Evaluation of Public Service Provision Costs

Impact of Antelope Ridge Wind Power Project on the City of Union

July 2011

Final Report

ECONorthwest
ECONOMICS • FINANCE • PLANNING

99 W. 10th Avenue, Suite 400
Eugene, OR 97401
Phone: 541-687-0051
www.econw.com

CONTACT INFORMATION

This report was prepared by Mark Buckley, Tom Souhlas, Sarah Reich, and Nick Popenuk of ECONorthwest, which is solely responsible for its content. Portions of this report were drafted by staff at Anderson Perry and Associates, Inc. and Kittleson and Associates, Inc.

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For more information about ECONorthwest, visit our website at http://www.econw.com.

For more information about this report, please contact:

Mark Buckley
ECONorthwest
222 SW Columbia Street
Portland, OR 97201
503-222-6060

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GLOSSARY

Antelope Ridge	Antelope Ridge Wind Power Project LLC
ASC	Application for Site Certificate
AV	Assessed Value
City	City of Union
Council	Union City Council
County	Union County
DWP	Oregon Department of Human Services, Drinking Water Program
DWPA	Drinking Water Protection Area
Elkhorn Project	Elkhorn Valley Wind Farm project
GPM	Gallons per Minute
Horizon	Horizon Wind Energy LLC
MW	Megawatts
OAR	Oregon Administrative Rule
ODOE	Oregon Department of Energy
Project	Antelope Ridge Wind Power project
RMV	Real Market Value
SIP	Strategic Investment Program
WSMP	Water System Master Plan

EXECUTIVE SUMMARY

Antelope Ridge Wind Power Project LLC, a wholly owned subsidiary of Horizon Wind Energy LLC, is proposing to construct and operate the Antelope Ridge Wind Power project (Project). The Project would involve erecting up to 164 wind turbines, varying in height from 328-475 feet each, on 11,000 acres of land in Union County in the vicinity of the City of Union (City), with the potential to generate up to 300 megawatts of electricity. We investigated the potential for the Project to impact the City's costs of providing public services, and its property tax revenue. In general, we find that other communities near similar wind projects have so far experienced minimal impacts related to the projects. Still, while the likelihood of effects generating costs for the city is low, the limited city resources equate to a high relative costs if effects do materialize. The Project-related burden on the City's voluntary and understaffed fire and emergency resources could be noticeable relative to the City's existing needs and responsibilities. Also, while data from other communities do not show that nearby wind projects have so far resulted in substantial reductions in property values, other evidence suggest that there is potential for the City's property tax revenues to decrease due to the Project. We summarize our results in Table ES-1.

Table ES-1 Summary of Impacts on City of Union Services and Property Tax Revenue

Service	Impact*	Description
Water	High likelihood High cost *($140,000 - $180,000)*	The City may need to develop a truck fill station at the existing Catherine Creek surface water pump house or undertake necessary control system work at well pump stations to reduce reservoir operational storage. The City should provide standby power capabilities at Well No. 2 and monitor water-use activities.
Sewer, Stormwater, and Waste	Low to no likelihood Not Available	Levels of waste would increase during construction but likely would have negligible impacts on workforce requirements and costs.
Traffic Safety	Low likelihood Low cost	Minimal construction traffic, including Project-related commuter traffic, would travel through the City.
Police	Low likelihood Moderate cost	We estimate there may be about one Project-related incident requiring police services during construction. If more incidents materialize, the existing shortfall in police coverage could be made worse.
Fire	Low likelihood High cost	We estimate there likely would be about three Project-related fire incidents during construction, but the number could be higher, especially if a significant portion of the workforce lives in the City. These incidents might temporarily restrict the City's ability to serve its existing population.
Emergency	Low likelihood Moderate cost *(~$35,000)*	We estimate there likely would be about 1-2 Project-related medical incidents associated, half of which may require emergency services). Furthermore, the prospect of potential emergencies may require that the purchase a new Jaws of Life and other materials.
Schools	Low likelihood Low cost	Traffic avoidance while children crossing the street requested.
Property Value	Low likelihood *(Up to 12% decline.)*	The literature suggests that the wind facilities may potentially diminish property values. Most studies of existing facilities, however, find the impacts on property values have been small, and temporary.
Property Tax Revenue	Low likelihood High cost *(Up to $0.7 million.)*	Our analysis of growth scenarios suggests that the Project could cause the net present value of revenue from property taxes to decline by up to $0.7 million over the next 50 years.

* Impact includes the **likelihood** (probability) that an effect of the Project will occur, and the **severity** (cost) of the impact if it does occur. Both should be considered when assessing significance of the effect.

I. INTRODUCTION

Antelope Ridge Wind Power Project LLC, (Antelope Ridge) a wholly owned subsidiary of Horizon Wind Energy LLC (Horizon), is proposing to construct and operate the Antelope Ridge Wind Power project (Project) in Union County. On December 30th of 2010, Horizon completed its Application for Site Certificate (ASC) for the Project. The City of Union (City) requested that ECONorthwest analyze the potential impacts the Project may have on costs incurred by the City's government. In this study, we estimate the costs imposed via services due to the Project, and the potential impact on property tax revenues. The City plans on using the result of this analysis to comment on the ASC in their role as a reviewing agency under Oregon Department of Energy (ODOE) rules.

