the right-of-way." The referenced 2-year study shows yield reductions and soil compaction, but also shows that those impacts are recovering over time. The quotations from the website and the Tekeste 2020 study below indicate that better control of topsoil removal and replacement, and deep tillage, could have reduced impacts:

> "Though the heavy equipment-induced compaction was still evident two years after construction, a deep subsoil tillage treatment showed some benefit for alleviating the compaction." Website.
>
> "However, we have already started to see gradual recovery in yields from the soybean-corn rotation re-established in the right-of-way," Ebrahimi said. "Also, results from our tillage comparisons suggest that use of no-till slightly improved corn production in the right-of-way zones, especially under the unfavorable weather conditions of 2020." Website.
>
> "Another potential reason for crop yield depressions in the ROW might be because of the mixing of top- and subsoil layers during construction activities and replacement of top-soil[.]" Tekeste 2020, page 552.

The authors of the Tekeste 2020 study recommended visual assessment that could potentially be integrated into a post-construction feasibility assessment to minimize top- and subsoil mixing, especially during the topsoil replacement phase. This further reinforces the importance of the double lift concept.

Overall, the website indicates that in this study "the researchers are finalizing analyses from the subsequent years of the project. What they can say at this point is that the compaction and yields are slowly starting to recover", and that mitigation in the form of subsoil tillage can be effective as a mitigation for areas that experience issues.

The Agricultural Soil Restoration Plan includes the requirement to have an agricultural specialist work with farmers during and after construction. That requirement is designed to minimize impacts during construction and alleviate any ongoing issues after construction.

Comment 5:

> "These papers mostly deal with one-year crops such as corn, soybeans and other grains. They all showed strong data regarding the degradation of soil and important factors related to soil health and productivity. In our case, we are talking about growing nursery stock with a 3-5 year growing

> cycle. Their data shows very strongly that the PWB's conclusion that 'the pipeline will not cause any significant change in the accepted farm practices or increase cost and reduce productivity' is just not true for Ekstrom and Schmidt Nursery."

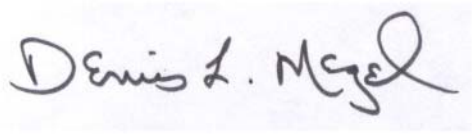
Response to Comment 5:

As mentioned in the response to the comments on the papers above, the studies generally review older methods rather than the more expensive, double lift method required by the Agricultural Restoration Plan, and, even with the single lift method described in the Tekeste 2020 study, compaction and yields are slowly recovering and would be expected to continue this trend over time. As described, the crops studied are all one-year crops, not 3-5 years, which makes it difficult to draw conclusions about the 3-5 year crops from these studies. However, the Agricultural Restoration Plan's specifications to rip the subsoil will allow for seedling root penetration with the nursery (3-5 year) crops.

Comment 6:

> "Horsetail rush (the weed of concern) can only be eradicated with fumigation or monthly spraying for multiple years. A simple google search proves the difficulty of eradicating horsetail rush."

Response to Comment 6: This was addressed in the Previous Response Memorandum, Comment 2.



Certified Professional Soil Scientist

Certification Number 03391