COMPATIBILITY OF PROPOSED PORTLAND WATER BUREAU FILTRATION FACILITY & PIPELINE OPERATIONS WITH SURROUNDING AGRICULTURE

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Prepared for City of Portland



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Definitions

Accepted Farm Practice	"A mode of operation that is common to farms of a similar nature, necessary for the operation of such farms to obtain a profit in money, and customarily utilized in conjunction with farm use." ORS 215.203(2)(c).
Altman Finished Water	New finished water pipeline from the filtration facility to the Finished Water Intertie. Abbreviated as Altman FWP.
Appurtenance	As used in this report, auxiliary, above-ground physical components of a pipeline. Examples are air release valves, water drains, and accessways.
Ball & Burlap Trees (B&B)	A nursery plant production method where a tree is grown to a predetermined size and then dug with the roots placed in coarse woven canvas (burlap) and secured with string, wire, or twine.
Bareroot Trees	Dormant perennial plants that are harvested and stored without any soil around their roots. They are dug when dormant and then refrigerated until shipping.
Conduit 2 Connection	Water Bureau proposed new finished water pipeline from the Finished Water Intertie to Pipeline Road and connection to existing Conduit 2.
Conduit 3 Connection	Water Bureau proposed new finished water pipeline from the Finished Water Intertie to slightly past the intersection of Altman Road and Lusted Road. This new pipeline section will connect to existing Conduit 3 in Lusted Road.
Conduit 4 Connection	Water Bureau proposed new finished water pipeline from the Finished Water Intertie to SE Oxbow Drive and connection to existing Conduit 4.
Core Analysis Area	As defined further in this report, properties in close proximity to either the filtration facility or pipelines proposed by the Water Bureau that have been closely analyzed and described in this report.
Exclusive Farm Use (EFU)	The zoning district established in the Oregon Revised Statutes Chapter 215 and applied by Multnomah County.

Farm Use	As defined in ORS 215.203(2), including, without limitation: "The current employment of land for the primary purpose of obtaining a profit in money by raising, harvesting and selling crops or the feeding, breeding, management and sale of, or the produce of, livestock, poultry, fur-bearing animals or honeybees or for dairying and the sale of dairy products or any other agricultural or horticultural use or animal husbandry or any combination thereof."
Farmers	Farm operators who conduct Farm Use as defined by ORS 215.203(2).
Filtration Facility	Portland Water Bureau proposed drinking water treatment facility in east Multnomah County using conventional treatment, flocculation, sedimentation, and filtration with a target capacity of 135 million gallons per day, as further defined in the land use application for which this report was prepared.
Finished Water Pipelines	The pipelines that convey treated ("finished") water from the filtration facility to the existing conduits, namely Conduits 2, 3 and 4.
Finished Water Intertie	The proposed Water Bureau intertie connecting pipelines near Lusted Road. The Finished Water Intertie is part of the pipelines.
Lusted Finished Water	New finished water pipeline from the filtration facility to the Finished Water Intertie. Abbreviated as Lusted FWP.
Lusted Flats	The area in the Sandy River valley where Lusted Road roughly parallels the river.
Lusted Hill Improved Corrosion Control Treatment (ICCT) Facility	Facility near filtration facility that treats Bull Run water to reduce potential levels of lead at customers' taps. It is also referred to as the Lusted Hill Corrosion Treatment Facility.
Lusted Road Distribution Main (LRDM)	New water main to connect the new Finished Water Pipelines at the intersection of Cottrell Road and Dodge Park with existing Lusted Road Distribution Main. It will provide service to existing customers of the Water Bureau east and south of the Lusted Hill ICCT Facility. This pipeline is also referred to as the Back Feed line.
Multiple Use Agriculture (MUA-20)	Multnomah County zoning district which allows, among other things: 1) agricultural uses; 2) residential use under prescribed conditions; and 3) Community Service Uses as a conditional use.
Multnomah Connection	The location along Lusted Road where the new Raw Water Pipelines connect to the three existing Water Bureau conduits.

Pipelines	The Raw Water Pipelines and the Finished Water Pipelines. References to the pipelines portion of the project include the Finished Water Intertie.
Pleasant Home Water District (PHWD)	A water utility primarily serving residential customers in east Multnomah County. PHWD purchases water from the Water Bureau.
Raw Water Pipelines	The two new pipelines that convey raw water from the Multnomah Connection to the filtration facility.
Road Right of Way (ROW)	The land area on, below, or above a public roadway, highway, street, waterway, or utility easements dedicated for compatible uses.
Rural Residential (RR)	Multnomah County zoning district which primarily allows single family dwelling units constructed on a single lot.
Surrounding Lands	As defined further in this report, the area around the proposed filtration facility site and pipelines which encompasses the land area with any potential for significant impacts on accepted farm practices or farm operating costs. The Surrounding Lands are the same area described as the "study area" in the land use application narratives. Note that the filtration facility site itself and the ROW and permanent easement areas for the pipelines are not part of the Core Analysis Areas or Surrounding Lands because they are not located on "surrounding lands" for purposes of the relevant zoning approval criteria, described further in this report.
Water Bureau	The City of Portland's drinking water utility – the Portland Water Bureau – with the authority to build, manage, and maintain water for residents of Portland and wholesale water service customers.

1.0 Introduction

This report evaluates potential impacts on accepted farm practices of the proposed Portland Water Bureau ("Water Bureau") Bull Run filtration facility (referred to as the "filtration facility") and the associated Water Bureau pipelines in Multnomah County (referred to as the "new pipelines," or "pipelines"). This report considers the potential impacts on surrounding accepted farm practices during operation of the filtration facility and the pipelines under the requirements of Multnomah County Code and Oregon State land use regulations.

The filtration facility is proposed on an approximately 94-acre property on Carpenter Lane which has been owned by the Water Bureau since 1975. The filtration facility will receive "raw" Bull Run water delivered from two new pipelines in Multnomah County (the Raw Water Pipelines). After processing, the filtration facility will send "finished" water to new pipelines that will connect to existing Water Bureau pipelines in Lusted Road, Pipeline Road, and Oxbow Drive. These large diameter pipelines are known as "conduits." A smaller-diameter distribution pipeline, the Lusted Road Distribution Main (LRDM), also known as the Back Feed line, will also send water north in Cottrell Road and connect to an existing main that serves local residential customers east of Cottrell Road.

This analysis is conducted to determine compliance with Multnomah County's criteria for approving land use permits for the filtration facility and pipelines in the Multiple Use Agriculture ("MUA-20") zone, Rural Residential ("RR") zone, Exclusive Farm Use ("EFU") zone, and Commercial Forest Use ("CFU") zone. Key agriculture-related approval criteria require the Water Bureau to provide evidence that the filtration facility and pipelines:

1. Are consistent with the character of the area, and
2. Will not: a) Force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; nor b) Significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use. (EFU and CFU zones include variations on this approval criteria, as discussed further below).

This report covers accepted farm practices. A separate report addresses accepted forest practices.



The proposed filtration facility is surrounded by nursery crops.

2.0 Multnomah County Project Overview

The Water Bureau is making important improvements to the Bull Run water supply to provide consistent, high-quality drinking water for nearly one million people that meets today's water quality standards and helps address future risks and regulations. These improvements include a new filtration facility and pipelines in eastern Multnomah County near the Bull Run Watershed.

2.1 Bull Run Filtration Facility Operations

The proposed filtration facility site (the "filtration facility site" or "site") is in unincorporated Multnomah County just north of the Clackamas County line and approximately three miles southeast of the City of Gresham urban growth boundary (see Figure 1). The filtration facility site is zoned Multiple Use Agriculture (MUA-20) in the Rural Plan Area West of Sandy River. This zoning allows municipal water treatment as a conditional use.

Figure 1: Portland Water Bureau Project Area



Design parameters for the filtration facility and pipelines include:

- Design capacity of 135 million gallons per day to meet projected peak day demands through 2045 and beyond;
- Conventional treatment, including flocculation (assists in settling particles), sedimentation, and filtration to best handle turbidity events; and
- Large diameter pipelines to and from the facility.

The Water Bureau has constructed and operated facilities in the area for more than 125 years. The Water Bureau has also owned the proposed filtration facility site since 1975 for the purpose of future water facilities. The site consists of two adjacent parcels: a 56.87-acre lot to the west and a 36.62-acre lot to the east. The approximately 94-acre site consists principally of undeveloped agricultural land. An approximately ten-acre area along the north-eastern edge of the site along SE Dodge Park Boulevard is forested hillslopes that will remain undeveloped. The remaining portions

of the site are cleared and over the years have been leased for agricultural operations for commercial production of nursery crops.

There is no water source on-site. The two nurseries currently operating on the site utilize irrigation water from wells on their adjoining properties. Water for operational use at the filtration facility will be sourced from finished water provided on-site.

The entire non-forest area of the site will be needed during construction of the filtration facility. After the facility is in operation, there may be an undeveloped approximately 15-acre remnant that could return to agricultural production. The use of any undeveloped remnant of the site has not yet been determined.

Farm access roads along the site's northern, eastern, western, and southern boundaries and through the middle of the site currently support agricultural operations and access to the existing Pleasant Home Water District (PHWD) water towers to the south. The site consists of a hill on the eastern portion of the site with the existing grade gently sloping downward to the northwest, southwest, and southeast.

The existing SE Carpenter Lane access to the site will be the primary facility access once operational. Secondary access will extend from SE Bluff Road and would be used for emergency services access or when facility access on Carpenter Lane is unavailable due to planned or unplanned events.

The filtration facility will operate 24/7, year-round. After the filtration facility begins operation, staff is estimated at a maximum of 18 employees per shift. In addition to employee commute trips, there will be approximately five truck trips per weekday for chemical deliveries and solids off-hauling (i.e., sediment removed by the filtration process).

The footprint of the proposed water filtration facility will be approximately 60 acres, with a landscaped perimeter and the approximately 15-acre undeveloped remnant described above. Globalwise interviewed project designers and reviewed the 60-percent design plans for the facility to evaluate operational and other considerations that could influence the use of nearby agricultural land.

2.2 Multnomah County Pipelines

The Water Bureau is proposing new pipelines to deliver raw water to the filtration facility and finished water to existing conduits. The pipelines maximize gravity flow and provide a more resilient, easier-to-maintain system.

Raw Water Pipelines in Multnomah County to deliver Bull Run water to the filtration facility will consist of:

- A connection (the Multnomah Connection) of three existing Water Bureau conduits in Lusted Road within Multnomah County to a 0.5-mile pipeline alignment that includes a tunnel and two large diameter raw water pipelines (the Raw Water Pipelines).
- The Raw Water Pipelines will have the capacity to deliver 135 million gallons per day from the Multnomah Connection to the filtration facility.
- Appurtenances include water drain valves, air release valves, and a tunnel portal.

The Finished Water Pipelines infrastructure includes:

- Two pipelines, the Altman FWP and the Lusted FWP, with the capacity to deliver 135 million gallons of water per day to existing conduits, and ultimately to customers of the Water Bureau. These pipelines include two new pipelines which extend approximately 1.3 miles from the filtration facility to the new Finished Water Intertie proposed near Lusted Road. The Finished Water Intertie controls the flow of finished water to the three existing conduits. At the intertie, the Altman FWP and the Lusted FWP split into three conduits: Conduit 2 Connection, Conduit 3 Connection, and Conduit 4 Connection. From the Finished Water Intertie, three pipelines will continue west in Lusted Road. One of the new pipelines will connect to existing Conduit 3 near the intersection of Lusted Road and Altman Road. The other two new pipelines will extend north in Altman Road from the intersection of Lusted Road and Altman Road to connect with existing conduits. At Pipeline Road, one pipeline will connect to existing Conduit 2. At Oxbow Drive, the final pipeline will connect to the existing Conduit 4 (see Figure 2).
- A separate 12-inch diameter distribution main connection, the LRDM, connects with the Finished Water Pipelines at the intersection of Cottrell Road and Dodge Park Boulevard and goes north in the Cottrell Road ROW then through the Lusted Hill Improved Corrosion Control Treatment Facility (here after referred to as the Lusted Hill ICCT Facility) and connects with the existing LRDM. This line will allow for continued service to existing local water customers and five wholesale water districts.
- Appurtenances include water drain valves, air release valves, and access covers.

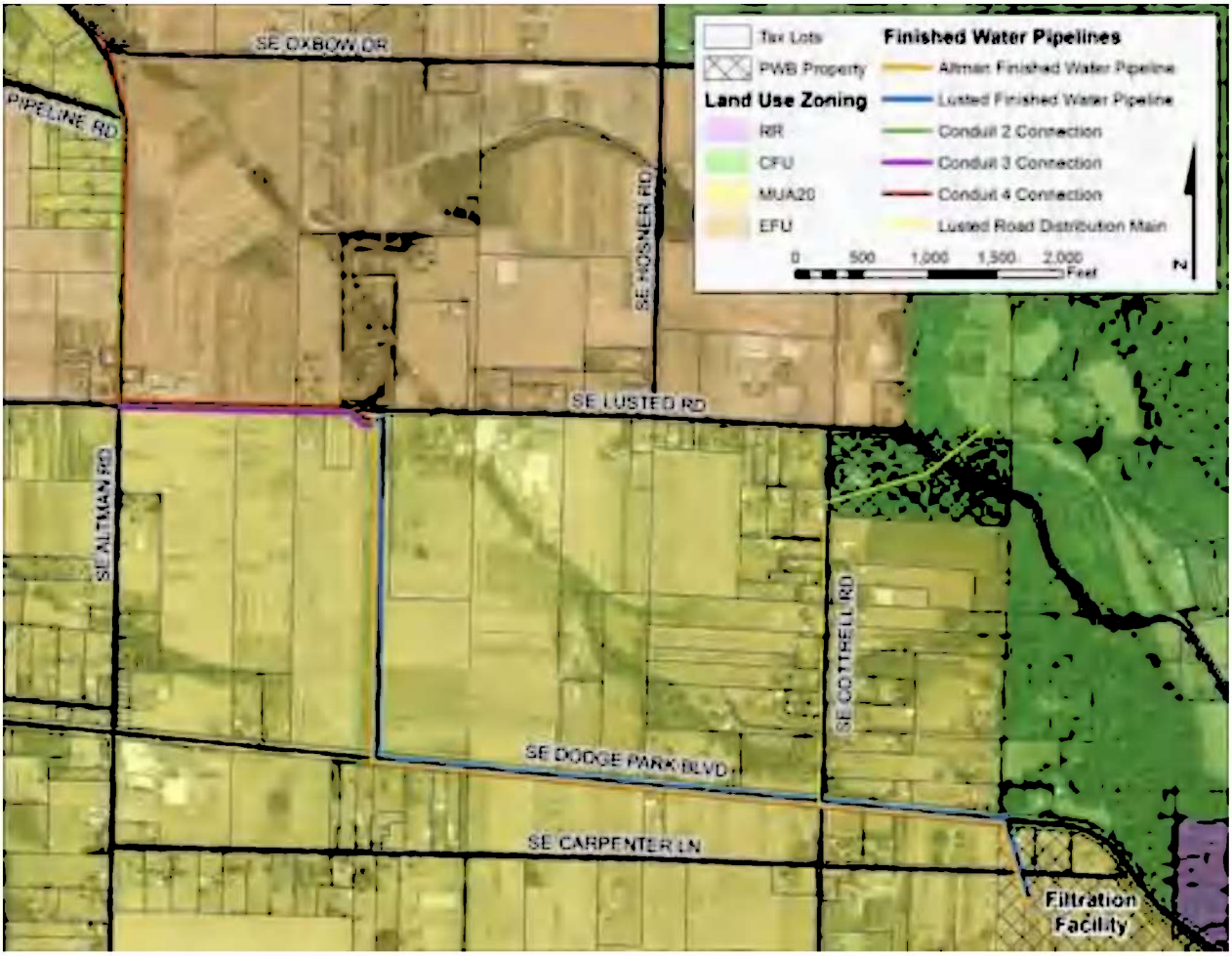
3.0 Information Collection Methodology

3.1 Overall Approach

Throughout the filtration facility and pipeline design and planning process, the Water Bureau has considered and implemented ways it can eliminate or reduce negative impacts to insignificant levels on farm use properties and farmers. Globalwise asked farmers to identify their concerns and suggestions to avoid impacts. These concerns have been considered and are addressed in this report.

The Water Bureau will compensate farmers for crop damage and other impacts that are directly associated with the Water Bureau projects. However, this compensation is not relied on as a remedy for impacts on accepted farm practices. This analysis reviews impacts on accepted farm practices and determines if they are significant, following the guidance of Oregon land use law.

Figure 2: Finished Water Pipeline Alignments



Globalwise initiated contact and communication with farmers in the Surrounding Lands in late spring of 2020. Contact and information exchange is ongoing and now exceeds two years. Knowledge of accepted farm practices learned by Globalwise was shared and evaluated in regular meetings and individual discussions with the filtration facility and pipeline decisionmakers and designers in the Water Bureau and project consulting team members. This knowledge helped shape the project and determine Water Bureau actions and design decisions which eliminate or avoid significant impacts on farmers in the Surrounding Lands. The key Water Bureau staff and consultants who have provided project information to Globalwise are identified as sources of information throughout this report. All persons referenced have reviewed the final version and confirm the accuracy of the information they provided.

3.2 Procedures for Identifying Farmer Contacts

Analyzing the compatibility of accepted farm practices with operation of the filtration facility and pipelines in Multnomah County requires in-depth understanding of agricultural practices in the area. This is best obtained through contacts with local farmers representing every type of crop or livestock production found in the land area of the filtration facility and the pipeline route.

Globalwise has been contacting area farmers since May 2020, ongoing to the date of this report. The contacts include as many local farmers as possible in a large area around the proposed Water Bureau projects. The initial outreach extended to farmers who operate as far as three miles from the filtration facility. This ensured all types of area farm uses were considered, and also ensured that farmers who operate multiple locations were included.

The initial effort focused on identifying nursery operators since horticulture (growing nursery crops) is the major farming activity in the Surrounding Lands, defined below. The first source Globalwise consulted was the online directory of Oregon Nursery Association members. Internet searches identified additional nurseries and locations. By driving through the area, Globalwise identified business signage and addresses of farm businesses. Locations were further identified by online searches for nursery businesses and farm websites. This was helpful to identify both nurseries and other types of farms of all sizes. The Oregon Blueberry Commission was another source Globalwise used to search for fresh u-pick blueberry farms in the area. Farm locator internet sites were also helpful in identifying farms that are direct sellers to customers.

Once a sizeable number of farmers was identified, Globalwise contacted farmers by email with telephone follow-up. When telephone numbers and email addresses were not current or accurate, web searches were used to locate accurate, current telephone and/or email information.

Farmers interviewed were asked to identify additional farmer contacts. These additional names were also added to the contact group.

Globalwise attempted to reach 82 property owners to determine if they engage in farming operations within the Surrounding Lands area. Of those, 60 property owners in the area were interviewed, with 48 identified as farmers representing the full range of agricultural crops grown in

the Surrounding Lands. Property owners and farmers that Globalwise could not reach are those whose contact information was not found, or who did not respond to requests for information by email or telephone. Globalwise made seventeen field trips to the Surrounding Lands area for farmer meetings, to verify crops and evaluate accepted farm practices, check field locations, and evaluate farm traffic.

Globalwise prepared a survey form and responses were recorded for each grower contacted. Responses were compiled as a primary way to confirm and document what crops and livestock are raised and understand how farmers view potential effects of filtration facility and pipeline operations. Additionally, interview notes were used in this analysis. Summary discussion of the farmer comments on the survey and in the interviews are included later in this report.

3.3 Farm and Nursery Headquarters (Operations Center) and Field Locations

Multiple sources of information were referenced by Globalwise to find the headquarters base (also known as an operations center) for each farm's operations and any field locations they also access. Assessor's maps and databases for Multnomah and Clackamas Counties were a primary information source. In November 2020, Multnomah County added property owner names to Assessor's map records. Globalwise used Google Earth as another source to help identify farm properties and determine what crop production might be occurring at farm locations. This information was then cross referenced to tax parcels. County Assessor's online records were also acquired from a Portland area title company to help Globalwise identify property owner names, tax lot numbers, and physical addresses.

During the interviews, farmers were asked to verify their headquarters sites and all of their field locations. An Oregon Nursery Association map with member nursery loading docks was also used as a reference to verify farm headquarters locations and to help determine transportation routes for nursery product loading points for customer product shipments.

In cases where farmers lease or rent property, they were asked to provide addresses or descriptions to aid in locating fields. Farmers with multiple locations were also asked for their primary and secondary routes of travel. This information was also supplemented through inquiries with neighboring farmers. An example of a farm with multiple sites is seen in Figure 3.

Figure 3: Example of a Nursery with Multiple Locations



4.0 Surrounding Lands

The Surrounding Lands – which is the same area referred to as the "study area" in the land use application narratives – were defined to be sufficiently large to encompass all potential impacts that the proposed filtration facility and the pipelines (including the Finished Water Intertie) might have on accepted farm practices or on the costs of accepted farm practices. The potential impacts from the filtration facility and the pipelines on accepted farm practices relate to the potential "externalities" of the filtration facility and pipelines. The potential externalities identified are noise, vibration, odor, light/glare, dust, mud, litter, vector control, air emissions, water quality/quantity, radio transmission, security, traffic, and chemicals used at the filtration facility. There is also the potential for impacts to emanate from any "sensitivities" of the proposed use, and how any sensitivity interacts with farmers who follow accepted farm practices in the Surrounding Lands. The potential sensitivities of the proposed use relate to agricultural chemicals and farm traffic in the Surrounding Lands. Both potential types of impacts (related to externalities and sensitivities of the

proposed use) are more likely to occur for accepted farm practices on lands located adjacent to the filtration facility or the pipelines than farm practices at more distant locations.

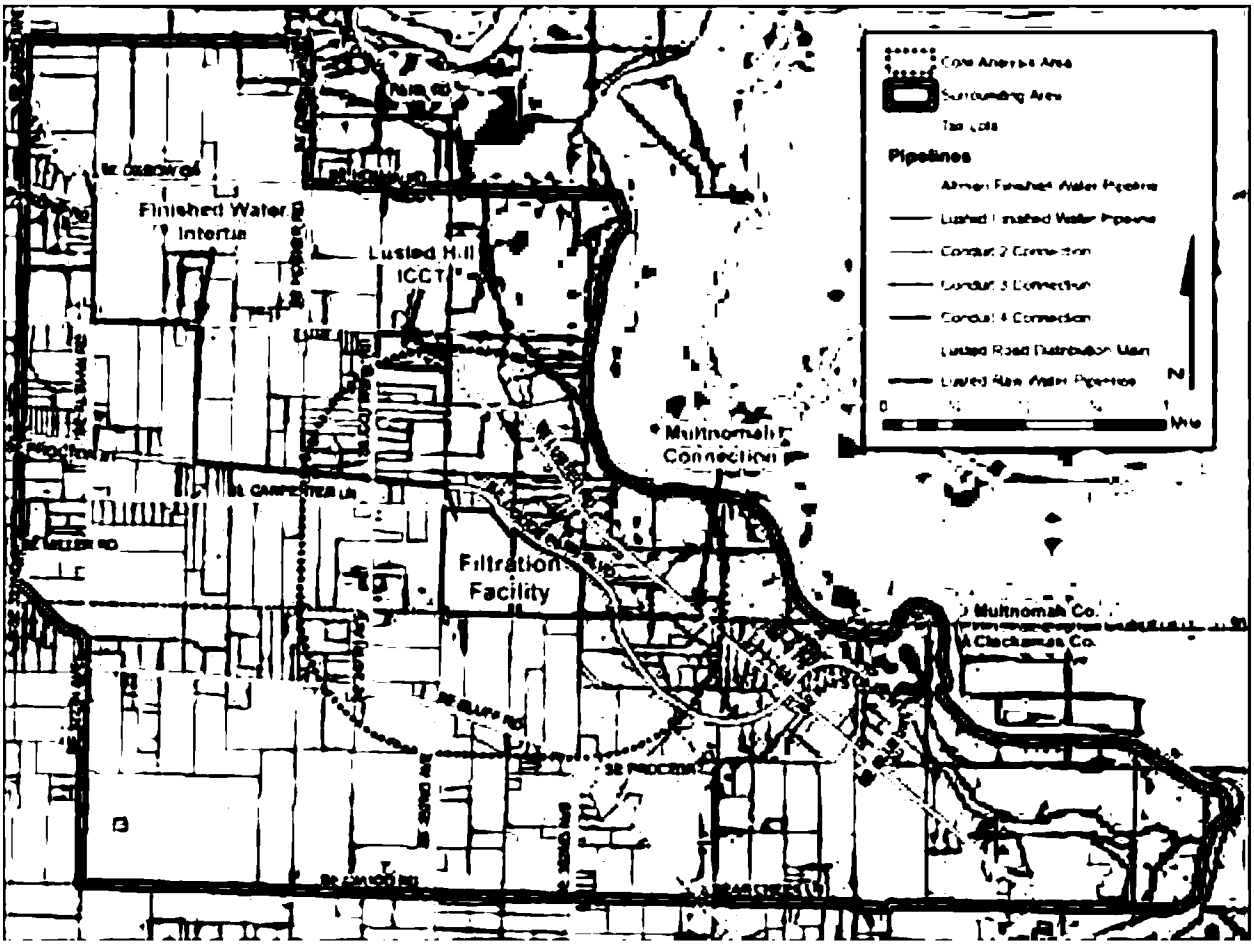
A basic test is whether the operation of the filtration facility or the pipelines will force farmers to either significantly change their accepted farm practices or incur significantly increased costs for those practices. Later in this report those tests, and others where applicable, are analyzed in-depth for the farm use properties and specific crops in the Surrounding Lands.

4.1 Criteria for the Surrounding Lands

The boundary of the Surrounding Lands (see Figure 4) was defined after extensive grower contacts contributed to deeper understanding of local crops, farming practices, and the principal externalities or sensitivities that could impact those accepted farm practices. As noted above, the Surrounding Lands were primarily defined to be sufficiently large to encompass all potential impacts that the proposed filtration facility and the pipelines might have on accepted farm practices or on the costs of accepted farm practices. Accordingly, the boundary of the Surrounding Lands for this analysis is based on these criteria:

1. Encompasses area covered predominately by *current, active "farm use"* as defined by ORS 215.203 and "farming practices" as defined by MCC 39.2000.
2. *Zoning:* allows farm use, especially EFU and MUA-20 zones. Excludes areas inside Urban Growth Boundaries (UGBs).
3. *Agricultural in character*, as defined by larger farm sites (individual or contiguous parcels), types and diversity of farm uses, and evidence of accepted farm practices. Available for agricultural use (not forested; not in public park use).
4. *Considers natural barriers* that eliminate the potential for impacts on/or from agriculture: principally the Sandy River and steep terrain.
5. *Transportation*: includes the area where the transportation network (and farm use of that network) is potentially subject to the impacts of increased traffic from filtration facility and pipeline operation.
6. *Other impacts:* includes lands close enough to be subject to any other (non-transportation) impacts of the filtration facility and pipelines, considering both the potential direct impacts (externalities) of the facility and pipelines as well as the ways in which those proposed uses may be sensitive to farm uses on the surrounding lands.

Figure 4: Core Analysis Area and Surrounding Lands for Filtration Facility



5.0 Core Analysis Areas

The Core Analysis Areas for the operation of the filtration facility and for the pipelines are sub-areas within the Surrounding Lands. Note that the filtration facility site itself and the ROW and easement areas for the pipelines are not part of the Core Analysis Areas or Surrounding Lands because they are not located on "surrounding lands" for purposes of the relevant zoning approval criteria, described below.

5.1 Core Analysis Area – Filtration Facility

The Core Analysis Area for the filtration facility is the area with the most potential for impacts on accepted farm practices due to its close proximity to the filtration facility. The Core Analysis Area for the filtration facility is approximately one-half mile in all directions from the filtration facility.[1]

[1] The one-half mile was chosen as the minimum core analysis area because it exceeds the minimum study area used in other land use contexts, such as the surrounding lands area of ¼ mile used on other Water Bureau reviews

Globalwise conducted an in-depth study of each tax parcel in this area and identified 62 tax parcels in farm use, including nurseries and other farms of varying sizes near the filtration facility site. Each farm use property was analyzed for potential impacts due to operation of the filtration facility (see Figure 5).

5.2 Core Analysis Area – Pipelines

The Core Analysis Area for the pipelines includes all farm production units which include or are adjacent to any direct use area (the easement or ROW where the pipeline will be placed, and associated activities will occur) for the operating pipelines. Maps of the Core Analysis Areas are shown by segments of the pipelines later in this report.

Farm production units are the appropriate measure of an impact area whether the pipeline is within an easement on the farm use property or the pipeline is in the public road ROW that adjoins the farm production unit. The reason is that farm production units delineate important farm characteristics that could be impacted by the pipeline operations. A large farm production unit, for example, would be accessed more often than a small farm production unit. The equipment and crews are also determined by conditions at the farm production unit level. The production unit therefore most accurately defines the area for analysis around the pipeline routes. Farm use properties were mapped by tax parcels. Where adjacent tax parcels are in contiguous farm use, they were included as part of the farm production unit (and therefore in the Core Analysis Area, even if the tax lot was not adjacent to a direct use area).

By their nature, the impacts of pipeline operations do not extend far from the pipelines (which includes the Finished Water Intertie). Ken Ackerman, Principal Engineer at the Water Bureau, and Brad Philips, Senior Pipeline Design Engineer with Jacobs Engineering, described the pipeline operations to Globalwise. The following reasons are why the Core Analysis Area does not go beyond the farm production unit which includes or is adjacent to the direct use area:

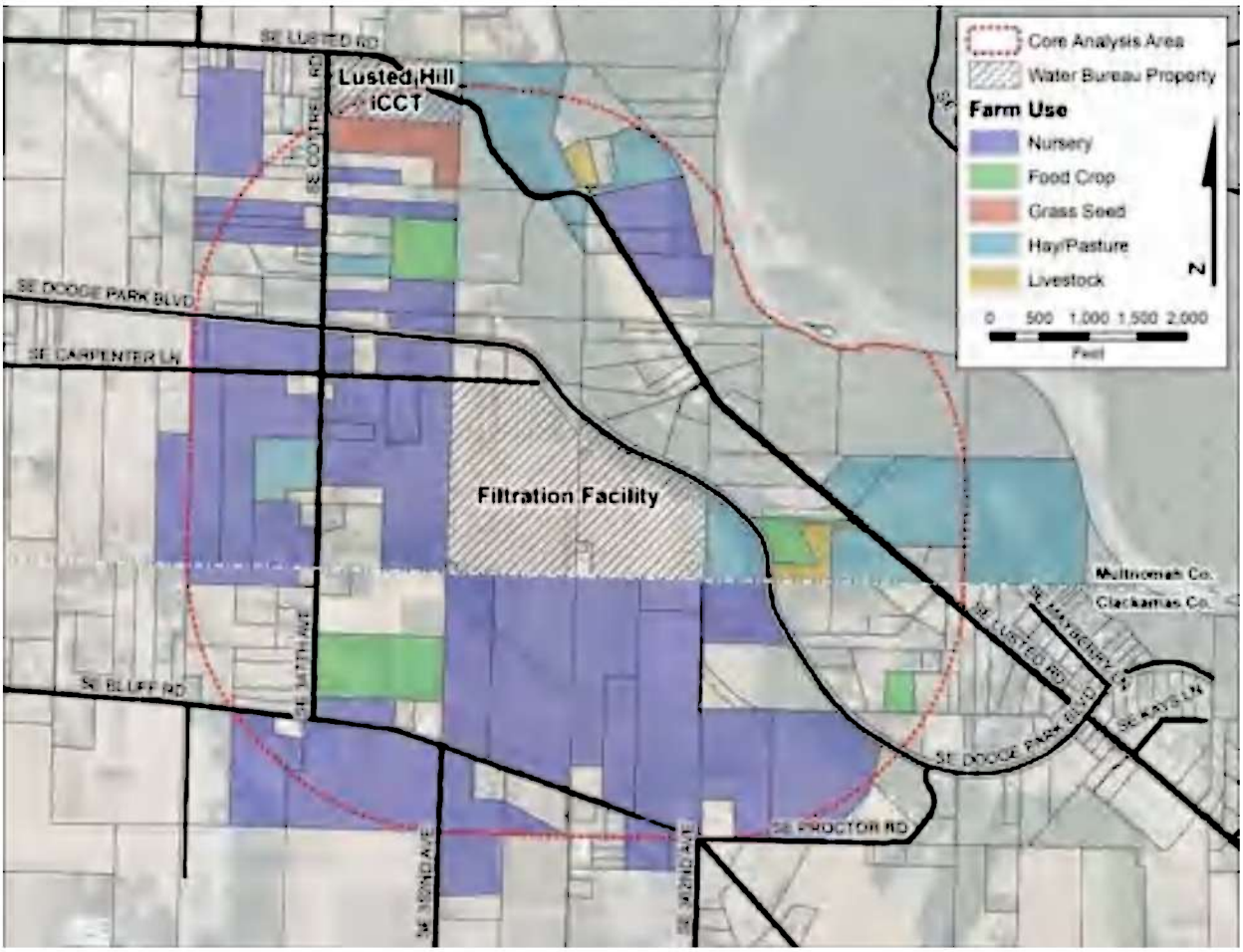
- The pipelines are buried underground with few if any above ground appurtenances in a farm production unit. The Water Bureau will only install pipeline appurtenances within a farm property where the associated pipelines are placed in an easement on that property (rather than in adjoining public road ROW).
- Pipelines and appurtenances in public road ROW are at or below the road level so road traffic is not impeded by the pipelines, except in rare cases when maintenance or repairs in pipelines beneath the road are needed. In these cases, the traffic impact is minimal.
- Water Bureau personnel do not need frequent access to the pipelines or the Finished Water Intertie within farm properties. Even when Water Bureau crews travel on farm roads, the

by Multnomah County (at the Lusted Hill ICCT Facility) and the 1,500 foot impact area to be evaluated for mining using under OAR 660-023-0180(5)(a)), and therefore will result in an analysis of an area which can be expected to capture any potential impacts on accepted farm practices.

frequency and duration is minor. This means pipeline operations will add little to traffic on either the public roads or the farm roads associated with the pipelines. Information on the frequency of access is described later in this report. Further information about pipeline access on farm roads is analyzed later in this report.

- The pipelines and valves in the Finished Water Intertie are below ground level and completely covered. The only structures above ground level are a low covering for the pipelines, a building housing electrical controls and a generator, and a perimeter fence with lighting. As discussed later in this report, the potential sources of externalities and sensitivities of the Finished Water Intertie are minimal and limited in their potential reach.

Figure 5: Types of Farm Uses in the Core Analysis Area



6.0 Relationship of Core Analysis Areas to Surrounding Lands

Globalwise extensively studied the Core Analysis Areas for the filtration facility and pipelines. The broader Surrounding Lands have also been closely reviewed and compared to the Core Analysis Areas, which were evaluated in even greater detail. The comparison was conducted by 1) review of Google Earth imagery, 2) interviews with farmers, Oregon State University Extension personnel, and farm organizations to determine farm crops, farm sizes, and production practices, and 3) driving through the area to observe and further "ground-truth" all sources of information.

The two areas are closely related in terms of the potential for susceptibility to impacts from the filtration facility or pipelines, such as potential based on the mixture of farm types and sizes and scope of activities. The following are the key shared characteristics and similarities of the Core Analysis Areas and Surrounding Lands:

- The topography, climate, and soils are homogenous throughout the areas.
- The same nursery crops predominate.
- Nurseries range in size from small to large with some nursery operators traveling several miles to farm separate fields.
- Farm headquarters are located in each.
- There is also a small amount of non-nursery farm use: hay, pasture, livestock and food crops.
- Farms rely on groundwater wells for irrigation.
- Farms operate with a similar pattern of close proximity to dispersed residential properties and other community uses.

Because of these and other shared characteristics and similarities, and because potential impacts (both related to externalities and sensitivities of the proposed use) are more likely to occur for accepted farm practices on lands located closer to the filtration facility or the pipelines than farm practices at more distant locations, the detailed analysis and conclusions for the more focused Core Analysis Areas also apply to the larger Surrounding Lands further away from the filtration facility and pipelines.

7.0 Relevant Zoning Approval Criteria

The relevant tests for evaluating farm use impacts are based on Multnomah County zoning districts. Most of the area around the filtration facility and in major sections of the Finished Water Pipeline alignment are zoned MUA-20. For this zone, the agriculture related approval criteria require the Water Bureau to provide evidence that the filtration facility and pipelines:

1) Are consistent with the character of the area; and
2) Will not: a) Force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; nor b) Significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

Properties in the Rural Residential (RR) zone have the same approval criteria as property in the MUA-20 zone.

There is also some Exclusive Farm Use (EFU) zoning on farm property adjacent to the filtration facility site and along the pipeline routes. In EFU, where the pipelines are located outside of public roads and highways,[2] the Water Bureau's proposed use is defined as "utility facilities necessary for public service", a review use, where the approval criteria require "the county [to] impose clear and objective conditions ... to mitigate and minimize the impacts of the proposed facility, if any, on surrounding lands devoted to farm use in order to prevent a significant change in accepted farm practices or a significant increase in the cost of farm practices on the surrounding farmlands."

Finally, there is also Commercial Forest Use (CFU) area along the pipeline routes, specifically in the location of the LRDM. In CFU, the Water Bureau's proposed use is subject to the same approval criteria as property in the MUA-20 zone. Additionally, in the CFU zone, the Water Bureau must provide evidence that the "use will: (a) Not force a significant change in, or significantly increase the cost of, accepted forestry or farming practices on surrounding forest or agricultural lands[.]"