A. Project Background

The Project will involve erecting up to 164 wind turbines, varying in height from 328-475 feet each, on 11,000 acres of land in Union County (County) in the vicinity of the City, with the potential to generate up to 300 megawatts (MW) of electricity. In addition to the wind turbines, the Project will involve the construction of access roads, foundations, underground and overhead electrical collection systems, meteorological towers, an operations and maintenance building, a communication system, a power collection system, a substation, and interconnection facilities to tie into the electrical grid. To connect with the existing transmission network, the Project will construct a network of 230 kilovolt transmission lines with line poles ranging in height from 80-120 feet each.[1]

In January of 2011, the Union City Council (Council) met to discuss and vote on mitigation measures related to the Project's impacts on the City. The Council agreed to a deal in which the City will receive $2 million over the next 15 years from Horizon to cover potential impacts incurred by the City due to the Project including: 1) property value reduction, 2) lost tourism, 3) degraded view sheds, and 4) adverse health impacts.[2] The $2 million will come from the Strategic Investment Program (SIP) Agreement negotiated between Horizon and the County in the fall of 2010. The SIP allows the County to retain more revenues (about 70 percent more) from Horizon than regular property taxes would allow for the first 15 years of the Project, after which, property taxes on the Project will return to their standard rates. An additional $40 million will go to the County and other communities in the County over the 15-year term. It is unclear how much money will be distributed each year.

In considering streams of revenue that go into the future, it is useful to recognize that, all else equal, most people prefer to receive money in the near future rather than the same amount of money in the far future. To adjust for this preference, economists convert future streams of money to their equivalent, net present value, using a process called discounting. In this instance, we discount using a discount rate, called the nominal

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[1] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit B: Facility Description. OAR 345-021-0010(1)(b).

[2] City of Union and Union County. 2011. *City of Union Approves Resolution in Support of Antelope Ridge Strategic Investment Program*. Joint Press Release. January 12, 2011; City of Union. 2011. *City of Union Resolution No. 2011-3*. January 10, 2011.

interest rate, that reflects both the time preference and expected inflation.[3] Using the assumptions provided in the SIP presentation, the stream of revenue the City will receive from the SIP has a present, discounted value of about $1.8 million, and the expected stream of revenue for the County and other communities has a present, discounted value of about $31.8 million.[4] The SIP funds are intended to compensate for the four negative impacts identified above. They are not explicitly targeted as compensation for increased demand on services the City provides. The SIP funds are also not directly intended to compensate for reduced City revenues due to property taxes.

B. Methods and Overview of Report

The City requested that we analyze the potential costs the City may incur due to Project-related increases in demand for the City's public services, increases in costs for service provision, decreases in revenue, or other impacts on the City's ability to provide for its citizens. To conduct our analysis, we reviewed the Project's ASC insofar as it complies with Oregon Administrative Rule (OAR) 345-022-0110, which describes the standards for public services as they relate to facility siting. Table 1 contains the specific text contained within the OAR.

For each relevant section in the Project's ASC, we summarize the ASC's findings, then evaluate the potential impacts of the Project as they relate to the City independently. In evaluating the potential impacts on the City, our team: made site visits; interviewed relevant staff and officials in the City and the County, Horizon staff, and city and county staff from other communities near the Project and in other areas with wind projects; and reviewed relevant literature.

Table 1. Oregon Administrative Rule 345-022-0110 Public Services

1	Except for facilities described in sections (2) and (3), to issue a site certificate, the Council must find that the construction and operation of the facility, taking into account mitigation, are not likely to result in significant adverse impact to the ability of public and private providers within the analysis area described in the project order to provide: sewers and sewage treatment, water, storm water drainage, solid waste management, housing, traffic safety, police and fire protection, health care and schools.
2	The Council may issue a site certificate for a facility that would produce power from wind, solar or geothermal energy without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.
3	The Council may issue a site certificate for a special criteria facility under OAR 345-015-0310 without making the findings described in section (1). However, the Council may apply the requirements of section (1) to impose conditions on a site certificate issued for such a facility.

Source: Oregon State Archives. 2010. Retrieved on February 15, 2011 from: http://arcweb.sos.state.or.us /rules/OARs_300/OAR_345/345_022.html

[3] In calculating the net present value of the stream of the SIP revenues we used the average of the 10-year (3.0 percent) and 20-year (3.9 percent) nominal interest rate on treasury notes and bonds as identified by the U.S. Office of Management and Budget.

[4] ECONW with data from. *SIP: Proposed Agreement for Antelope Ridge Wind Power Project*. Retrieved on June 3, 2011, from *union-county.org/pdf/SIP%20Presentation.pdf.*

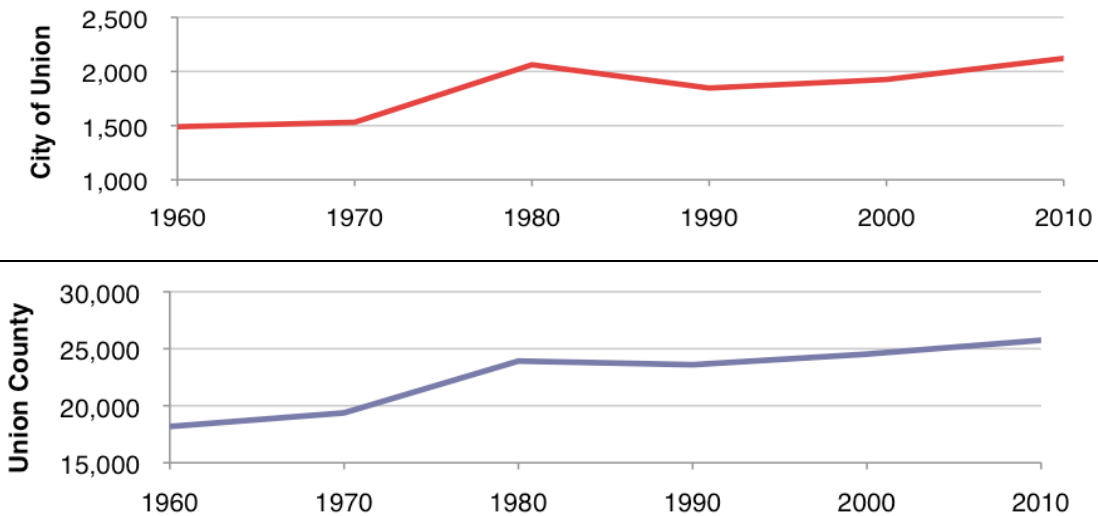
We also analyze the potential impact the Project may have on the City's property tax revenues. We use data from the County Assessor's office to identify current property values and current revenues from property taxes. We project these values into the future under four different scenarios and discuss the results of our analysis along with the findings of relevant literature describing the relationships between property values and wind-energy projects.

II. Project Impacts on Services the City of Union Provides

In this section, we examine the sections of Exhibit U in the Project's ASC that relate to the services the City provides. First, for each relevant impact category, we summarize the ASC's findings. Then we summarize our independent analysis. Additional materials supporting our analyses are in Appendices A-E. In general, we find that the City has limited capacity to provide services additional to those it currently provides its residents. In that respect, any increase in demand for the City's services likely would negatively impact the City's capacity to provide services to its resident population. In the remainder of this section, we describe, in detail, some specific instances in which the Project likely would impose costs on the City.

The magnitude of the services the City provides is largely dependent on the population. Figure 1 shows that the City's population has fluctuated between 1,500 and 2,000 over the past 50 years, with a general increasing trend over the past twenty years. The pattern of growth and decline is similar for the County as a whole.

Figure 1. Population in the City of Union and Union County (1960-2010)



	1960	1970	1980	1990	2000	2010
City of Union	1,490	1,531	2,062	1,847	1,926	2,121
Union County	18,180	19,377	23,921	23,598	24,530	25,748

Source: U.S. Census Bureau. 1960, 1970, 1980, 1990, 2000, 2010. Retrieved on May 13, 2011, from http://www.census.gov.

A. Water

1. ASC Findings

The ASC concluded that the Project would have no significant adverse impacts to the local water supply. In justifying this conclusion, the ASC states that the City of Union and the City of North Powder provide assurance that water will be available for purchase during the construction phase of the Project. Alternatively, the Project's construction phase could use water purchased from the Jimmy Creek Reservoir. During the operation phase of the Project, the ASC states no water will be required from municipal sources.[5]

2. Analysis

In this section, we describe issues related to water demand during the Project's construction phase and issues related to the City's Drinking Water Protection Area (DWPA), and provide recommendations for what actions the City may need to take to mitigate the Project's impacts. To conduct our analysis, we reviewed the City's water system service, the system's components, issues relating to water rights, historical water demand, and historical water reliability.[6] We used this review to inform our analysis of water demand and the DWPA, and to formulate our recommendations.

Water Demand During the Project's Construction Phase

Projected Water Demand. Based on information obtained from bulk water sales the City made to the Elkhorn Project in 2007, bulk water sales needed to support construction activities would typically be about 60,000 gallons per day, and could be as high as 200,000 gallons per day during peak construction activity. The City's water system demands were approximately 24 percent higher than average demands with the development of the Elkhorn Project. The City should anticipate that, with the Project, water demand will be somewhat higher than it was in 2007 during the construction of the Elkhorn Project.

Evaluation of Impact to Water Supply Sources. With the projected increase in water demand from the Project, the City likely will see both average day and peak day demand increase. From a reliability perspective, the City's current peak day demand can barely be met by running one of the City's wells all day. If the Project requires large amounts of bulk water sales, Catherine Creek surface water likely provides the most reliable water source. Using Catherine Creek surface water has many benefits, including:

- No need to pump water (saves electricity).
- No need to disinfect water (saves chlorine expenses).
- Minimal impacts on City storage reservoir and distribution system.
- The Catherine Creek water has a certified water right associated with it.
- Settling cells help remove any turbidity from water diverted from the creek.