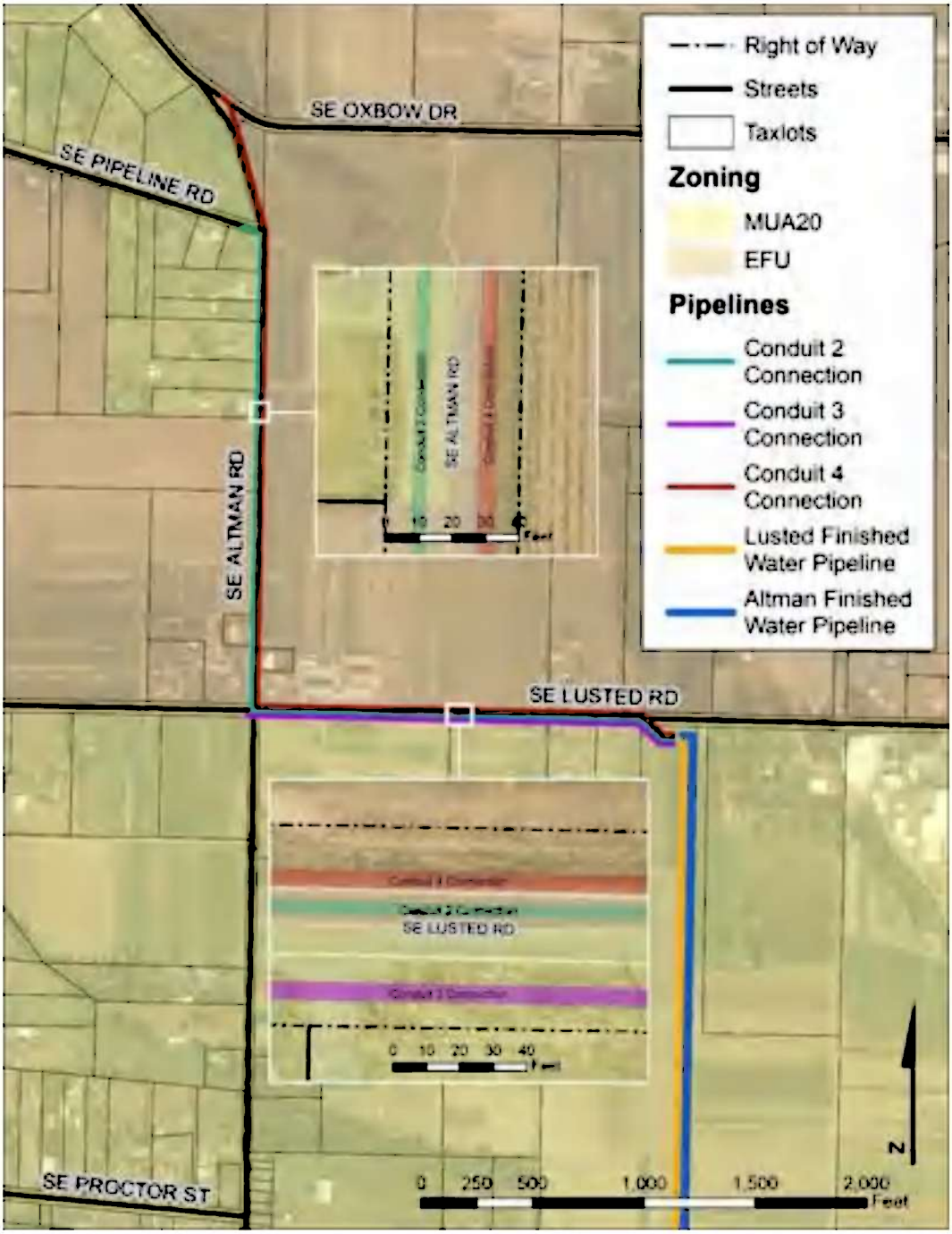
For the vast majority of the Finished Water Pipeline alignment, pipelines are proposed in the existing public road right of way (ROW). The ROW also frequently serves as the dividing line between zoning districts. For example, in Lusted Road east of the intersection of Altman Road and Lusted Road, the zoning to the north of Lusted Road is EFU and to the south the zoning is MUA-20. The centerline of Lusted Road is the border between the two zones. Conduits 2 and 4 are proposed for construction north of the centerline within the Lusted Road ROW so they are in the EFU zone. Conduit 3 is in the ROW and south of the centerline, so this conduit will be in the MUA-20 zone. Figure 6 shows the placement of the pipelines in the ROW of the two finished water areas where the zoning border is at the centerline of the road.

A second location where road ROW separates two zones in the Surrounding Lands is a short length of Dodge Park Boulevard to the north of the filtration facility site, However, in this case MUA-20 is

[2] Within public roads and highways, the Water Bureau's proposed use is an allowed use, namely "(G) Reconstruction or modification of public roads and highways, including the placement of utility facilities overhead and subsurface of public roads and highways along the public right-of-way, but not including the addition of travel lanes, where no removal or displacement of buildings will occur, or no new land parcels result." MCC 39.4220(G). This allowed use is not subject to the approval criteria related to impacts on farmlands. Nevertheless, the Water Bureau requested that this analysis ensure that no significant impacts would be caused on these farmlands in EFU areas where the pipelines are located in public roads and highways. Accordingly, this analysis includes farm use areas in EFU in the Surrounding Lands.

to the south of the centerline and CFU is to the north and there are no farm use properties in the vicinity of Dodge Park Boulevard in this area.

Figure 6: EFU and MUA-20 Zoning in the Finished Water Pipeline Alignment



Where the pipelines are proposed for placement in the public road ROW and the zoning is the same on either side of the road, the impacts test is uniformly applied with the appropriate zoning on farm use properties on both sides of the road. This is the case for most of the distance of the pipeline alignment on Dodge Park Boulevard and also on portions of Altman Road.

In the Raw Water Pipeline alignment within Multnomah County, two farm use properties in the RR zone are within the alignment and will have pipelines and access easements. One farm use property is in the EFU zone, although, as described further below, it is not impacted because the pipelines are in a tunnel over 150 feet under this farm property.

8.0 Inventory of Farm Uses in the Filtration Facility Core Analysis Area

A property-by-property inventory of farms and other land uses was conducted in the filtration facility Core Analysis Area. First, from the interviews of farmers, the land leased or owned by most farmers was identified and included. Aerial photos were used to indicate farm activity where previous searches had not identified farm use. Properties with clear indications of farming activity were cross referenced to public property tax records to identify property owners. Properties in Oregon's farmland property tax deferral program were identified and included as farm use properties. Property owners (or lessees, where known) were contacted by email and telephone to ask if they were engaged in farm use activity. Websites and social media platforms were researched as another source to determine farm use.

Table 1 provides a property-by-property analysis of properties in the filtration facility Core Analysis Area, the total land devoted to farm use, and the amount by crop category. The crops grown in the Core Analysis Area are shown in Figure 5.

Table 1. Property Devoted to Farm Use in the Core Analysis Area for the Filtration Facility

Farm Production	Number of Tax Parcels	Total Acres
Nursery Crops	40	457
Food Crops	4	35
Grass Seed Crops	2	22
Grass for Pasture or Hay	9	73
Grass/Undetermined	6	43
Total Crops	61	630
Horses/Equine	1	2
Cattle & Other Livestock	1	5
Sheep & Goats	*	*

Farm Production	Number of Tax Parcels	Total Acres
Other Animals and Animal Products	*	*
Total Livestock	2	7
Total Crops and Livestock	62	637

* Properties are counted once for the main farm use activity if they have multiple types of farm activity. Note that this is an inventory of farm acreage, not a count of farmers – many farms have multiple fields.

The acreage of the filtration facility is excluded.

Source: Calculations based on farmer/property owner interviews, review of Agricultural Property Tax Deferral Program participation, and Google Earth imagery.

Table 1 shows that farm use accounts for 637 acres in the Core Analysis Area which is 58 percent of the 1,099 total acres in this area. Within the farmland, nursery crop production predominates at 457 acres or 72 percent of the land in farm use. There are small acreage and large acreage nurseries operating in the Core Analysis Area. Three nurseries are headquartered here. Several of the larger nurseries routinely operate in multiple fields and drive farm equipment from site-to-site on public roads within the area.

After nurseries, the second most common type of farm use is grass grown for hay or pasture which is about 11 percent of the farm production acreage. There are 43 acres of grass where there was not enough evidence to determine whether it is farmed or is lawn area associated with residence or other non-farm uses.

In 2020, a non-profit organization made land available to immigrant farmers for food crop production. In addition, there is one other small vegetable crop farm and two small blueberry fields.

One property is identified as a horse boarding facility, with two acres devoted to that use. Another small property is known to have cattle. Other small acreage farms that have small numbers of livestock are included in the hay or pasture category in cases where the type of livestock is unknown. Several farm use properties in the area also raise chickens.

9.0 Surrounding Lands Area Conditions Affecting Agriculture

The land within the Core Analysis Area and the Surrounding Lands includes a range of successful agricultural operations. The next sections describe conditions and factors that affect agriculture in the Surrounding Lands

9.1 Nursery Dominance

The primary type of farming in the Surrounding Lands is horticulture (nursery plant production). The number of producers in this sector declined sharply in the 2008 recession coinciding with the steep

drop in housing development. The larger, professionally managed nurseries survived and are now thriving with recent economic growth in the U.S. The pandemic further increased demand for residential landscape beautification. Beyond market forces, there are other competitive advantages for area nurseries: ideal growing conditions that include favorable climate, existing supply of irrigation water, and suitable soils. Well established nurseries have specialized knowledge and have honed their practices to capitalize on these natural advantages.

Prosperity of the nursery sector over the last decade has led it to surpass alternative types of farming in the Surrounding Lands. While nursery production has been expanding, other types of farms, such as blueberry and other food crops, have contracted. These farms have become less profitable than similar farms in other areas of Oregon and beyond.

9.2 Competition from Residential Land Development

In spite of favorable markets for nursery products, nurseries report that they are challenged by the competition from home buyers who want to live in the semi-rural Surrounding Lands. This competition from residential development precedes the proposed siting and operation of the filtration facility or pipelines.

Demand for residential development is the major cause for rapid land price increases in the Surrounding Lands, and negatively impacts farming. Farmers report that properties with a house create a financial obstacle for farmers who want to purchase the property for farm use. The house and any residential outbuildings increase the total price of the property, but the added capital cost does not contribute to the potential profitability of the farm business. The MUA-20 zone allows a residence on twenty-acre parcels, so homes built on farmable land have reduced the farmland base. There is also the legacy of homes in the Surrounding Lands on parcels much smaller than 20 acres.

Water access for irrigation is an increasing obstacle to area farming. This is illustrated at the filtration facility site, which has no wells on site and requires nearby farms to supply well water site in order to produce the high-value nursery crops. Obtaining new water rights for a well is an uncertain and expensive endeavor. Without water from adjoining properties, the Water Bureau site could not produce high-value nursery crops. This same issue occurs on many properties in the Surrounding Lands. Securing smaller quantities of water from wells for new residences is much easier to acquire than obtaining water rights for new irrigation wells, further contributing to the forces pushing conversion of farmland to residential development in the Surrounding Lands.

These factors impacting agriculture in the Surrounding Lands have no relationship to siting the filtration facility or pipelines but do help define the character of the area.

9.3 Topography and Water Sources

The land west of the filtration facility extending to Gresham and to the south features a broad, rolling terrace. Open, non-farmland is often grass or tree covered, or in riparian zones. Tilled farmland is gentle to moderately sloped. The terrace elevation ranges from a high of about 750 feet

and declines toward the west and north from the ridge above the Sandy River Valley to a low point around 350 feet. Four main creeks flow through the terrace: Beaver, Johnson, Doane, and Dolan. These creeks flow toward the west and northwest.

The Sandy River Valley is located along the eastern edge of this large area. The valley drops steeply from the terrace above. The elevation in the valley floor, known as Lusted Flats, is 450 to 550 feet.

Most cropland is irrigated to achieve high yielding production. Groundwater wells supply all but a small fraction of irrigation water. Nurseries mainly irrigate by pumping from deep wells. Wells and surface water supply water to ponds which are artificial reservoirs to store water for crop irrigation.



Crops grown in the Surrounding Lands rely on irrigation from groundwater

Flat terrain or gentle slopes of eight percent or less are favored by farmers for growing crops. This reduces soil and water erosion and is beneficial for field operations. Area farmers are using the higher quality soils on lower sloped land in the terrace area and Lusted Flats.

Nearby land in Clackamas County is completely within the Sandy-Boring Groundwater Limited Area regulated by the Oregon Water Resources Department. It is difficult to secure new irrigation well permits because groundwater rights are only issued if it can be demonstrated the water is not hydraulically linked to a surface water source.[3]

[3] Personal communication with Oregon Department of Water Resources District 20 Watermaster on March 1, 2021.

9.4 Soils

Most area soils were formed by alluvial materials. The soils are mainly deep well-drained or moderately well-drained silt loams, loams, and silty clay loams.

Across this area there are many different soil series. Productive soils found in the area are classified as capability class II and class III by the Natural Resource Conservation Service. This soil is suited for tillage and annual or perennial crops. The limitation of heavier clay composition makes "pockets" of area soils unsuited for crop production. These less productive soils are dispersed but a larger concentration is found south of Bluff Road. Other farm field limitations to productivity are gullies, ravines, lack of irrigation access, and ground that is poorly drained soil in lowland sites.

9.5 Climate

The Surrounding Lands is part of the Sandy-Boring area for analyzing climate. This area has a maritime climate featuring warm, dry summers and cool, moist winter conditions. The growing season is influenced by micro-climates and elevation but is acceptable for a range of crops. Two to four times each winter the continental influence brings chilly interior air flows west through the Columbia Gorge and produces higher wind and freezing rain or snow. Rainfall is in the range of 45 to 60 inches. Most rainfall occurs from November to March. Summer heat and absence of rain requires that ornamental and food crops receive supplemental irrigation in June through August (or longer). Unseasonal rainfall at harvest time is a problem that has contributed to significant reduction in berry crops in recent decades.

Table 2. Sandy-Boring Area Climate

Climatic Element	Sandy - Boring	Metro Portland	U.S. Average
Annual Precipitation (inches)			
Rain	60	43	38
Snow	5	3	28
Rainy Days*	175	156	106
Sunny Days	141	144	205
Temperature			
Ave. July High	78	80	86
Ave. January Low	34	35	21

* Sandy-Boring is the rainiest zone in the Portland metro area and one of the rainiest in Oregon.

The marine climate of this area clearly favors the production of ornamental nursery crops. Oregon nurseries throughout the Willamette Valley have an advantage in comparison to the rest of the U.S. for their ability to rapidly grow high quality trees, shrubs, and container plants. More than 72 percent of the agricultural land in the Core Analysis Area of the filtration facility is devoted to horticulture (nursery crops).

10.0 Accepted Farm Practices in Core Analysis Areas and Surrounding Lands

This section identifies accepted farm practices for the diverse types of farming in the Surrounding Lands, including the Core Analysis Areas. The leading crops include bareroot and ball and burlap (B&B) trees, container nurseries, mixed greenhouse, grass seed, hay, pasture, livestock, and vegetable crops. "Accepted farm practice" means "a mode of operation that is common to farms of a similar nature, necessary for the operation of such farms to obtain a profit in money, and customarily utilized in conjunction with farm use" under ORS 215.203(2)(c), as interpreted by case law. "Farm use" has the meaning given to it in ORS 215.203(2), as interpreted by case law.

10.1 Nursery Related Accepted Farm Practices

There are four main types of nursery production in the Surrounding Lands: bareroot plant production, B&B production, container plant production, and mixed greenhouse plant production.

Commercial nurseries – the bulk of the site's neighboring farm uses in the Surrounding Lands – have year-round operations and keep employees busy throughout the year. The numbers of employees depend on the size and type of nursery. For the operations closest to the filtration facility, employment ranges from about five to forty employees. Every season throughout the year requires

both field-grown and container plant nurseries to manage tasks as plants progress from cuttings, grafting and young seedlings to transplanting, protecting from disease and insects, pruning, fertilizing, and other tasks before readiness for customer delivery. The least active time of year is October through mid-November. The sections below cover accepted farm practices in the Surrounding Lands and detail the on-going, crop-specific farm activities of nurseries and the relevant timing.

Most medium to large scale nurseries here farm separate fields that require moving employees and equipment over the roads. Employees are moved in buses and equipment is moved by driving trucks or tractors that pull equipment. When large equipment such as forklifts, disks, or diggers are moved, they are sometimes transported on trailers or flatbed trucks. Plants dug in the fields are moved to the headquarters for grading, sorting, and short-term storage before shipping. Semi-trailer trucks are loaded at the nursery headquarters to transport the loads to wholesale customers.

10.1.1 BAREROOT NURSERY PLANT PRODUCTION[4]

The following are accepted farm practices for nursery plant production using bareroot growing methods in open fields in the Surrounding Lands.

INITIAL PROPAGATION

Bareroot nurseries utilize one or more of the following plant propagation practices: 1) grafting and budding; 2) cuttings from stems and roots; 3) propagation from seeds; and 4) tissue culture (also called micropropagation).

Grafting and budding refer to joining parts from two plants, so they grow as one. It is a frequent practice to graft scion wood (the upper part of a plant) to the root stock of another plant. Budding can refer to either 1) removing the bud of one plant and attaching it to grow on another plant or 2) taking a plant cutting back to a point just above a bud which supports the new leader growth. These methods are labor intensive and require significant skill, so another option is to purchase the desired plant materials in lieu of doing propagation internally. Many types of nursery plants are grafted or budded, including deciduous and conifer trees, shrubs, and ground covers.

Most grafting is done in the winter and early spring months during plant dormancy. Grafting can be done on containerized plants, which is usually conducted indoors (called bench grafting) and then placed in protected areas such as greenhouses for overwintering. Under proper conditions some field grown stock is grafted or budded in place. Deciduous trees are commonly grafted as bare rootstock during the winter and gradually acclimated to outdoor conditions for spring planting.

[4] Sources are personal conversations with Shawn Nerison, Production Manager at Surface Nursery, May 11, 2020, and September 8, 2020, and Craig Spinks, owner of Craig Spinks Nursery on Sept 9, 2020; and A Manual for Field Production of Nursery Stock by Anthony V. LeBude, et.al, North Carolina State University, et al. (undated).

Alternatively, propagation from seeds works best for other plants. The seeds are started in the greenhouse and carefully transitioned to outdoor conditions with shade cloth coverings, and limited exposure to sunlight before planting in the fields.

Tissue culture refers to propagation by regeneration of small pieces of plant tissue. This is a high technology method of rapidly propagating a high volume of plants under sterile conditions. Procedures have been refined and expanded over time. There are typically four stages to this propagation method, starting with a parent specimen plant and proceeding to remove a growth tip that is then induced to create new growth. That new growth is then multiplied geometrically to produce more plant material until the plants are sufficiently developed to grow in greenhouse conditions. Plants progress through hardening for transplanting in the greenhouse or moved to outdoor planting. Nurseries can specialize in any or all stages of tissue culture propagation. It is common for most nurseries in the Surrounding Lands to purchase rooted tissue culture plants and further grow them in greenhouses before outdoor planting. Tissue culture production under laboratory and greenhouse protection can be done at any time of year and is timed to meet the production schedule of the farmers. For example, a nursery might order stage three tissue culture (miniature plants) for their greenhouse in November to move them through further growth and development for late spring planting the following year. Table 3 shows the accepted farm practices for bareroot nursery production in the Surrounding Lands.

Table 3. Accepted Farm Practices for Bareroot Nursery Plant Production

Typical Time Period	Accepted Farm Practices
Establishment (First Year)	
Fall or Summer	Soil fumigation following all product label instructions of open fields (if needed)
Fall or Spring	Lime or other soil amendments (if needed)
Winter – early Spring	Pre-emergence herbicide spray following all product label instructions
Spring/Summer	Sub-soil/plow/disk/rototill (any combination, as needed)
Summer	Herbicide spray following all product label instructions
Fall or Spring	Field planting
Post Establishment	
All year	Regularly scout fields for pests, weeds, and diseases and treat them as necessary following all product label instructions
All year	Maintain, construct, and repair farm infrastructure, including greenhouses, storage facilities, loading areas/docks, wells, irrigation ponds, water distribution systems, water collection structures, and other critical infrastructure
December – January	Dig (harvest) plants (trees and shrubs in ground 2-4 years; can be longer)
December – January	Sort and grade trees

Typical Time Period	Accepted Farm Practices
January – May	Hold plants in cold storage as needed before shipment
February – April	Load and ship
February to mid-March	Fertilize, dormant oil, and pre-emergent herbicide spraying following all product label instructions
February to April	Transplant, including to containers (if a hybrid container nursery)
February – November	Prune and limb, tie, and re-tie plants (depending on the age and specific plant requirements)
March – May	Disk in cereal grain cover crops between rows; fertilize; spring tree and shrub re-planting
February – November	Mechanical and/or "spot" spray weeds/pests/fungus control following all product label instructions
March – May	Stake trees if needed; transplant
June – September	Irrigate, fertilize as needed, and disk to hold soil moisture
August – September	Plow and disk in preparation for seeding fall cover crops; transplant; apply lime and other soil amendments, if needed
October	Remove stakes
October – November	Plant fall cover crops; plant fall trees and shrubs
November	Prune, tag trees and shrubs in field for harvest; clean and disinfect storage facilities

Some nurseries favor "resting" fields a full year between bareroot tree plantings. If following this accepted farm practice, nurseries commonly plant a cover crop after the previous nursery crop is harvested. The cover crop will be plowed or disked into the soil before the next tree planting. Soil amendments such as lime and other soil treatments will also be applied if needed.

An accepted farm practice is holding production in-field until it is harvested and prepared for shipment in the winter dormant period. Other nurseries have a hybrid business where they sell bareroot plants in the winter months but also move plants to containers before they are sold. In a hybrid operation, nurseries consolidate the containerized plants on gravel ground, for intensive management of irrigation, fertilization, and weed/insect/fungus control. These nurseries will also likely have an expanded shipping season compared to what is discussed above. Container nursery practices are covered in a later section on container plant production.

10.1.2 BALL AND BURLAP NURSERY PRODUCTION[5]

The following are accepted farm practices for nursery plant production using B&B growing methods in open fields in the Surrounding Lands.

[5] Sources are personal conversations with the following farmers: Pat Holt, owner of R&H Nursery, on June 19, 2020, and September 8, 2020; Anthony Kinen, owner of Kinen's Big and Phat Specialty Plants on August 11, 2020: and Eric Schmidt, owner of Don Schmidt Nursery on August 13, 2020; and A Manual for Field Production of Nursery Stock by Anthony V. LeBude, et.al, North Carolina State University, et al. (undated).

INITIAL PROPAGATION

B&B nurseries utilize the same plant propagation practices as bareroot nurseries: 1) grafting and budding; 2) cuttings from stems and roots; 3) propagation from seeds; and 4) tissue culture.

Grafting and budding refer to joining parts from two plants, so they grow as one. It is a frequent practice to graft scion wood (the upper part of a plant) to the root stock of another plant. Budding can refer to either removing the bud of one plant and attaching it to grow on another plant or cutting a plant back to a point just above a bud which then supports the new leader growth. These methods are labor intensive and require significant skill, so another option is to purchase the desired plant materials in lieu of doing propagation internally. Many types of nursery plants are grafted or budded, including deciduous and conifer trees, shrubs, and ground covers.

Most grafting is done in the winter and early spring months during plant dormancy. Grafting can be done on containerized plants, which is usually conducted indoors (called bench grafting) and then placed in protected areas such as greenhouses for overwintering. Under the proper conditions, field grown stock is grafted or budded in place. Deciduous trees are commonly grafted as bare rootstock during the winter and stored until spring planting.

Alternatively, for some plant species propagation from seeds works best. The seeds are started in the greenhouse and carefully transitioned to outdoor conditions, by placing the plants in unheated spaces or under shade cloth coverings and gradually extending their exposure to sunlight and outdoor temperature. At the appropriate time they are planting in fields.

Tissue culture refers to propagation by regeneration of small pieces of plant tissue. This is a high technology method of rapidly propagating plants under sterile conditions. Procedures have been refined and expanded over time. There are typically four stages to this propagation method, starting with a parent specimen plant and proceeding to excise a growth tip that is then induced to create new growth. That new growth is then multiplied geometrically to produce more plant material until the plants are sufficiently developed to grow in greenhouse conditions. Plants progress through hardening for transplanting in the greenhouse or moved to outdoor planting. Nurseries can specialize in any or all stages of tissue culture propagation. It is common for nurseries in the production area to purchase rooted tissue culture plants and further grow them in greenhouses before outdoor planting. Tissue culture production under laboratory and greenhouse protection can be done at any time of year and is timed to meet the production schedule of the commercial producers. For example, a nursery might order stage three tissue culture (miniature plants) for their greenhouse in November to move them through further growth and development for late spring planting the following year.

Table 4 shows the accepted farm practices for B&B nursery production in the Surrounding Lands.

Table 4. Accepted Farm Practices for B&B Nursery Plant Production in Field

Typical Time Period	Accepted Farm Practices
Establishment (First Year)	
Fall or Summer	Soil fumigation of open fields following all product label instructions if needed.
Fall or Spring	Lime or other soil amendments if needed.
Winter/early Spring	Pre-emergence herbicide spray following all product label instructions
Spring/Summer	Sub-soil/plow/disk/rototill (any combination, as needed).
Summer	Herbicide spray following all product label instructions.
Fall or Spring	Field planting (fall is preferred).
Post Establishment Production	
All year	Regularly scout fields for pests, weeds, and diseases; and treat as necessary following all product label instructions.
All year	Maintain, construct, and repair farm infrastructure, including greenhouses, storage facilities, loading areas/docks, wells, irrigation ponds, water distribution systems, water collection structures, and other critical infrastructure.
January – July	Mechanical and/or hand dig (harvest) plants (trees and shrubs in ground five to ten years; can be longer).
February – July	Sort, grade trees, load, and ship.
February to April	Transplant in field or in containers (if a hybrid nursery).
February – May	Stake and tie trees, transplant in field or to containers.
February – November	Prune and limb; re-tie plants as needed.
February – March	Fertilize, dormant oil and pre-emergent herbicide spray following all product label instructions.
February – November	Mechanical and/or "spot" spray weeds/insect pests/fungus control following all product label instructions.
March – May	Disk in cover crops for planting preparation; option of spring tree and shrub planting.
June – September	Irrigate (an accepted alternative for some bareroot nurseries is only partially irrigation), fertilize as needed; may disk to hold soil moisture
August – September	Plow and disk in preparation for seeding fall cover crops; transplant; apply lime and other soil amendments, if needed.
October – November	Remove stakes, fertilize as needed.
October – November	Plant fall cover crops; plant fall trees and shrubs.
November – January	Tag trees and shrubs in the field for harvest.
Year-round	Scout for pests and diseases in the growing areas.

B&B nurseries hold production in-field until it is harvested and prepared for shipment. The preferred harvest and shipping period is winter to early summer. Other nurseries have a hybrid business where they sell bareroot plants in the winter to summer months but also move plants to containers before they are sold. If a nursery has a hybrid operation, they will normally place

container plants on gravel yards, for more intensive management of irrigation, fertilization and weed/insect and fungus control. These nurseries will also likely have an expanded shipping season compared to the discussion above. In that case, those practices and their timing are covered in the later section on container plant production.

10.1.3 CONTAINER NURSERY PRODUCTION[6]

All Oregon perennial nursery plants can be grown in a container. This includes coniferous and broadleaf evergreen trees and shrubs; deciduous shade trees and shrubs; fruit bearing trees, shrubs, and vines; and ground covers. These nurseries upsize the containers as the plants grow until they are at the desired size for target markets.

Container nurseries usually start plants in greenhouses. Accepted farm practices for greenhouse propagation of perennial plants are described below. Accepted farm practices for greenhouse grown annuals such as seasonal annuals or hanging baskets grown in greenhouses are covered elsewhere in this report.

The outdoor growing areas of container yards often have a gravel layer over the ground. For nurseries that use overhead sprinklers for irrigation the gravel bed is often lined with a subsurface catchment system to return excess irrigation water for irrigation recycling. Gravel beds also keep the containers cleaner and allow workers and vehicles to move through the nursery without collecting mud from exposed soil.

INITIAL PROPAGATION

Like propagation in bareroot nurseries, container plants can be started by 1) grafting and budding; 2) cuttings from stems and roots; and 3) propagation from seeds; and 4) tissue culture. The most common method container nurseries utilize is taking cuttings from parent plants in the nursery.

Selecting healthy, pest-free mother plants is a key starting point. The optimum part of the mother plant for obtaining cuttings varies among plant species. Container nurseries take the cuttings in early fall. Cuttings are brought to the greenhouses and placed in flats with special growing media for rooting for the fall and winter. During the greenhouse phase, the young plants are watered and carefully monitored for disease and pest control, with adequate treatment as needed. In January and February, the young, rooted plants are ready for transplanting to liner pots. Further re-potting and transfer to outdoors varies with plant species, weather, and the availability of nursery labor since springtime is the busy shipping season for market-size plants. As the weather warms and plant hardiness increases during April, May, and June, plants are gradually moved from the greenhouses to hoop or shade houses and finally to the outdoor container yards.

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[6] Sources are personal conversations with Michael Reardon, owner, Reardon Nursery, on October 1, 2020, and Jim Ekstrom on September 24, 2021; Basic Principles of Nursery Crop Propagation, in Nursery Magazine, September 18, 2017, downloaded October 3, 2020, from www.nurserymag.com/article/grow-tech-basic-principles-nursery-crop-propagation/ and Best Management Practices: Guide for Producing Nursery Crops, Third Edition – 2013, downloaded October 22, 2020, from contents.sna.org/bmpgeneral.html.

Cuttings from mother plants can be supplemented with propagation from any of the other methods described above. For example, a container nursery may choose to purchase starter plants in liners from a specialty nursery or from a micro propagator for any new plant variety they might want to sell. In this case they may also be required to pay royalty rights for proprietary plants.

Table 5 describes accepted farm practices in the Surrounding Lands for open field container plant management, starting in the winter months.

Table 5. Accepted Farm Practices for Open Ground Container Nursery Plant Production

Typical Time Period	Farm Practices
All year	Regularly scout fields for pests, weeds, and diseases; and treat as necessary following all product label instructions.
All year	Maintain, construct, and repair farm infrastructure, including greenhouses, storage facilities, docks, wells, irrigation ponds, water distribution systems, gravel beds, water collection structures, and other critical infrastructure.
January – February	Prune in dormant period.
Mid-February – May	Major spring shipping season: Container plants are selected from fields and taken to the main shipping location. Plants may be pre-sorted at the field or sorted for customer orders at the shipping point. Trucks are loaded for delivery to customers.
Mid May - June	Early re-potting season: initial re-potting to upsize for plant growth. Herbicides are applied with potting substrate.
February – early March & May – August	Apply preemergence herbicides as needed, following all product label instructions.
May – Mid September	Irrigation season: by overhead sprinklers; or micro-irrigation application from a micro-emitter by drip or sprinkler at an individual container). Liquid fertilizer is commonly applied with irrigation water. Follow all fertilizer label instructions.
February - December	Pest & disease control is a constant threat and container nurseries have a wide range of pesticides and fungicides that are applied as needed. Follow all product label instructions.
June – August	Main period for re-potting during rapid plant growth periods. Herbicides are applied with potting substrates, following all product label instructions.
August - October	Light pruning and shaping.
September – early November	Fall shipping season: select and move plants from fields to main shipping location.
October – December	Sanitize and other prepare greenhouses for plant starts.

Note that while the above table shows two main marketing periods, container plants are also sold in the summer months. It is also common for nurseries that feature container plants to also grow

B&B trees in open fields. The practices for this aspect of plant production are described earlier in this report.

10.1.4 MIXED GREENHOUSE PRODUCTION[7]

This section describes the small-scale greenhouse farmers in the Surrounding Lands that produce annual ornamental bedding plants, vegetable starts, herbs, hanging flower baskets, and greenhouse-grown vegetable bedding plants. Mixed greenhouse production practices also include the cultivation of perennial ornamental bedding plants and vegetable starts and herbs.

Smaller-scale mixed greenhouse production farmers usually have two to four free standing or attached greenhouses. This segment of nurseries sells in niche, local markets, such as directly from the farm, at farmers markets or direct to local, specialty retailers. The following are popular greenhouse plants grown in the Surrounding Lands:

- Ornamental bedding plants: Annual and perennials – petunia, million bells, geraniums, marigold, verbena, zinnia, pansy, impatiens, lobelia, salvia, coleus.
- Vegetable start bedding plants: pepper, tomato, broccoli, lettuce, cabbage, cucumber, squash, peas, corn, and more.
- Hanging basket plants: petunia, ivy geranium, calibrachoa, alyssum, lobelia, verbena, and fuchsia.

Ornamental bedding plants are generally started in greenhouses in January or early February and timed to reach the peak marketing season that runs from approximately May 1 to June 15. Vegetable starter plants have a similar production cycle, with the peak marketing season of March 15 to the end of May. Plants grown for hanging baskets are targeted for the peak market season of late April to about June 15.

Growing vibrant, healthy plants presents challenges and requires close attention to the environment maintained in the greenhouse. Careful management also means diagnosing and responding quickly to disease or pest issues that frequently arise.

GREENHOUSE STRUCTURES

The types of greenhouse structures which include permanently placed use a variety of fabrics, polycarbonate panels, and film covers. Also, temporary "hoop houses" that are erected for specific,

[7] Sources are personal conversations with Barry Bushue on October 9, 2020 and Shawn Nerison on November 16, 2020; "Vegetable Bedding Plant Production and Pest Management" at the website of The Center for Agriculture, Food and the Environment at the University of Massachusetts Amherst, as of November 11, 2020 at ag.umass.edu/greenhouse-floriculture/fact-sheets/vegetable-bedding-plant-production-pest-management; "Managing Bedding Plants," by Aaron Palmateer in Greenhouse Product News, April 2018 downloaded at gpnmag.com/article/managing-bedding-plants/ November 10, 2020; and The Hortitech website, at www.greenhouseht.com/greenhouse-heaters as of November 10, 2020.

short-season usage. Due to the cost of structures and the need for internal components such as heat sources, fans, and benches, more permanent structures are favored in the Surrounding Lands.

PROPAGATION

Depending on the plant type and variety, desired final plant size, greenhouse configuration, and other factors, plants in mixed greenhouse production can be started from seed, cuttings, or tissue culture. Annual vegetable plants are commonly started in greenhouses from seed. Bedding plants and flowers may be started from seed, plant cuttings,[8] plugs,[9] and liners.[10] The cost of purchasing plugs and liners for bedding plants and flowers is more economical for farmers than propagating from seeds, especially for farmers with limited greenhouse space.

Seed germination and early growth of seedlings in plugs requires more exacting environmental control than needed for older greenhouse plants. The germination area must provide a high degree of control over temperature, light, and humidity and this can vary among plant varieties. Farmers can maintain different "zones" within a greenhouse or have a designated greenhouse for this purpose.

VENTILATION

Ventilation may include automatic systems or manual operation. If the greenhouse is sealed in order to maintain the desired temperature, exhaust fans must operate at the appropriate cubic feet per minute. This allows for operation without harmful temperature and humidity spikes. Shutters work in concert with exhaust fans to properly evacuate air. Circulatory fans are also needed to ensure constant air flow for air health and disease resistance. These fans promote the proper rate of plant transpiration and aid in photosynthesis. A final method of ventilation on structures is roll up sides. Thermostatic controls are usually relied on as an integral part of the greenhouse ventilation system.

HEATING

Heating is required for bringing bedding plants and vegetable starts to market at the appropriate time. Commercial greenhouses most often use propane gas because of its accessibility and as it burns it releases carbon dioxide, a source of plant food. Another common option for small greenhouses is electric heaters. Greenhouse managers must weigh the cost of heat with the effect cooler temperatures have on growing conditions and market timing. Managers also evaluate ways they can take advantage of favorable spring temperatures to reduce their need for greenhouse heating while still meeting their target dates for plant marketing.

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[8] A plant cutting is a portion of a plant that is used in horticulture for vegetative propagation. A piece of the stem or root from the source plant is placed in a suitable growing medium to produce a new, complete plant.

[9] Plugs are small plants, usually produced from seeds in lesser amounts of growing medium.

[10] "Liner" is a broadly defined term within the nursery industry. Here liners are defined as young plants in soil medium using cuttings or tissue culture.

PLANT SCHEDULING

Accurate scheduling is critical to plan for greenhouse plants to reach marketable size at the right time of year. Prime marketing windows are as short as four to six weeks for bedding plants and vegetable starts but are wider for hanging baskets. Delivering products outside of prime time can negatively affect sales and profitability. Factors that influence finish timing of bedding plants, vegetable starts and hanging baskets include the maturity of plugs and liners, growing conditions for seeds, plugs and liners, average day-time temperature, photoperiod, use of plant growth regulators and finished container sizes.

GROWING MEDIUM, TRANSPLANTING, AND GROWTH RETARDANTS

The growing medium is critical to assure adequate water holding capacity, proper aeration, and drainage, and to support the plant. Soilless mixes are most often used, and quality plants can be grown in a wide variety of media combinations. The typical medium for plug flats commonly includes finer grades of peat, vermiculite, and perlite. During the growing period, the pH may need to be adjusted with dolomitic limestone, superphosphate, and micronutrients in limited amounts. Any purchased medium should come from a reliable source to minimize insect or disease problems.

As the types of plants progress in size and are transplanted to larger containers, the mixes may be composed of sphagnum peat moss, perlite, vermiculite, composted bark, compost, and coconut coir. At the time of transplanting, the media should fill the cells of the market packs but not over the rim. Immediately after transplanting, the plants should be watered thoroughly. A standard preventative measure is the addition of a fungicide drench to reduce damping-off diseases.

Bedding plants, including vegetable plants, may begin to stretch and develop long, thin, spindly stems a few weeks after transplanting. To keep them shorter, sturdier, and greener farmers may apply a growth retardant. Several growth retardants are approved for use for bedding plants with fewer approved for vegetables. For vegetable starts, a limited but sufficient supply of water can be used to retard growth. Stem growth can also be controlled by adjusting temperature and fertilizer levels. Fertilizer application follows label instructions. Another control is physically brushing the plants which adds stem rigidity.

WATER QUALITY AND IRRIGATION

The water for irrigation should be tested annually for pH, alkalinity, and electrical conductivity. Proper pH determines the availability of almost all essential plant nutrients. Water needs proper alkalinity to support plant nutrition. Water with a high concentration of dissolved salts can cause plant damage.

Misting or fogging young plant cuttings and some plugs is a frequent practice to minimize transpiration. Overhead or hand watering can be used. The goal is to apply enough water to keep the growing medium wet, but not saturated. Some bedding and vegetable plants are sensitive to excess misting.

As plants develop, watering practices extend to more irrigation methods. Thorough watering in each application, to ensure all of the medium is moist, is a standard practice. Also, watering is timed before moisture stress occurs. These practices help to achieve healthy root development.

A range of irrigation systems can be utilized in greenhouses. Overhead systems typically include misters and other sprinklers, including hand watering methods. At later stages plants can be irrigated by other methods such as individual container emitters and applying water through subirrigation at the bottom of the container.

To aid in applying the right amount of water at the right time, plants should be grouped by species, age, container size, and growth rate as all of these factors determine moisture requirements.

FERTILIZATION

Bedding plants should be provided with essential nutrients and minerals from either the liquid fertilization program or incorporation at the time the medium is mixed. Most farmers use a combination of both types of application. Water-soluble fertilizers come in a wide range of formulations. It is accepted practice to follow all label instructions.

A week after germination, seedlings require a small amount of nutrients, mainly nitrogen (N), phosphorus (P), and potassium (K) (one fourth to half the amount needed during the active growth and flowering / fruiting phase). It is the accepted practice to follow recommended rates of fertilizer to seedlings or plants. Over-fertilizing promotes poor shape or excessive vegetative growth, reduction of fruit production, greater insect problems and build-up of fertilizer salts which can burn roots and kill seedlings. It is accepted practice to follow all label instructions.

There is no ideal fertilizer or nutrient solution suitable for all plants. Plant nutrient needs depend on the type of crop, stage of plant development, season of the year and environmental conditions. For example, leafy vegetables and herbs have different fertilizer and calcium requirements than fruiting plants such as tomatoes.

Laboratory testing of tissue samples to adjust the fertility program provides guidance. Any changes to the nutrient content are usually applied gradually.

INSECT AND DISEASE CONTROL

Regular monitoring for early detection of pests and disease is essential in greenhouses. Scouting guidelines for timely detection which vary by plant species is recommended. Plants or cultivars[11] that have known persistent problems should be given particular attention.

Integrated pest management[12] (IPM) is a practical way to manage both pests and diseases. One of the IPM tools for pest controls in greenhouses includes biological methods using parasites,

[11] Cultivars are a plant variety that has been produced in cultivation by selective breeding. Cultivars are a sub-grouping within a species, whereas a hybrid results from the cross pollination of two cultivars.

[12] IPM programs use a series of management evaluations, decisions, and controls to indicate when and how environmentally sensitive economic and least hazardous actions need to be taken.

predators, or pathogens which are natural enemies to pest populations. Effectiveness of biological controls are usually evaluated in a limited area of the greenhouse before full scale use.

Insecticides are heavily relied upon for a comprehensive pest control program. A large number of products are available to address the substantial number of different pests that can be harbored in greenhouses. Crops are labeled for insecticide use and all label restrictions must be carefully followed. A limited number of insecticides are approved for greenhouse-grown vegetable (food) bedding plants compared to ornamental (non-food) bedding plants.

Similarly, disease management is a major task. Here, too, vegetable starts have fewer chemical treatments available relative to ornamental plants.

Diseases of greenhouse plants include Botrytis blight, damping-off, Alternaria blight, late blight, powdery mildew, downy mildew, bacterial diseases such as bacterial leaf spot, bacterial canker, and black rot, and viral diseases such as Cucumber Mosaic Virus (CMV) and Tobacco Mosaic Virus (TMV). Control starts with proper identification and appropriate control. Improper cultural practices may be incorrectly diagnosed as disease symptoms. Nutrient deficiency, or high soluble salts will not be corrected by a fungicide application. A fully integrated approach to disease management involves the use of resistant cultivars, sanitation, sound cultural practices, and the proper use of the correct chemical when needed.

ACCLIMATING OR HARDENING-OFF TRANSPLANTS

Before plants are sold, a transition to the outdoors is needed. Greenhouse plants benefit from a gradual "hardening" process. This is accomplished by exposure to outdoor growing conditions and reduced watering at the end of the indoor growing period with protection from wind and temperature. This is often accomplished with shade houses which can be regulated or the amount of direct sun on the plants. The process ends with full exposure to light. This process is accomplished in a few days, but some plants require more gradual hardening.

SANITATION AND MAINTENANCE IN THE GREENHOUSE

Preventive cleaning establishes the baseline for successful biocontrol of pathogens and disease. It is recommended that greenhouse sanitization be performed after each crop cycle. Sanitizing should occur immediately after a crop cycle ends so weeds, pests, and diseases are not allowed to multiply in the interim before a new crop begins.

Decluttering and removal of essential products used in the greenhouse is helpful to ensure thorough cleaning can be achieved. For example, plastics need to be removed and disposed of or thoroughly cleaned for re-use.

Weeds are manually pulled or dug before they reproduce, followed by application of approved pre and post emergent herbicides. The structure, surfaces and tools are disinfected. Care is needed to use cleaning products whose residues will not burn plants. All regulated chemicals are required to be applied at label rates with recommended application methods. Walls, benches, and floors are

washed with special emphasis on problem areas such as watering systems where algae and moss accumulate.

Regular system maintenance is an important practice and needs to be conducted as needed with added emphasis in the "off-season." This includes inspecting and repairing all leaks and replacing worn, outdated, or inefficient irrigation system components and equipment. It also includes flushing and unclogging lines, emitters, and sprinkler heads and regularly cleaning filters.

10.2 Grass Seed Accepted Farm Practices

Tall fescue is grown in the Surrounding Lands for seed production. It is grown for three or more years as a rotation crop between ornamental nursery crops. Tall fescue is an income-producing crop that improves and restores soil quality due to its deep-rooting and straw-producing characteristics. These soil benefits are important to support high revenue generating nursery crops. Tall Fescue is grown for several years and is harvested for seed.

10.2.1 TALL FESCUE GRASS SEED PRODUCTION[13]

Tall fescue is a deep-rooted, perennial, cool-season bunchgrass. Most Pacific Northwest tall fescue is produced in western Oregon where it is harvested for seed. Most seed varieties are used for turf production, but tall fescue seed is also used for animal forage production. As a perennial, tall fescue is normally grown for several years before converting to another crop.

Grass seed production relies on large field equipment that "moves fast" over fields to till, seed, fertilize, spray, and harvest the seed crop. Little labor is required in comparison to nursery crops and food crops.

Farmers favor growing certified tall fescue seed. Seed certification standards cover genetic purity, germination rates, inert matter content, and weed-free condition. Some farmers contract to sell their seed crop for up to five years.

PROPAGATION PRACTICES

New seedings of tall fescue can be established in spring or fall. If it follows the harvest of nursery crops, tall fescue is mainly planted in the fall. In the Surrounding Lands, tall fescue is typically a two to four-year crop with little harvestable seed in the first year of seed production.

Tall fescue can be grown with or without irrigation. However, tall fescue is sensitive to drought stress during the flowering and seed development. Strategic irrigation timing can increase yield even in years when soil moisture is not particularly low. Because most ornamental nurseries have

[13] Sources are personal conversation with Nicole Anderson, Oregon State University, Field Crops Extension Agent, on August 2, 2021; Tall Fescue Grown for Seed: A Nutrient Management Guide for Western Oregon by Nicole P. Anderson, Thomas G. Chastain, et.al, Oregon State University Extension, EM9099, September 2014; Pacific Northwest Pest Management Handbooks Searched July 31 and August 2, 2021, for tall fescue in categories of weed, insect, and plant disease.

irrigation systems, this crop is primarily irrigated in the Surrounding Lands. Irrigation also helps reduce soil crusting.

Table 6 shows the accepted farm practices for tall fescue seed production in the Surrounding Lands. Grass seed is produced as a non-organic crop. Note that timing of practices may change depending on seasonal conditions.

Table 6. Accepted Farm Practices for Conventional Tall Fescue Seed Production [14]

Typical Time Period	Accepted Farm Practices
Late Summer/early Fall Year 1	Pre-planting land preparation: sub-soil, plow, roto-till, etc.
Early Fall Year 1 and annually in the Spring thereafter	Soil test for nutrient requirements and pH.
Summer – Fall Year 1	Apply lime to adjust pH as needed.
Summer – Fall Year 1	Apply pre- and post-emergent herbicides as needed following all product label instructions.
Fall – Year 1	Plant treated seed using a planting drill: may include carbon banding sprayed over the seed row. Follow all label instructions for banding.
Fall – Year 1	Apply pre-emergent herbicides after planting as needed following all product label instructions.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Treat above ground or underground for voles and other rodents as needed following all product label instructions.
Year round	Spray insect pests as needed following all product label instructions.
Fall – Year 1 and annually thereafter in May to October	Place equipment and irrigate field as needed (growers may elect to not irrigate or partially irrigate).
Early Spring Year 2 and annually thereafter	Apply pre-emergent herbicides as needed following all product label instructions.
Early Spring to summer Year 2 and thereafter	Apply nitrogen, phosphorus, potassium, and other nutrients such as sulfur, calcium, and magnesium at required rates.
Spring to early Summer Year 2 and thereafter	Apply plant growth regulators as needed following all product label instructions.
July Year 2 and thereafter	Swath (windrow) and field dry seed, followed by harvesting seed using a combine.
Post-harvest	Bale straw and remove or finely chop (flail) and disk into soil.

[14] Tall fescue is usually planted in the fall months in the Surrounding Lands and this planting schedule is followed in the table.

Typical Time Period	Accepted Farm Practices
Post-harvest	Haul bulk seed to a seed cleaning facility to remove soil, weeds, and small pieces of straw.
Post-harvest	Bag, inspect/test, and certify seed for sale. Farmers may contract with buyers of their seed crops.
Summer to Fall Year 2 and thereafter	Apply post emergent herbicides as needed following all product label instructions.
Early Spring to Fall in Year 2 and thereafter	Apply fungicides to control rust and other diseases as needed following all product label instructions.
Fall Year 2 and thereafter	Apply nitrogen and potassium fertilizer as needed and follow all label instructions.
Fall Year 2 and thereafter	Apply lime as needed.

10.3 Grass for Hay and Pasture Accepted Farm Practices

A small number of farmers grow grass hay crops in the Surrounding Lands. Grass hay crops are either sold to other livestock producers or kept for winter feed on diversified farms with livestock. Producing hay also helps to control weeds and build organic matter in soil. Farmers have the option to bale hay in the late spring and graze livestock during late summer and fall months. In this case, accepted farm practices are a combination of both hay crop and pasture management practices.

10.3.1 GRASS HAY PRODUCTION[15]

This section covers grass hay and is followed by a separate set of accepted practices for pasture grass production. Most pasture practices are similar to accepted farm practices for grass hay production since grass is the main crop in both cases.

Grass hay production is also a low intensity farm use with the main activity occurring in April to July. Most activities except harvest are conducted with little labor by use of farm equipment. Grass is managed to prevent weed growth with spray equipment. Yields are boosted with fertilizer, but irrigation water is rarely applied. Harvest is once or twice in summer by mowing, raking, and baling. Picking up hay bales in the field and stacking them in barns or outdoors is the most labor-intensive activity. Little travel is required except for occasional equipment moves from the field to the farm headquarters.

The land use pattern in the Surrounding Lands includes a few small acreage owners who are the most likely to grow grass for hay. Small acreage grass hay production practices are typically less

[15] Sources are personal conversation with Shelby Filley, Oregon State University, Livestock and Forage Specialist, on August 11, 2021; Haymaking on the Westside by Steven C. Fransen and Michael R. Hackett, Washington State University Extension Service, 2001; Nutrient Management for Pastures: Western Oregon and Western Washington by A. Moore, G. Pirelli, S. Filley, S. Fransen, D. Sullivan, M. Fery, and T. Thomson, Oregon State University Extension Service, EM9224, January 2019; Pasture and Hayland Renovation for Western Washington and Oregon by Steven C. Fransen and Marty Chaney, Washington State University, EM1870, 2002.

intensively managed than hay produced on large, specialty crop farms. No fields of alfalfa were found in the Surrounding Lands, a crop that is produced elsewhere in western Oregon as an alternative feed source to grass hay production.

A range of grass species are planted for hay production. Often legumes are included in the seed mix. The typical grasses are orchard grass, tall fescue, ryegrass, and timothy. Timothy is considered particularly well suited as roughage for horses. Legumes that may be seeded in a mix for hay include red or white clover, alsike clover, and alfalfa.

If rain occurs when hay is in the field after being cut and baled, the quality of the hay crop can dramatically decrease. Monitoring internal crop moisture content, as well as watching weather and adjusting harvest timing are critical in years with harvest time rain. Also prolonged drying of hay before baling can diminish certain plant vitamins and pigments. Two cuttings are typical, but there is potential for up to three cuttings of hay per season. Prolonged delays in removing hay from fields, especially the first cutting, can seriously reduce total crop yield for the year.

Hay baling equipment is highly specialized and costly to purchase and maintain or repair. Some smaller acreage farms rely on hiring third parties – typically other local farmers – who offer custom cutting and baling services.

PRODUCTION PRACTICES

Hay fields can be planted in either spring or fall. Early fall planting is often preferred so seeds can germinate after fall rain and then mature sufficiently to withstand winter weather. Grass hay can be produced either "dryland" or irrigated, but most is grown without irrigation and with low intensive management. With more intensive management, which may mean irrigation, more chemical controls are needed for weeds and pests, along with fertilization. Higher yields can be attained, and this allows for hay cuttings and partial season livestock grazing.

Daylight length, air temperature, soil temperature, water, and nutrients are all critical to grass growth. Most new dry matter grass growth occurs in the late spring to early summer with a secondary growth period in the fall months. Like pasture management, hay production requires that both plant biology and environmental factors are considered.

Table 7 shows the accepted farm practices for grass hay in the Surrounding Lands. Most hay fields are managed using non-organic production practices. Note that the timing of accepted practices may change depending on seasonal conditions. Also note that these practices start with a complete reseeding. In some cases, a hay field can also be renovated by overseeding to improve the quality of the grass or grass-legume hay crop.

Table 7. Accepted Farm Practices for Conventionally Grown Grass Hay[16]

Typical Time Period	Accepted Farm Practices
Late Summer/early Fall Year 1	Pre-planting land preparation (sub-soil, plow, roto-till as need to prepare the seed bed).
Early Fall Year 1 and annually in the Spring thereafter	Soil test for nutrient requirements and pH.
Summer – Fall Year 1	Apply lime to adjust pH if needed.
Summer – Fall Year 1	Apply pre- and post-emergent herbicides as needed following all product label instructions.
Fall – Year 1	Plant clean, high germination rated grass and mixed with legume seed at recommended seeding rates using either no-till methods or a planting drill.
Fall – Year 1	After planting, apply herbicides if needed following all product label instructions.
Fall – Year 1	Apply fertilizer at rates indicated by nutrient soil test and following all label instructions.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Treat above ground or underground for voles and other rodents as needed following all product label instructions.
Spring to Fall	Spray for insect pest control as needed following all product label instructions.
Fall – Year 1 & annually thereafter in May to October	If irrigation water is applied, place equipment and irrigate field as needed (often grass hay crops are grown without irrigation or with only minimal supplemental irrigation).
Winter Year 1 to early Spring Year 2 and annually thereafter	Secure a custom third party to cut and bale hay crop if needed or repair and/or maintain swather, tedder, baler, and hay loading equipment for upcoming harvest season.
Early Spring to Summer year 2 and thereafter	Apply nitrogen, phosphorus, potassium, and other nutrients such as sulfur, calcium, and magnesium at required rates.
Spring to Summer Year 2 and annually thereafter	Monitor forage and soil conditions. Cut, bale, and remove hay crop. Consider tedding grass (fluffing and repositioning) for drying before baling. Repeat harvest process for a second and often a third cutting if forage growth is sufficient.
Summer Year 2 until crop is used or sold and annually thereafter	Monitor for proper moisture level of baled hay as it is placed in storage, preferably under roof coverage. If stored outside, keep hay off of the ground with suitable barrier and cover with plastic or tarps.
Summer to Fall Year 2 and thereafter	Apply herbicides as needed following all product label instructions.
Fall Year 2 and thereafter	Apply nitrogen and other fertilizer as needed and follow all label instructions.
Spring or Fall Year 3 and periodically thereafter	Apply lime as needed. Consider overseeding field to renovate and increase forage yield.

[16] Most hay fields in the Surrounding Lands are planted in the fall months and this planting schedule is followed in the table.

10.3.2 PASTURE FOR LIVESTOCK GRAZING[17]

Pastures for livestock grazing include a wide range of perennial grass and legume species. However, grasses dominate pastures in the Surrounding Lands. The preferred grass species for grazing are perennial ryegrass, tall fescue, and orchard grass. Clovers and alfalfa are common legumes that may be mixed with grass.

Pastures are a key to raising healthy livestock while providing a cost-effective feed source. Pastures are relied upon to provide ample roughage to the animals.

Pasture is managed much like hay except livestock grazing substitutes for baling and removing hay bales. Livestock require daily care or supervision throughout the year. However, livestock production in the Surrounding Lands is a small-scale, part-time activity handled by families who usually live on site or close by. There is minor use of roads to manage pasture and livestock production.

Horses, sheep, and cattle are the most common livestock that graze pasture in the Surrounding Lands. Chickens can be raised as "free-range" by also being in fenced fields near roosting areas.

Pasture can be planted in either spring or fall. Late spring planting is possible if irrigation is available. Early fall planting is often preferred, especially if irrigation is not used. Fall planting increases seed germination after rain and allows for sufficient growth to withstand winter weather.

Once the pasture is established and grazing commences, care must be taken to avoid overuse which diminishes the field's productive capacity. Animal forage requirements, measured in pounds of dry matter per animal per month, vary widely. For example, a goat consumes 200 pounds of dry matter per month while a horse requires 1,000 pounds. Rotational grazing is a fundamental requirement in order for pasture to recover and continue to produce forage. Proper grazing is aided by a fencing system that controls livestock movement.

Daylight length, air temperature, soil temperature, water, and nutrients are all critical to forage growth. Most new dry matter grass growth occurs in the later spring to early summer with a secondary growth period in the fall months. Pasture management requires that plant biology and environmental factors are both considered.

[17] Sources are personal conversation with Shelby Filley, Oregon State University, Livestock and Forage Specialist, on August 11, 2021; The Western Oregon and Washington Pasture Calendar by Steven Fransen, Gene Pirelli, et.al., A Pacific Northwest Extension Publication, PWN 699, 2017; Pasture and Grazing Management in the Northwest edited by Glenn E. Shewmaker and Mylen G. Bohle, A Pacific Northwest Extension Publication, PWN 614, 2010; and Coastal Pastures in Oregon and Washington by Fred Lundin, Oregon State University Extension, September 1996, downloaded from extension.oregonstate.edu/crop-production/pastures-forages/coastal-pastures-oregon-washington.

Pasture management entails these principles: 1) protect roots and soil from damage by compaction; 2) maintain prescribed level of plant material height throughout the year to avoid depletion of stems and leaves; 3) supply nutrients according to plant needs; 4) provide adequate plant rest between seasonal grazing periods; 5) establish a "sacrifice area" where livestock are maintained and fed apart from the grazing area; and 6) carefully consider where livestock drinking water will be supplied when fields are segregated for rotation.

Pastures may be "dryland" or irrigated. Most pastures in the Surrounding Lands are dryland with low intensive management. High yield fields may be partially grazed and also cut for hay. Many of the production practices for grass pasture are common also for fields devoted to grass hay production.

Table 8 shows the main accepted farm practices for pastures in the Surrounding Lands. Most pastures are managed using non-organic production practices. Note that timing of practices may vary depending on seasonal conditions. Also note that these accepted practices start with complete reseeding. In some cases, pasture can also be renovated by overseeding to improve the quality of the grass or grass-legume for livestock grazing.

Table 8. Accepted Farm Practices for Pastures[18]

Typical Time Period	Accepted Farm Practices
Late Summer/early Fall Year 1	Pre-planting land preparation - sub-soil, plow, roto-till, etc.
Early Fall Year 1 & annually in the Spring thereafter	Soil test for nutrient requirements and pH.
Summer – Fall Year 1	Apply lime to adjust pH if needed.
Summer – Fall Year 1	Apply pre- and post-emergent herbicides as needed following all product label instructions.
Fall – Year 1	Plant clean, high germination rated grass seed with legume seed if desired at recommended seeding rates using either no-till methods or a planting drill.
Fall – Year 1	After planting, apply herbicides as needed following all product label instructions.
Fall – Year 1	Apply fertilizer at rates indicated by nutrient soil test and following all label instructions.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Install and/or maintain fences. Fence separate grazing areas to rotate livestock for optimal forage production.
Year round	Treat above ground or underground for voles and other rodents as needed following all product label instructions.

[18] Most pastures in the Surrounding Lands are planted in the fall months and this planting schedule is followed in the table.

Typical Time Period	Accepted Farm Practices
Fall – Year 1 & annually thereafter in May to October	If irrigation water is applied, place equipment and irrigate field as needed (pasture grass may be grown without irrigation or with minimal supplemental irrigation).
Early Spring Year 2 Annually thereafter	Apply pre-emergent herbicides as needed following all product label instructions.
Early Spring to Summer Year 2 and thereafter	Apply nitrogen, phosphorus, potassium, and other nutrients such as sulfur, calcium, and magnesium at required rates.
Late Spring Year 2 and year-round thereafter	Monitor forage and soil conditions and move/remove livestock as needed to maintain plant vigor for optimum forage production. Move animals when soil is saturated with water or during extended drought conditions if irrigation is not applied.
Spring to Fall Year 2 and annual thereafter	Spray for insect pest control as needed following all product label instructions.
Summer to Fall Year 2 and thereafter	Apply herbicides as needed following all product label instructions.
Fall Year 2 and thereafter	Apply nitrogen and other fertilizer as needed and follow all label instructions.
Spring or Fall Year 3 and thereafter	Apply lime as needed. Overseed fields to renovate and increase forage yield.

10.4 Livestock Accepted Farm Practices

Livestock is a minor farm use in the Surrounding Lands. However, there are distinct types of livestock farms that are covered in this section.

10.4.1 HORSE BOARDING AND TRAINING[19]

There are at least two horse boarding and training facilities in the Surrounding Lands. Activities conducted at an equine center can include any of the following: boarding horses, horse training, riding lessons, clinics for horse owners, arena rental, sale of horse-related products, horse sales, and horse shows.

Horse owners who keep their horse at the stable travel daily or nearly daily to the stable from their homes to groom, ride and feed their animals. It is also common for the stable's proprietor or employees to manage some of these tasks as part of their service. Infrequently grain, hay, and other supplies are trucked to the facilities. Horse owners also occasionally transport their horses off-site for rides or events. Periodic equine events also bring larger groups to the stable.

[19] Sources are personal conversation with Angela Parker, owner of Hawk Haven Equestrian Center, on October 9, 2020, and Horse Business Expenses: Do You Know All the Expenses Involved in Running a Horse Business? by Denise Cummins, PhD., March 2016/updated January 23, 2020, in the Thinking Equestrian, at www.successful-horse-training-and-care.com/stable-magement-expenses.html.

The facilities at horse businesses typically include stables which include individual horse stalls, feed storage (hay and feed concentrates), and storage for animal bedding, saddles, and other tack, and other supplies and washing area. Covered riding arenas (usually covered), pasture or "turn-out" area, and parking for vehicles and horse trailers are also components of most horse facilities. A water well is the typical source for large quantities of fresh, clean drinking water.

Fees for boarding usually include horse feed. Otherwise, the horse owner is responsible for bringing feed to their animal. One component of the feed is roughage (hay or pasture grass), and the other is mixed feed concentrate that includes cereal grain such as oats, corn, or barley. Horses are also fed supplements that may include protein, minerals, trace minerals, and/or vitamins. Boarding facility managers can purchase mixed feed concentrates or they can buy component feed ingredients for custom mixes.

Most equine centers hold horses in individual stalls when the animal is not being ridden, groomed, or attended to in some other manner. This is particularly true in the winter months and other high-rainfall periods. In warm weather, it may be possible to maintain horses in paddocks or pasture.

When horse owners are not at the stable for daily animal care, it is the responsibility of the stable manager to observe overall animal health, ensure that proper feed is provided, monitor eating and behavior, maintain clean stalls and pens, and exercise or groom the animals. Stable managers also assist with minor medical treatments for animals and call a local veterinarian when needed. Stable managers also schedule farriers for hoof care.

Equestrian centers may use third party vendors such as outside riding instructors or horse trainers. In this case the owner of the stable must manage these vendors, including the use of contracts to maintain business control, profit and manage risk.

10.4.2 SHEEP PRODUCTION[20]

Sheep are raised on a small number of farms in the Surrounding Lands. Production includes meat or wool; or a combination of these. No dairy (milk) sheep were identified in the Surrounding Lands.

Sheep graze in pasture and may be fed hay that is grown on the farm. For these accepted farm practices, refer to the previous discussion of pasture and hay.

The standard accepted practice is to breed have mother sheep (ewes), with the lambs raised for meat. Adults are sheared for wool, adding a further source of income. Sheep shearers are often hired, as this is a specialized skill that many small-scale sheep farmers do not perform.

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[20] Sources are personal communication with Shelby Filley, Oregon State University Extension Specialist for Livestock and Forage on December 6, 2021, Sheep Production Guide, by J.M. Thompson, Oregon State University Extension Service Publication EM 8916-E, November 2006, downloaded on November 30, 2021 from: https://catalog.extension.oregonstate.edu/em8916; Emerging Concepts in Small Ruminant Parasite Control from collection of articles maintained by Shelby Filley, undated, downloaded from https://extension.oregonstate.edu/emerging-concepts-small-ruminant-parasite-control.

The target is to achieve a high percentage of twin lambs per ewe. Successful sheep farmers seek at least a 150 percent lamb crop, meaning half the ewes raise twins. Triplet lamb births are possible.

Lambing season is critical; with timely management leading up to breeding, during ewe pregnancy, and after lambs are born. Before breeding, ewes are treated for parasites and vaccinated to prevent abortion-causing infections (vibrio). Ewes are at a healthy weight at the beginning of breeding season. "Flushing" ewes occurs two to three weeks before breeding; this entails feeding ewes a high-quality diet for moderate weight gain and body conditioning. During breeding season, the rams' breeding activity is monitored, particularly in hot weather. Cooler conditions favor larger lamb crops. In early pregnancy, ewes are usually vaccinated a second time for vibrio. Ewes are monitored for body condition and under-weight ewes are segregated to ensure their health and vigor can be addressed. In the latter stage of pregnancy, all ewes receive high quality feed or pasture to increase healthy birthing.

Normal gestation for lambing is 148 days. Typically, the lambing season is in spring, which follows the ewe's natural breeding cycle of breeding during October through December and lambing from March to May. Some breeds can switch to a fall-winter lambing season.

Ewes are observed closely at lambing time and at the time of birth have a separate pen. After lambing, ewes and lambs are checked for problems several times per day. Ewes may need help to ensure milk is readily available for the lambs. Ewes and lambs can be sorted into small groups within a day or two of lambing.

Milk from healthy ewes is usually sufficient to meet the nutritional needs of lambs, even if the ewe has twins or triplets. However, if necessary, lambs are grafted to another ewe. Artificial rearing is also an alternative with the weakest lamb selected. All newborn lambs should initially receive an ewe's colostrum. Thereafter liquid milk replacer is used. A heat lamp and clean, dry conditions are needed for optimal nursing lamb conditions. Along with milk replacer, lambs get supplemental feed. Milk replacer is stopped at about five weeks of age.

Ewes are given a suitable lactation diet. Lambs are started on supplemental feed at 10 to 14 days old. Attention is needed to address scours and or pneumonia in lambs.

A schedule of vaccinations for lambs is recommended to address preventative health needs and treat diseases such as enterotoxemia (overeating disease). Ewes are subject to contracting mastitis and sheep are also susceptible to other diseases. Regular herd inspections check for evidence of these and other serious diseases. In case of severe diseases, veterinarian consultations or visits are an accepted farm practice.

When grazing, sheep are dewormed within three weeks of pasture entry. External parasites are treated with sheep dip, and internal parasites are treated with medications administered by mouth. If grazing is extended, further deworming follows. Oral treatments supplement nutrient requirements.

Lambs are weaned at approximately 50 to 70 days of age. Lambs are completely separated from ewes. Ewes and rams are commonly treated for internal and or external parasites at weaning time. This is the time to also cull barren ewes and to bring replacement females to the flock.

Production records identify ewes with superior performance. Lamb birth and weaning weights are primary records. Records on twin lambing rates, lamb mortality, and fleece weight are other key performance benchmarks.

Rams with superior genetics are important to a successful breeding program. Rams born as twins are selected for exceptional growth, rapid weight gain, and soundness of feet, legs, and mouth. Rams with dense, uniform fleece free of dark fibers are also desired. Males are fed a high energy diet in breeding season.

All sheep have their feet trimmed regularly to prevent or control foot rot, a contagious disease. Affected animals are isolated from other sheep and treated by foot bathing. Sheep that do not respond after extended treatment are culled.

Lambs are marketed as feeder lambs or as market weight lambs. Sheep farmers plan their marketing carefully because the availability of customer slaughter is increasingly limited. Customers for market weight lambs are secured in advance to the extent possible.

10.4.3 CATTLE PRODUCTION[21]

One small-scale cattle farm was identified in the filtration facility Core Analysis Area.[22] They previously had a cow-calf breeding operation and now raise feeder cattle for meat production. Regarding cow-calf operations, the options include: 1) producing animals for breeding purposes; 2) producing calves to sell as young feeder animals; or 3) producing calves that are kept and fed to finished harvest weigh and sold to meat processors or directly to consumers as "locker beef." Cows are also occasionally sold as either breeding stock to another producer or marketed for meat.

The alternative is raising feeder cattle without breeding stock. In this case the farmer buys young, weaned cattle, and feeds them to finished weight for sale. This is the production method currently followed and it is the focus of this report. Note that the raising of one or two head of cattle only for personal (household) meat consumption does not meet the definition of farm use for this report.

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[21] Sources are personal communication with Max and Mike Bissell, cattle farmers in the Surrounding Lands on November 4, 2021; Beef Production for Small Farms: An Overview, by Gene J. Pirelli, Dale W. Weber and Susan Kerr, Oregon State University Extension Service Publication EC 1514, Revised March 2018, downloaded on October 6, 2020 from: https://catalog.extension.oregonstate.edu/ec1514/html; The Western Oregon and Washington Pasture Calendar by Steve Fransen, Gene Pirelli, Marty Chaney, Larry Brewer, and Scott Robbins, Pacific Northwest Extension Publication PNW 699, November 2017, downloaded from https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw699.pdf.

[22] Accepted farm practices described in this report are typical of the Surrounding Lands more broadly as well, for the reasons explained above in Section 6.0.

Cattle graze in pasture and may be fed from hay produced on the farm. For these accepted farm practices refer to the previous discussion of pasture and hay accepted farm practices.

The following are the accepted practices for operating a feeder cattle farm:

- Facilities – adequate feed, water, and fences are available to accommodate year-round operation. An adequate amount of land for the herd size prevents overgrazing pasture. In most weather conditions, cattle do well outside. However, in extreme cold or wet conditions, covered shelter is the accepted farm practice. Storage is necessary for maintaining quality forages such as hay or straw. An adequate year-round supply of clean water is essential and must be provided daily. A combination of pens, feedlots, and corrals are made available. All structures are maintained in good working order to prevent injury to animals and handlers.

- Animal nutrition – healthy cattle require protein, energy, water, fat, minerals, and vitamins in their diet. As ruminants, cattle need high fiber intake. High quality protein is supplied by any of these main sources: legume hay, alfalfa, and clover. Poorer quality feeds such as cereal straw, grass straw, or rain-damaged hay require added protein and energy supplements. Energy can also be provided by concentrates, which are feedstuffs high in digestible nutrients such as grain or protein supplements. Mineral supplements are also needed in the diet to maintain healthy animals. Forage analysis ensures cattle receive nutritional value and the proper ration balance for growth and full function.

- Pasture management – cattle are turned out to graze pasture in the late spring, summer, and fall to reduce the cost of supplying purchased hay or other roughage. The ratio of cattle to pasture area is kept in balance so grass can be available in ample quantities to maintain animal weight. For optimum grass production, pastures are seeded to selected forage species best adapted to the microclimate. Pastures are limed, fertilized, and kept weed-free. Irrigation is used to increase forage production for more intensive grazing. Active pasture management is needed in the spring, summer, and fall. Cattle are rotated between fields, so pasture stubble (the grass height) is maintained to produce abundant and nutritious forage throughout the grazing season. Both grazing and equipment use are avoided when soil is saturated with water.

- Animal health – cattle are subject to a variety of ailments and diseases. Maintaining clean sheds, corrals, and feed and water troughs promotes disease prevention. Regular observation of the herd to identify sick animals, and isolate and treat them prevents the spread of contagious disease. Common animal health medications are readily available with consultation or services by veterinarians as needed, following all label requirements.

- Feeder cattle nutrition – young feeder cattle which are newly weaned need palatable, high-quality feedstuffs as they transition from mother's milk. A mixed ration with concentrates is slowly introduced and gradually increased over several weeks. The composition of the feed

is monitored as the calves adjust to diets that "step-up to" the final diet. As the ration is changed, it is carefully monitored for acceptance by the animals to produce the desired weight gain.

- Feeder cattle are generally marketed at 750 to 800 pounds, or they are held until they reach finished weight for processing.

10.4.4 CHICKEN EGG PRODUCTION[23]

Chicken egg production is a small-scale business for at least one farmer in the filtration facility Core Analysis Area.[24] Their customers come to the farm to purchase eggs.

The egg producer selects chicks from among sixty plus breeds of chickens used for commercial poultry production in the U.S. Preferred breeds are evaluated for egg production by this producer rather than meat. Breed selection is a major decision for profitable egg production.

Pullets (hens under one year) start producing eggs at 20 to 24 weeks after hatching. Healthy hens reliably yield eggs for the first two to three years, and most hens will lay eggs for several more years. Older hens produce eggs more erratically, but the size increases.

Chicken housing (the coop) provides protective confinement and room for feeding and roosting. Farmers alter feed sources in response to changes in eating habits, so pullets and hens consume more high-value nutrients to maintain body weight and egg production. Artificial lights help maintain higher level egg production.

If chickens roam "free-range" it is important to minimize standing water in higher rainfall periods. Chickens that drink from the ground are more likely to ingest pathogens and parasites. Intestinal round worms are also a frequent problem if chickens drink from standing water. Worm infected chickens need to receive deworming compounds following all product labels. Chickens are protected from fall and winter rain periods with places to roost off of wet ground.

If chickens walk on muddy ground, the mud balls as well as manure collect on the birds' claws and ends of their toes. Any accumulation is removed regularly to prevent foot damage.

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[23] Sources are personal communication with Sarah Schwab, Operations & Automation Specialist, Oregon Department of Agriculture, November 2, 2021; "Small-Scale Egg Production (Organic and Non-Organic)" in poultryproducer.com, September 6, 2019 downloaded from https://www.poultryproducer.com/production/small-scale-egg-production-organic-and-non-organic/; "Seasonal changes Affect Poultry" by James Hermes, Oregon State University, March 2021 in https://extension.oregonstate.edu/animals-livestock/poultry-rabbits/seasonal-changes-affect-poultry; and "Raising Baby Chicks" by James Hermes, Oregon State University, March 2021 in https://extension.oregonstate.edu/animals-livestock/poultry-rabbits/raising-baby-chicks.

[24] Accepted farm practices described in this report are typical of the Surrounding Lands more broadly as well, for the reasons explained above in Section 6.0.

ACQUIRING BABY CHICKS

Chicks are added to both expand the flock or replace older hens. The main way to add chicks is to purchase them at local feed stores. New chicks are kept at approximately 90 degrees Fahrenheit with spacing sufficient to avoid overcrowding and pecking. Continuously adding small batches avoids potential overcrowding problems while adding to flock size.

MAINTAINING THE FLOCK

Providing at least 1.5 square feet of floor space per bird is an accepted farm practice. Adequate nest box bedding consists of clean straw, wood shavings, or sawdust. Up to 20 birds can use one feed pan with nearby water access. The ventilation of the house varies with ambient air temperature. The temperature of housing is kept from 62 to 75 degrees Fahrenheit. In extreme heat, misting is the accepted farm practice for added protection. Lighting is required to maintain higher yielding egg production and timers are used to extend lighting as day length decreases.

Feed, called layer mesh, is available at local feed stores. It has the recommended nutrients to maintain bird health and support egg production.

Chickens have cannibalistic tendencies, so they are grouped by age and size. Beak trimming of all birds at 14 days of age is the accepted farm practice.

For human as well as animal health, biosecurity and sanitation are important. Biosecurity requires the following: isolating birds by age-group, restricting human access to buildings, thorough and regular cleaning of buildings, and proper disposal of dead birds. Diseases are prevented by isolating new birds in the flock and regular observation of all birds for disease symptoms.

If mortality in the flock suddenly increases, the accepted farm practice is to contact a veterinarian and the Oregon Veterinary Diagnostic Laboratory (OVDL) at the Oregon State University, College of Veterinary Medicine. OVDL can aid in prompt diagnosis of disease problems.

HOLDING AND SELLING EGGS

Direct farm egg sales by a producer does not require an Oregon egg handler's license or payment of an egg fee to the State. The handler's license and egg fee are required for sales through all other market channels.

For wholesomeness, the accepted farm practice is to candle, clean, and hold eggs at 45 degrees Fahrenheit until sold. Clean cartons are used and must include the producer's name and physical address. For traceability, the label must also state the product is not for resale and is not inspected.

10.5 Food Crops Accepted Farm Practices

Vegetable food crops are grown in at least two locations in the filtration facility Core Analysis Area.[25] One farm uses greenhouses and row covers to raise organic vegetable crops. The second farm area is a 19.4-acre property managed by a non-profit that leases small plots to refugee farmers. This is a new enterprise, which started in 2020. These farmers are using small-scale farming practices, are adopting to climate conditions, and using growing methods that are unlike what they experienced before emigrating to the U.S. The refugee farmers are also using organic production practices. This section covers much of the variety of organic vegetable crops grown by these farms, including the first year of production by the farmers who grow cabbage, carrots, daikon radish, eggplant, green beans, hot peppers, and winter squash.