[5] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

[6] Additional details on these topics are in Appendix A.

- A rotating fish screen is located at the diversion from the settling ponds to the City pipe system to help prevent any impacts to fish species.
- Water quality should be adequate to meet construction water needs.

If water from Catherine Creek is not available for construction-related bulk water sales, the City's community water supply wells likely could meet the increased demand for water sales. However, significant increased operational costs for water treatment, electrical draws from well pump motors, increased wear on the pumps and system controls, and increased operational staff monitoring and activities would increase the City's cost for providing the water. The City would also have to monitor pump hours of operation and water reservoir levels daily to verify adequate system performance under increased demands on the water system.

Evaluation of Impact to Water Storage. The Project's peak water demand is estimated at 200,000 gallons per day. At this rate, 27 percent of the City's storage reserve could be consumed in a given day due to the Project. Should the City's reserves diminish, such as during peak day demands, the City's operators would need to closely monitor reservoir water levels to ensure the City's water supply wells pump adequate volumes to replenish the water reservoir on a daily basis.

As identified in the City's 2004 Water System Master Plan (WSMP), the City needs to update the well control and telemetry system so each of its wells can operate in a lead/lag scenario, keeping the reservoir as full as possible while using both wells. The current system requires significant operator monitoring during peak demand periods. Well pump operational set points are not adjustable in the current control system and the existing operational storage volume (volume between on/off set points) is excessive (about 160,000 gallons).

Should the Project use water from Catherine Creek, the impact to the City's water storage system would be negligible because the surface water supply is no longer connected to the storage reservoir. The settling ponds at the intake from Catherine Creek would act as the storage reservoir to meet the construction water supply needs, thereby removing any impact to the City's 750,000-gallon storage reservoir.

Evaluation of Impact to Water Distribution. The City's water distribution system is generally in need of repair. The City has been working to replace key sections of the steel piping throughout the distribution system in recent years. However, the City is still working on replacing large sections of the system that are known to have leaks. The City should minimize impacts to the distribution system caused by construction activities. More specifically, the opening and closing of fire hydrants too rapidly can cause "water hammer" in the system causing pipes to rupture or leak, or impact private residences connected to the system.

With the Elkhorn Project, the City requested that the contractors use a specific hydrant located near the fire department known to be served by newer 6-inch PVC pipe. The City also requested that a large truck fill tank be placed at the water filling site to help the water tankers fill at a rapid flow rate, while buffering the flow actually demanded from the distribution system. The large truck fill tank was filled at a lower flow rate, generally between 200 and 300 gpm, while the water tankers were able to be filled with

large volumes in a relatively short duration. The lower inlet flow rate helped buffer the impact to the distribution system and minimize the potential water hammer on the system, while the increased fill tank discharge rate allowed the contractor to minimize standby time to fill the tanks. Such a fill tank is also recommended for use during the Project's construction activities. The tank would be needed on a temporary basis and could be removed from the site once construction activity was complete.

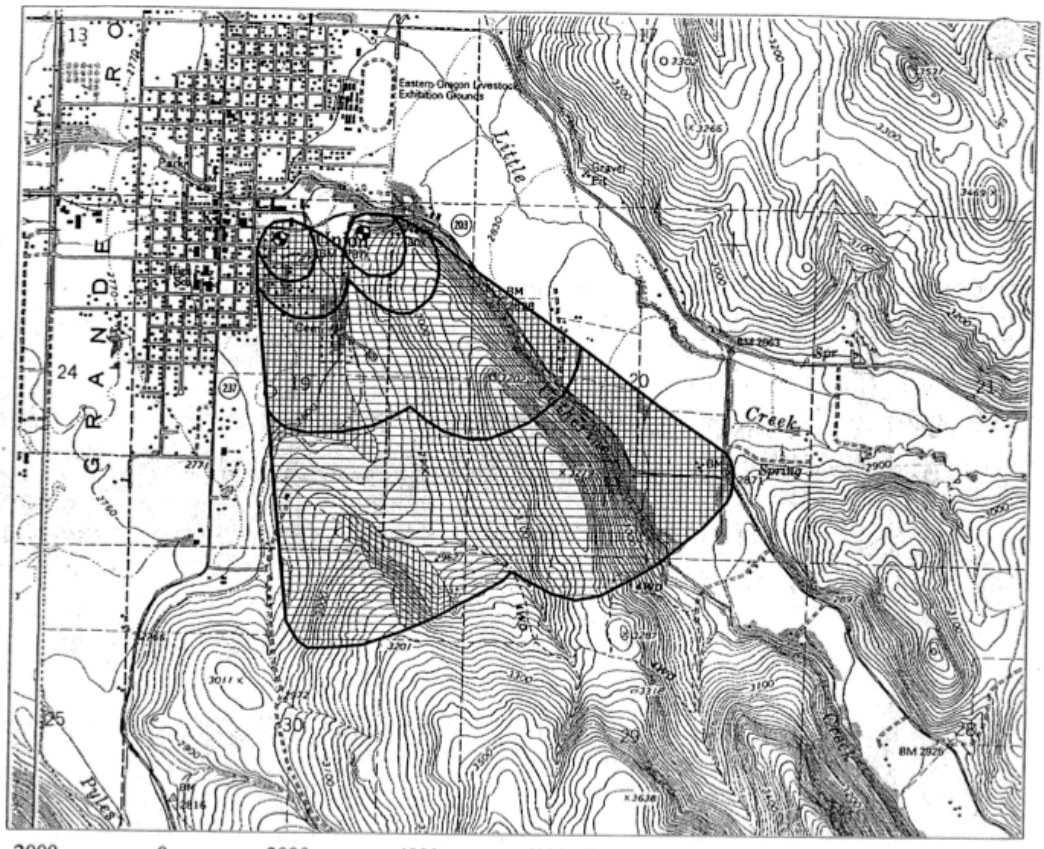
A new truck fill pipe, meter, and valving are needed at the City's existing surface water pump house adjacent to Highway 203 for contractors to access the Catherine Creek surface water supply. The flows provided by the surface water supply system would also need buffering to minimize water hammer on approximately two miles of old steel pipeline between the City's diversion point and the pump house. A large truck fill tank connected to the truck fill apparatus is also recommended for use at this site to prevent the operators from having to control valves with every needed truck fill and to allow adequate volume to quickly fill tanker trucks.