The immigrant farmers travel to the plots they manage and average about one trip per day from approximately March to Late October. The other farm has a more extended growing season by utilizing greenhouses and protective row covers.

Blueberries and peaches are fruit crops growing in the Core Analysis Area or in the Surrounding Lands. There are two blueberry farmers and one peach grower.

10.5 1 CABBAGE PRODUCTION[26]

Cabbage is a cool-season specialty vegetable in the cole family (Brassica oleracea). Cole crops also include broccoli, Brussel sprouts, cauliflower, kale, kohlrabi, and others. These farmers generally raise cabbage for fresh market sales and can grow a range of leafy cole vegetables to meet customer preferences.

Variety selection depends on factors, which include buyer preference, yield, disease resistance, and suitability for the growing area. Oregon State University tests cabbage and other vegetables for characteristics such as appearance, earliness, flavor, yield, and disease resistance under western Oregon growing conditions.

Cabbage is grown on a limited acreage within the Core Analysis Area. It can be produced by either organic or conventional methods or a combination of the two methods. This discussion first addresses conventional accepted production practices followed by discussion of organic cabbage production practices.

Cabbage can be directly seeded or transplanted. For direct seeding, the accepted farm practice is to purchase treated seed to protect against seed-borne diseases. Transplanting is also an accepted

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[25] Accepted farm practices described in this report are typical of the Surrounding Lands more broadly as well, for the reasons explained above in Section 6.0.

[26] Sources are personal conversation with Nick Andrews, Oregon State University, Small Farms Specialist, on August 31, 2021; Commercial Production and Management of Cabbage and Leafy Greens, University of Georgia Extension Service Bulletin 1181, Reviewed January 2017; Vegetable Variety Trials, 2017 Oregon State University, EM 8777-10 – Revised May 2018; and Cabbage for Fresh Market, Oregon State University production guide downloaded from horticulture.oregonstate.edu/oregon-vegetables/cabbage-1.

farm practice and has advantages over direct seeding but adds to the cost of production. Certified transplants are purchased from specialty greenhouse farmers or if farmers have greenhouses, they can raise their own plants to transfer to fields.

Direct seeding presents challenges to farmers that are avoided by transplanting. The problem areas with direct seeding include more difficult weed control, the need for precision seeding that is aided by specialized equipment, tight irrigation control to prevent seed loss, and the longer in-field growing season compared to transplants.

Accepted farm practices for successful cabbage production include soil testing for pH and nutrients, proper seed bed preparation, active fertilizer management, and effective weed and disease control. All pesticides, herbicides, fungicides, and other farm chemicals must strictly follow all product label requirements. Irrigation scheduling to maintain adequate but not excessive water supply to plants is also an important part of the accepted farm practices.

Field selection for cabbage follows these fundamental accepted farm practices:

1. No cruciferous crop (Brassicaceae family) or related weed (such as wild radish, shepherd's purse, or mustards, etc.) precedes cabbage for at least two years, and preferably for four years. Crucifer plant waste is not deposited in the fields.
2. If soil has a history of club root, soil pH over 6.8 is necessary to manage this disease. Six weeks prior to planting 1,500 lb./acre of hydrated lime is the recommended rate of application for soils with pH less than 7.5.
3. Transplanted and direct-seeded fields are kept separate to minimize spread of certain diseases that are more prevalent in transplanted fields.

Cabbage is produced as an annual crop. Field preparation starts either the year prior to planting or the year of planting. Depending on the variety, cabbage can be planted over a wide time period from mid-March to August to allow for staggered harvesting.

Table 9 shows the accepted farm practices for cabbage production in the Surrounding Lands.

Table 9. Accepted Farm Practices for Conventional (Non-Organic) Cabbage Production

Typical Time Period	Accepted Farm Practices
Prior Fall or early Spring of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes.
Early Spring of planting year	Fumigate soil if needed following all product label instructions.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Treat above ground or underground for voles and other rodents as needed following all product label instructions.
Prior Fall or early Spring of planting year	Pre-planting land preparation (sub-soil, plow, roto-till, etc.) and may apply compost. Field leveling may be required. Can use raised beds.
Early Spring to Summer	Apply fertilizer as needed and follow all label instructions. In addition to nitrogen, phosphorus, and potassium, application of sulfur, magnesium, and boron may be needed.
Spring to Summer	Cultivate field for weed control, beginning with early season control. Apply herbicide spray as needed and supplement with hand hoeing or spot spraying. Follow all label instructions.
Spring to Summer and early Fall	Apply pre-emergent and emergent fungicides and herbicides following all product label instructions. Monitor disease and weed conditions to maintain effective control during the growing season.
Spring to Summer	Plant either by direct-seeding or transplants. Consider staggered planting times to extend harvest period.
Spring to Fall	Apply insecticides as needed following all product label instructions. and maintain active monitoring for on-going response. Consider using mesh plant covers to reduce pest infestations.
Spring	Install irrigation system (overhead or drip system).
Spring to Summer	Monitor soil moisture and schedule irrigation throughout the growing season.
Summer to Fall	Harvest crops at optimum maturity, preferably at a cooler time of day. Hand cutting and trimming for fresh market is generally practiced. Cabbage may be field packed or loaded in bulk containers and hauled to a packing operation.
Summer to Fall	Post-harvest handling may include washing, further trimming, and cooling by vacuum or forced air. Ice packing may also be used. Standard packaging may include waxed, corrugated cartons but can vary with farmer and customer preferences.

ORGANIC CABBAGE

Organic cabbage production must follow all approved organic practices from certifying organizations to earn organic label approval. Annual inspections are performed to maintain organic certification.

Many of the practices described above can be performed on organic farms. However, accepted organic practices that differ from conventional production methods include:

1. Use of cover crops to support soil function, increase soil organic matter, promote nitrogen fixation, suppress weeds and pests, manage soil moisture, and minimize soil compaction.
2. Organic Integrated Pest Management (IPM) uses a variety of pest control techniques. With any treatments for insects, weeds, rodents, fungus, or other diseases, follow all product label instructions. These are: maintaining soil health for cycling nutrients and soil microbial activity, and use of biological controls such as beneficial insects. Cultural controls include interplanting crops such as clover to control certain pests or use of "trap crops" at intervals within fields that attract pests away from the cabbage crop. Approved botanical insecticides can also be employed effectively.
3. Addition of other approved soil nutrients such as animal manures or organic products such as soybean meal or bone meal are options.

10.5.2 CARROT PRODUCTION[27]

Carrots are grown in the filtration facility Core Analysis Area for direct consumer sales by the immigrant farmers. Extensive plant breeding has resulted in numerous varieties of carrots suited to production in Western Oregon. The range of varieties offers alternative shapes, lengths, colors, and flavors. The different varieties can thrive in varying conditions such as growing season temperatures, and the length of the growing season.

Oregon State University has conducted growing trials of at least 20 carrot varieties over the last 15 years. This provides helpful guidance for Western Oregon variety selection.

The accepted farm practice for carrot site selection is land with lighter, sandy-textured soils with pH of 5.5 to 7.0. These soils are not widely available in the Surrounding Lands, so soil amendment is recommended.

The considerable number of varieties available for carrots makes it possible for farmers to plant them over several months of the growing season. The growing season ranges from 65 to 100 days

[27] Sources are personal conversation with Nick Andrews, Oregon State University , Small Farms Specialist, on August 31, 2021; Carrots – Western Oregon, Oregon State University, accessed from web at horticulture.oregonstate.edu/oregon-vegetables/carrots-western-oregon-0, downloaded August 10, 2021; Small Scale Organic Carrot Production by Colin Thompson, Michigan State University Extension, October 30, 2017, accessed from web at www.canr.msu.edu/news/small_scale_organic_carrot_production, downloaded August 12, 2021.

to reach maturity, depending on variety. Local fresh carrots are available to harvest from late June until the fall. Early season carrot varieties are planted before the last frost.

Accepted farm practices dictate adherence to appropriate irrigation water management. Lack of water causes stress that results in woody, hard carrots and too much water causes poor color and rot. Furrow irrigation or overhead sprinklers are the two main ways water is delivered.

Carrots are directly seeded only, and not transplanted in fields. Raised beds are often preferred over non-bedded planting. Soil is prepared with chisel plowing or similar deep tillage to a depth of approximately 12 to 15 inches. Farmers use a range of suitable seed spacing and row spacing configurations. For small acreage farms in the Core Analysis Area, manually held seeders can precisely distribute the seed. Seeding is extended over many weeks in the season to extend the harvest.

It is an accepted farm practice to use floating row covers for fresh market carrots. The covers are available in various materials and offer advantages such as pest control, increased yields, wind protection, and extension of the growing season.

For disease control, particularly fungus, the following crops do not precede a carrot crop or be in rotation with it: wheat, cauliflower, broccoli, celery, cucumber, sugar beet, and watermelon.

Table 10 shows the accepted farm practices for carrot production in the Surrounding Lands.

Table 10. Accepted Farm Practices for Conventional (Non-Organic) Carrot Production

Typical Time Period	Accepted Farm Practices
Prior Fall or early Spring of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes.
Early Spring of planting year	Fumigate soil if needed following all product label requirements.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Treat above ground or underground for voles and other rodents as needed, following all product label requirements.
Prior Fall or early Spring of planting year	Pre-planting land preparation (sub-soil, plow, roto-till, etc.) and may apply compost. Raised beds are usually preferred.
Early Spring to Summer	Apply fertilizer as needed and follow all label instructions. In addition to nitrogen, phosphorus, and potassium, application of sulfur, magnesium and boron may be needed.
Spring to Summer	Cultivate field for weed control, following all product label requirements. Emphasis is on early season control. Apply herbicide spray as needed following all product label requirements and supplement with hand hoeing or spot spraying.

Typical Time Period	Accepted Farm Practices
Spring to Summer and early Fall	Apply pre-emergent and emergent fungicides and herbicides as needed following all product label requirements. Monitor disease and weed conditions to maintain effective control during the growing season.
Spring to Summer	Plant high quality, size-graded, and fungicide-treated seed from certified seed suppliers. Plant by direct seeding. Consider staggered planting times to extend harvest period. Thin young plants when the tops are approximately one inch.
Spring to Fall	Apply insecticides as needed following all product label requirements and maintain active monitoring for on-going response. Consider using mesh plant covers to reduce pest infestations.
Spring	Install irrigation system (drip system is often preferred).
Spring to Summer	Monitor soil moisture and schedule irrigation throughout the growing season. Soil moisture management is most critical during stand establishment and rooting expansion.
Mid-Summer to Fall	Harvest crops at optimum maturity, preferably at a cooler time of day. On the small farms located in the Core Analysis Area, the standard practice is to loosen soil manually and pull carrots by hand (hand bunch with tops intact). Tops may be trimmed. Carrots may be field packed or loaded in bulk containers and hauled to a packing operation.
Mid-Summer to Fall	Post-harvest handling includes washing, sorting, and refrigeration. Standard packaging is plastic bags.

ORGANIC CARROTS

Organic carrot production must follow all approved organic practices from certifying organizations to earn organic label approval. Annual inspections are performed to maintain organic certification.

Many of the practices described above can be performed on organic farms. However, accepted organic practices that differ from conventional production methods include:

- Use of cover crops to support soil function, increase soil organic matter, promote nitrogen fixation, suppress weeds and pests, manage soil moisture, and minimize soil compaction. Most farmers use a bare fallow period to increase weed control before planting carrots. Newly emergent plantings require care in weeding, and often this means use do shallow cultivation by gentle hoeing.
- Organic Integrated Pest Management (IPM) uses a variety of pest control techniques. With any treatments for insects, weeds, rodents, fungus, or other diseases, follow all product label instructions. IPM may include maintaining soil health for cycling nutrients and soil microbial activity; and use of biological controls such as beneficial insects. Cultural controls

include interplanting crops such as clover to control certain pests or use of "trap crops" at intervals within fields that attract pests away from the carrot crop. Approved botanical insecticides can also be employed effectively.

- Addition of other approved soil nutrients such as animal manures or organic products such as soybean meal or bone meal are options.

10.5.3 ORGANIC DAIKON RADISH PRODUCTION[28]

Unlike the more familiar short, red radishes with a pungent flavor, daikon radish is a white, elongated radish with a sweet, mild flavor. Daikon is native to Japan and a winter radish, meaning it is best to sow the seed in August when most of the growth occurs in cooler fall weather. Early spring planting may also be successful. Refugee farmers near the filtration facility site are growing this crop with organic practices and this discussion describes the accepted farm practices used by those farmers.

Daikon seed is sown directly in fields, with transplants as an option. Seeding may require thinning as crowding will limit root growth with seedling spacing of four to six inches. Staggered plantings are common but need to allow for optimal growing temperature in the range of 40 to 70 degrees Fahrenheit. Daikon will normally reach harvest maturity 60 to 70 days after planting. The crop must be harvested before winter temperatures reach freezing.

The land grant universities in Oregon and Washington have few resources to guide farmers for best practices to produce daikon. This is particularly true for organic production. Farmers need to network with other farmers or use their own experience to refine production techniques. This review is based mainly on university recommendations for Northwest gardeners and research reported outside the Northwest.

Daikon can tolerate planting in a wide range of soil types but the most preferred is light, sandy loams with pH of 6.5 to 7.0. Optimal results are obtained by planting in an aerated seed bed. Full sun is needed, generally at least eight hours per day.

As with other vegetable crops reviewed in this report, daikon is grown on a limited acreage within the Core Analysis Area. Daikon is less sensitive to diseases and pests in comparison to other vegetable crops. The most common diseases are Septoria leaf spot and black root rot. Common insect pests are cabbage maggots and flea beetles.

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[28] Sources are personal conversation with Nick Andrews, Oregon State University, Small Farms Specialist, on August 31, 2021; My Northwest Garden Growing Guides – How to Grow Radishes in Oregon, Washington and British Columbia downloaded from www.mynorthwestgarden.com/home/radishes-2, undated; Radish by Joe Masabni, Department of Horticulture, AgriLife Extension Service, Texas A&M University, Undated; Vegetables: Growing Radishes in Home Gardens, by Catherine Daniels, Extension Fact Sheet FS127E, Washington State Pest Management Resource Service, Washington State University Puyallup Research and Extension Center, 2013.

Daikon seedlings need uniformly moist soil but not excessive wetness as this crop is subject to "damping off" caused by fungus or mold growth during cooler, wet conditions. Row covers can aid in reducing over wet conditions from rain as well as supplemental irrigation. Seeds should be treated with organic-approved biofumigants to reduce this risk.

Frequent scouting for early detection of pests and disease is a critical aspect of organic daikon production. Crop rotation is also important to suppress diseases in fields. It is recommended that daikon be rotated with bean and pea crops or other legumes. Daikon farmers avoid planting after garlic, corn, potatoes, or tomatoes.

In cases where farmers want organic certification approval, they must carefully follow approved organic practices for a transition period of three years. This requires periodic audits by certification organizations. Field preparation for organic producers often includes periodic planting of cover crops to improve soil tilth and fertility.

Table 11 shows the accepted farm practices for organic daikon production in the Surrounding Lands.

Table 11. Accepted Farm Practices for Organic Daikon Radish Production

Typical Time Period	Accepted Farm Practices
Prior Fall of planting year	Plant legume cover crops if needed to restore organic matter, improve soil tilth, or restore soil nutrients. Note that Daikon may be a second crop following an early summer harvest of a first crop.
Prior Fall, early Spring, or early Summer of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes.
Early Spring or Summer of planting year	Manage soil to prepare the seed bed and remove or incorporate prior crop residue into soil.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Trap and/or use biological controls for voles, other rodents, and/or other pests as needed. For any chemical-based control, follow all product label instructions.
Spring to early Summer of planting year	Pre-plant land preparation (sub-soil, plow, roto-till, etc.) and compost may be applied. Raised planting beds are recommended.
Summer to early Fall	Apply organic certified approved plant nutrients/fertilizers including compost, animal manures, and fertilizers and micronutrients as needed before planting. Avoid applying excessive nitrogen. Follow all label instructions.
Early Summer	Use flame weeding and consider disk harrow and/or roto-till soil if needed.
Early Summer	Activate/install irrigation system (drip system or overhead sprinkler systems are common). Daikon can be a second crop in which case irrigation will be needed.

Typical Time Period	Accepted Farm Practices
Summer to early Fall	Plant using certified seed that is disease resistant and treated with organic approved pesticides. Follow all product label instructions. Plant seed in moist soil with desired spacing. Avoid post-plant irrigation for 1-2 weeks if possible. Thin seedlings if needed. Staggered plantings to extend harvest and marketing.
Summer to Fall	After daikon plants emerge, apply organic certified weed treatment materials as needed following all product label instructions. Supplement with hand hoeing or later season mechanical weeding in the rows. Consider incorporating living mulch with selective mowing between crop rows and light application of mulch on raised beds.
Summer and early Fall	Apply organic certification approved pesticide applications for insect control following all product label instructions. Consider placing general predators and parasites within the field as natural enemy habitat.
Summer to Fall	Apply organic approved biological deterrents as soil inoculants for disease control and spray foliage with approved products. Follow all product label instructions. Remove diseased forage immediately. Maintain active monitoring for on-going response. Sanitize tools and equipment contacting the soil.
Summer to Fall	Monitor soil moisture and regulate irrigation applications.
Summer to Fall	Harvest the roots when the foliage is of sufficient size. Harvest by hand pulling.
Fall	Post-harvest handling includes cutting the greens from the roots. Wash roots to remove dirt. The greens (tops) can be used for salads if market outlets are available. The roots and greens are kept under refrigeration with high humidity and quickly distributed to customers. Roots are commonly packaged in bunches in individual or bulk cartons.

10.5.4 ORGANIC EGGPLANT PRODUCTION[29]

Eggplant is a warm season crop that needs approximately 65 to 85 days from transplanting to reach harvest maturity in the temperate climate of the Surrounding Lands. As with other vegetables

[29] Sources are personal conversation with Nick Andrews, Oregon State University, Small Farms Specialist, on August 31, 2021; Eggplant, Oregon State University production guide downloaded from horticulture.oregonstate.edu/oregon-vegetables/eggplant-0, Revised February 5, 2010; Biodiversity and Pest Management, Oregon State University College of Agricultural Sciences Small Farms Program, downloaded from smallfarms.oregonstate.edu/biodiversity-pest-management, undated; Biodesign Farm Insect Management System by Helen Atthowe and Alex Stone at eOrganic website, downloaded from eorganic.org/node/15584, published February 12, 2021; Organic Disease Control in Organic Farmers School downloaded from the web at organicfarmersschool.org/gardeners/library/organic-disease-control/, undated; Creating a Weed Management

crops, eggplant is grown on limited acreage in the Core Analysis Area. This section discusses accepted practices for organic production by the immigrant farmers.

Since eggplant comes from warm climates, varieties are sensitive to low temperatures and frost. Once planted outdoors, the soil temperature should not fall below 68 degrees Fahrenheit. Eggplant comes in a variety of colors, but most include purple, white, pink, and green and can range from 12 inches long to only one or two inches.

Eggplant is potentially high yielding with the right growing conditions and practices. Installing heat mats, such as black plastic mulch is an accepted farm practice to increase production. Installing heat mats, such as black plastic mulch, increases soil temperature and boosts production.

The optimum soil for high yields is fertile, well-drained, and high in organic matter. This crop is particularly sensitive to soil and air temperatures and is also susceptible to diseases.

Eggplant is normally transplanted in the field from greenhouse-grown starter plants. Direct field seeding in western Oregon is not recommended by Oregon State University horticultural specialists. Young plants are susceptible to "damping off," which is caused by fungus or mold growth during cooler, wet conditions. Both seeds and transplants are treated to reduce fungal risk following all product label instructions.

Crop rotation is an accepted farm practice to suppress diseases in organic eggplant production. Legumes like beans or peas are excellent to precede eggplant. Root crops other than potatoes, such as beets or carrots are recommended to follow. Tomatoes are not an accepted farm practice to be in close rotation with eggplant.

In cases where farmers want organic certification approval, they must follow approved organic practices for a transition period of three years. This requires periodic audits by certification organizations.

Field preparation for organic producers often includes the planting of cover crops to improve soil tilth and fertility. The table below assumes that a cover crop is planted in the fall prior to planting the eggplant crop.

Table 12 shows the accepted farm practices for organic eggplant production in the Surrounding Lands.

Plan for the Organic Farm, downloaded from https://extension.psu.edu/creating-a-weed-management-plan-for-your-organic-farm; Updated September 2, 2015.

Table 12. Accepted Farm Practices for Organic Eggplant Production

Typical Time Period	Accepted Farm Practices
Prior Fall of planting year	Plant cover crops such as legume or rye grass.
Prior Fall or early Spring of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes and treat if needed following all product label instructions.
Early Spring of planting year	Mow and work cover crop residue in soil.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Trap or use biological controls for voles and other rodents as needed following all product label instructions.
Early Spring of planting year	Pre-planting land preparation (sub-soil, plow, roto-till, etc.) and compost may be applied. Raised planting beds are recommended.
Early Spring to Summer	Apply organic certified approved fertilizers and micronutrients as needed and follow all label instructions.
Early Spring to Fall	Use flame weeding and consider till soil early in spring and repeat as needed. Minimum or "no-tillage" is recommended. Apply organic certified materials as needed following all product label instructions and supplement with hand hoeing or later season mechanical weeding. Consider incorporating living much with selective mowing between crop rows.
Late Spring to early Summer	Plant using certified transplants that are disease resistant. Use standard spacing and thin young plants as needed to allow adequate growth. Staggered planting times can extend harvest and marketing, but late season planting is limited due to the long growing season.
Spring	Activate/install irrigation system (overhead or drip system).
Spring to Summer and early Fall	Apply organic certification approved pesticide applications following all product label instructions for insect control. Consider placing general predators and parasites within the field as natural enemy habitat.
Spring to Fall/Winter	Apply organic approved biological deterrents as soil inoculants following all product label instructions for disease control. Spray foliage with approved products. Remove diseased forage immediately. Maintain active monitoring for on-going response. Remove plant debris from fields. Sanitize tools and equipment that contacts the soil.
Spring to Summer	Monitor soil moisture and regulate irrigation applications. The most critical period is during flowering and fruit formation.

Typical Time Period	Accepted Farm Practices
Summer to Fall	Harvest crops at optimum maturity before reaching full size. Small farm practice is removal by hand trimming at the stem. Quickly remove the field heat by cooling.
Summer to Fall	Post-harvest handling may include brushing off dirt but not washing. Eggplants is kept cool in the range of 46 to 54 degrees Fahrenheit. Standard packaging includes waxed, corrugated cartons but varies with farmer and customer preferences. The crop is moved quickly to customers.

10.5.5 ORGANIC GREEN BEAN PRODUCTION[30]

Green bean, also known as snap bean, is a warm season crop that grows rapidly in warm weather. This crop is divided into pole bean and bush bean varieties. Green beans are directly seeded in fields and have a short growing cycle with harvest typically 60 to 75 days after planting. The harvest is completed in a short two- to three-week period. Immigrant farmers near the filtration facility site use organic methods to raise green beans for fresh market sales, so this section discusses accepted practices for organic production.

Green beans do not tolerate cold weather. Fields are planted after temperatures rise to about 60 degrees Fahrenheit. Seed germination is best when soil is 60 to 84 degrees Fahrenheit. Farmers can grow either pole or bush beans in confined space. Pole beans are trained on a trellis and have greater yield than bush beans. Except for placing the trellis for pole beans, both types of green beans have the same production practices.

Care is taken to minimize soil compaction. A range of soil types are suitable, but silt loam fields are preferred as the primary accepted farm practice.

Oregon State University conducted recent variety development and growing trials for green beans. Farmers consult the University and extension agents for the best varieties as well as other farmers in western Oregon. Farmers also evaluate several green bean hybrid varieties to plant to select those that do well under their individual production system and meet their market requirements. Smaller size varieties are often favored since they ripen more quickly than larger green bean varieties.

[30] Sources are personal conversation with Nick Andrews, Oregon State University, Small Farms Specialist, on August 31, 2021; Beans, Snap – Green, Romano and Yellow Wax, Oregon State University production guide downloaded from horticulture.oregonstate.edu/oregon-vegetables/beans-snap-green-romano-yellow-wax, Revised January 11, 2010; 2016 Organic Production and IPM Guide for Snap Beans edited by Abby Seaman, New York State Integrated Pest Management Program, Cornell University, 2016; Organic Beans Cultivation Practices and Farming Methods, downloaded from www.agrifarming.in/organic-beans-cultivation-practices-farming-methods, last updated May 3, 2020.

Organic green beans are grown on a limited acreage in the Core Analysis Area. Soil must be fertile, well-drained, and high in organic matter. Green beans are particularly sensitive to soil and air temperatures and are susceptible to diseases.

Young bean plants are susceptible to "damping off" caused by fungus or mold growth during cooler, wet conditions. Seeds are treated with organic-approved biofumigants to reduce this risk and product labels are strictly followed. Additionally, irrigation must be carefully applied as noted in the table below.

Crop rotation is important to suppress diseases in fields growing organic green beans. Beans are planted following wheat or cereal crops to reduce soil borne diseases. Farmers avoid fields that have residue of lettuce, carrots, cabbage potatoes, tomatoes, squash, and pumpkins, among others. Green bean plantings also do not follow strawberries.

In cases where farmers want organic certification approval, they must follow approved organic practices for a transition period of three years. This requires periodic audits by certification organizations. Field preparation for organic producers often includes periodic planting of cover crops to improve soil tilth and fertility.

Table 13 shows the accepted farm practices for organic green bean production in the Surrounding Lands.

Table 13. Accepted Farm Practices for Organic Green Bean Production

Typical Time Period	Accepted Farm Practices
Prior Fall of planting year	Plant cover crop such as cereal grains, Sudan grass, or other crops if cover cropping is needed to restore organic matter, improve soil tilth, or restore soil nutrients.
Prior Fall or early Spring of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes.
Early Spring of planting year	Mow and work cover crop residue into soil.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Trap and/or use biological controls for voles and other rodents and other pests as needed. Follow all product label instructions.
Early Spring of planting year	Pre-planting land preparation (sub-soil, plow, roto-till, etc.) with compost applied as needed. Raised planting beds are recommended.
Early Spring to early Summer	Apply organic certified approved plant nutrients/fertilizers including compost, animal manures, and fertilizers and micronutrients as needed before planting. Follow all product label instructions.
Early Spring to Fall	Use flame weeding and consider cultivating soil early in spring and repeat as needed. Light hoeing above the planted seed helps reduce emerging weeds. After bean plants emerge, apply organic

Typical Time Period	Accepted Farm Practices
	certified materials as needed following all product label instructions. Supplement with hand hoeing or later season mechanical weeding in the rows. Incorporate living mulch with selective mowing between crop rows and lightly applying mulch on raised beds.
Late Spring to early Summer	Plant using certified seed that is disease resistant and consider treatment with organic approved biofumigants following all product label instructions. Plant seeds in moist soil with desired spacing. Transplants may be an alternative to direct planting seed. Avoid post-plant irrigation for two weeks if possible. Staggered planting times to extend harvest and marketing.
Spring	Activate/install irrigation system (drip system for ground application is preferred to aid disease control).
Spring to Summer and early Fall	Apply organic certification approved pesticide applications for insect control following all product label instructions. Consider placing general predators and parasites within the field as natural enemy habitat.
Spring to Fall/Winter	Apply organic approved biological deterrents as soil inoculants for disease control and spray foliage with approved products following all product label instructions. Remove diseased forage immediately. Maintain active monitoring for on-going response. Sanitize tools and equipment that contacts the soil.
Summer to early Fall	Monitor soil moisture and regulate irrigation applications. The most critical period is during flowering and pod sizing.
Summer to early Fall	Harvest crop at just prior to full maturity or at optimum maturity. Small farm practice is removal by hand trimming or gently separating at the stem. Quickly remove field heat by air cooling.
Summer to Fall	Post-harvest handling may include brushing off dirt but not washing. Green beans for fresh markets are kept in cool storage in the range of 40 to 45 degrees for a maximum of ten days. Bulk containers of beans have good air circulation and ideal conditions of controlled atmosphere with 2-3 percent oxygen and 5-10 percent carbon dioxide. The crop is moved quickly to customers.

10.5.6 ORGANIC HOT PEPPER PRODUCTION[31]

Peppers are a warm season crop that needs a long season for high quality production. Food crop farmers in the filtration facility Core Analysis Area use organic methods to raise hot (chili) peppers.

[31] Sources are personal conversation with Nick Andrews, Oregon State University, Small Farms Specialist, on August 31, 2021; Vegetable Variety Trials, 2017 Oregon State University, EM 8777-10 – Revised May 2018; Peppers, Oregon State University production guide downloaded from horticulture.oregonstate.edu/oregon-

This section discusses accepted practices for organic production of hot peppers that include habanero, jalapeno, and other species.

Peppers are grown as an annual crop. Temperature has a large effect on the rate of plant and fruit growth and the development and quality of the red or yellow pigments.

Numerous hot pepper varieties are available for western Oregon farmers. Oregon State University has conducted growing trials to aid farmers in identifying varieties that are adapted to local growing conditions. However, it is also accepted farm practice for farmers to evaluate several varieties and select those that do well under their individual production system and meet their market requirements.

Peppers are potentially high yielding with the right growing conditions and practices. Yields increase with plastic covers over rows. Yields depend on the timing and number of harvests as well as seasonal conditions.

Organic peppers are grown on a limited acreage within the Core Analysis Area. Peppers are particularly sensitive to soil and temperature conditions and susceptible to diseases which make them challenging to grow with organic methods.

Normally peppers are transplanted in the field from greenhouse-grown starter plants. Direct field seeding in western Oregon is not recommended by Oregon State University horticultural specialists. Seedlings and young plants are susceptible to "damping off," which is caused by fungus or mold growth during cool, wet conditions. Both seeds and transplants should be treated to reduce fungal risk following all product label instructions.

Attention to soil temperature is critical to achieve high yields. Oregon State University recommends that western Oregon farmers use either clear plastic mulch applied over herbicide treated soil, black plastic mulch, or infra-red treated. These are alternative methods to warm the soil. In addition, crop covers are also commonly used to provide wind breaks, protect against frost, and support higher yields.

Crop rotation is a valuable accepted farm practice to reduce disease pressure for organic production of peppers. Legumes like beans or peas are excellent to precede peppers. A root crop other than potatoes, such as beets or carrots is acceptable to follow. Tomatoes are not a crop to include in close rotation with peppers.

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vegetables/peppers-0, Revised February 12, 2010; Biodiversity and Pest Management, Oregon State University College of Agricultural Sciences Small Farms Program, downloaded from smallfarms.oregonstate.edu/biodiversity-pest-management, undated; Biodesign Farm Insect Management System by Helen Atthowe and Alex Stone at eOrganic website, downloaded from eorganic.org/node/15584, published February 12, 2021; Organic Disease Control in Organic Farmers School downloaded from the web at organicfarmersschool.org/gardeners/library/organic-disease-control/, undated; Creating a Weed Management Plan for the Organic Farm, downloaded from extension.psu.edu/creating-a-weed-management-plan-for-your-organic-farm; Updated September 2, 2015.

In cases where farmers want organic certification approval, they must carefully follow approved organic practices for a transition period of three years. This requires periodic audits by certification organizations.

Field preparation for organic pepper producers often includes the planting of cover crops to improve soil tilth and fertility. The table below assumes that a cover crop is planted in the fall prior to planting the pepper crop.

Table 14 shows the accepted farm practices for pepper production in the Surrounding Lands.

Table 14. Accepted Farm Practices for Organic Pepper Production

Typical Time Period	Accepted Farm Practices
Prior Fall of planting year	Plant cover crops such as legume or rye grass.
Prior Fall or early Spring of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes and treat if needed, following all product label instructions.
Early Spring of planting year	Mow and work cover crop residue into soil.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Trap or use biological controls for voles and other rodents as needed following all product label instructions.
Early Spring of planting year	Pre-planting land preparation (sub-soil, plow, roto-till, etc.) and may apply compost. Raised planting beds are recommended.
Early Spring to Summer	Apply organic certified approved fertilizers and micronutrients as needed. Follow all label instructions.
Early Spring to Fall	Use flame weeding and consider disk harrow and/or roto-till soil early in spring and repeat as needed. Minimum or "no-tillage" is recommended. Apply organic certified materials as needed following all product label instructions. Supplement with hand hoeing or later season mechanical weeding. Incorporate living mulch with selective mowing between crop rows.
Spring	Activate/install irrigation system (overhead or drip system).
Late Spring to early Summer	Plant using certified transplants that are disease resistant. Use standard spacing and thin young plants as needed. Staggered plantings will extend harvest and marketing, but late season planting is limited due to the long growing season.
Spring to Summer and early Fall	Apply organic certification approved pesticide applications for insect control. following all product label instructions. Consider placing general predators and parasites within the field as natural enemy habitat. Consider using plant covers to reduce pest infestations.

Typical Time Period	Accepted Farm Practices
Spring to Fall/Winter	Apply organic approved biological deterrents as soil inoculants for disease control and spray foliage with approved products and follow all product label instructions. Remove diseased forage immediately. Maintain active monitoring for on-going response. Plant debris is removed from fields. Sanitize tools and equipment that contacts the soil.
Spring to Summer	Monitor soil moisture and regulate irrigation applications to ensure sufficient water without over application during growing season.
Summer to Fall	Harvest crops at optimum maturity. Harvest acceptable size and color product and hand trim at the stem. Quickly remove the field heat by cooling.
Summer to Fall	Post-harvest handling may include brushing off dirt but not washing. Hot peppers are kept cool while stored and distributed. Standard packaging may include waxed, corrugated cartons but vary with farmer and customer preferences.

10.5.7 ORGANIC WINTER SQUASH PRODUCTION[32]

Winter squashes are species of cucurbit. Cucurbits are distinguished by their stem structure and normally do not cross pollinate. While there are numerous species of cucurbits, this summary focuses on varieties cultivated in the Surrounding Lands, namely Tetsukabuto, a Hubbard type squash that is an interspecies hybrid between C. *moschata* and C. *maxima* and Calabaza, a squash in the C. *moschata* family. Calabaza are popular in Latino countries such as Mexico, Cuba, and other Latino countries. Calabaza has similar production and pest management practices to butternut squash. Tetsukabuto was bred in Japan in the 1960s and is gaining popularity in Oregon for commercial production.

Tetsukabuto are medium size squash with a 90- to 100- day growing season, while Calabaza produces large fruit and requires a long growing season of approximately 120 days. Both are annual crops and are planted in May after the danger of frost has passed.

All squash plants are particularly attractive to insects and diseases, making organic production a challenge. A common strategy is to place insect-attracting plants nearby to lure pests away from the commercial squash crop. Predators of squash bugs such as parasitic wasps can also be utilized.

[32] Sources are personal conversation with Nick Andrews, Oregon State University, Small Farms Specialist, on August 31, 2021; Diagnosis and Management of a New Disease pf Cucurbits in Oregon by Principal Investigator Alexandra Stone, Oregon State University, Sustainable Agriculture Research and Education Projects, 2016 Annual Report for SW15-021, downloaded from www.projects.sare.org/sare_project/sw15-021/?ar=2016; Organic Pumpkin and Winter Squash Marketing and Production by Janet Bachmann and updated by Katherine L. Adam, National Sustainable Agriculture Information Service, downloaded from www.attar.cat.org/attar-pub/pumpkin.html, 2010; Squash, Pumpkin and Winter, Oregon State University production guide downloaded from www.horticulture.oregonstate.edu/oregon-vegetables/squash-pumpkin-and-winter, revised February 12, 2010.

Removal of crop residues from fields is also necessary to reduce pests and diseases. Careful crop rotation is also an accepted farm practice. Mulches must be fully composted before being applied to fields.

Planting in light, well drained soils is accepted farm practice and allows for earliest plantings. Soils are well-drained and supplied with organic matter. In western Oregon, winter squash is normally planted from seed with transplants also used.

Squash are vine crops that require wide spacing. Calabaza are planted with row widths of six to eight feet and spaced four to five feet within rows. Tetsukabuto is planted slightly closer.

Farmers prefer to use black plastic to cover soil to increase soil temperature, reduce soil evaporation, protect against pests, and reduce fruit rotting. All of these advantages are particularly helpful for organic production. In addition, row covers can further protect against pest problems.

Soil moisture is maintained at proper levels with irrigation. However, like so many other food crops, squash seedlings are susceptible to "damping off" caused by fungus or mold growth during cooler, wet conditions. The most common virus diseases in Cucurbits *are Zucchini yellow mosaic virus*, *watermelon mosaic virus*, and *cucumber mosaic virus*. Striped cucumber beetle and spotted cucumber beetle are the two main insect pests of winter squash in Oregon.

Fruit set in winter squash occurs with pollination. If farmers are not assured of sufficient natural bee pollination, then pollinator habitat is provided in the vicinity of the crop or beehives; mainly – placed in the field.

Frequent scouting for early detection of pests and disease supports prompt action to reduce disease and pests in fields. It is recommended that winter squash follow a grass or legume crop and that a crop in the legume family follow the year after winter squash.

In cases where farmers want organic certification approval, they must carefully follow approved organic practices for a transition period of three years. This requires periodic audits by certification organizations. Field preparation for organic producers often includes periodic planting of cover crops to improve soil tilth and fertility.

Table 15 shows the accepted farm practices for organic winter squash production in the Surrounding Lands.

Table 15. Accepted Farm Practices for Organic Winter Squash Production

Typical Time Period	Accepted Farm Practices
Prior Fall of planting year	Plant grass cover crops to restore organic matter and improve soil tilth.
Prior Fall, early Spring, or early Summer of planting year	Soil test for pH and soil nutrient levels. Apply lime if needed. Examine soil for nematodes and treat If needed following all product label instructions.

Typical Time Period	Accepted Farm Practices
Early Spring or Summer of planting year	Manage soil to prepare the seed bed and remove or incorporate prior crop residue into soil.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Year round	Trap and/or use biological controls for voles, other rodents and/or other pests as needed following all product label instructions.
Spring of planting year	Pre-plant land preparation (sub-soil, plow, roto-till, etc.) and compost may be applied.
Spring to early Fall	Apply organic certified approved plant nutrients/fertilizers including compost, animal manures, other fertilizers and micronutrients as needed before planting. Follow all product label instructions.
Spring	Use flame weeding and hand hoeing to control early weed emergence.
Spring	Activate/install drip system or overhead sprinkler systems. Install black plastic over the soil to retard weed growth and install row covers.
Late Spring	Plant using certified seed that is disease resistant and treated with organic approved pesticides. Follow all product label instructions. Plant seed in moist soil with desired spacing. Avoid post-plant irrigation for 1-2 weeks if possible. Staggered plantings will extend harvest and marketing.
Late Spring to Fall	After squash plants emerge, apply organic certified weed treatment materials as needed and supplement with hand hoeing or later season mechanical weeding in the rows.
Late Spring to Fall	Apply organic certification approved pesticide applications for insect control following all product label instructions. Place suitable general predators and parasites within the field as natural enemy habitat.
Summer	If natural pollination is not adequate for satisfactory fruit set, utilize pollinator habitat or placement of beehives.
Summer to Fall	Apply organic approved biological deterrents as soil inoculants for disease control and spray foliage with approved products following all product label instructions. Remove diseased forage immediately. Maintain active monitoring for on-going response. Sanitize tools and equipment contacting the soil.
Summer to fall	Monitor soil moisture and regulate irrigation applications.
Fall	Harvest when squash reaches desired size and maturity. Harvest by hand.
Fall	Post-harvest handling includes cutting the squash from vines, washing to remove dirt and sorting. Squash is kept under refrigeration with humidity control with short term storage if needed. Squash is commonly packaged in bulk waxed cardboard.

10.5.8 CONVENTIONAL (NON-ORGANIC) BLUEBERRY PRODUCTION[33]

The filtration facility Core Analysis Area has limited blueberry production with at least two blueberry farmers.[34] Both farmers have small fields of a few acres or less. Harvest is u-pick (buyers do their own harvesting).

The current grower is an organic producer, the new grower will be planting blueberries using conventional methods. The discussion first addresses conventional accepted farm practices followed by discussion of organic blueberry production practices.

Blueberry farmers buy and transplant certified disease-free nursery stock. Specialized nurseries grow these plants in Oregon and Washington.

Table 16 shows the accepted farm practices for blueberry production in the Surrounding Lands.

Table 16. Accepted Farm Practices for Conventional (Non-Organic) Blueberry Production

Typical Time Period	Accepted Farm Practices
Early Spring Year 1 & approx. every 4 – 5 years	Soil test.
Spring – Summer Year 1	Pre-planting land preparation (sub-soil, plow, disk, etc.) and apply sawdust for mulch as needed; may also plant cover crop.
Year round	Scout fields for weeds, insects, rodents, and diseases.
Summer – Fall Year 1	Apply fertilizer at recommended rates if needed and follow all label instructions.
Fall Year 1	Cultivate field for weed control and hand hoe or spot spray. Follow all chemical product label instructions.
Early Spring Year 2 and annually thereafter	Apply pre-emergent herbicide as needed following all product label instructions.
Early Spring Year 2, then approx. every 3-4 years thereafter	Apply additional sawdust for mulch as needed.
Early Spring Year 2	Form raised beds and transplant blueberry bushes.
Early Spring Year 2 and annually thereafter	Apply herbicide in plant row as needed following all product label instructions.

[33] Sources are personal conversation with Dr. Bernadine Strik, Oregon State University, Professor and Berry Crops Research Leader, on October 8, 2020; Nutrient Management for Blueberries in Oregon by J. Hart, B. Strik, L. White and W. Yang, EM 8918, November 2006; and Blueberry Economics: The Costs of Establishing and Producing Conventional Blueberries in the Willamette Valley by Scout Sutton and James Sterns, AEB 0061, March 2020.

[34] Accepted farm practices described in this report are typical of the Surrounding Lands more broadly as well, for the reasons explained above in Section 6.0.

Typical Time Period	Accepted Farm Practices
Spring Year 2	Install permanent irrigation system (either drip or overhead systems).
Spring Year 2	Install weed mat if desired as alternative to seeding grass in the rows.
Spring, approx. every 2 – 3 years	Open weed mats and check irrigation system, add organic matter.
Spring, approx. every 5 – 7 years	Remove and replace weed mats.
March – April Year 2	Install trellis (post and wire).
Late Spring – Fall Year 2 and annually thereafter	Apply insecticide as needed following all product label instructions.
Spring – Summer Year 2 and annually thereafter	Apply fungicide as needed following all product label instructions.
Late Spring – Summer Year 2 and annually thereafter	Collect and analyze leaf samples for nutrient analysis.
Late Spring – Year 2 and annually thereafter	Apply pre-emergent herbicide as needed following all product label instructions.
Late Summer Year 2 and annually thereafter	Mow for weed control with hand weeding near plants as needed.
April – August, Year 2 and annually thereafter	Fertilize at recommended rates, apply with irrigation ("fertigation") and/or granular fertilizer application. Follow all fertilizer label instructions.
Fall Year 2 and annually thereafter	Apply post-emergent herbicide as needed following all product label instructions.
Winter Year 2 and annually thereafter	Apply fungicide as needed following all product label instructions.
November – February Year 2 and annually thereafter	Prune plants.
Spring Year 3 and annually thereafter	Place beehives for pollination.
Summer Year 3 and annually thereafter	Install and operate visual and auditory bird deterrents which include any of the following: decoys, startling noise devices, birds of prey, and laser lights.
June to September Year 3 and annually thereafter	U-pick customers at the farm are responsible for cooling and washing.
October – November Year 3 and annually thereafter	Apply lime as needed based on soil pH.

The conventional blueberry grower will have compliance costs which are necessary for proper record keeping such as documentation for use of chemicals/food safety, environmental/third party compliance and inspections by government agencies. Inspections can occur at various times of the year.

ORGANIC BLUEBERRIES

The organic blueberry producer must follow approved organic practices to have certified organic production. Annual inspections are performed to maintain organic certification.

Numerous accepted farm practices described for conventional farmers above can also be performed on organic farms. The accepted organic farm practices that differ from conventional production methods:

- Broadcast applications of animal manures/compost are approved fertilizers and follow all label instructions
- Add other approved soil nutrients such as borax and gypsum
- Use biological controls such as predatory insects to reduce harmful insects
- Use a limited number of herbicides, insecticides, and fungicides which contain naturally occurring, approved ingredients. Product labels are strictly followed. The time of application and total number of applications are limited.

10.5.9 PEACH PRODUCTION[35]

One peach orchard was found in the Surrounding Lands. The orchard uses conventional (non-organic) production methods. The trees are in a phase of expanding production in the 5th year after planting. Commercial peach trees have wide variation in productive life, from 10 to 20 years. Weather, pests and disease pressure, and other factors can shorten the life span. Peak production is reached at four to eight years after planting, and most commercial farmers typically remove trees around year 12 since yields and tree vigor decline at that point.

Peaches are not commonly grown in the Surrounding Lands because the spring weather at blossom time in March and April can be cool and rainy. Under these conditions there is greater disease potential and reduced fruit production. The two primary diseases are peach leaf curl, shothole borer, and brown rot blossom blight. Peaches are also susceptible to peach twig borer, leafrollers, Asian fruit moth, aphids, and powdery mildew. Frequent scouting for indication of pests and diseases is an accepted farm practice with an active spray control program for most months of the year. The accepted practice is to follow all label instructions.

[35] Sources are personal conversation with Dr. Erica Chernoh, Assistant Professor (of Practice), Commercial and Community Horticulture, Oregon State University Extension, on November 30, 2021; Pest Management for Peaches by N.G. Wiman, J.W. Pscheldt, and M. Moretti, EM 8419, May 2020; and Peach Production by R. Crassweller, L. Kime, and J.K. Harper, PennState Extension, Updated July 7, 2017.

The orchard sells the majority of fruit to customers that come to the orchard for u-pick. A small share of the crop is picked and sold by the box to customers that come to the farm.

This orchard is well established, and new plantings are only necessary if trees die. Replacement trees are planted as dormant, bareroot trees. Trees are selected to meet specific growing conditions and disease resistance, as well as having fruit characteristics that meet customer preferences. Specialized nurseries grow these plants in Oregon and Washington.

Pruning in the first two years is important to create the proper tree structure. This develops the correct canopy for fruit to develop and adds convenience for picking the fruit by hand. Thereafter, annual pruning is needed to remove diseased and dead wood and encourage new growth for increased yield.

Table 17 shows the accepted farm practices for a peach orchard that is currently established in the Surrounding Lands.

Table 17. Accepted Farm Practices for Conventional (Non-Organic) Peach Production

Typical Time Period	Accepted Farm Practices
Winter – annually	Dormant spray for peach leaf curl and shothole borer. Follow all label instructions. Check for Cytospora canker and remove and destroy dead cankered limbs.
Winter – annually	Apply delayed dormant spray for peach leaf curl, shothole borer, other indicated pests and diseases as needed. Follow all label instructions.
Late Winter – annually	Prune to remove dead/diseased wood and maintain the required open tree canopy for fruiting wood. Check for additional pruning needed throughout winter.
Early Spring approx. every 3 - 4 years	Soil test for fertilizer and mineral nutrient requirements.
Early Spring – annually	Apply pre-emergent herbicide for weed control as needed following all product label instructions.
Spring and Summer - annually	Apply fertilizer at recommended rates and follow all label instructions.
Spring to Summer	Manage soil with tillage, disking, and/or mowing. Plant cover crops or grass between rows.
Spring – annually (at Popcorn stage)	Apply insecticide sprays as needed following all product label instructions for any of the following pests: peach twig borer, leafrollers, aphids, eyespotted bud moth, or stinkbugs. Monitor peach twig borer with pheromone traps.
Spring to late Spring – annually (at Popcorn stage and at full bloom)	Apply fungicide spray for brown rot blossom blight as needed following all product label instructions.

Typical Time Period	Accepted Farm Practices
Spring – annually	Maintain, test, and repair drip irrigation system for operation during warm, dry irrigation season.
Late Spring – annually (at petal fall)	Repeat insecticide sprays for any indicated pests following all product label instructions.
Late Spring – annually	Continue spraying shothole and powdery mildew as needed. Follow all product label instructions.
Early Summer – annually	Thin fruit by hand for proper fruit sizing.
Summer - annually	Conduct leaf tissue analysis for summer and fall fertilizer recommendations.
Summer - annually	Spray and repeat as needed to control powdery mildew, shothole borer, peach twig borer, fruit moth, and spotted wing Drosophila. Follow all product label instructions.
Late Spring to Summer - annually	Irrigate trees with drip system to maintain optimum moisture levels during dry periods.
Summer – annually (pre-harvest)	Spray brown rot if rain is forecasted, following all product label instructions.
Summer – annually	Moderately prune for light penetration and/or branch training.
Summer – annually (in August)	Prepare for harvest and sales: procure cartons/other package supplies, conduct crew training, preparation of signage and parking/sales area.
Fall – annually	Apply preemergent and post emergent herbicide, following all product label instructions, or cultivate for weed control.
Fall and Winter – annually (post- harvest)	Spray fungicide as needed for peach leaf curl and shothole and repeat winter dormancy, following all product label instructions.

10.6 Cannabis Production Accepted Farm Practices

Cannabis is a broad taxonomic classification that contains both hemp plants and marijuana plants. The terms cannabis, marijuana, and hemp all describe plants in the Cannabaceae family. The terminology is complicated, but marijuana and hemp are legally and chemically distinct.

Marijuana and industrial hemp are both grown in the Surrounding Lands. The accepted farm practices for each are separately covered here.

10.6.1 MARIJUANA PRODUCTION[36]

Marijuana is grown in Oregon for recreational or medicinal purposes. Industrial hemp is closely related to marijuana but has much lower tetrahydrocannabinol (THC) concentration. Industrial

[36] Sources are personal conversation with Paul Luttrell, December 7, 2020; "An Introduction to Cannabis Cultivation," at https://weedmaps.com/learn/the-plant/cannabis-cultivation-intro/, downloaded September 30, 2020. "How to Grow Cannabis Plants for Concentrate Production" in Cannabis Industry Journal, by Andrew Myers,

hemp also differs because it is primarily grown outdoors. Accepted practices for hemp are described separately in this report.

Farmers do not advertise their locations, and the Oregon Liquor Control Commission (OLCC) does not disclose the addresses or provide contact information for these businesses. This increases the difficulty of locating farmers, but visual observation and aerial photography were used to identify indoor marijuana producers in the Surrounding Lands.

In the Surrounding Lands, marijuana is principally grown indoors. Based on review of aerial imagery study and extensive driving in this area, only indoor production is feasible to control climate and protect against theft or vandalism. Indoor production also has the advantage of a highly controlled environment which reduces the production cycle to increase total production. Operation security and prevention of crop loss also favors indoor production. Since there is no known outdoor marijuana production in the Surrounding Lands, this analysis of accepted farm practices covers indoor production.

Marijuana producers must comply with state licensing requirements as well as applicable local ordinances. Local ordinances control grower operations for hours of operation, access requirements, noise and odor limits, and waste management practices. Local building codes govern the construction of greenhouses and other buildings.

Marijuana production must be laboratory evaluated for potency, pesticides, water activity, and moisture content. Different tests are required depending on whether the final product is usable marijuana, extract/concentrate, or cannabinoid products intended for human consumption.

Indoor marijuana growing facilities are greenhouses using artificial lighting, air conditioning, dehumidification, and irrigation. Lighting is a critical factor that affects energy consumption, heat production, and plant growth response. Monitoring temperature, humidity and carbon dioxide levels is important as is ventilation to manage air flow. Video camera surveillance and perimeter fencing are facility features controlled by zoning regulation.

All employees who perform work on behalf of an OLCC licensed producer must have a valid marijuana worker permit issued by the OLCC.

Before propagation starts, the marijuana strain is selected. Strains respond to specified growing environments. Farmers select the strain or strains that are best suited to their growing conditions and market segments.

Accepted farm practices include alternative growing methods: 1) "live soil" which includes microbes, fungi, and other beneficial soil organisms; 2) amended soil including peat; 3) growing medium such as coconut coir; and 4) hydroponic (soil-less production in a nutrient-rich water).

December 30, 2019, downloaded from https://cannabisindustryjournal.com/feature_article/how-to-grow-cannabis-plants-for-concentrate-production/. Articles on several aspects of marijuana production are from https://www.cannabisbusinesstimes.com/page/from-the-experts/, reviewed October 29, 2021.

Regardless of the production method, the high humidity and temperature levels maintained in the greenhouse can allow for rapid disease spread. Regular cleaning of surfaces and equipment in the indoor environment reduces the risk of disease.

There are four stages of marijuana plant production. The first is the seed or clone stage, followed by the vegetative stage, then the flowering stage and finally harvest. With precise management and environmental control, within twelve months an indoor grower can achieve four or more complete growing cycles from initial planting through harvesting. Highly accelerated growing cycles require separate "grow rooms" with different lighting, temperature, and other growing conditions for plants at the vegetative stage and those at the flowering stage. In addition, growing cycles are reduced by planting cloned plants instead of starting with seeds.

Lighting maintenance and replacement is important for performance and efficiency. Cleaning includes optic lens and reflectors. Maintenance depends on the specific lighting technology used. HVAC and dehumidification systems for climate control are large energy users and require proper design and regular maintenance.

Alternatives for the irrigation system are acceptable and depend on the production system. The alternatives range from traditional hand watering and drip systems to hydroponic flood tables where plant trays are flooded with water and nutrients. Also, aeroponic systems are used to spray water to mist plants. Different irrigation systems can be used at each plant growth stage.

A high-yielding indoor marijuana operation requires strict specification of applied water. Water may need to be filtered. Water recycling with repurification is a recommended practice to ensure nutrified water is effectively managed. Excess process water including HVAC condensate may need to be held in a retention reservoir and evaluated before discharge.

Inoculation of marijuana plant roots with mycorrhizal fungi is widely practiced. This adds vigor to plant growth. This can be usually accomplished by mixing inoculant to the growing media at planting time or dusting the root ball with fungi at the time of transplanting.

Fertilization is critical and is closely monitored over the growing cycle. In the vegetative stage, the young plants need precise amounts of nitrogen, phosphorus, and potassium. Calcium and magnesium are important additions at the start of the bloom stage. Higher amounts of fertilizer are needed in the bloom stage compared to the vegetative stage. Later in the bloom stage more fertilizer is applied according to plant needs. All fertilizers are applied following all label instructions.

There are no registered pesticide products currently labelled specifically for use on marijuana. However, the Oregon Department of Agriculture has established criteria and a list of pesticide products to guide marijuana farmers and pesticide applicators. Because of stringent testing for allowed pesticides and levels, it is accepted farm practice to reduce or eliminate pesticide applications with Integrated Pest Management (IPM). The goal is to keep pests at non-damaging levels by thorough cleanliness, use of disease resistant plants, use of biologic controls such as natural predators, ongoing scouting for disease and pests, and removal of infected plants.

It is an accepted farm practice to add carbon dioxide to stimulate plant growth. The added carbon dioxide is regulated to ensure the right amount is available to the plants along with other managed growing conditions such as lighting.

Higher yields are achieved by training and pruning plants. The timing of training depends on the end goal. Mother plants require constant training. If the need is to keep plants short during the flowering stage, then training is done in the vegetative phase. Topping the plants is another pruning technique.

The time of harvest is determined by close inspection of the flower parts. First, large fan leaves are removed, and the plants are hung in a well-ventilated drying room with temperature and humidity-control. Curing starts after the flowers are dry enough to be cut from the stem. The flowers are placed in airtight containers for a minimum of two weeks. The containers are opened several times per day during the final curing process to allow for the release of excess moisture.

After curing, the marijuana is ready for trimming, packaging, and shipping. If marijuana is stored before sales, humidity, oxygen exposure, and temperature are regulated for quality control. Final packaging is based on the distribution system used.

10.6.2 HEMP PRODUCTION[37]

Hemp (*Cannabis sativa L.*) is grown in the Surrounding Lands. It is a minor crop and grown in Clackamas County by one grower. The major Oregon hemp production areas are in southern and eastern counties.

Hemp is closely related to the marijuana plant but distinguished by having a THC concentration of not more than 0.3 percent on a dry weight basis. THC levels are monitored to ensure compliance with this limit.

After a long history as an illegal crop, hemp was authorized for production in the 2014 U.S. Farm Bill. It is therefore a relatively new crop in the U.S. and production techniques are still being developed and refined. The following is a guide to accepted farm practices for hemp, with the recognition that farmers and plant researchers are still experimenting and learning what works best given variable production conditions such as soil, climate, and plant variety selection.

[37] Sources are personal conversation with Dr. Gordon Jones, Extension Specialist, November 23, 2020; "What is Industrial Hemp?" EM 9240, August 2019 by V.D. Jeliazkov, J. Noller, S. Angima, S. Rondon, R. Roseberg, S. Summers, G. Jones, and V. Sikora, Oregon State University, downloaded November 17, 2020 from https://catalog.extension.oregonstate.edu/em9240/html#:~:text=Industrial%20hemp%20is%20an%20annual,hemp%20are%20fiber%20and%20food; and "Seedbed Preparation and Seeding for Hemp in Oregon" EM 9239, August 2019 by R. Roseberg, S. Angima, and V.D. Jeliazkov, Oregon State University, downloaded November 17, 2020 from https://catalog.extension.oregonstate.edu/em9239.

Hemp is a major component of numerous products, but most farmers focus on producing hemp for extraction of cannabidiols (CBD), essential oil and seed fixed (fatty acid) oil. Fiber is also extracted from the plant.

Hemp is an annual crop grown outdoors in fields. It can be a rotation crop with other subsequent crops in later years. However, some farmers have grown hemp without switching to other crops for a span of years. Traditional rotation crops include field crops such as alfalfa or corn. Since these are rarely grown in the Surrounding Lands, the most suitable alternate crops include wheat and other grains or vegetable crops. A limitation for growing hemp is that few traditional pesticides are approved for this crop. The pesticides that are used are used in compliance with all label instructions. Soils that have residual pesticides from growing other crops also present problems in fields planted to hemp.

Hemp farmers must register with the Oregon Department of Agriculture whether they grow, harvest, or dry hemp.

Most farmers purchase seed to grow their hemp crop. However, some farmers focus on growing certified seed to sell to other farmers or producing plants for transplanting. Hemp can be grown to finished size in greenhouses or open fields, but open field production is most common.

Table 18 shows the accepted farm practices for hemp production in the Surrounding Lands.

Table 18. Accepted Farm Practices for Conventional Hemp Production

Typical Time Period	Farm Practice
Previous Summer or Fall	Plant cover crops to improve soil tilth and weed management if needed.
Previous Fall	Plow field.
February – following year	Test for pH & soil nutrients.
Early Spring	Lime or other soil amendments if needed.
Early Spring	Disk/rototill (any combination, as needed) to prepare firm seed bed and reduce weeds.
Spring	Seed bed preparation includes use of plastic on raised beds or no-till preparation.
Mid to late Spring	Transplant hemp starts after danger of last frost, or directly seed.
Late Spring/early Summer	Irrigation may be needed after planting to establish the crop; drip method is recommended.
Late Spring to late Summer	Select and apply only pesticides approved by the Oregon Dept of Agriculture following all label instructions. Application rates are monitored to avoid plant injury or result in excessive residue detected by testing.
Early Summer	Fertilize based on nutrient test.

Typical Time Period	Farm Practice
Mid-Summer	For CBD maximation, when plant sexual maturity is reached, manually pull male plants to eliminate pollination of female plants.
Late Summer	Within 28 days of harvest, obtain flower samples and test for THC concentration in accordance with Oregon Dept of Agriculture regulations.
Late Summer/early Fall	Harvest seed and/or fiber, harvest is by machine or hand methods.
Fall	Drying for oil extraction is done on-farm or sent to a third-party drying facility.
Fall	Plow or otherwise manage soil for following crop.

10.7 Further Review of Pesticide Accepted Farm Practices

Pesticides (i.e., insecticides, herbicides, and/or fungicides) are chemicals that farmers use to promote the quality and yield of agricultural crops. Pesticides control weeds, insect infestations, and diseases, and can be used on conventionally grown (non-organic) crops. Select pesticides approved by certifying organizations can also be applied on organic crops. Pesticides are sprayed toward the ground to eradicate weeds or soil-borne organisms or sprayed directly on plants.

It is an accepted farm practice in the Surrounding Lands to carefully monitor fields and indoor growing areas such as greenhouses to determine if insect, weed, or disease threats need attention. This scouting involves early detection because, in some cases, if crop threats are untreated, they quickly spread. Farmers and their workers walk and drive through growing areas and have access to evolving technologies such as drones to scout and monitor disease conditions. Close field monitoring allows farmers to maintain an effective pest management program where they only apply the most appropriate pesticides and amounts where and when needed. Early detection is also important because it reduces the rate of application and also limits the area needing treatment.

When treatment is required, it is accepted farm practice to select the correct pesticide and apply it as specified on the product label and by following all Federal and State regulations regarding its use. Certified pesticide applicators are required for many pesticides. Certified applicators may be farmers, hired workers, or third-party hired commercial applicators. Regular training and testing improve skills and prove qualification for this certification.

Except for minimum risk pesticides, commercial pesticides for crop production in the Surrounding Lands must be registered with both the U.S. Environmental Protection Agency (EPA) and the Oregon Department of Agriculture (ODA). Before registering a pesticide, EPA extensively evaluates each for its public health and environmental safety and appropriate use. Approved pesticides are labeled with all the information EPA determines farmers and applicators need to know to effectively apply the pesticides while safeguarding human health and safety and protecting the surrounding environment.

It is accepted farm practice to carefully follow all requirements specified on the pesticide labels. Warnings about when, how, and where the pesticides can be used are prominently displayed on labels. ODA assists with monitoring pesticide use with inspectors that regularly check farms.

Spraying from ground equipment is the most common method of applying pesticides. Aerial (e.g., via airplane or helicopter) spraying is not practiced and is not an accepted farm practice in the Surrounding Lands. It is accepted farm practice to only apply pesticides when weather conditions meet specific benchmarks. These include temperature, wind, humidity, and rain. It is accepted farm practice to immediately stop spraying if conditions change and chemical drift could occur. This is because drift or overspray[38] to a non-target area such as adjoining property are not allowed under label warnings and are not accepted farm practices. Drift also can cause economic loss for a farmer – drift can injure crops on nearby farms or fields, and the crops can become unsellable if the drifting pesticide is not registered for use on the crop. Additionally, when pesticide drift occurs, some amount of the pesticide is not reaching its intended target, so the potential benefit from the application is reduced and the cost of using the pesticide is increased, as more is needed. For all these reasons, overspray and drift of pesticides and other agricultural chemicals are not accepted farm practices.

10.8 Further Review of Fertilizer Accepted Farm Practices

Synthetic (human-made) commercial fertilizers are the most common type that farmers add to their soil or growing medium in the case of some nurseries. Fertilizers provide nutrient supplementation that supports high quality, rapid plant growth. Nitrogen, phosphorus, and potassium are the most commonly applied, but farmers also apply micronutrients if soil is determined to be deficient in boron, etc.

The State of Oregon requires all fertilizer manufacturers to be licensed and their products to be registered in order to be sold in the State. Labels must list the primary ingredients, secondary nutrients, and micronutrients that are claimed or advertised, and they must be guaranteed. Laboratory analysis is required before products can be registered. These State requirements allow farmers to follow the accepted farm practice of accurately applying fertilizers in proper amounts that are effective for delivering nutrients directly to the plants without wasteful and costly excessive application.

The accepted farm practice for all types of farming and crops in the Surrounding Lands starts with soil testing before planting to determine what, if any, nutrient deficiencies are in the soil for the crop to be grown. The soil test indicates the proper amount of fertilizer nutrients and supplements to apply. For certain fertilizers, such as nitrogen, it is also accepted farm practice to only apply fertilizer when the plant can optimally receive the nutrient value of fertilizer.

[38] Overspray is the application of chemicals beyond the targeted site as a result of operator error.

In the case of nurseries and food crop farming, it is accepted farm practice to 1) avoid fertilizers with heavy metals that may be taken up in plants or that are toxic to the environment; and 2) to use only commercial fertilizers free of animal manures so that nutrients are highly controlled which aids consistent yields and crop quality. However, organic farmers use manure as an accepted farm practice.

Accepted farm practice for pasture grazing or hay production use may include not using supplemental fertilizer but relying on animal manure. Organic farms may also use animal manure in accordance with the national organic standards or the guidance specified by organic certifying organizations. It is also accepted farm practice to avoid pasturing animals until the manures are composted and incorporated in the soil in proper amounts so that excessive nutrients do not reach surface or groundwater sources.

Regardless of the crop being grown, it is accepted farm practice to target the quality of fertilizer applied to equal only the amount needed to remain in the root zone, or in leaves in the case of foliar application. This results in proper nutrient uptake in the crop while saving cost by not applying an excessive amount.

In field nurseries, it is accepted farm practice to apply fertilizers during the transition period after the harvest of one crop and before the next crop is planted. This is effective for fertilizers that remain active in the soil for several years and are available as needed by the nursery crop. Supplemental fertilization will be applied when necessary. Nitrogen fertilizer is typically applied annually.

Methods of field fertilizer applications are determined by farmer preferences and unique crop requirements. It is accepted farm practice to apply fertilizers under the most suitable temperature, humidity, and rainfall conditions.

Before planting when fields are bare ground, the accepted farm practice is to apply commercial fertilizers in dry (granular) form by use of a broadcast spreader or a drill with incorporation into soil by disking, tilling, or similar method. After planting, dry fertilizers are typically applied by manual means (hand-held spreader) or side dressing in a band application.

For field application of liquid fertilizers, the fertilizers are diluted with water in a mixing tank and are either applied by spray at ground level or injected into soil. Less frequently, liquid fertilizers are mixed with liquid pesticides and applied as a foliar spray with a blast sprayer. In these cases, the pesticide label requirements dictate the conditions for application. In greenhouses, it is accepted farm practice to apply granular fertilizer by hand to pots or by adding liquid fertilizer to irrigation water.

10.9 Accepted Farm Practices Apply to Surrounding Lands

As stated previously, there are no notable differences for farm characteristics or crops found in the Core Analysis Areas and the Surrounding Lands. It follows that the accepted farm practices are no

different between farms located in the Core Analysis Areas and those in the wider Surrounding Lands.

11.0 Filtration Facility Compatibility with Character of the Surrounding Lands

There are currently numerous community service uses that support area residents within the Surrounding Lands. These include the PHWD's twin water towers that are on an adjoining site at the highest elevation in the area, and therefore easily seen from many locations. Other community uses include the Oregon Trail Academy, a public school at the intersection of Bluff Road and Proctor Road, and the Water Bureau's Lusted Hill ICCT Facility with a communication tower at the corner of Lusted Road and Cottrell Road.

Medium size and large nurseries in the Surrounding Lands have buildings that are comparable in size or larger than the proposed filtration facility. These nursery operations have greater numbers of employees and a higher level of daily access and vehicle trips than will be needed for operation of the filtration facility (see Figure 7). The Water Bureau Land Use Application narratives have comparative information about farm buildings in the Surrounding Lands and the filtration facility.



J. Frank Schmidt Nursery is among the largest nurseries in Oregon and has a major presence in eastern Multnomah County

The existing community service uses and the presence of medium and large nursery operations have defined the scale of development and character of the area in the Surrounding Lands. The filtration facility is designed to operate without significantly changing or impacting the character of the Surrounding Lands.

11.1 Semi-Rural Land Uses

Many residential properties are in the area around the filtration facility site. Within the Core Analysis Area of the filtration facility, there are 72 residences that have no associated farm use. These properties are found along all roads in the area, and there are also residences with longer driveway access to properties that set back from the roads. Clusters of small, rural residential properties are found in most directions in the Core Analysis Area. The larger clusters of residential development are on: Carpenter Lane; Cottrell Road near Bluff Road; Cottrell Road from Dodge Park Boulevard to Lusted Road; Lusted Flats from where Lusted Road enters the valley in the north to

where Dodge Park Boulevard meets Lusted Road; and along Bluff Road on the south side from Cottrell Road to the Oregon Trail Academy.

The surrounding residential properties in Multnomah County are in the MUA-20 and RR zones. Both of these zones allow residential development outright. New residences require a minimum lot size of 20 acres in the MUA-20 zone and five acres in the RR zone.

11.2 Building Types

Typical buildings observed during trips to evaluate the Surrounding Lands include:

1. *Single family farm residences:* these homes vary in size and appearance. Older farm homes tend to be two-story and have traditional wood exteriors. Large, modern farm homes on larger parcels are often single story and have brick or wood exteriors.
2. *Outbuildings associated with farm residences:* detached garages, barn-like buildings and sheds, open-side covered vehicle parking, and other small buildings of varying sizes and shapes.
3. *Farm buildings on properties with headquarters* for larger commercial farming:
    a. Metal clad siding and roofs, usually of pole barn type construction. These buildings are common for storing and repairing vehicles and equipment; handling, grading, and storing crops; and storing supplies.
    b. Farm office buildings either metal or wood covered, using simple commercial building design, or converted residences.
    c. Fuel tanks, wells, and pumps may be completely without associated structures, roof-covered only for moderate weather protection or fully enclosed using many different construction types.
    d. Nursery greenhouses covered with acrylic, polycarbonate, fiberglass-reinforced plastic, polyethylene film, or glass. These are constructed as either permanent or temporary (seasonal) structures. Open-sided shade structures are also typical temporary nursery structures. Shade cloth is commonly made from polyethylene and polypropylene.
    e. Buildings are often clustered to maximize farmable land.
4. *Farm buildings on smaller farms:* these are often smaller variations of those found on large farms. Older farm buildings are usually wooden structures, including buildings with a barn-like appearance.



Older farm structures/buildings in the Surrounding Lands

11.3 Filtration Building Design Compatibility with Farm Character of Area

The filtration facility will be a low profile set of buildings and related structures designed to discreetly function in the surrounding natural and built environment setting, as described in the land use application. Landscaping will further reduce views of the filtration facility from off-site. The proposed filtration facility is comparable in size to several of the nursery headquarters and major ancillary farm complexes in the Surrounding Lands. Filtration facility structures will be clustered, which is also a feature of most nearby farm headquarters.

Figure 7: Example of Nursery Headquarters & Field Locations



11.4 Noise and Olfactory Generation

Farms in the Surrounding Lands occasionally generate noise and odors. These are more noticeable over a larger area than noise or odors generated by the operation of the filtration facility. This is further discussed in later sections of this report.

11.5 Existing Water Treatment and Distribution Facilities

The Surrounding Lands have had Water Bureau pipelines delivering water to residences and some farmers in the area for decades, as well as to Portland area residents. Bull Run water is an important water source for customers of the Pleasant Home Water District. Two water towers owned and operated by the PHWD are on 0.60 acres adjacent to the Water Bureau property. PHWD purchased their first parcel in the 1930s for one water tower and later purchased additional land (from the City of Portland) for their second water tower to meet growing water demand as

residential development expanded. PHWD has a long-term purchase agreement for water supplied by the Water Bureau to store and distribute water from these towers.



Pleasant Home Water District towers adjacent to the filtration facility site

In addition to the filtration facility, Water Bureau has treatment facilities in the Surrounding Lands to make Portland's water less corrosive to lead and other metals found in residential and commercial plumbing. The new corrosion control facilities were completed in mid-2022, located at the existing Lusted Hill ICCT Facility site near the proposed filtration facility site.

11.6 Farm Property Edges

Farm properties across the Surrounding Lands were studied to evaluate their typical borders or "edges" and assess the compatibility with the proposed filtration facility. Property edges for transition at nursery headquarters and fields nearly always have simple borders. It is not common to see dense plantings or other structures that create a barrier from roads or property boundaries to farm properties. Field grown nursery crops are set back from property boundaries a distance of eight to ten feet (or more) to allow farmers to maneuver vehicles and equipment between crop rows, or for perimeter travel to interior farm roads or driveways that reach public roads.

Examples of farm buffers/edges observed in the Surrounding Lands include:

- No buffer – grass strip only (most common edge observed)
- Perimeter road
- Fences: cyclone, barbwire, white rail, opaque (several varieties)
- Horticulture specimens: many farmers have planted their specialty ornamental trees as a buffer (and an advertisement)
- Hedge/screen plantings: arborvitae, laurel, other evergreen species – many residences in the area use this treatment along their road frontage, but it is not used by farms
- Rows of deciduous trees
- Small berm – not commonly used as a buffer in this vicinity
- At some locations, the roadway elevation is four or more feet below the adjacent farms, so that elevation difference provides the effect of a berm-like buffer.

General conclusions about farm property edges in the Surrounding Lands:

1. Whenever possible, farmers try to maximize the farmable area on their land. Farmable areas include the non-crop areas of fields for turning farm equipment, and vehicle access on farm roads. Fences, berms, walls, and wide buffers take land out of the farmable area and are avoided wherever possible.
2. The desire to maximize farmable areas also explains the clustering of buildings on farms. Operators want to conserve the farmable land in larger contiguous blocks, so they tend to cluster the structures. Nurseries also find that clustering contributes to more efficient operations.
3. The lack of fences on most properties also confirms there are few livestock in the area. Farmers are not too worried about cattle or horses (or goats or llamas) escaping from corrals or pastures and damaging their crops.



Typical "edge" on area farm use property (Bluff Road)

12.0 Analysis of Potential Impacts from Externalities of the Filtration Facility on Accepted Farm Practices in the Surrounding Lands

The Water Bureau's filtration facility will help protect public health and comply with federal and state safe drinking water regulations by removing Cryptosporidium and other potential contaminants from the Bull Run supply. The design of the filtration facility is informed by good neighbor principles and commitments developed through a series of meetings beginning in October 2019 with the Water Bureau and the Site Advisory Group that includes local residents and area farmers. The Water Bureau's good neighbor practices are an important way to ensure compatibility of the facility with residents and area farmers.[39]

[39] The goal of the Good Neighbor Agreement is to document the Water Bureau's commitments to filtration facility neighbors during design, construction, and ongoing operation to ensure neighbors' interests are considered. See Appendix B of the land use application package for more information about the Site Advisory Group and Good Neighbor Agreement.

The next sections evaluate the filtration facility's potential impacts on accepted farm practices in the Surrounding Lands and how the Water Bureau has designed the filtration facility to avoid or mitigate any potential impacts. As described above, the Surrounding Lands were defined to be sufficiently large to encompass all potential impacts that the proposed filtration facility might have on accepted farm practices or on the costs of accepted farm practices. The potential impacts from the filtration facility on accepted farm practices relate to the potential "externalities" of the filtration facility. The potential externalities identified – and analyzed in each subsection below – are 1) noise, 2) vibration, 3) odor, 4) light/glare, 5) dust, 6) mud, 7) litter, 8) vector control, 9) air emissions, 10) water quality/quantity, 11) radio transmission, 12) security, 13) traffic, and 14) chemicals used at the filtration facility. There is also the potential for impacts on accepted farm practices to emanate from any "sensitivities" of the proposed use, and how any sensitivity interacts with farmers who follow accepted farm practices in the Surrounding Lands. Potential sensitivity impacts are addressed in Section 13.

In addition to the reports referenced in footnotes, information relied upon in the section below was provided by Lyda Hakes, Water Bureau Project Manager, Mark Graham, lead consultant for filtration facility design and Kim Gupta, Water Bureau Bull Run Supply and Treatment Manager.

12.1 Noise

Farming operations, which themselves can generate substantial noise, typically are not sensitive to noise from off-site sources. Additionally, the design of the filtration facility has various noise-limiting design measures to help reduce off-site sound impacts. A Noise Analysis at the site has determined that operation of the filtration facility will meet the applicable Multnomah County and Clackamas County noise standards.[40] Other Oregon water treatment facilities clearly demonstrate that water processing is quiet.[41] Actions the Water Bureau has taken to accomplish this are: 1) designing pumps, equipment, and filtration facility processes to mitigate potential off-site noise impacts; 2) utilizing landforms and landscaping where possible to block sounds; and 3) designing the filtration facility to meet the code limit of 60 decibels during daytime and 50 decibels at night, as measured by the applicable county standards.