Evaluation of Potential Impacts on Drinking Water Protection Areas

Overview of Drinking Water Protection Areas. In April of 2003, the Oregon Department of Human Services, Drinking Water Program (DWP) developed a Source Water Assessment Report for the City of Union. This report identified a DWPA for the City. The DWPA is "the area at the surface that overlies that part of the aquifer that supplies groundwater" to the City's wells. The DWPA further identifies that the Columbia River basalt aquifer supplies drinking water to the City's system, and this aquifer is a confined layered basalt aquifer with water bearing zones between 400 and 1,686 feet below the surface. Both of the City's primary water supply wells are cased and sealed to avoid direct contamination from potential surface water contamination. However, the DWPA states that "the aquifer supplying the wells is considered moderately sensitive based on the presence of highly permeable soils within the delineated area and the proximity of surface water." Figure 2 shows the 1-, 2-, 5-, and 10-year time of travel limits, as well relative soil sensitivities.

Typical Contaminant Sources in DWPAs. In developing the Source Water Assessment Report, the DWP inventories significant sources of contamination. The inventory was designed to identify several categories of potential sources of contaminants including microorganisms, inorganic compounds, and organic compounds. Some of the contaminant sources the DWP identifies as having potential impacts on the area aquifer include utility stations with maintenance transformer storage, automobile repair shops, cement/concrete plants, chemical/petroleum processing/storage, electrical/electronic manufacturing, machine shops, aboveground storage tanks (excluding water), transmission lines, and construction/demolition areas.

Figure 2. City of Union Drinking Water Protection Area Soil Sensitivity Analysis



USGS Union, Craig Mtn., OR Quadrangle (part section) 7.5' Series (Topographic)

Drinking Water Protection Area (DWPA) 1,2, 5, and 10 Year Time of Travel (TOT) Analytical Method

Prepared by: JF 05/28/03
Project Manager: JF RG#1867
File # 4100915

N

Sensitivity Analysis
- **High Soil Sensitivity**
- **Medium Soil Sensitivity**
- **Low Soil Sensitivity**

Well Location: Township 4S Range 40E Section 19
Union County WGS84
Well #2 45°12'28.640"N 117°51'42.324"W
Well #3 45°12'29.729"N 117°51'24.678"W

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff. Environmental contamination is not likely to occur when chemicals are used and managed properly. Numbers indicate potential contaminant sources indexed to Appendic C, Table 2.

Monitoring of Potential Impacts to Drinking Water Sources. The City is currently relying on two deep basalt wells to provide the community with drinking water. Both of these wells provide protection against surface water contamination. However, if groundwater is contaminated in the surrounding area, and the contaminated water reaches the Columbia River basalt aquifer, the City would need to develop additional water treatment measures or additional water supply sources. The City should monitor activities within the DWPA and attempt to limit or have strict control measures in place

for those activities that could have negative impacts on the City's groundwater supply sources. With the Project, potential impacts from construction activities and hazardous liquids, oil, or grease storage, as well as other site activities, could lead to groundwater contamination. The City should request that Horizon develop a spill prevention plan including measures to immediately address and mitigate any events potentially impacting the City's drinking water resources.