The noise levels generated at the filtration facility are lower than the noise levels generated by farms. During field operations, tractors generate noise in the range of 80 to 100 decibels or more[42] and are operated immediately adjacent to property lines in order to turn farm equipment at the edges of farmed areas, as described above. An irrigation pump generates an estimated 100 decibels

[40] Technical Memorandum, Exterior Noise Analysis, August 2022, by Stantec. Available as Appendix E.3 of the land use application package.
[41] Oregon's Water Treatment Plant Operations, by Barney & Worth, July 2022. Available as Appendix E.1 of the land use application package.
[42] Source: https://gpcah.public-health.uiowa.edu/fact-sheets/hearing-loss/.

of noise. Power tools, chicken coops, and conveyors also generate noise above 60 decibels.[43] These levels are higher than the operating noise level of the proposed filtration facility.

The insignificant amount of sound generated by the filtration facility will remain within county standards and is also below background levels already created by farming operations in the area.

For these reasons, noise generated by the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.2 Vibration

Some equipment housed inside buildings at the filtration facility will vibrate during operation. Farming operations, which themselves can generate substantial vibrations as described below, typically are not sensitive to vibration from off-site sources. Additionally, equipment that could potentially produce vibrations will be mounted with mass and base isolation to limit the area where vibration can be perceived to those areas within 10 feet of the equipment – meaning that no vibration will leave the filtration facility site.[44]

Additionally, the main farm equipment in fields near the filtration facility site are tractors that pull various implements. Tractor motors generate significant vibration, especially when pulling equipment that works under the surface of the ground.

For these reasons, vibration from the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.3 Odor

The filtration facility is not expected to generate any off-site odors under normal or emergency operation.[45] A survey of Oregon water treatment plants shows that drinking water treatment plants emit only minor odors.[46] The design of this filtration facility minimizes possible odor generation from all sources. No odors will be detected off-site.

In contrast to the filtration facility, farms occasionally create odors that are detected off the farm property. This primarily is due to chemical odors from fertilizer application and farm spraying for insects, weeds, and other purposes. The airborne odors dissipate quickly. The greatest generators

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[43] Source: https://nwdistrict.ifas.ufl.edu/phag/2018/01/26/farming-is-noisy-business-dont-let-it-steal-your-hearing/.

[44] Technical Memorandum, Potential Local Impacts of Facility Operation: Air Quality, Dust, Noise, and Vibration, August 2022, by Stantec. Available as Appendix E.4 of the land use application package.

[45] Technical Memorandum, Filtration Facility Odor Considerations, August 2022, by Stantec. Available as Appendix E.5 of the land use application package.

[46] Oregon's Water Treatment Plant Operations, by Barney & Worth, July 2022. Available as Appendix E.1 of the land use application package.

of farm odors are large, confined livestock operations. Within the Surrounding Lands, there are fewer than five livestock operations, and they each have few animals. These farms are not directly adjacent to the filtration facility, with the closest being approximately one-quarter mile east of the filtration facility in the Lusted Flats area. Furthermore, reasonable generation of farm odors is allowed under Oregon right-to-farm laws and will have no effect on the filtration facility. Overall, odors are a common part of farming practices and for this reason farming operations are typically not sensitive to odors from off-site sources.

For these reasons, odors will not force any change in accepted farm practices, nor will there be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.4 Light and Glare

The filtration facility's lighting will be designed to follow best practices that shield facility lighting at the source and minimize night-time impacts to neighboring properties. The filtration facility lighting will be designed to comply with Multnomah County's applicable Dark Sky lighting standards. The lighting will be no brighter than necessary for operational safety and filtration facility security around and within the filtration facility. Lighting will not illuminate anything beyond the filtration facility site boundaries.[47]

Furthermore, farming is rarely done at nighttime in the Surrounding Lands and there are no livestock adjacent to the site which could be sensitive to light or glare (the closest is one-quarter mile). Daytime glare from filtration facility surfaces is minimized by the selection of building materials, use of berms, and perimeter landscaping that includes trees.

A survey of Oregon water treatment facilities shows that directional lighting, such as proposed for the filtration facility, does not cause concerns.[48]

For these reasons, light and glare from the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.5 Dust

The filtration facility will have permanent landscaping, buildings, and impervious surfaces that will not generate dust.[49] In general, non-impervious surface areas of the filtration facility will be landscaped with plants that will retain rainfall and help hold dust to a minimum. Because the landscaping of the filtration facility is designed to prevent dust (such as through mulch or plants to

[47] Technical Memorandum, Land Use Permit Lighting Report, August 2022, by Stantec. Available as Appendix E.2 of the land use application package.
[48] Oregon's Water Treatment Plant Operations, by Barney & Worth, July 2022. Available as Appendix E.1 of the land use application package.
[49] Technical Memorandum, Potential Local Impacts of Facility Operation: Air Quality, Dust, Noise, and Vibration, August 2022, by Stantec. Available as Appendix E.4 of the land use application package.

avoid exposed dirt areas), the filtration facility will generate less dust than surrounding farm uses, which inherently have exposed soil as part of crop areas and frequently use dirt roads.

In contrast to the lack of dust created at the filtration facility, farm fields do create dust. Consequently, farms are not sensitive to dust from off-site sources at the level a neighboring farm use might produce.

For these reasons, dust from the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.6 Mud

Vehicles coming to the filtration facility will include passenger vehicles and supply delivery vehicles. According to Lyda Hakes, no filtration-related processes at the facility will generate mud and all vehicle travel within the filtration facility for filtration–related processing functions will be on paved surfaces and therefore will not generate mud that could be deposited off-site. Only incidental maintenance activities such as landscaping could generate any mud. In contrast, because farm work often in fields with exposed soil, farming often generates significant amounts of mud within fields, and is not sensitive to incidental mud from off-site sources.

For these reasons, mud from the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.7 Litter

Lyda Hakes stated that the filtration facility operations will not generate litter that migrates off-site. Incidental litter at the filtration facility will be controlled by site buffers, reduced with recycling of materials to the maximum degree possible, and disposal of non-recyclable materials through standard best practices. Additionally, the Water Bureau will use municipal services for garbage and recycling pick-up.

For these reasons, litter from the filtration facility will not force any change in accepted farm practices and there not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.8 Vector Control

Lyda Hakes stated that the Water Bureau uses pest control services at its facilities to control pests including those that transmit vector-borne diseases such as mosquitoes and flies. This service is used at the Lusted Hill ICCT Facility and the Water Bureau will use the same service at the filtration facility.

In contrast to the controls planned for the filtration facility, farms often do not have controls to limit the presence of these pests. Consequently, farms are not sensitive to these pests from off-site sources at the level a neighboring farm use might produce.

For these reasons, vector control at the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.9 Air Quality

Vehicle operations, which include truck deliveries off-hauling of residual solids and employee vehicle travel, have minor impacts on air quality. Also, chemical storage and operation of standby diesel generators only have the potential for similarly minor air quality impacts.[50] Farms make extensive use of tractors, trucks, and other vehicles on roads and in fields which also have minor air quality impacts. Typically, farms are not sensitive to emissions from other vehicles generated off-site.

For these reasons, the potential impacts on air quality from the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.10 Water Quantity/Quality – Stormwater

The filtration facility site design incorporates best practices for managing stormwater following Multnomah County design standards. The design of stormwater facilities on-site will maintain the volume discharged and the rate of drainage at or below the current pre-construction level.[51] This will be accomplished by, among other things, using five on-site detention ponds. Stormwater quality will be managed by swales and basins throughout the site. Trees, understory plants, and groundcover will be dispersed throughout the site to hold and transpire stormwater. The neighboring farm's irrigation ponds will not be impacted with either increased run-off or sediment.

For these reasons, stormwater from the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.11 Radio Transmissions

Radio communications will be managed with a microwave communications tower constructed at the filtration facility. Transmission from other towers to the new tower has been studied and the findings are that human exposure to nonionizing electromatic radiation at the ground level is well

[50] Technical Memorandum, Potential Local Impacts of Facility Operation: Air Quality, Dust, Noise, and Vibration, August 2022, by Stantec. Available as Appendix E.4 of the land use application package.
[51] Technical Memorandum, Stormwater Water Drainage Report, prepared by Emerio Design, Table 4, September 2022. Available as Appendix H.1 of the land use application package.

within safety standards for all individuals and occupations in the vicinity of the tower.[52] It is important to note that the addition of the tower at the filtration facility will allow de-commissioning of the radio tower at the Lusted Hill ICCT Facility. That similar, existing tower has not caused any issues with accepted farm practices in the Surrounding Lands.

According to Paul Gamboa, Project Manager the City of Portland, Bureau of Technology Services, the radio frequencies that will be used at the filtration plant are currently in use throughout Multnomah County. Regarding microwave frequency, the technology employed in microwave transmissions makes it highly improbable that microwave will be a source of interference for farmers in the area. Should interference issues occur, the City of Portland works to mitigate the interference as quickly as possible.

For these reasons, the radio communications tower and its operation at the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.12 Security

Physical security and cybersecurity are important concerns for the Water Bureau because the filtration facility is critical infrastructure. According to Lyda Hakes, the Water Bureau will use perimeter fencing and video surveillance monitoring as the main deterrence to physical intrusion. This has no impact on security issues farmers face, such as theft or vandalism. Farmers that Globalwise interviewed did not express any concerns about the security of their farm businesses in the vicinity of the filtration facility.

For these reasons, the security at the filtration facility will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

12.13 Traffic

The filtration facility will be staffed by 26 full-time employees, with a maximum of 10 working any individual shift. [53] For a conservative estimate, all 26 employees were accounted for in the trip generation. A maximum of 16 chemical delivery trucks will enter and exit the filtration facility during a five-day work week.[54] A maximum of nine solids haul-off trucks will enter and exit the site during a five-day work week.[55] Combined, this amounts to five trucks entering and exiting the site per day (see Table 19).

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[52] Letter addressing the Proposed Bull Run Filtration Tower NIER Study by E. Robin Symth, P.E., to City of Portland, May 2022. Available as Appendix M.11 of the land use application package.
[53] Draft Memorandum, Portland Water Bureau Bull Run Filtration Project Traffic Impact Analysis, by Global Transportation Engineering, September 2022. Available as Appendix C.1 of the land use application package.
[54] *Ibid.*
[55] *Ibid.*

Table 19. Anticipated Average Daily (Weekday)
Filtration Facility Site-Generated Trips

	7-9 am Peak Hour			4-6 Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
Water Bureau Staff	16	4	20	4	16	20
Tours/Pipeline & Intertie Maintenance	1	1	2	1	1	2
Chemical Deliveries & Solids Off-hauling	5	5	10	5	5	10
Total			32			32

Source: Table 5, Portland Water Bureau Bull Run Filtration Project Traffic Impact Analysis, by Global Transportation Engineering, dated September 2022.

The traffic engineer's analysis concludes that, even with these small increases in traffic, under 2040 total traffic conditions all study intersections and site accesses will operate at levels of service better than the levels of service standards established by Multnomah County and Clackamas County. Other Oregon water treatment facilities clearly demonstrate that these types of facilities do not cause concerns about traffic generation.[56] Therefore, the negligible amount of filtration facility generated traffic will not affect accepted farm practices in the Surrounding Lands.

For these reasons, the slight increase in traffic generated by the filtration facility will not force any change in accepted farm practices and there will not be any significant increase in the cost of accepted farm practices in the Surrounding Lands.

12.14 Chemicals Used at Filtration Facility

The Water Bureau has many years of experience with safe handling of chemicals. Furthermore, the agency has prepared a hazardous materials management plan (HMMP) to address proper storage, handling, and use of all chemicals at the filtration facility.[57] The HMMP addresses the measures for minimizing the potential for release of chemicals to the environment during chemical delivery. On-site chemical storage features include secure tanks, secondary containment, and building enclosure. All chemicals needed for water treatment are pumped into the water through injection lines that are below the water surface. None of these chemicals are applied from the surface or sprayed.

[56] Oregon's Water Treatment Plant Operations, by Barney & Worth, July 2022. Available as Appendix E.1 of the land use application package.
[57] Technical Memorandum, Hazardous Materials Management Plan, by Stantec and Carollo, July 2022. Available as Appendix E.6 of the land use application package.

Any chemical spray used for landscape plant insect, weed, or disease control at the filtration facility will be applied by persons certified for pesticide applications. They will follow all label instructions and will not spray during weather conditions when spray drift to adjoining properties might occur.

These safety and management measures followed by the Water Bureau ensure that there will be no chemical drift from the filtration facility to neighboring farm properties.

For these reasons, the chemicals used at the filtration facility will not force any change in accepted farm practices nor will there be any significant increase in the cost of accepted farm practices in the Surrounding Lands.

13.0 Analysis of Potential Impacts from Sensitivities of the Filtration Facility on Accepted Farm Practices in the Surrounding Lands

As described above, the Surrounding Lands were defined to be sufficiently large to encompass all potential impacts that the proposed filtration facility might have on accepted farm practices or on the costs of accepted farm practices. Section 12 above reviewed the potential impacts from the filtration facility on accepted farm practices related to the potential "externalities" of the filtration facility. There is also the potential for impacts on accepted farm practices to emanate from any "sensitivities" of the proposed use, and how any sensitivity interacts with farmers who follow accepted farm practices in the Surrounding Lands. These potential sensitivity impacts are addressed in this Section. The potential sensitivities of the proposed use – each analyzed below – relate to how those potential sensitivities interact with two accepted farm practices in the Surrounding Lands:

- Chemical applications from farmers that could drift to the filtration facility and enter the Water Bureau water supply; and
- Farmers' use of roads that delay or impede either employees or supply deliveries to the filtration facility.

13.1 Farm Chemical Applications

Farmers use farm chemicals referred to as pesticides to prevent damage to crops. As described in Section 10, these products are subject to stringent pesticide control regulations. Agricultural chemicals are used on the ornamental nursery crops grown in fields adjacent to the filtration facility. Food crops in the Surrounding Lands, which include blueberries and vegetables, also are treated with chemical applications.

Dr. Allan Felsot, an entomologist and expert on the use of agricultural chemicals in the Pacific Northwest, has conducted an in-depth analysis of farmers' use of agricultural chemicals in the

Surrounding Lands.[58] For farm chemicals, Globalwise provided Dr. Felsot with a list of pesticide active ingredients used in the Surrounding Lands based on this study of the accepted farm practices in the Surrounding Lands and from the contacts with local farmers described in Section 3 above. These contacts with local farmers included nursery growers and a representative of a nursery immediately adjacent to the filtration facility site to receive input on chemicals used in nursery operations in the Surrounding Lands. All chemicals identified by nursery growers, including a specific list of chemicals used adjacent to the filtration facility site, were included in Dr. Felsot's analysis. Additionally included in the list were a broad set of representative chemicals from each chemical category (fungicides, insecticides, herbicides) based on industry publications and consultation with agricultural organizations.

Dr. Felsot's risk assessment determined that farm chemical use will not force changes to accepted farm practices or increase the costs of those practices. Analysis by Dr. Felsot and Mr. Mark Graham, senior environmental engineer at Stantec and Project Manager for filtration facility design,[59] also determined that farm chemical use will not impact the safety of the drinking water treated at the filtration facility site.

Dr. Felsot concludes:

> "The overall conclusion of this risk characterization is twofold. First, the proposed Filtration Facility will not force a significant change in, nor significantly increase the cost of, accepted farm or forest practices in the surrounding lands of the Filtration Facility site. Second, with setbacks from property lines as part of the design, the location of the Filtration Facility at a site near pesticide users will not create a risk of pesticide residue concentrations in the finished water that exceed safe drinking water quality standards or guidelines. Fundamentally, these conclusions are based on the risk analyses presented herein showing that the distances between any pesticide use in the surrounding lands and the bystander and open water areas of the Filtration Facility are sufficiently wide to exceed the distances needed to ensure compliance with label mandates, to exceed ESDs [Equivalent Safe Distances] modeled by AgDrift [EPA model] for all chemicals, and to exceed distances modeled to ensure any drift deposited on open water basins results in finished water concentrations significantly lower than clean drinking water standards and guidelines."[60]

Mr. Graham analyzed the risk associated with the chemical concentrations that could accumulate in the water basins of the Filtration facility from nearby pesticide use. Mr. Graham's analysis considers all of the pesticides that Dr. Felsot analyzed. The analysis factors in the highest risk scenarios for

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[58] Report by Dr. Allan Felsot "Use and Safety Characterization of Pesticides Used on Agricultural and Forestry Lands Surrounding the Proposed Site for the Portland Water Bureau's Bull Run Filtration Facility in Multnomah County, Oregon." Available as Appendix D.4 of the land use application.

[59] Technical Memorandum, Potential Impacts of Pesticide Use on Finished Water Quality, August 2022, by Mark Graham, Stantec in association with Carollo, et. al. Available as Appendix D.5 of the land use application.

[60] Report by Dr. Allan Felsot "Use and Safety of Pesticides on Agricultural and Forestry Lands Surrounding the Proposed Site for the Portland Water Bureau's Bull Run Filtration Facility in Multnomah County, Oregon."

chemicals that could be found in the water distributed from the Water Bureau system. These high-risk conditions would not occur with accepted farm practices, but they give an extra margin of safety for analysis. Overall, Mr. Graham concludes that:

> "[T]he levels of chemicals that could result from the nearest possible pesticide application are far below the levels which pose potential regulatory compliance or human health risks, particularly when considering the potential concentration in the finished water. For all chemicals evaluated, the predicted concentration in finished water is less than two percent of the concentration of concern. Furthermore, potential exposure duration would be only for the hours immediately following the pesticide application, so the comparison to concentrations of concern based on chronic health effects are very conservative.
>
> The potential introduction of chemicals will be further mitigated by the construction of berms and plantings between the property line and the basin, as well as the elevation of open water basins above the level of agricultural fields. These features will disperse or capture pesticide drifting from adjacent properties.
>
> Because the scenarios evaluated used conservative assumptions to represent the highest-risk scenarios, this evaluation concludes that pesticide application in the surrounding lands of the Facility does not pose a human health risk or risk of violating drinking water regulations or exceeding advisory levels or benchmarks." [61]

Farmers also use fertilizers, which, as described above, are synthetic compounds to provide nutrition for healthy, vigorous plant growth. Fertilizers are regulated at the manufacturing level but not at the grower level. Growers use accepted farm practices that utilize soil test results which determine the proper type and quantity of fertilizers to apply which remain in the fields and indoor growing facilities. Therefore, crop fertilization that adheres to accepted farm practices will not result in any impact on the filtration facility operations.

Based on independent research and reviewing Dr. Felsot and Mr. Graham's extensive evaluations, Globalwise concludes that, as designed with buffers between any nearby chemical use and the bystander areas and open water basins of the filtration facility, the filtration facility is not sensitive to accepted farm practices in the Surrounding Lands related to chemical use. Therefore, the filtration facility will not force a significant change in nor significantly increase the cost of accepted farm practices related to chemical use in the Surrounding Lands.

Additionally, Globalwise has reviewed the Water Bureau easement recorded for the Lusted Hill ICCT Facility that protects farm use property owners from legal action by the agency when farmers follow accepted farm practices. A similar document will be recorded at the filtration facility and

[61] Technical Memorandum, Potential Impacts of Pesticide Use on Finished Water Quality, August 2022 by Mark Graham, Stantec in association with Carollo, et. al.

further protects farmers near the filtration facility from legal action when they follow accepted farm practices.

13.2 Farm Road Traffic

It was previously discussed that medium and large nurseries in the Surrounding Lands have multiple farm fields and facility locations and frequently move their workforce and machinery on the public roads. Their transportation methods rely on slow moving tractors, crew buses, heavy trucks and trailers, and pick-ups that move at or below posted speed limits. The trips generated for operation of the filtration facility included employee commute trips and delivery of supplies.

The normal pattern of farm traffic in the Surrounding Lands will not cause significant delays or otherwise impede employees or deliveries when travelling to or from the filtration facility. First, farm trips originate from diverse and sometimes distant locations, and are distributed throughout the entire workday from 7:00 am to approximately 5:00 pm, typically on Mondays to Saturdays. This reduces the potential for traffic congestion caused by farm traffic. Second, Water Bureau employees, delivery service vendors, as well as the farmers may periodically use alternate routes to reach their destination to avoid the most heavily travelled roads in the area.

Therefore, the filtration facility is not sensitive to farm traffic on public roads, as it will not significantly increase travel times or travel costs for either Water Bureau employees or suppliers going to or from the filtration facility. For this reason, the filtration facility will not force a significant change in nor significantly increase the cost of accepted farm practices related to farm traffic and movement of their workforce and machinery in the Surrounding Lands.

14.0 Application of Legal Tests for the Filtration Facility Impacts in the Surrounding Lands

Accepted farm practices for each farm type and crop in the Surrounding Lands are detailed earlier in Section 10. As described further above, these accepted farm practices were identified through: 1) interviews with farmers; 2) interviews with Oregon State University Extension and research personnel and others in agricultural disciplines; and 3) review of agricultural publications covering recommended farm practices specific to these crops.

Section 9 above describes the relevant zoning approval criteria related to agriculture for the filtration facility in the MUA-20 zone, namely that the proposed use will not: a) Force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; nor b) Significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

Table 20 summarizes the categories and types of all accepted farm practices in the Surrounding Lands. The table and the narrative that follows assess the potential for changes in those practices

and potential for any significant cost increases associated with the filtration facility in accordance with the MUA-20 approval criteria.

Table 20. Assessment of Changes in Accepted Farm Practices and Cost Increases Due to Filtration Facility Operation

Major Farm Practice Category	Sub-categories	Change in Accepted Practices	Significance of Cost Increase
Crops and Livestock			
Land Preparation	Tillage, soil test & plant nutrient analysis	Unaffected	None
	Fertilize	Unaffected	None
	Other nutrient applications (lime, mulch, compost, etc.)	Unaffected	None
Field Operations/Land Care	Plant & transplant	Unaffected	None
	Spray for weeds, pests, viruses, etc.	Unaffected	None
	Mechanical & other weed control	Unaffected	None
	Soil moisture monitoring and irrigation	Unaffected	None
	Scout for pests, disease, predators, etc.	Unaffected	None
	Place & remove beehives	Unaffected	None
	Mow/bale	Unaffected	None
	Haul to farm headquarters	Unaffected (added traffic negligible)	None or negligible increase
Post-Harvest Handling	Inspect, wash, cool & humidity control	Unaffected	None
	Sort, grade & package	Unaffected	None

Major Farm Practice Category	Sub-categories	Change in Accepted Practices	Significance of Cost Increase
Farm Infrastructure	Maintenance, construction, & repair of facilities	Unaffected	None
	Facility sanitation	Unaffected	None
	Water wells (drill & operate)	Unaffected	None
	Irrigation distribution systems	Unaffected	None
	Water test, filtration & purification	Unaffected	None
Transportation Activity	Supply purchases	Unaffected	None
	Drive and/or haul equipment	Unaffected (added traffic negligible)	None or negligible increase
	Farm worker travel	Unaffected (added traffic negligible)	None or negligible increase
	Supervisor travel	Unaffected (added traffic negligible)	None or negligible increase
	Final product shipping	Unaffected (added traffic negligible)	None or negligible increase
Marketing Related	Sorting & grading	Unaffected	None
	Product loading for customer shipping	Unaffected	None
	On-farm sales	Unaffected	None
Crops Only			
Greenhouse Plants	Plant & transplant	Unaffected	None
	Fertilize	Unaffected	None
	Soil moisture monitoring & Irrigation	Unaffected	None
Field Operations/Land Care	Stake & removal	Unaffected	None
	Prune & tag	Unaffected	None
	Cull diseased plants	Unaffected	None
	Dig & harvest	Unaffected	None

Major Farm Practice Category	Sub-categories	Change in Accepted Practices	Significance of Cost Increase
	Install and maintain weed mats, trellises, plastic covers, & other crop-related field structures	Unaffected	None
Post-Harvest Handling	Trim, wash, cool & humidity control	Unaffected	None
	Sort, grade, bundle, & or package	Unaffected	None
Livestock Only			
Animal Care	Animal health safeguards - vaccinations, drenches, dips, veterinarian checks	Unaffected	None
	Animal monitoring	Unaffected	None
	Breeding & pregnancy management	Unaffected	None
	Birth, incubate, & hatch eggs	Unaffected	None
	Drinking water supply	Unaffected	None
	Feed management	Unaffected	None
	Pasture grazing rotation &/or hay production	Unaffected	None
	Shear wool (sheep)	Unaffected	None
	Isolate or cull sick or unproductive animals	Unaffected	None
Farm Infrastructure	Build, maintain, and clean corrals, pens, barns, feeders &	Unaffected	None

Major Farm Practice Category	Sub-categories	Change in Accepted Practices	Significance of Cost Increase
	feed/supply storage areas		
	Build & maintain fences	Unaffected	None
Marketing & Sales	Product sales (often direct marketed)	Unaffected	None

In general, accepted farm practices in the Surrounding Lands are managed, controlled, and conducted within each farm's property holdings. Farm holdings typically include multiple fields and ancillary facility locations that are separate from the headquarters location. For every farm, every crop, and every location, this evaluation confirms that the filtration facility will not result in any significant changes in accepted farm practices or significant increases in the cost of those accepted farm practices in the Surrounding Lands.

The reason accepted farm practices will not change and there will be no significant cost increases is straightforward. The filtration facility and its operation will generate no perceptible changes or externalities outside the boundary of the facility site. The design and operation of the filtration facility will have no external impacts which could affect when or how farm uses are conducted in the Surrounding Lands or the costs of those operations.

Similarly, how farmers conduct accepted farm practices in the Surrounding Lands will not affect the operation of the water filtration facility – that is, there are no sensitivities of the proposed filtration facility which could potentially cause significant changes in or significantly increase the cost of accepted farm practices in the Surrounding Lands. Two areas of potential sensitivity were identified and investigated in detail: the use of chemicals by farmers and farm traffic on roads in the Surrounding Lands.

Examples illustrate this point. Bareroot nursery managers determine their harvest schedule for digging trees from a field. The decision is based primarily on current and anticipated weather conducive to dig and move the plants. No aspect of the filtration facility will impact when or how those farmers manage their accepted farm practices for harvest.

Another example is pest control in a field of organic vegetables. If a farmer finds a pest infestation or threat of a pest outbreak, their accepted farm practice is to immediately treat the crop appropriately using organic methods available to reduce or eliminate crop damage. The presence of the filtration facility has no bearing on the farmer's decision of when or how to treat pests. Similarly, a conventional crop farmer (i.e., a farmer not using organic production practices) also

follows the accepted farm practice of immediately treating for any known or suspected threat of a pest or disease problem with no need to consider the filtration facility.

Only one potential externality was identified where the filtration facility could conceivably cause any measurable effect on nearby farm uses in the Surrounding Lands, namely traffic generation from the filtration facility operation. As described above, however, this analysis confirms there will be no change in accepted farm practices and no significant increases in the costs of those accepted farm practices caused by traffic generation from the filtration facility operation. Due to the filtration facility's low projected daily traffic volumes, analysis confirms this would have no discernable impact on surrounding agriculture. In all other categories of externalities, the potential for impacts does not exist because the possible externalities would be contained within the Water Bureau filtration facility site and/or because farm uses are not sensitive to the potential externalities from activities occurring at the filtration facility. Therefore, the filtration facility will not force significant changes in accepted farm practices nor cause any increased costs for accepted farm practices in the Core Analysis Area of the filtration facility.

Because there are no significant impacts to accepted farm practices in the Core Analysis Area, and the surrounding agricultural area further away from the filtration facility is similar in character and susceptibility to impacts, as described in Section 6 above, this analysis concludes that the filtration facility will have no significant impacts on accepted farm practices in the Surrounding Lands.

15.0 Farmer Concerns About the Filtration Facility

In the interviews conducted with farmers in the Surrounding Lands, they were asked if they had any concerns about potential impacts to farm uses or costs from the filtration facility operating on the proposed site. Some farmers responded with specific concerns related to the filtration facility. These concerns are outlined below, along with responses.

The two nurseries that farm adjacent to the filtration facility site share two concerns for filtration facility operations.[62]

1. Restrictions on Applying Farm Chemicals – The nursery operators are concerned they could be restricted as to when or how they can apply agricultural chemicals to their fields due to their proximity to the filtration facility site. The nursery to the south is also concerned about additional restrictions on chemical application if the Water Bureau has a permanent access road at the edge of their farm field.
   Response: The Water Bureau will comply with right-to-farm laws and allow the nurseries to operate without impairing their accepted farm practices for chemical application. As discussed above, the Water Bureau, through the reports by Dr. Felsot and Mr. Graham, has carefully analyzed the chemicals used in the Surrounding Lands and has determined that, as

[62] As discussed above, the filtration facility site itself is not part of the Surrounding Lands and for that reason comments regarding impacts of the proposed facility on farm practices on the site are not included here.

designed with buffers between any nearby chemical use and the bystander areas and open water basins of the filtration facility, the filtration facility is not sensitive to accepted farm practices in the Surrounding Lands related to chemical use. Therefore, the filtration facility will not place restrictions on chemical applications and will not force a significant change in nor significantly increase the cost of accepted farm practices related to chemical use in the Surrounding Lands.

2. Receiving Stormwater Sediment in Run-off – One adjacent nursery expressed concern that they would receive surface water with greater sediment loads deposited in their irrigation pond during the operation of the filtration facility.
   Response: As described previously, the filtration facility site design incorporates best practices for managing stormwater and will maintain discharge at or below the current pre-construction level. This will be accomplished by, among other things, using on-site detention ponds. Stormwater quality will be managed by swales and basins throughout the site. Trees, understory plants, and groundcover will be dispersed throughout the site to hold and transpire stormwater. The neighboring farm's irrigation ponds will not be impacted with either increased run-off or sediment.

Another nursery nearby, located south of Bluff Road and within the Surrounding Lands, raised another concern:

3. If a permanent south entrance to the filtration facility was built across from their nursery, it would cause traffic congestion on Bluff Road and hinder access to their nursery.
   Response: After construction, the Water Bureau will use this road only as access for emergency vehicles and planned and unplanned maintenance when the primary access to the filtration facility is not reasonably available. This infrequent use will not cause any noticeable increase in traffic or congestion at the intersection of this road with Bluff Road. The traffic engineer studied the intersection where the southern access would connect to Bluff Road as well as other intersections along Bluff Road and concluded that, even with these small increases in traffic, under 2040 total traffic conditions all study intersections and site accesses will operate at levels of service better than the levels of service standards established by Multnomah County and Clackamas County. Therefore, the southern access to the filtration facility will not have significant impacts on access to this nursery or any other lands dedicated to farm use in the Surrounding Lands.

Other nursery operators located beyond the immediate vicinity of the site expressed these additional concerns about potential filtration facility impacts:

4. Operation of the filtration facility will create off-site noise and light "pollution."
   Response: As described previously, the filtration facility will be built to generate less noise than is produced by standard farm equipment and will comply with all county noise ordinances. Lighting will only illuminate the facility for security and safe operations and will not extend beyond the filtration facility site perimeter.

5. Operation of the filtration facility could create hazardous conditions for the surrounding area, from chemicals spilled during off-loading and storage.
   Response: As described previously, chemical spills will be prevented and managed by strict operational procedures followed by Water Bureau personnel trained in handling chemicals received, stored, and used in the filtration facility's on-site processes. All non-Water Bureau personnel with responsibilities for handling chemicals will receive on-going training in safe handling methods. The Water Bureau has experience and a safe track record at its other facilities – including its Lusted Hill ICCT Facility in the Surrounding Lands – in safely transporting, handling, receiving, storing, and using chemicals.
6. The City of Portland will, at a later date, determine that applying approved farm chemicals is too risky for the City's water supply and they will seek to limit the use of farm chemicals by the adjoining farmers.
   Response: As stated previously, the City of Portland will comply with right-to-farm laws which establish the right of farms to operate with accepted farm practices, including applying chemicals following instructions on product labels, and will record a document similar to the one already recorded at the Lusted Hill ICCT Facility to that effect. Additionally, the filtration facility has been designed with landscaping, berms, and buffers internal to the site in order to ensure safe distances and screening from any pesticide application are provided on Water Bureau property rather than being required on adjacent farm use lands. While inherently the chemicals analyzed in Dr. Felsot's and Mr. Graham's reports are the currently used chemicals, Dr. Felsot notes in Section 2.1 of his report that "the wide diversity of types of chemicals [studied in this report], with different application rates and potential hazards, allows conclusions to be drawn regarding the use of alternative or newly registered chemicals that could be used in the surrounding lands now or in the future." Therefore, the Filtration Facility will not limit accepted farm practices related to the use of farm chemicals in the Surrounding Lands, either now or in the future.

16.0 Pipelines' Compatibility with Character of the Surrounding Lands

Water Bureau pipelines have been routed through the Surrounding Lands since the 1890s, when the pipeline conduits first connected the Bull Run water supply to Portland and water customers in East Multnomah County. Since Water Bureau pipelines pre-dated many of the area roads, the early pipeline routes west of the Sandy River crossed farm fields in the shortest and most direct routes between the Bull Run reservoirs and the City of Portland. Some of these older pipelines in farm fields will remain in service after this project is completed.

The Water Bureau's Lusted Hill ICCT Facility, which treats Bull Run water, is located within the Surrounding Lands. This facility treats water to prevent corrosion and was recently upgraded pursuant to Multnomah County permits subject to nearly identical approval criteria that apply to the filtration facility. This facility was originally approved for construction in 1991 and is located

along current pipeline routes within one-half mile of the proposed filtration facility. The recent upgrades included new pipeline connections and new chemicals stored on-site that are used for water treatment.

In addition to the Water Bureau pipelines and appurtenances, the Pleasant Home Water District has operated pipelines, water storage tanks, and appurtenances in the Surrounding Lands since the 1930's.

16.1 Existing Pipelines & Appurtenances

The Water Bureau's long history of operating facilities in the Surrounding Lands began when the initial Bull Run pipeline became operational in 1893. Since then, additional pipelines and appurtenances below and above ground have been constructed, modified, added to, and replaced.

The pipelines are underground and produce no odor. They operate with little maintenance or repairs over their very long life. Appurtenances on the pipeline allow for monitoring and inspections without being intrusive because easement agreements between property owners and the Water Bureau specify the allowed activities the Water Bureau needs to conduct. There are few and minor cases of past conflicts with farmers in the Surrounding Lands, as described below.

Ben Kersens of the Water Bureau indicated that there are over 10 miles of existing Water Bureau pipelines within the Surrounding Lands. There are also 176 existing Water Bureau pipeline appurtenances within the Surrounding Lands and 95 are at ground level or above ground, which include:

- 33 test stations
- 18 air valves
- 16 rectifiers
- 12 water drain valves
- 5 hatches
- 3 surge tanks
- 3 water quality sampling stations
- 3 valves
- 2 valve boxes

Interviews Globalwise conducted with 60 area farmers did not elicit any concern about current appurtenances on Water Bureau pipelines. Water Bureau operations staff report only two instances where the agency addressed conflicts with farmers regarding pipeline easements in farm fields during the last twenty years. In one case, a farmer violated the terms of the easement agreement by digging close to the pipeline and blocking agency access to the pipeline. In the other case, the

Water Bureau added improvements to the pipeline and paid the farmer compensation for removing an area of crop production.

The operations staff also report that there have not been any conflicts with farmers over the operation of the Lusted Hill ICCT Facility or the Hudson Intertie on Lusted Road, indicating that the smaller and less impactful Finished Water Intertie similarly will not conflict with farmers in the area. This confirms that none of these existing community service uses or appurtenances have created significant conflict with farm uses or have impeded the development of farm uses in the Surrounding Lands. There are no reports from farmers of significant impacts on accepted farm practices or costs imposed by these existing uses and facilities.

16.2 Farmer Chemical Spray or Ground Applications

In general, the Water Bureau pipelines are a closed and pressurized system constructed of welded steel materials ranging in thickness from 5/16" to 1/2", with the depth of cover over the pipeline ranging from 7-feet to top of pipe to over 200-feet. Exceptions to the pressurization of the system are rare and have not presented conflicts with farm uses for the miles of pipelines the Water Bureau currently has in farmed lands. Therefore, the pipelines are not affected by the above ground environment with the pipelines operating in controlled conditions.

For the reasons stated, there is no conflict between the pipeline system and farmers applying chemicals on their land when following accepted farm practices, and therefore the pipelines are consistent with the agricultural character of the area.

16.3 Farm Equipment Subsurface Contact with Pipelines

The few pipeline easements proposed in farm fields will allow farmers to grow crops or raise livestock on the surface of land on top of the pipelines. The pipelines will be buried seven feet or deeper below ground in agricultural areas. This is deeper than the subsurface depth reached by plowing, disking, or other similar field work in the Surrounding Lands. Additionally, the easements notify farmers about pipeline location and depth, providing additional information to avoid contact with the pipelines if a farmer were to engage in unusual practices below the subsurface depth of the pipelines. Well drilling will not be allowed within the permanent pipeline easements; however this leaves large alternative areas of the farm fields for any irrigation well locations.

There is only a total of 0.7 miles of pipeline buried in farm use property. Furthermore, easement agreements between the Water Bureau and farmers clearly indicate the location of the pipelines.

For the reasons stated, the proposed buried Water Bureau pipeline system is compatible with, and consistent with the character of, all farming activity in the Surrounding Lands.

16.4 Farm Roads Shared with Water Bureau

In the cases of properties "R1" and "R2" along the Raw Water Pipeline and property "F11" on the Finished Water Pipeline, farmers will regularly use the farm roads which will be shared with the Water Bureau. The use of these farm roads by the Water Bureau is infrequent (see Table 23) but it is possible that farmers could have equipment temporarily occupy a farm road that the Water Bureau wants to use for pipeline inspection, maintenance, or repairs. This concern will be alleviated at property "F11" because the Water Bureau plans to have three wide gravel areas along the road on the eastern edge of the field where Water Bureau vehicles can pull out to accommodate farm vehicles. Road sharing can also be achieved simply by the Water Bureau returning when the farm roads are not in farm use.