Recommendations

The Project may impact the City's community water system. In order to minimize these impacts, we suggest that the City take the following actions:

- Develop a truck fill station at the existing Catherine Creek surface water pump house site to meet anticipated construction water needs and minimize the impact to the City's groundwater supply sources. The anticipated cost of such a station and the needed access improvements is anticipated to range from $50,000 to $60,000, depending on potential land acquisition needs.
- Should the Catherine Creek surface water supply not be available to meet anticipated construction water needs, the City should undertake necessary control system work at the well pump stations to reduce reservoir operational storage and help provide reliable backup pumping operations, if needed. The anticipated cost of such a control system upgrade is anticipated to range from $40,000 to $50,000, depending on the amount of existing equipment that can be utilized for the replacement.
- The Project should use a temporary water truck fill tank to fill water trucks, allowing the City to fill the tank at a reduced flow and minimize potential water hammer on system piping, while allowing truck operators to quickly fill their tanks.
- The City should provide standby power capabilities at Well No. 2, particularly if the City's wells will be utilized to meet construction water needs. The cost of a generator installation at Well No. 2 that is enclosed and operated via an automatic transfer switch is anticipated to range from $100,000 to $120,000.
- The City should monitor activities within the DWPA and attempt to limit and/or provide strict controls on those activities that could have negative impacts on the City's groundwater supply sources.

B. Sewer, Stormwater, and Waste

1. ASC Findings

The ASC concluded that the Project would have no impact on existing wastewater treatment facilities or collection systems. In justifying this conclusion, the ASC states that the Project would not require any municipal wastewater treatment services during the construction or operation phases.[7]

[7] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

The ASC concluded that the Project would have no significant adverse impacts to stormwater drainage. In justifying this conclusion, the ASC states that the Project would not require the services of stormwater system providers during the construction or operations phases.[8]

The ASC concluded that the Project would have no significant adverse impacts on the ability of Union Sanitation to provide services. In justifying this conclusion, the ASC describes conversations with area garbage service providers in which it was agreed that the solid waste generated during the Project would not strain service providers, the La Grande Transfer Station, or the Baker Landfill.[9]

2. Analysis

We found no evidence suggesting that Horizon's claims in the ASC for waste management were likely to be incorrect. There might be some incremental increase in stormwater pollutant loads from increased vehicle traffic, and some increase in wastewater and solid waste burden if a substantial share of the workforce does reside within the City's jurisdiction. We found no evidence though that the City's systems are unlikely to be able to handle this short-term incremental waste load.

C. Traffic Safety

1. ASC Findings

The Project's ASC contains a general discussion of the Project's anticipated traffic impacts. It notes that traffic will be generated in two waves. The first wave of traffic will occur during construction. After construction is completed, traffic related to the facility will be associated with the maintenance and operation of the wind farm. [10]

2. Analysis

In this section, we briefly describe the Project's likely traffic impacts during the constructions phase and the operation phase, and provide recommendations for how the City can mitigate these potential impacts. To conduct our analysis, we consider data from the Project's construction schedule as well as interviews with relevant City staff and officials. Additional information supporting this analysis is in Appendix B.

Construction Traffic

Based on the Project's construction schedule, Horizon staff anticipate that a maximum of 75 deliveries of gravel and water per day will travel through the City on OR 237 and OR 203, which equates to a maximum of 150 trips per day (75 inbound and 75 outbound).

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[8] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

[9] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

[10] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

This maximum assumes that all gravel will come from north of the City and will not routed to the west on OR 203, and that some water will come from the City. According to Horizon staff, this traffic will be distributed throughout the construction workday. Concrete will be batched on-site, so there should not be a need for trucks to travel in a convoy through town. Assuming an 8 ½-hour workday and equal distribution of deliveries, 15-20 trucks would travel through the City per hour, or one truck every 3-4 minutes, from 8 a.m. to 4:30 p.m. This level of traffic would be noticeable, but it would not significantly impact the capacity of Main Street and the City's intersecting roadways.

Operations and Maintenance Traffic

The Project's ASC concludes that there will be no significant negative impacts from traffic related to the operation and maintenance of the facility. Since area roadways currently have low traffic volumes, the 20 employees expected to work at the site during the operations phase will not impact existing traffic.

Consultation with City of Union

The ASC notes that the City has submitted comments and been consulted during the development of the draft Construction Traffic Management Plan. According to Horizon staff, the draft Construction Traffic Management Plan submitted with the ASC is still valid. Horizon staff do not anticipate a need to temporarily close Main Street at any point, in part because large equipment loads cannot travel on OR 237, immediately south of the City, and therefore will not travel through the City.

In response to concerns raised by the City, Horizon intends to take the following measures for gravel deliveries:

- The route through the City for gravel deliveries will only be preferred when trucks need to access the east side of the facility.
- Gravel trucks will travel only on the State system (OR 203 and OR 237) when passing through the City.
- Drivers and contractors will be "educated and instructed to take great care to heed to pedestrians crossing Main Street (OR 237/203)."
- Drivers will obey all speed limits, including a 20 mph speed limit in school zones during school hours. They will also be made aware of pedestrian and student use of Main Street in the City.

The following measures will be implemented for water deliveries:

- Water trucks will travel only on the State system (OR 203 and OR 237) when passing through the City, assuming water is obtained from the Union Fire Station. The Plan will be modified accordingly if an alternate location is selected for water purchase.
- Drivers and contractors will be "educated and instructed to take great care to heed to pedestrians crossing Main Street."
- Drivers will obey all speed limits, including a 20 mph speed limit in school zones during school hours. They will also be made aware of pedestrian and student use of Main Street in the City.

Conclusions and Recommendations

The following is a summary of our conclusions and recommendations as they relate to the findings in the ASC.

Operations and Maintenance Traffic. Based on the level of anticipated permanent employment at the facility, traffic related to the operation and maintenance of the facility likely would not cause significant negative impacts.

Construction Traffic – Temporary Workers. Traffic related to the employment of temporary construction workers is only briefly discussed in the ASC. The ASC notes that most temporary construction workers will be from out of the area and require temporary housing. It anticipates that most workers will obtain temporary housing at motels, RV parks, and other rental housing in the nearby larger cities of La Grande and Baker City where there are more options available. Under this assumption, most temporary construction workers would not travel through the City to reach the facility.

Construction Traffic – Deliveries. Based on the information contained within the ASC summarized above and assuming that the draft Construction Traffic Management Plan and the measures outlined in it to satisfy City concerns are followed, significant adverse impacts to City public facilities likely will not occur from traffic related to construction. This finding is consistent with the letter submitted by the City to Horizon on January 26, 2010, which is what prompted the drafting of these measures. City streets will not be directly impacted by construction-related traffic from the facility, since traffic will travel on State highways only. Should construction traffic need to divert onto City roadways, the City should first be consulted to determine potential impacts and mitigation measures.

The City has expressed concern for the safety of pedestrians, particularly school-age children, along Main Street. Horizon has responded to this concern by including the measures outlined above in its Construction Traffic Management Plan. Additionally, much of the peak construction traffic will be occurring during the summer months when school is not in session. If the City feels that trucks traveling through town are not obeying traffic laws as outlined in the measures above, they could contract with the Union County Sheriff for selective enforcement on Main Street.

The City should work with Horizon and its subsidiary to ensure that the above described measures outlined in the draft Construction Traffic Management Plan are maintained when the plan is finalized. City staff should also be consulted by Horizon if deviations from the Construction Traffic Management Plan in Union need to be made. Following these conditions should satisfy City concerns as they have been expressed and minimize negative impacts to traffic safety in the City.

D. Police, Fire and Emergency Services

1. ASC Findings

The ASC concluded that the Project would have no significant adverse impacts on local police services or fire protection services. Regarding police services, the ASC justifies its conclusions by citing conversations with Union County Sheriff Boyd Rasmussen during

which the Sheriff indicated that he did not anticipate any potential adverse impacts. Regarding fire protection, the ASC justifies its conclusions by describing the Project's Fire Protection Plan, which it plans to implement internally.[11]

2. Analysis

In this section, we discuss the potential Project-related costs the City may incur related to police, fire, and other emergency support services. We briefly describe the City's available resources for police, fire, and emergency services. We also discuss the Project's potential impacts on the City's capacity to provide these services to its residents. At the end of the section, we briefly describe our recommendations for mitigating the Project's potential impacts on these services. To conduct our analysis, we compiled incident reports from past wind projects completed by Horizon and projected the potential frequency of police, fire, and other emergency incidents. We also compiled details describing Horizon's approach to dealing with these issues during the construction and operations phases of all of its projects.[12]

City of Union's Available Resources and Impacts

Police. In 2007, the City's police department disbanded, and the City began to contract with the Union County Sheriff's Office for police services. Currently the City pays for 138 hours per month from the County. In the past, it had 7 full-time officers.[13] Boyd Rasmussen, Union County Sheriff, reported that an appropriate number of officers is roughly 1.5–2 per 1,000 population, which would equate to 3-4 full-time officers for the City.[14] Consequently the police staffing availability for the City is below current needs. While the Project is not expected to substantially increase the permanent population, the estimated 250 workers for the 8-12 month construction phase would increase the general population presence, if they generally congregate in the area of the City, by roughly 1/8th and would require, assuming 40 hour weeks, roughly 60-80 additional officer hours per month. Additional officer hours would require overtime rates, which the Union County Sheriff's Office reports to be $42.85/hour.[15] This equates to roughly $2,600-$3,400 per month. The office also reports that officer vehicle costs are $5,800 per month. Assuming half time for a vehicle, this is an additional $2,900 per month.

Direct requirements for police officers on sites associated with the Project should not directly affect City costs, because no time outside of the City's jurisdiction counts towards the contracted hours for the City. It is possible that an officer in the City would be the nearest available officer to respond to a call though, so it could potentially draw officers away. Again though, this time would not count against the City's allotment. The frequency of calls for past projects suggests this occurrence to be highly unlikely.

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[11] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

[12] Additional information describing these portions of our analysis is in Appendix C.

[13] Patterson, Sandra. 2011. Personal Communication. January 20, 2011.

[14] Personal Communication. January 26, 2011.

[15] Personal Communication. February 7, 2011.