For the reasons stated, shared use of farm roads near the proposed pipelines in the Surrounding Lands will not significantly hinder the movement of farm vehicles and equipment and is consistent with the character of the area.

17.0 Analysis of Potential Impacts of Pipeline Operations on Surrounding Lands

Potential sources of impacts on accepted farm practices in the Surrounding Lands were considered for the proposed Water Bureau pipelines, including the Finished Water Intertie. As described in each of the following sections, in general the pipelines have very few externalities or sensitivities which could be potential sources of impacts from the pipelines on neighboring farms. This section covers potential externalities or sensitivities of the pipelines generally and concludes that none are anticipated to be sources of impacts from the pipelines on neighboring farms and accepted farm practices. Section 19 below then confirms that conclusion through a property-by-property analysis of the Core Analysis Area for each segment of the pipelines.

The following discussion covers the pipelines' potential impacts on accepted farm practices in the Surrounding Lands and Water Bureau's steps to avoid any potential impacts. As noted above, Brad Phelps, and Ken Ackerman, as well as farmers, provided information to Globalwise about the characteristics of the pipelines detailed in this report, such as the fact that the pipelines operate silently and without creating odor. Water Bureau personnel who manage the existing pipelines have also explained the low maintenance needs of that system of older pipelines.

17.1 Appurtenances Within Farm Fields

Appurtenances placed in easements in fields which are at ground level or above ground may pose a concern for farm workers to avoid these permanent structures. However, it is already an accepted farm practice for equipment operators to watch for common obstacles in fields such as irrigation well heads, irrigation risers, above ground pipes, fences, rock outcroppings, and portable toilets.

To the extent possible, the Water Bureau's pipeline design will place appurtenances close to field edges, in the public ROW, or away from crop production areas and main equipment travel. This will minimize the chance that farmers need to avoid these features of the pipeline. The Water Bureau will also place and maintain high visibility markers that clearly indicate locations for any appurtenances that might pose problems.

For these reasons, the appurtenances placed near the pipeline in farm fields will not cause any change in accepted farm practices and there will not be any significant increase in the cost of accepted farm practices in the Surrounding Lands.

17.2 Water Bureau Use of Farm Roads

Table 23 in Section 18.1 shows the frequency that pipeline appurtenances are inspected and maintained by Water Bureau operations staff. Travel to access the appurtenances, typically by a single vehicle, and the time required for these visits is minimal. Therefore, the shared use of farm roads in easements purchased by the Water Bureau will mean that Water Bureau personnel will not impede normal farm access to the fields.

For this reason, the Water Bureau's use of farm roads to access the pipelines will not force a change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in Surrounding Lands.

17.3 Water Discharge for Periodic Pipeline Maintenance

Pipelines are rarely drained for maintenance. Information from Ken Ackerman indicated that in all cases where pipeline water is to be discharged, including in or near farm fields, the Water Bureau will manage the discharge to prevent on-farm impacts. First, the Water Bureau will only schedule discharge water from the pipelines when natural drainage ways are not receiving substantial amounts of water from rainfall events. During rain, water will only be discharged due to an emergency. This will minimize pipeline water contributing to erosion or soil saturation. Second, the Water Bureau will regulate the rate of discharge to avoid water ponding in fields or eroding soil on farms. Third, the Water Bureau will dechlorinate the water before it is discharged to natural drainage ways.

For these reasons, the Water Bureau's maintenance of pipeline water discharge will not force a change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in Surrounding Lands.

17.4 Water Discharge Due to Potential Pipeline Leaks

The pipeline design incorporates the latest technology and safeguards for leak prevention and detection. Ken Ackerman stated that past leaks of the pipeline have been minor and not significantly disturbed farm fields over the long history of the pipelines in the area. This demonstrates the Water Bureau's effort and ability to guard against major leaks. Mr. Ackerman also

indicates that the new pipelines' welded joints for pipeline sections are a significant improvement over older methods of forming joints. Additionally, creating a more resilient pipeline system is one of the primary goals of the current project. Installing dual pipelines with valves in numerous locations allows for quick isolation of leaks and minimized water discharge.

With the design features planned for the pipelines, there is assurance that any potential leaks will not force a change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in Surrounding Lands.

17.5 Noise

The operating, pressurized pipelines are silent. A slight noise could occasionally be heard at air release valves, but this noise is infrequent and either imperceptible or at minimal noise levels.

The Finished Water Intertie will create some noise. However, the valves are underground, encased in a concrete vault and lid with air vents. Periodically a diesel generator will be started for testing. This noise will be equivalent to a diesel tractor. Noise modeling indicates that under normal operations the predicted noise level at the nearest residence will be less than 50 dBA, below the noise code limit for Multnomah County.[63] It is also a factor that farming is not sensitive to noise, since tractors, pumps, and other farm equipment often generate significant noise.

For these reasons, the noise created by pipelines will not force a change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in Surrounding Lands.

17.6 Vibration

According to Brad Phelps, no vibration from pipeline operations will be perceptible anywhere along the raw water or finished water pipeline system, including from the Finished Water Intertie. This is comparable to the lack of any vibration currently generated by the existing conduits in the Surrounding Lands. As stated previously, farms themselves create vibration in conducting accepted farm practices and they are not typically sensitive to vibration created off-site.

For these reasons, vibration will not force a change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in Surrounding Lands.

17.7 Odor

Brad Phelps stated that because the pipelines operate underground, they will not emit odors. In rare instances where the pipelines are drained for inspection or repairs, the water will be dechlorinated before it is released to drainage ways. Raw water and finished water are odorless,

[63] Technical Memorandum by Mark Bastasch, P.E., Jacobs, August 2022. Available as Appendix F.2 of the land use application package.

and the above-ground appurtenances and Finished Water Intertie also will not generate odors. Since farms themselves create odors, they are typically not sensitive to off-site odor generation.

Therefore, odor from the pipelines will not force any change in accepted farm practices and there will not be an increase in the cost of accepted farm practices.

17.8 Light and Glare

The only pipeline feature with exterior area lighting will be the Finished Water Intertie. As detailed in the lighting study for the Finished Water Intertie, even when all the lights are energized, there will be no light trespass outside of the Finished Water Intertie site boundary.[64] Field operations are not common at night and even if they occurred, no light would trespass outside of the Finished Water Intertie site boundary to affect farming activity. Similar to the filtration facility, daytime glare from pipeline and Finished Water Intertie surfaces is minimized by the selection of building materials, use of berms, and perimeter landscaping that includes trees.

Therefore, light and glare will not force any change in accepted farm practices and there will not be an increase in the cost of accepted farm practices.

17.9 Air Quality

According to Brad Phelps, the Water Bureau pipelines will not create air quality emissions at any significant level. The emergency generator at the Finished Water Intertie could have emissions during testing and if needed for emergency operations, but at a level no greater than a single diesel truck which are commonly found in the Surrounding Lands. Since farms themselves create air emissions, they are typically not sensitive to off-site air emissions.

As stated in section 17.7, water in the pipelines is odorless. Any incidental release of air through air values will not be detectable for air quality.

For these reasons, therefore, air emissions from the pipelines will not force a change in accepted farm practices and there will not be an increase in the cost of accepted farm practices.

17.10 Water Quantity/Quality - Stormwater

The design of the entire project's pipeline alignment has been designed and evaluated for stormwater impacts. Best practices for managing stormwater conditions at the Finished Water Intertie to meet Multnomah County standards include a lined bioretention basin.[65] This design achieves water quality treatment and flow requirements that meet or improve upon current pre-construction conditions. All conveyance structures including pipes, swales, and drains will be

[64] Technical Memorandum by Morgan MacRostie, P.E., Jacobs, September 2022. Available as Appendix F.1 of the land use application package.

[65] Stormwater Management Report – Pipelines Project Finished Water Intertie – Multnomah County, Oregon by Emerio, August 2022. Available as Appendix H.2 of the land use application package.

maintained and inspected regularly for proper drainage. The mitigated peak rate of flow and the volume release capacity will exceed the pre-developed flow rates and volume.

In addition to the Finished Water Intertie, along the entire length of the pipeline alignment steps have been taken to meet Multnomah County stormwater requirements.[66] The assessment has determined that in all areas where pipelines are located the designed improvements will meet Multnomah County requirements for flow control and stormwater quality treatment where needed.

For these reasons, stormwater from the Finished Water Intertie and at all other pipeline areas will not force any change in accepted farm practices and there will not be any increase in the cost of accepted farm practices in the Surrounding Lands.

17.11 Communications Transmission

The Finished Water Intertie will have a communications link with the filtration facility through buried fiber optic cable and there will be no interference with farmer wireless communications service. Therefore, there is no impact to accepted farm practices and there will not be an increase in the cost of accepted farm practices.

17.12 Crop Production Area Loss

The Water Bureau's pipeline alignment plan avoids crossing farmland to the maximum extent possible. Only two farmers' properties require trenching and installation of pipelines in farm use areas with new permanent easements.

Although, as mentioned above, the permanent easement areas for pipelines are not part of the Surrounding Lands because they are not located on "surrounding lands" for purposes of the relevant zoning approval criteria, the Water Bureau nonetheless will allow crops to be grown over and near the pipelines with minor exceptions in the minimal easement areas currently in crop production (the Water Bureau has also avoided crop production areas by siting pipelines under existing farm roads, which can continue to be used as they current area for accepted farm practices). As discussed in Section 16.3, pipelines will be at sufficient depth so that field work can be conducted without damage to the pipelines.

Additionally, the Water Bureau will take actions necessary to restore to high-level productivity all farmland that is disturbed by installing the pipelines. This is addressed in the technical memorandum by Dr. Denny Mengel, certified professional soil scientist.[67] The soils restoration plan describes the criteria and methods used for soil protection and how disturbed soil will be quickly returned to highest productivity. The plan relies on key principles that include evaluating the soil

[66] Pipelines Stormwater Management Report – Bull Run Filtration Pipelines Project – Multnomah County, Oregon, by Emerio, August 2022. Available as Appendix H.3 of the land use application package.
[67] Technical Memorandum, "Agricultural Soils Restoration Plan" by Dr. Denny Mengel, September 21, 2022. Available as Appendix D.2 of the land use application package.

characteristics before disturbance, minimizing disturbance to the extent practicable, taking actions to restore drainage, and returning the original topsoil to the fields to bring back soil productivity. The plan will be customized to the specific conditions of both farm use properties. All farm infrastructure in place before disturbance that is affected by the pipeline will be replaced. This includes subsurface drainage pipe and irrigation pipe.

By allowing farmers to raise crops close to pipelines and following the extensive plans for soil restoration, the Water Bureau will have no significant impact on accepted farm practices and there will not be a significant increase in the cost of accepted farm practices where farmland is within the new permanent easements for the pipelines themselves.

17.13 Farmer Concerns About Pipeline Operations

Farmers in the Surrounding Lands did not express any concerns about the operation or location of the pipelines.

17.14 No Other Potential Externalities or Sensitivities of the Pipelines

The pipelines (including the Finished Water Intertie) do not have any potential to generate dust, mud, litter, vectors, or security concerns and therefore those potential externalities are not analyzed further here. Additionally, the minimal traffic related to the pipelines and Finished Water Intertie are included in the traffic analysis above for the filtration facility (See Sections 12.13 and13.2 above). No chemicals are used at the Finished Water Intertie or otherwise in the pipelines and as described in Section 16.2 the pipelines are not sensitive to chemicals used in accepted farm practices. Therefore, no other externalities or sensitivities of the pipelines could force a change in accepted farm practices or cause an increased cost of those practices in the Surrounding Lands.

18.0 Property-by-Property Application of Legal Tests for Pipelines on Core Analysis Areas

As described in Section 7 above, the relevant tests for evaluating farm use impacts are based on the Multnomah County zoning districts through which the applicable segment of the pipelines passes, including MUA-20, RR, EFU, and CFU.

Section 16 reviews the compatible nature of pipelines with farming in the Surrounding Lands. Section 17 covers potential externalities or sensitivities of the pipeline operations with farming and concludes that none are anticipated to be sources of impacts of the pipelines on neighboring farms. This Section confirms that conclusion through a property-by-property analysis of the Core Analysis Area for each segment of the pipelines. Where there is no reason to believe that the general conclusions of Section 17 should be further examined for a particular segment, that analysis is not repeated in this Section.

Overall, the pipelines will not have any significant impact on, nor cause any significant increase in the cost of, accepted farm practices in the Core Analysis Area or Surrounding Lands.

18.1 Raw Water

The Raw Water Pipeline route is in a single segment from Lusted Road to the filtration facility (see Figure 8). The entire alignment is within Multnomah County. The three existing pipelines -- Conduits 2, 3, and 4 -- are in the Lusted Road ROW within Multnomah County and will connect to a new pipeline in an area of the ROW and a small adjacent strip of Water Bureau property. This connection is referred to as the Multnomah Connection. There are three properties in farm use in this raw water pipeline alignment (see Figure 9). Two new pipelines enter property "R1," enter a tunnel portal, and continue west through property "R2." The two pipelines continue west in a tunnel and pass under Dodge Park Boulevard. They also pass more than 150 feet beneath property "R3" to reach the filtration facility site.

Figure 8: Raw Water Pipeline Alignment from Lusted Road to the Filtration Facility



18.1.1 RAW WATER PIPELINE SEGMENT

Properties labeled "R1" and R2" are in the same ownership and are in the RR zone. The third farm use property, "R3," is in the EFU zone (see Figures 8 and 9).

Figure 9: Farm Use Properties in the Raw Water Pipeline Alignment

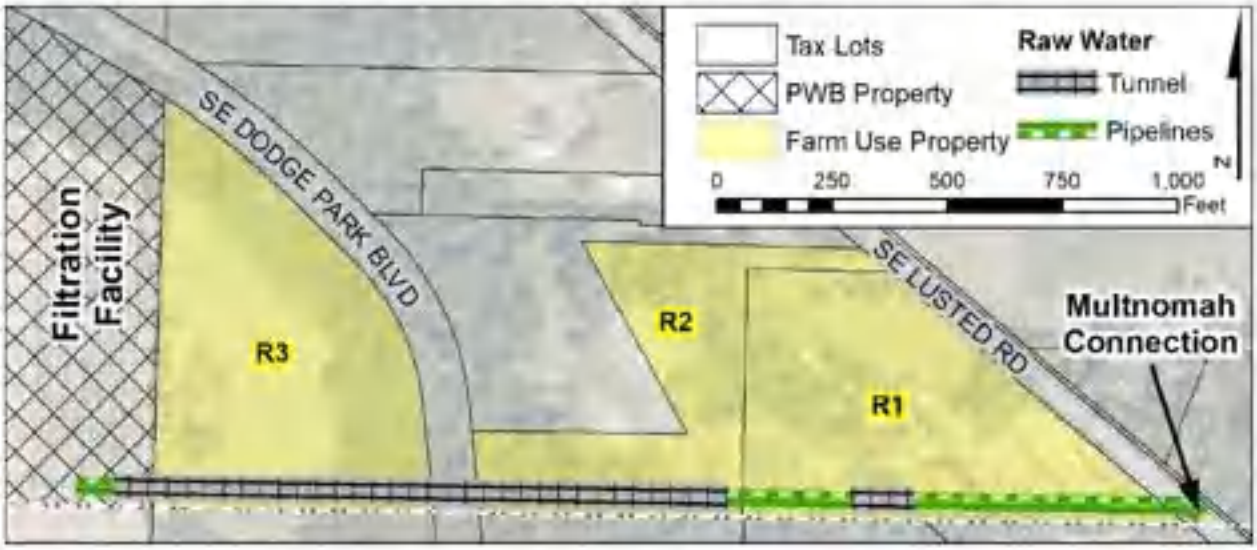


Table 21 profiles the first of the three farm use properties in the Raw Water Pipeline alignment.

Table 21. Raw Water Pipeline – Farm Use Property "R1"

Farm Use Property Designation	"R1"
Tax ID	1S4E23C -01400
Zoning	RR / Multnomah County
Situs Address	36910 SE Lusted Road, Boring 97009
Total Acres	7.95; includes residence
Farm Type / Accepted Farm Practices – see Sections 10.3.1, 10.3.2 and 10.4.3	Hay, pasture, and cattle production
Farm Tax Deferral Status	Deferral
Location	West of Lusted Road in Lusted Flats. Access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	Permanent easement for 2 pipelines, appurtenances, and access

The permanent pipeline easement with a width of 100 feet is planned for the full length along the southern boundary of property "R1" to provide access for pipeline maintenance. According to Ken Ackerman, the design engineers have carefully considered the necessary area to meet, but not

exceed, what is needed for maintenance of the two pipelines. The road currently located within the easement will continue to provide access to the residence and farm, as well as allow the Water Bureau to maintain and operate the pipeline and appurtenances. The Water Bureau will maintain the road with gravel for all-weather use, which also adds significant benefit for the property's farm use.

Appurtenances will be placed above or near the pipelines on property "R1" but entirely within the easement area. Appurtenances in farm fields include one fiber optic accessway, one water release valve, and two access vaults. Each of these is at the ground level or below ground and will not interfere with hay production or cattle grazing.

Further information about the frequency of access to appurtenances needed on farm use properties with pipelines is given in Table 23. This information was provided by Ken Ackerman at the Water Bureau.

Hay, pasture, and cattle production are the current farm uses of property "R1" with only two head of cattle raised. The same owner has hay and pasture production available on adjoining property "R2." The Water Bureau will allow the property owner to continue hay, pasture, and cattle production within the permanent easement so there is no significant reduction in land available for these farm uses.

The Water Bureau will not disturb the pond or nearby wetlands and will ensure the pond continues to function as it does now for irrigation if needed for farm use on property "R1" and "R2" or for an adjoining property owner who is planting blueberries next to property "R2." Livestock water will continue to be supplied by the domestic water supply for property "R1."

As explained previously, the permanent easement area itself is not part of the Core Analysis Area for the pipelines nor the Surrounding Lands, because it is not located on "surrounding lands" for purposes of the zoning approval criteria. Nevertheless, the Water Bureau has designed the proposed pipeline system to reduce any impacts to the farm unit composed of property "R1" and "R2" below the level of significance by: (1) improving and following the footprint of existing farm roads to the maximum extent possible; (2) keeping the existing farm building and the pond unimpacted within the easement; (3) agreeing to provisions in the easement documents themselves that will allow continued use of cropland area in the permanent easement area where possible; and (4) engaging a soils expert to prepare a best-practices plan for restoring that continued-use cropland area back to pre-construction productivity, and implementing that plan. The pipelines on properties "R1" and "R2" will be buried to a depth with at least 7 feet of soil cover over the top of the pipelines, which will allow livestock grazing and most other farming over the pipelines.

For the reasons stated above and in Sections 16 and 17, the pipelines will have no significant impact on accepted farm practices on property "R1" and there will be no significant increase in costs of accepted farm practices.

Table 22 displays information on the second property in the Raw Water Pipeline route.

Table 22. Raw Water Pipeline – Farm Use Property "R2"

Farm Use Property Designation	"R2"
Tax ID	1S4E23C -01500
Zoning	RR / Multnomah County
Situs Address	36800 SE Lusted Road, Boring, 97009
Total Acres	5.00
Farm Type / Accepted Farm Practices – see Section 10.3.1, 10.3.2 and 10.4.3	Hay, pasture, and cattle production
Farm Tax Deferral Status	Deferral
Location	West of Lusted Road in Lusted Flats. Access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	Permanent easement for 2 pipelines, appurtenances, and access

Property "R2" will also have a planned 100-foot-wide permanent pipeline easement along the full length of the property's southern boundary. The existing farm road located within the easement allows for farm access to a grass field. It will be slightly realigned for Water Bureau use to maintain and operate the pipeline and appurtenances. The Water Bureau will rebuild the road with gravel for all-weather use.

Appurtenances will be placed above or near the pipelines within the easement on property "R2." The pipelines will have two underground vault accessways, a fiber optic accessway, and an air release valve. All of these appurtenances are in close proximity to the pipelines and within the permanent easement. Infrequent access to the appurtenances is not a significant interference with accepted farm practices. Additionally, properties "R1" and "R2" are jointly managed for only two head of cattle, and the Water Bureau will allow continued cattle grazing in the permanent easement areas.

For the reasons stated above and in Sections 16 and 17, the pipelines will have no significant impact on accepted farm practices on property "R2" and there will be no significant increase in costs of accepted farm practices.

The information in Table 23 was provided by Ken Ackerman and estimates of the frequency that Water Bureau personnel will be using the farm road to maintain and repair the pipeline appurtenances.

Table 23. Pipeline Appurtenance Activity and Frequency

Appurtenance Type	On Site Activity	Frequency
Vault Accessway	3 to 4 persons for inspection	Once every 15 to 20 years
Air Release Valve	1 person for inspections, 2 persons for repairs	Once per month for inspection, 2 times per year for repair
Water Drain Valve	2 persons for inspections and/or repairs	1 inspection annually, 1 repair every 5 years

Source: Water Bureau operations staff as reported by Ken Ackerman.

Table 24 profiles farm use property "R3," the third property in the Raw Water Pipeline route.

Table 24. Raw Water Pipeline – Farm Use Property "R3"

Farm Use Property Designation	"R3"
Tax ID	1S4E23C -02200
Zoning	EFU / Multnomah County
Situs Address	36322 SE Dodge Park Blvd., Boring 97009
Total Acres	9.19; includes residence
Farm Type /Accepted Farm Practices – see Section 10.3.1	Hay
Farm Tax Deferral Status	Deferral
Location	East of Dodge Park and bordering the filtration facility to the west. Access from Dodge Park Blvd.
Existing Water Bureau Easements	None
New Easements Planned[68]	Deep underground easement

The pipeline tunnel will pass under property "R3" at a depth of more than 150 feet. The only easement restrictions on this property are prohibited subsurface disturbance at a depth that would interfere with the pipeline operations. The Water Bureau will have no road access and no appurtenances on property "R3."

For the reasons stated above and in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "R3" and there will be no increase in costs of accepted farm practices.

[68] Only permanent easements are needed for operating the pipelines and are referenced in this report.

18.2 Finished Water

The Finished Water Pipelines are divided into seven segments for the purposes of this analysis. Farm use properties in each segment have been evaluated for the applicable legal tests and identified in the maps provided.

Segment 1 starts where the Altman FWP and the Lusted FWP leave the filtration facility and enter Dodge Park Boulevard ROW. This segment goes west approximately 0.9 miles in the Dodge Park ROW until turning north and leaving the Dodge Park ROW.

Segment 2 starts where the Altman FWP and Lusted FWP leave Dodge Park ROW and go north across farm use property. The two pipelines are parallel and go approximately 0.48 miles and then turn west to enter the Finished Water Intertie. Segment 2 includes the Finished Water Intertie. At the Finished Water Intertie, the water from the Altman FWP and the Lusted FWP is redistributed into three pipelines (Conduit 2 Connection, Conduit 3 Connection, and Conduit 4 Connection), which enter the Lusted Road ROW.

Segment 3 starts where the three conduits – Conduit 2 Connection, Conduit 3 Connection, and Conduit 4 Connection – enter Lusted Road. This segment goes west a distance of approximately 0.33 miles to the intersection of Lusted Road and Altman Road. This segment also includes a short section of the Conduit 3 Connection in Lusted Road that continues west of the intersection approximately 50 feet. At that point, the Conduit 3 Connection will be connected to the existing portion of Conduit 3 that continues west in Lusted Road.

Segment 4 contains the Conduit 2 Connection and the Conduit 4 Connection within the Altman Road ROW and proceeds north for approximately 0.25 miles from the intersection of Altman Road and Lusted Road. For all of Segment 4, EFU zoning is on both sides of Altman Road.

Segment 5 continues with the Conduit 2 Connection and the Conduit 4 Connection in the Altman Road ROW from where MUA-20 zoning is on the west side of Altman Road and EFU zoning is on the east side of Altman Road. The Conduit 2 Connection pipeline connects to the existing Conduit 2 at Pipeline Road, a distance of about 0.20 miles past the beginning of Segment 5. Segment 5 ends at Oxbow Road with the connection of the Conduit 4 Connection to the existing Conduit 4. The total distance of the Conduit 4 Connection in Segment 5 is approximately 0.28 miles.

Segment 6 is a portion of the LRDM line on Cottrell Road. The LRDM is a small diameter pipeline that starts at the Altman FWP at the intersection of Cottrell Road and Dodge Park Boulevard. It will go north approximately 0.4 miles in the Cottrell Road ROW, then turn to the northeast at the Lusted Hill ICCT Facility.

Segment 7 is a portion of the new connection of the LRDM. It begins at the Lusted Hill ICCT Facility and continues to the northeast across that property, crosses under Lusted Road and will connect to the existing LRDM.

18.2.1 FINISHED WATER PIPELINE SEGMENT 1

Segment 1 is adjacent to nine farm use properties: "F1," "F2," "F3," "F4," "F5," "F6," "F7," "F8," and "F9." All of these properties are in the MUA-20 zone (see Figure 10). Both the Altman FWP and Lusted FWP will be south of the centerline of Dodge Park and will be within the ROW of Dodge Park in the MUA-20 zone for the entirety of Segment 1.

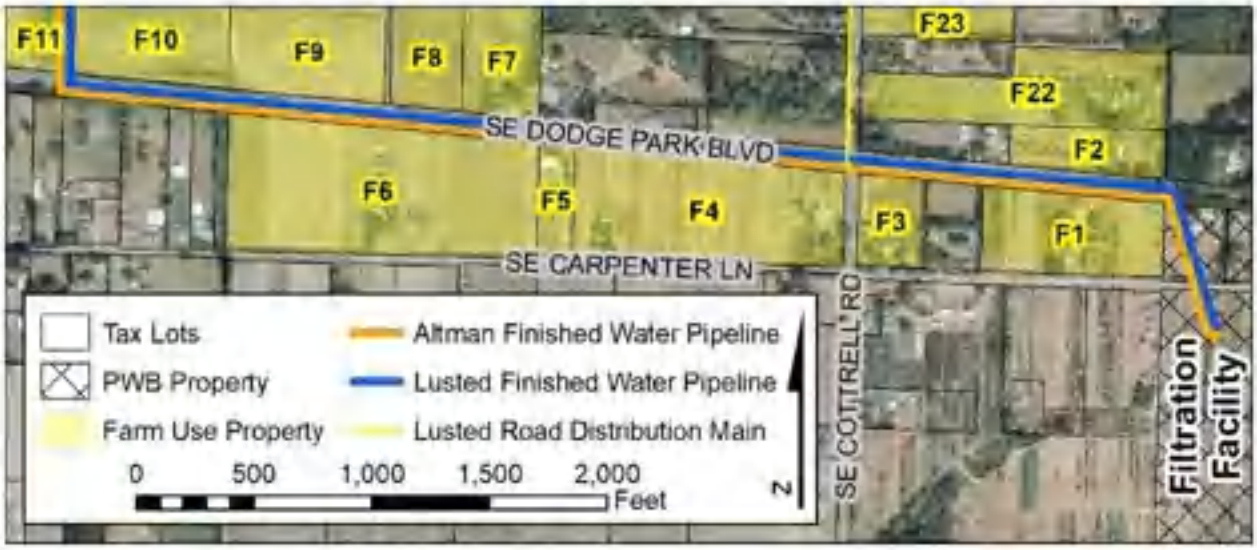
The pipelines will bypass Property "F1" in a tunnel which passes from the filtration facility and proceeds northwest to reach Dodge Park Boulevard. The pipelines in Segment 1 will be entirely north of property "F1."

Table 25. Finished Water Pipeline – Farm Use Property "F1"

Farm Use Property Designation	"F1"
Tax ID	1S4E22CA -00500
Zoning	MUA-20 / Multnomah County
Situs Address	35075 SE Carpenter Lane, Gresham 97080
Total Acres	6.50; includes residence
Farm Type / Accepted Farm Practices —see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	North of Carpenter Lane near filtration facility. Access from Carpenter Lane.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 25 profiles property "F1." No portion of the pipeline will pass through property "F1" and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

Figure 10: Farm Use Properties Adjacent to Finished Water Pipeline Segment 1



For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F1" and there will be no increase in costs of accepted farm practices.

Table 26 profiles farm use property "F2." No portion of the pipeline will pass through property "F2," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

Table 26. Finished Water Pipeline – Farm Use Property "F2"

Farm Use Property Designation	"F2"
Tax ID	1S4E22CA -00100
Zoning	MUA-20 / Multnomah County
Situs Address	35161 SE Dodge Park Blvd. Lane, Gresham 97080
Total Acres	2.98; includes residence
Farm Type /Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	North of Dodge Park Blvd. near filtration facility. Access from Dodge Park Blvd.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F2" and there will be no increase in costs of accepted farm practices on property "F2."

Table 27 profiles property "F3." No portion of the pipeline will pass through property "F3," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F3" and there will be no increase in costs of accepted farm practices.

Table 27. Finished Water Pipeline – Farm Use Property "F3"

Farm Use Property Designation	"F3"
Tax ID	1S4E22CA -00300
Zoning	MUA-20 / Multnomah County
Situs Address	34723 SE Carpenter Lane, Gresham 97080
Total Acres	2.51; includes residence
Farm Type /Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	North of Carpenter Lane near filtration facility. Access from Carpenter Lane.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 28 profiles farm use property "F4." No portion of the pipeline will pass through property "F4," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F4" and there will be no increase in costs of accepted farm practices.

Table 28. Finished Water Pipeline – Farm Use Property "F4"

Farm Use Property Designation	"F4"
Tax ID	1S4E22CB -00100
Zoning	MUA-20 / Multnomah County
Situs Address	7625 SE Cottrell Road, Gresham 97080
Total Acres	11.85; includes residence
Farm Type /Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	North of Carpenter Lane and west of Cottrell Road. Access from Carpenter Lane.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 29 profiles farm use property "F5." No portion of the pipeline will pass through property "F5," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F5" and there will be no increase in costs of accepted farm practices.

Table 29. Finished Water Pipeline – Farm Use Property "F5"

Farm Use Property Designation	"F5"
Tax ID	1S4E22CB -00200
Zoning	MUA-20 / Multnomah County
Situs Address	34201 SE Carpenter Lane, Gresham, OR 97080
Total Acres	1.67; includes residence
Farm Type /Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	North of Carpenter Lane and west of Cottrell Road. Access from Carpenter Lane.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 30 profiles farm use property "F6." No portion of the pipeline will pass through property "F6," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F6" and there will be no increase in costs of accepted farm practices.

Table 30. Finished Water Pipeline – Farm Use Property "F6"

Farm Use Property Designation	"F6"
Tax ID	1S4E21D -00100
Zoning	MUA-20 / Multnomah County
Situs Address	33907 SE Carpenter Lane, Gresham, OR 97080
Total Acres	16.40; includes residence
Farm Type / Accepted Farm Practices – see Section 10.1.2 & 10.1.4	B&B nursery, greenhouse
Farm Tax Deferral Status	Deferral
Location	South of Dodge Park Blvd., with access from Carpenter Lane
Existing Water Bureau Easements	None
New Easements Planned	None

Table 31 profiles property "F7." No portion of the pipeline will pass through property "F7," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F7" and there will be no increase in costs of accepted farm practices.

Table 31. Finished Water Pipeline – Farm Use Property "F7"

Farm Use Property Designation	"F7"
Tax ID	1S4E21A -00400
Zoning	MUA-20 / Multnomah County
Situs Address	34163 SE Dodge Park Blvd., Gresham, OR 97080
Total Acres	10.21; includes residence
Farm Type / Accepted Farm Practices – see Sections 10.1.2, 10.1.4, 10.3.1 & 10.3.2	B&B nursery, greenhouse, hay, & pasture
Farm Tax Deferral Status	Deferral
Location	North of Dodge Park Blvd. Access from Dodge Park Blvd.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 32 profiles farm use property "F8." No portion of the pipeline will pass through property "F8," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F8" and there will be no increase in costs of accepted farm practices.

Table 32. Finished Water Pipeline – Farm Use Property "F8"

Farm Use Property Designation	"F8"
Tax ID	1S4E21A -00500
Zoning	MUA-20 / Multnomah County
Situs Address	Unknown, Dodge Park Blvd., Gresham, OR 97080
Total Acres	4.77
Farm Type / Accepted Farm Practices – see Sections 10.1.2, 10.3.1, & 10.3.2	B&B nursery, hay, & pasture
Farm Tax Deferral Status	Deferral
Location	North of Dodge Park Blvd. Access from Dodge Park Blvd.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 33 profiles property "F9." No portion of the pipeline will pass through property "F9," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F9" and there will be no increase in costs of accepted farm practices.

Table 33. Finished Water Pipeline – Farm Use Property "F9"

Farm Use Property Designation	"F9"
Tax ID	1S4E21A -00700
Zoning	MUA-20 / Multnomah County
Situs Address	33752 SE Lusted Road, Gresham, OR 97080
Total Acres	39.33; includes farm headquarters facilities
Farm Type / Accepted Farm Practices – see Sections 10.1.1 and 10.1.4	Bareroot nursery & greenhouse
Farm Tax Deferral Status	Deferral
Location	Between Lusted Road and Dodge Park Blvd. Access from both roads.
Existing Water Bureau Easements	None
New Easements Planned	None

16.3.2 FINISHED WATER PIPELINE SEGMENT 2

Segment 2 passes through farm use property "F11," and adjacent to farm use properties "F10" and "F12" (see Figure 11). All three of these properties are in the MUA-20 zone.

Table 34 profiles farm use property "F10." No portion of the pipeline will pass through property "F10," and no Water Bureau appurtenances will be placed on this property. No easements are needed for access to the pipelines.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F10" and there will be no increase in costs of accepted farm practices.

Table 34. Finished Water Pipeline – Farm Use Property "F10"

Farm Use Property Designation	"F10"
Tax ID	1S4E21A -00802
Zoning	MUA-20 / Multnomah County
Situs Address	33608 SE Lusted Road, Gresham, OR 97080
Total Acres	Approx. 19.7
Farm Type / Accepted Farm Practices – see Section 10.1.1	Bareroot nursery
Farm Tax Deferral Status	Deferral
Location	North of Dodge Park Blvd. with existing road access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	None

Figure 11: Farm Use Properties in Finished Water Pipeline Segment 2



Table 35 profiles farm use property "F11." The Altman FWP and Lusted FWP will be located on property "F11" along its eastern border within a total of 45 feet in width of permanent easements that include a 20-foot-wide access easement with "bump-outs" extending approximately an additional 15 feet of width to a distance of 35 feet in width in three places for vehicle turnout and appurtenance access. The easement will be permanent to maintain access to the two pipelines. The permanent easement in property "F11" extends farther into the farm use area for the footprint of the Finished Water Intertie at the northeast corner of "F11" (see Figure 12).

As mentioned above, the permanent easement area itself is not part of the Core Analysis Area for the pipelines nor the Surrounding Lands, because it is not located on "surrounding lands" for purposes of the zoning approval criteria. Nevertheless, the Water Bureau has designed the proposed pipeline system to reduce any impacts to the farm unit of property "F11" (and other parts of the pipeline system) below the level of significance by, among other things: (1) using existing ROW, farm roads, or non-cropland areas wherever possible instead of taking a more direct route through cropland; (2) disrupting as little cropland as possible by reducing the easement areas to the smallest area practical to accommodate the Water Bureau use;[69] (3) agreeing to provisions in the easement documents themselves that will allow continued use of cropland area in the permanent easements where possible, such as along the edge of the pipelines on property "F11;" and (4) engaging a soils expert to prepare a best-practices plan for restoring that continued-use cropland area back to pre-construction productivity, and implementing that plan. The pipelines on property "F11" will be buried to a depth with at least 7 feet of soil cover to the top of the pipelines, which will not restrict accepted farm practices within the cropland area.

Along most of the eastern field edge, 25 feet of the pipeline permanent easement, by the terms of the easement document, will be available for on-going farm use because the Water Bureau will only need use of this area if a major pipeline repair becomes necessary, an exceedingly rare occurrence that has not happened in at least the last 20 years.[70]

There is an existing farm road along the south border of property "F11" that is in the public ROW of Dodge Park Boulevard. For its permanent pipeline access from the existing driveway on Dodge Park Boulevard, the Water Bureau will have a 15-foot-wide permanent easement completely within the southern boundary of property "F11." The Water Bureau will upgrade and maintain the existing farm road in its current location in the ROW to a graveled all- weather access road until at some future time it would be necessary to relocate the road within the easement of property "F11." This is an advantage for the landowner because it provides upgraded road use, removes their obligation for any future road relocation costs, and keeps the permanent easement area land in farm use while the road remains in the public ROW.

A total of 1.9 acres within all of the permanent easement areas of property "F11" is estimated to go out of crop production with the Finished Water Intertie and pipelines in place. This is the net loss of

[69] Based on interviews with Ken Ackerman and Brad Phelps.
[70] The 20-year period is the time period over which this data was available.

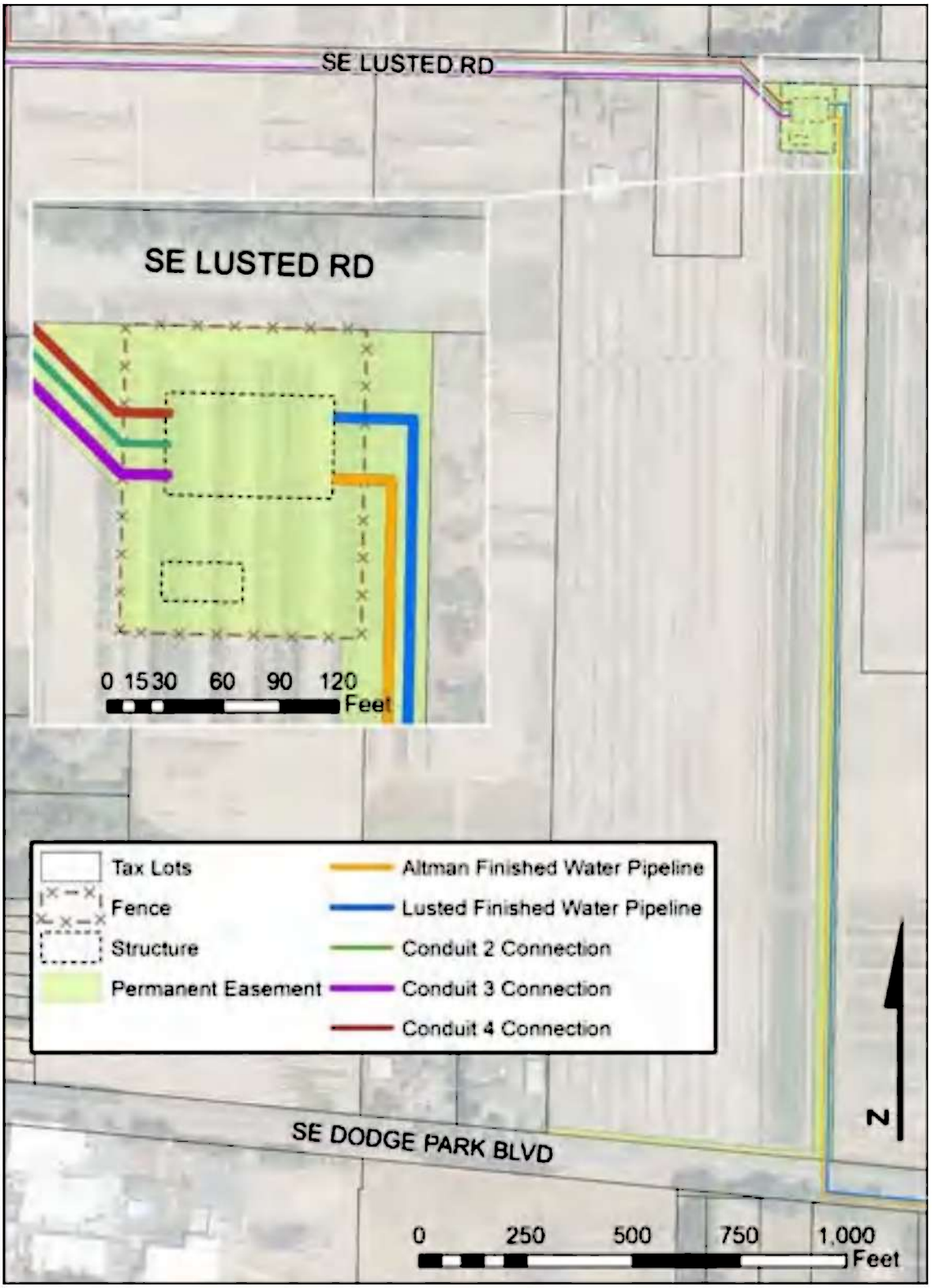
crop-growing-area that cannot be maintained in crop production once the pipelines are in operation. The farm production unit (the relevant area as described above in Section 5.2) for this farm includes both tax parcels "F11" and "F12", which are owned by the same entity and are farmed as one contiguous field. The acreage to go out of crop production is approximately 5.4% of the farm production unit.

The small loss of acreage will not change the accepted farm practices for production of B&B nursery crops on this property. Furthermore, there will be no increase in the cost of the accepted farm practices. There are several reasons for these conclusions: 1) the farm owner has many other fields in nursery production in this area and the percent loss of land in farm use for their total farming operation is less than one percent; 2) the land the Water Bureau is taking for permanent use is entirely along the outer perimeter of the field, which requires no change in crop row alignment, irrigation equipment layout, harvest planning, or any other accepted farm practice; 3) the Water Bureau is upgrading the farm roads to gravel, which significantly improves road access for the farmer in inclement weather; and 4) all future road maintenance and repairs will be made at the expense of the Water Bureau, reducing the farmer's road-related capital costs while benefiting from higher quality farm road access.

Table 35. Finished Water Pipeline – Farm Use Property "F11"

Farm Use Property Designation	"F11"
Tax ID	1S4E21A -00900
Zoning	MUA-20 / Multnomah County
Situs Address	33304 SE Lusted Road, Gresham, OR 97080
Total Acres	35.56; includes residence
Farm Type / Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	Between Lusted Road and Dodge Park Blvd. with existing road access from Lusted Road and Dodge Park Blvd.
Existing Water Bureau Easements	None
New Easements Planned	Permanent easement for 2 conduits, associated appurtenances, access to the conduits, and access to the Finished Water Intertie. Permanent access easement for pipelines and Finished Water Intertie access

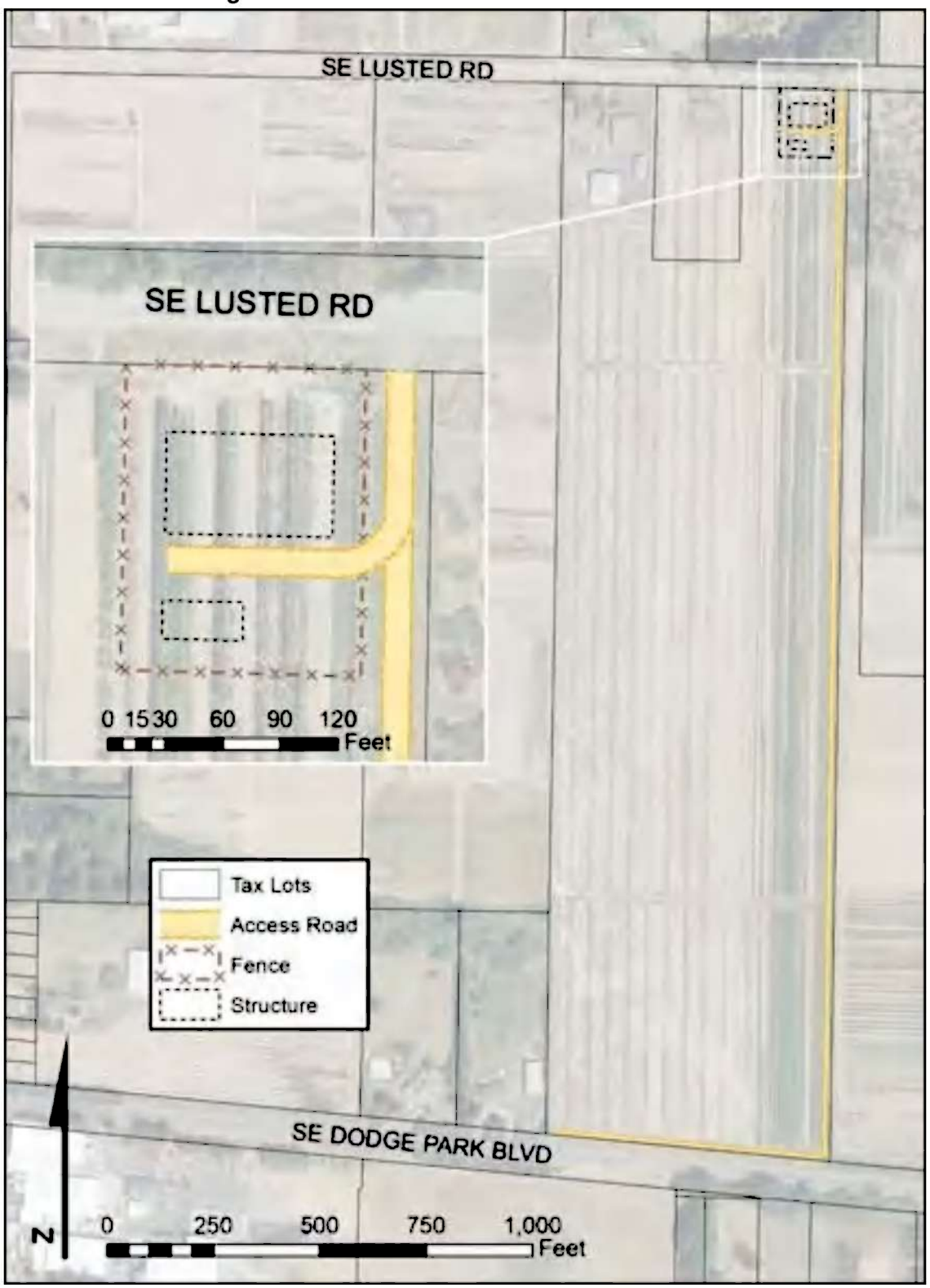
Figure 12: Pipeline Easement through Property "F11" and Finished Water Intertie



The pipelines will have five appurtenances on property "F11:" each conduit will have two air release valves and there will be one joint water drain valve for both. These appurtenances will be placed above or near the two pipelines on property "F11." Both pipelines will share an accessway for the water drain. All appurtenances will be placed in areas along the property edge outside crop growing areas and within permanent easement areas. Table 23 provides estimates of the frequency that Water Bureau personnel will be using the farm road to maintain the air release valves, water drain valve, and the vault accessway. The access of the existing driveway at Dodge Park also keeps the current drainage ditch unaltered along Dodge Park Boulevard.

The Finished Water Intertie will be located immediately south of Lusted Road in the northeast corner of property "F11". This facility will include valves to manage the water flow between the multiple conduits, electrical and power apparatus in a small building, a paved parking area, and a gated fence perimeter. The intertie will be accessed using the existing property "F11" farm road from Lusted Road (see Figure 13).

Figure 13: Road Access to Finished Water Intertie



At the Finished Water Intertie, the water from the Altman FWP and the Lusted FWP is redistributed into three pipelines (Conduit 2 Connection, Conduit 3 Connection, and Conduit 4 Connection), which then enter the Lusted Road ROW.

The Finished Water Intertie will be accessed once or twice per week for managing water flow control or to inspect facility equipment. Rarely, a crane will be needed at the intertie to lift the valves from their vaults for more in-depth maintenance or repairs. Maintenance or repair is performed only when needed and it is expected that many years will pass between the maintenance events requiring a crane. In these instances, the equipment and personnel will be on-site for several days and the maintenance equipment at the intertie will remain within the perimeter of the intertie easement and will not hinder farm use of the farm roads or other areas outside of the Water Bureau's easements.

The infrequent Water Bureau access to farm use property "F11" will not cause changes in accepted farm practices and there will be no increase in costs of accepted farm practices.

In summary, for these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F11" and there will be no significant increase in costs of accepted farm practices.

18.2.3 FINISHED WATER PIPELINE SEGMENT 3

Segment 3 is adjacent to five farm use properties: "F12," "F13," "F14," "F15," "F16," and "F17" (see Figure 14). Four farm properties in this segment are south of the centerline of Lusted Road in the MUA-20 zone and two farm use properties are north of the Lusted Road centerline in the EFU zone (also see Figure 6).

Figure 14: Farm Use Properties Adjacent to Finished Water Pipeline Segment 3

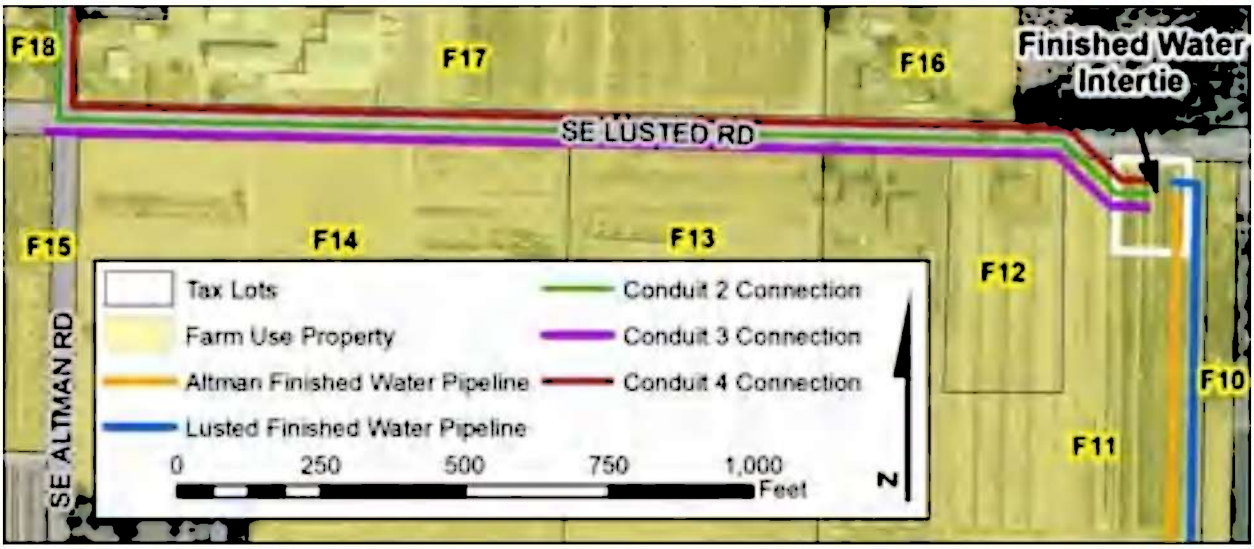


Table 36 profiles farm use property "F12." The pipelines will not pass through property "F12," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The pipelines will be located to the north of this property in the ROW of Lusted Road. Property "F12" is in the MUA-20 zone.

Table 36. Finished Water Pipeline – Farm Use Property "F12"

Farm Use Property Designation	"F12"
Tax ID	1S4E21A -01000
Zoning	MUA-20 / Multnomah County
Situs Address	33334 SE Lusted Road, Gresham, OR 97080
Total Acres	Approx. 1.86: includes residence
Farm Type / Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	South of Lusted Road. Access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	None

Table 36 profiles property "F12." As noted above, the farmed portion of the land in property "F12" is farmed with property "F11."

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F12" and there will be no increase in costs of accepted farm practices.

Table 37 profiles farm use property "F13." No portion of the pipeline will pass through property "F13" and no Water Bureau appurtenances will be placed on this property. No easements are needed for access to the pipelines.

Table 37. Finished Water Pipeline – Farm Use Property "F13"

Farm Use Property Designation	"F13"
Tax ID	1S4E21B -00200
Zoning	MUA-20 / Multnomah County
Situs Address	33030 SE Lusted Road, Gresham, OR 97080
Total Acres	Approx. 20.0; includes residence
Farm Type / Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	South of Lusted Road. Access from Lusted Road and Dodge Park Blvd.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F13" and there will be no increase in costs of accepted farm practices.

Table 38 profiles property "F14." The pipelines will not pass through property "F14" and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access. The pipelines will be located to the north of this property in the ROW of Lusted Road. Conduit 3 will be south of the centerline of Lusted Road. Property "F14" is in the MUA-20 zone.

Table 38. Finished Water Pipeline – Farm Use Property "F14"

Farm Use Property Designation	"F14"
Tax ID	1S4E21B -00100
Zoning	MUA-20 / Multnomah County
Situs Address	33030 SE Lusted Road, Gresham, OR 97080
Total Acres	Approx. 28.9
Farm Type / Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	South of Lusted Road. Access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F14" and there will be no increase in costs of accepted farm practices.

Table 39 profiles property "F15." The pipelines will not pass through property "F15," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access. The pipelines will be located to the north of this property in the ROW of Lusted Road. Property "F15" is in the MUA-20 zone.

Table 39. Finished Water Pipeline – Farm Use Property "F15"

Farm Use Property Designation	"F15"
Tax ID	1S4E21BB -00100
Zoning	MUA-20 / Multnomah County
Situs Address	SW corner of Lusted Road & Altman Road, Gresham, OR 97080
Total Acres	5.00
Farm Type / Accepted Farm Practices – see Sections 10.1.2 & 10.1.3	B&B and container nursery
Farm Tax Deferral Status	Deferral
Location	South of Lusted Road. Access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F15" and there will be no increase in costs of accepted farm practices.

Table 40 profiles property "F16." The pipelines will not pass through property "F16," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access. The pipelines will be located to the south of this property in the ROW of Lusted Road. Property "F16" is in the EFU zone.

Table 40. Finished Water Pipeline – Farm Use Property "F16"

Farm Use Property Designation	"F16"
Tax ID	1S4E16DC -00200
Zoning	EFU / Multnomah County
Situs Address	33233 SE Lusted Road, Gresham, OR 97080
Total Acres	9.77
Farm Type /Accepted Farm Practices – see Sections 10.1.4, 10.3.1, & 10.3.2	Greenhouse, hay, & pasture
Farm Tax Deferral Status	Deferral
Location	North of Lusted Road. Access from Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F16" and there will be no increase in costs of accepted farm practices.

Table 41 profiles farm use property "F17." The pipelines will not pass through property "F17," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access. The pipelines will be located to the south of this property in the ROW of Lusted Road. Conduits 2 and 4 will be north of the centerline of Lusted Road. Property "F17" is in the EFU zone.

Table 41. Finished Water Pipeline – Farm Use Property "F17"

Farm Use Property Designation	"F17"
Tax ID	1S4E16C -00100
Zoning	EFU / Multnomah County
Situs Address	32801 SE Lusted Road, Gresham, OR 97080
Total Acres	77.08; includes residence
Farm Type /Accepted Farm Practices – see Sections 10.1.1, 10.1.2, & 10.1.3	Bareroot, B&B and container nursery
Farm Tax Deferral Status	Deferral
Location	North of Lusted Road. Access from Lusted Road, Altman Road and from Oxbow Drive.
Existing Water Bureau Easements	None impacted by the project
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F17" and there will be no increase in costs of accepted farm practices.

18.2.4 FINISHED WATER PIPELINE SEGMENT 4

Segment 4 is adjacent to two farm use properties: "F18" and "F19" (see Figure 15). Both of these farm properties are west of Altman Road and are in the EFU zone. Segment 4 is also adjacent to property "F17," which is analyzed above and also in EFU zoning.

Figure 15: Farm Use Properties in Finished Water Pipeline Segment 4

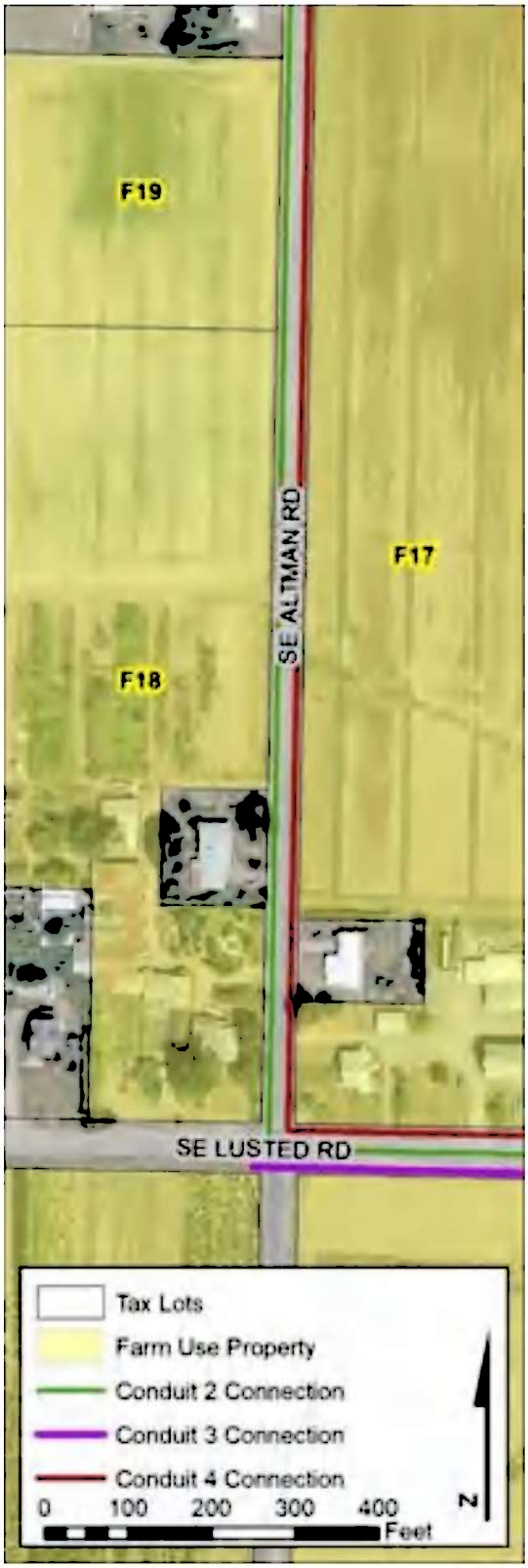


Table 42 profiles property "F18." The pipelines will not pass through property "F18," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access. Conduit 2 will be located to the east of this property in the ROW of Altman Road. Property "F18" is in the EFU zone.

Table 42. Finished Water Pipeline – Farm Use Property "F18"

Farm Use Property Designation	"F18"
Tax ID	1S4E16CC -00300
Zoning	EFU / Multnomah County
Situs Address	32627 SE Lusted Rd., Gresham, OR 97080
Total Acres	8.08; includes residence
Farm Type / Accepted Farm Practices – see Sections 10.1.2 & 10.1.3	B&B nursery & container nursery
Farm Tax Deferral Status	Deferral
Location	Northwest corner of Altman Road and Lusted Road. Access from Lusted Road and Altman Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F18" and there will be no increase in costs of accepted farm practices.

Table 43 profiles property "F19." The pipelines will not pass through property "F19," and no Water Bureau appurtenances will be placed on this property. No easements are needed for pipeline access. The pipelines will be located to the east of this property in the ROW of Altman Road. Property "F19" is in the EFU zone.

Table 43. Finished Water Pipeline – Farm Use Property "F19"

Farm Use Property Designation	"F19"
Tax ID	1S4E16CC -00100
Zoning	EFU / Multnomah County
Situs Address	None
Total Acres	9.85
Farm Type /Accepted Farm Practices – see Section 10.2.1	Grass seed
Farm Tax Deferral Status	Deferral
Location	West of Altman Road. Access from Altman Road and Lusted Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F19" and there will be no increase in costs of accepted farm practices.

18.2.5 FINISHED WATER PIPELINE SEGMENT 5

Segment 5 is adjacent to two farm use properties: "F20" and "F21" (see Figure 16). Both properties are in EFU zoning. The southern section of Segment 5 is also adjacent to property "F17," which is analyzed above and also in EFU zoning. The properties to the west of Segment 5 are not in farm use,

Figure 16: Farm Use Properties in Finished Water Pipeline Segment 5

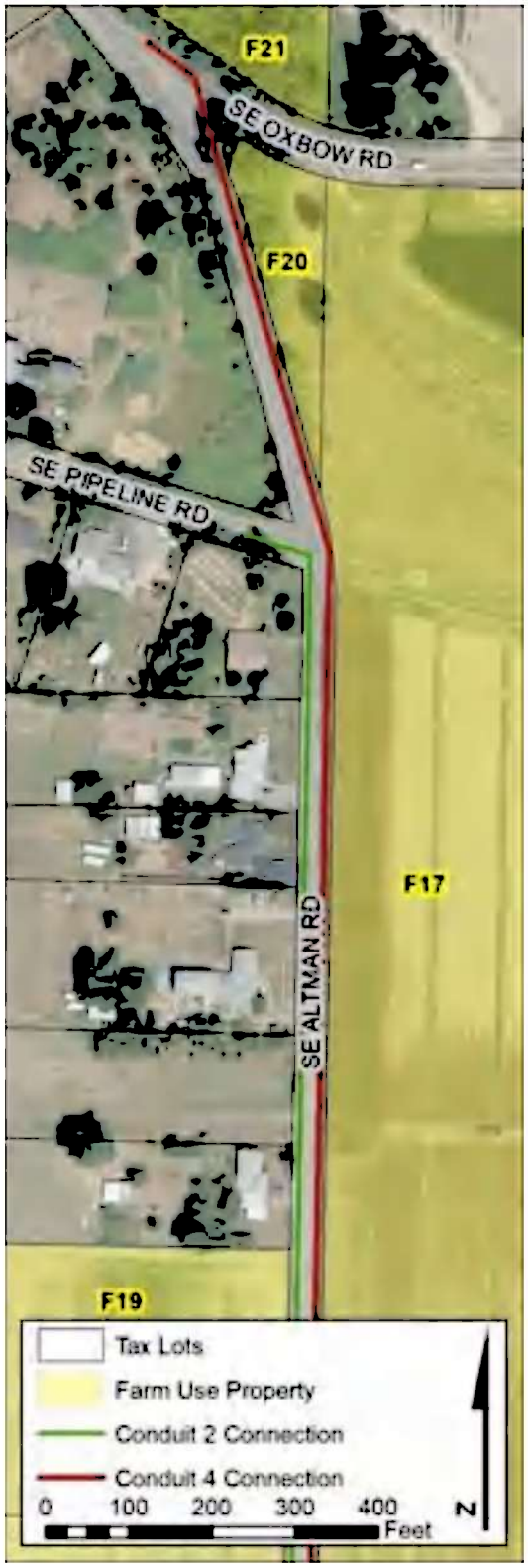


Table 44 profiles property "F20." Property "F20" is a small remainder site east of Altman Road and is adjacent to the Altman Road ROW area where the Conduit 4 Connection will be placed. This parcel is separated by Altman Road from the owner's residential property, which is on the west side of the road. Property "F20" is in the EFU zone.

Table 44. Finished Water Pipeline – Farm Use Property "F20"

Farm Use Property Designation	"F20"
Tax ID	1S4E16CB -00101
Zoning	EFU / Multnomah County
Situs Address	None
Total Acres	0.55
Farm Type Farm Type /Accepted Farm Practices – see Section 10.1.1	Bareroot nursery
Farm Tax Deferral Status	Not in deferral
Location	East of Altman Road with the northern edge on Oxbow Dr. Access from Oxbow Drive.
Existing Water Bureau Easements	None
New Easements Planned	None

A small portion of this property is farmed by the nursery that farms property "F20." Steep, tree covered portions of property "F20" are not in farm use. The Water Bureau will have no easement access on this property. The pipelines will not pass through property "F20," and no Water Bureau appurtenances will be placed on this property.

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F20" and there will be no increase in costs of accepted farm practices.

Table 45 profiles farm use property "F21." The pipelines will not pass through property "F21," and no Water Bureau appurtenances will be placed on this property. The Water Bureau will have no easement access to this property. Property "F21" is in the EFU zone.

Table 45. Finished Water Pipeline – Farm Use Property "F21"

Farm Use Property Designation	"F21"
Tax ID	1S4E16B -00501
Zoning	EFU / Multnomah County
Situs Address	4848 SE 322nd Ave., Troutdale, OR 97060
Total Acres	9.50
Farm Type /Accepted Farm Practices – see Section 10.1.1	Bareroot nursery
Farm Tax Deferral Status	Deferral
Location	North of Oxbow Dr. Access from Oxbow Dr.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F21" and there will be no increase in costs of accepted farm practices.

18.2.6 FINISHED WATER PIPELINE SEGMENT 6

Segment 6 is the LRDM connecting from the Altman FWP in Dodge Park Boulevard and then north along Cottrell Road before going through the Lusted Hill ICCT Facility to connect with the existing LRDM near Lusted Road (see Figure 17). There are seven farm use properties adjacent to this segment in Cottrell Road: "F22," "F23," "F24," "F25," F26," "F27," and "F28." The other properties adjacent to this segment in Cottrell Road are not in farm use.

Figure 17: Farm Use Properties in Finished Water Pipeline Segment 6



Table 46 profiles farm use property "F22." The LRDM will not pass through property "F22," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the west of this property in the ROW of Cottrell Road. Property "F22" is in the MUA-20 zone.

Table 46. Finished Water Pipeline – Farm Use Property "F22"

Farm Use Property Designation	"F22"
Tax ID	1S4E22BD -00800
Zoning	MUA-20 / Multnomah County
Situs Address	7450 SE Cottrell Road, Gresham, OR 97080
Total Acres	8.00; including residence
Farm Type /Accepted Farm Practices – see Sections 10.1.1 & 10.1.2	Bareroot & B&B nursery
Farm Tax Deferral Status	Deferral
Location	East of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F22" and there will be no increase in costs of accepted farm practices.

Table 47 profiles farm use property "F23." The LRDM will not pass through property "F23," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the west of this property in the ROW of Cottrell Road. Property "F23" is in the MUA-20 zone.

Table 47. Finished Water Pipeline – Farm Use Property "F23"

Farm Use Property Designation	"F23"
Tax ID	1S4E22BD -00600
Zoning	MUA-20 / Multnomah County
Situs Address	7326 SE Cottrell Road, Gresham, OR 97080
Total Acres	2.06 acres; including residence
Farm Type / Accepted Farm Practices – see Section 10.3.1	Hay
Farm Tax Deferral Status	Not in Deferral
Location	East of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F23" and there will be no increase in costs of accepted farm practices.

Table 48 profiles farm use property "F24." The LRDM will not pass through property "F24," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the east of this property in the ROW of Cottrell Road. Property "F24" is in the MUA-20 zone.

Table 48. Finished Water Pipeline – Farm Use Property "F24"

Farm Use Property Designation	"F24"
Tax ID	154E22BC -00500
Zoning	MUA-20 / Multnomah County
Situs Address	7205 SE Cottrell Road, Gresham, OR 97080
Total Acres	5.03 acres; including residence
Farm Type / Accepted Farm Practices – see Section 10.1.1	Bareroot nursery
Farm Tax Deferral Status	Not in deferral
Location	West of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F24" and there will be no increase in costs of accepted farm practices.

Table 49 profiles farm use property "F25." The LRDM will not pass through property "F25," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the east of this property in the ROW of Cottrell Road. Property "F25" is in the MUA-20 zone.

Table 49. Finished Water Pipeline – Farm Use Property "F25"

Farm Use Property Designation	"F25"
Tax ID	1S4E22BC -00200
Zoning	MUA-20 / Multnomah County
Situs Address	7035 SE Cottrell Road, Gresham, OR 97080
Total Acres	4.27 acres
Farm Type /Accepted Farm Practices – see Section 10.1.1	Bareroot nursery
Farm Tax Deferral Status	Not in deferral
Location	West of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F25" and there will be no increase in costs of accepted farm practices.

Table 50 profiles farm use property "F26." The LRDM will not pass through property "F26," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the west of this property in the ROW of Cottrell Road. Property "F26" is in the MUA-20 zone.

Table 50. Finished Water Pipeline – Farm Use Property "F26"

Farm Use Property Designation	"F26"
Tax ID	1S4E22BD -00200
Zoning	MUA-20 / Multnomah County
Situs Address	7044 SE Cottrell Road, Gresham, OR 97080
Total Acres	4.89 acres, including residence
Farm Type / Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Not in deferral
Location	East of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F26" and there will be no increase in costs of accepted farm practices.

Table 51 profiles farm use property "F27." The LRDM will not pass through property "F27," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the west of this property in the ROW of Cottrell Road. Property "F27" is in the MUA-20 zone.

Table 51. Finished Water Pipeline – Farm Use Property "F27"

Farm Use Property Designation	"F27"
Tax ID	1S4E22BA -00500
Zoning	MUA-20 / Multnomah County
Situs Address	6930 SE Cottrell Road, Gresham, OR 97080
Total Acres	2.48 acres; including residence
Farm Type /Accepted Farm Practices – see Section 10.1.4	Greenhouse
Farm Tax Deferral Status	Not in deferral
Location	East of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F27" and there will be no increase in costs of accepted farm practices.

Table 52 profiles farm use property "F28." The LRDM will not pass through property "F28," and no Water Bureau appurtenances will be placed here. No easements are needed for pipeline access. The LRDM will be located to the west of this property in the ROW of Cottrell Road. Property "F28" is in the MUA-20 zone.

Table 52. Finished Water Pipeline – Farm Use Property "F28"

Farm Use Property Designation	"F28"
Tax ID	1S4E22BA -00300
Zoning	MUA-20 / Multnomah County
Situs Address	6804 SE Cottrell Road, Gresham, OR 97080
Total Acres	12.14 acres; including residence
Farm Type /Accepted Farm Practices – see Section 10.2.1	Grass seed
Farm Tax Deferral Status	Not in deferral
Location	East of Cottrell Road. Access from Cottrell Road.
Existing Water Bureau Easements	None
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F28" and there will be no increase in costs of accepted farm practices.

18.2.7 FINISHED WATER PIPELINE SEGMENT 7

Segment 7 is the LRDM that continues from Segment 6 in Cottrell Road and passes through the Lusted Hill ICCT Facility and the CFU zoned area where it connects with the existing LRDM in Lusted Flats (see Figure 18). Property "F29" is the only farm use property adjacent to this segment near Lusted Road.

Figure 18: Farm Use Property in Finished Water Pipeline Segment 7

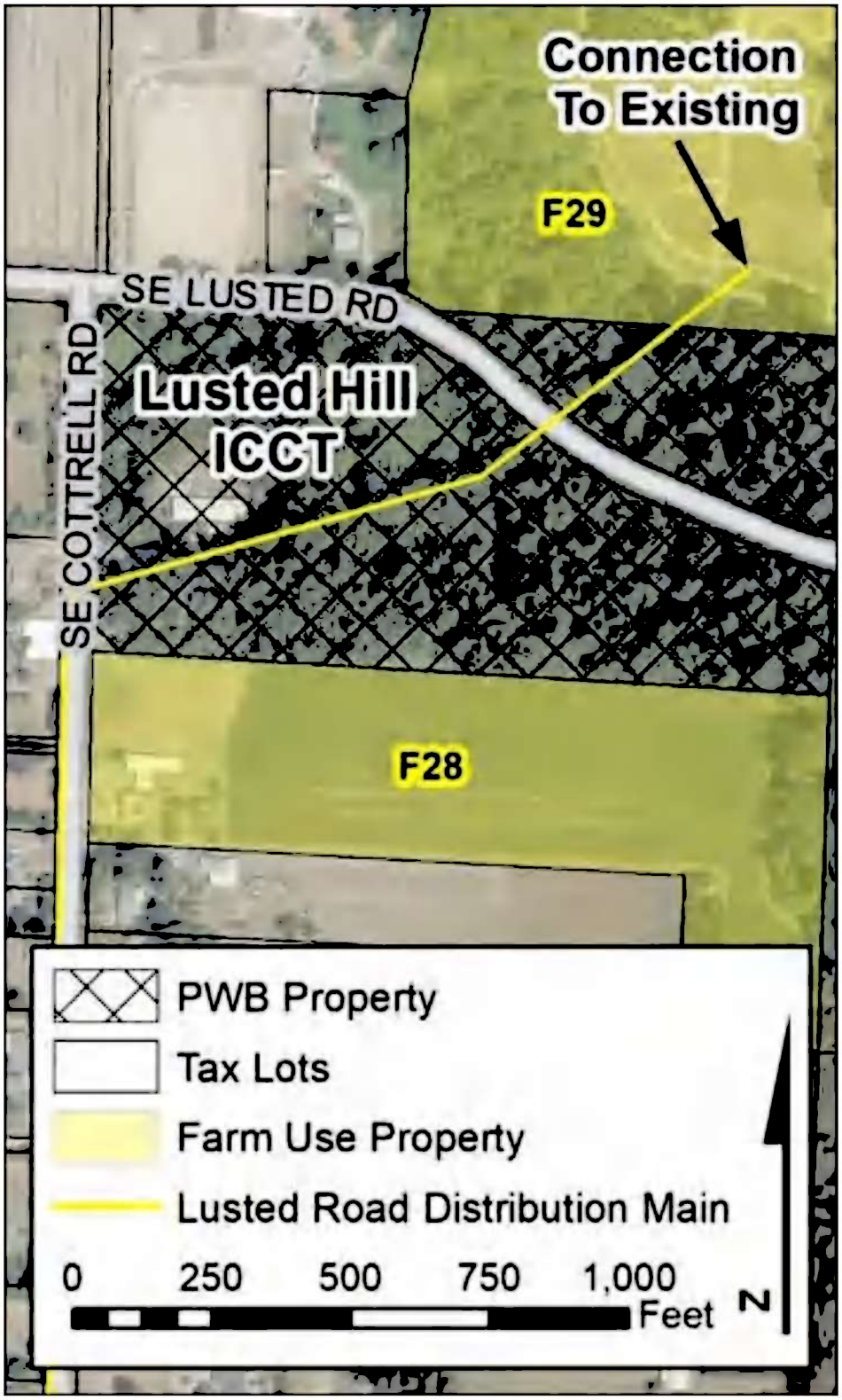


Table 53 profiles farm use property "F29." The Water Bureau has an existing permanent pipeline easement for this property. The new pipeline connection and all appurtenances will be placed within this existing easement. The installation of the new pipeline connection and appurtenances will not cause any impacts on accepted farm practices on property "F29" because the easement area has already been taken out of farm use by the existing easement. The LRDM will be located to the north of Lusted Road as it descends to the Lusted Flats area.

Table 53. Finished Water Pipeline – Farm Use Property "F29"

Farm Use Property Designation	"F29"
Tax ID	1S4E15C -00801
Zoning	CFU / Multnomah County
Situs Address	34747 SE Cottrell Road, Gresham, OR 97080
Total Acres	20.30 acres
Farm Type /Accepted Farm Practices – see Section 10.1.2	B&B nursery
Farm Tax Deferral Status	Deferral
Location	Northeast of Lusted Road.
Existing Water Bureau Easements	Yes
New Easements Planned	None

For these reasons and those above in Sections 16 and 17, the pipelines will have no impact on accepted farm practices on property "F29" and there will be no increase in costs of accepted farm practices.

19.0 Summary Conclusions for Farm Impacts from Pipelines

This analysis determined that in every category, the Water Bureau has designed the pipelines to eliminate the potential for significant impacts to accepted farm practices or significant increases in costs of those practices within the Core Analysis Area along the pipeline alignment. Because there are no significant impacts to or increased costs of accepted farm practices in the Core Analysis Area, and the surrounding agricultural area further away from the pipeline alignment is similar in character and susceptibility to impacts as described in Sections 16 and 17 above, this analysis concludes that the pipelines will have no significant impacts on accepted farm practices in the Surrounding Lands nor significantly increase the costs of those accepted farm practices in the Surrounding Lands.

20.0 Final Conclusions for Impacts on Accepted Farm Practices from the Filtration Facility and Pipelines

It is the conclusion of Globalwise that the operation of the Water Bureau's filtration facility and the pipelines for conveyance of raw water and finished water will not force any significant changes in accepted farm practices in the Surrounding Lands. Globalwise further concludes that the Water Bureau's filtration facility and the pipelines for conveyance of raw water and finished water will cause no significant increase in the costs of accepted farm practices in the Surrounding Lands.