Fire. The City does not have any paid fire fighters, but rather a completely volunteer force. This force works in conjunction with the County. Resources including vehicles are shared for City and rural County needs as well. Consequently, demands for firefighters impact the availability of fire staff for the City, whether the event is within the City's jurisdiction or outside the City in nearby rural parts of the County. While the availability and exact number fluctuates, the City and Rural Fire currently share approximately 16 volunteers, and require an additional 10 volunteers to meet current needs (not including any increased demand from the Project).[16]

Obtaining additional volunteers is difficult, and once people have volunteered, hiring a trainer costs $200/hour and training time ranges from 32 hours for basic to 60 hours for National Fire Protection Association standards. These equate to $6,400 to $12,000 for trainer costs. At these rates, an additional 250 people could require approximately 4 additional fire volunteers, not including any additional demand from Project activities on roads or at the Project's sites. These costs do not include any additional equipment and materials that might be required to supply additional staff to meet current and any expanded needs. While the specific equipment and material costs are unclear, current equipment and material costs suggest these costs could be within the range of $10,000s to $100,000s for the period of Project construction in order to meet current and expanded shortfalls. There are also potential increases in insurance costs for the City with increased fire response activity.

Based on experiences of other communities and Horizon's stated fire policies it is unlikely that rural county and consequently City fire resources would be called upon with any frequency. However, any demand at all on City fire resources would be significant. The only way to avoid such a significant impact is assurance that the City would never be put in a position of being unprotected for fire incidents by having all of its volunteers and equipment called to a Project event. This could be accomplished by assurance from Horizon that it will manage all fire risk without City fire resources, including via the City's support for rural fire resources. The City is concerned that periods of time without fire protection available within the city could affect City insurance rates. In general, City officials and staff show strong concern on this issue, making it relevant even if likelihoods are low.

Ambulance. The City currently has 5 volunteer emergency medical technicians (EMT), and to meet current needs, reports a need of an additional 5 EMTs.[17] Eliciting volunteer EMTs can be difficult, and training costs are $1,500/person. The City estimates that 10 people would need to be trained to have the 5 necessary EMTs available, for a training cost of $15,000. When the City provides ambulatory services privately for events, the costs to cover expenses are $45/hour per person, $100/hour for an ambulance, and $70 for a truck. The costs of an ambulance run are about $1,000-$1,400 per person. Emergency services would have potentially substantial material and equipment costs to meet current and expanded needs.

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[16] Hull, Todd and Nate Jacob. Personal Communication January 26, 2011.

[17] Hull, Todd and Pam Forest. Personal Communication. January 26, 2011.

Circumstances that require the City's emergency and fire protection to be called away can leave the City vulnerable, but in addition, the fire and emergency resources might not be adequate for situations that could occur during construction and possibly operation of the Project. For example, Todd Hull, Union Fire Chief, believes that their current Jaws of Life would be inadequate for rescues involving the trucks associated with transporting turbine parts. This is because of the heavy-duty construction of these trucks. To meet the needs of addressing potential accidents involving large trucks such as those associated with Project construction, Mr. Hull reports a need for upgraded Jaws of Life, which would cost $35,000 for the complete set of required equipment. There are potentially other, similar equipment inadequacies for fire and emergency services based on potential scenarios presented by the Project for which local volunteers have no experience.

Recommendations

Evidence from other similar projects operated by Horizon suggests that demands on the City's resources are likely to be very minimal if at all. Still, the existing shortfalls in resources for the City means that any demand for services at all would have a real effect on the ability of the City to serve its population. Therefore, if Horizon does call upon services, it should make every effort to avoid use of City resources. If it does expect to use City resources, it should arrange to augment City resources, at least during the period of construction. New Jaws of Life and support for training volunteer fire and EMT staff, as well as contributing to materials that could be necessary for workers would be practical.

E. Schools

1. ASC Findings

The ASC concluded that the Project would have no adverse impact to local schools. The ASC justifies its conclusions by stating that, during the construction phase, it is unlikely that any temporary workers would bring children to the area, and that during the operations phase, the children associated with the six staff hired from outside the area likely would not burden area schools.[18]

2. Analysis

While the Project reports that an increased student population would not be likely with the construction phase, the high school is directly on Main Street and the elementary school is just off Main Street on Dearborn Street. Any trucks passing through the City would travel on Main Street, and because it is a designated state highway, the schools are not allowed to disrupt traffic for student crossing. Nevertheless, students do make frequent crossing of Main Street.

Mike Woods, Union School District Superintendent, reported little disruption during the Elkhorn Project's construction phase, and does not expect substantial disruption from the Project. He did say that the potential for incidents and disruption could be greatly

[18] Antelope Ridge Wind Farm. 2010. Final Application for Site Certification. Exhibit U: Public Services. OAR 345-021-0010(1)(u).

reduced by concentrating efforts during school breaks, including summer vacation, weekends, and holidays. This can also be improved by avoiding times when students would be outside and potentially crossing streets, particularly before the start of school (7:20-8:00 am), during lunch (12:00-12:30 pm) and after school (3:20-3:45 pm). Police and emergency staff and equipment are on-hand for high school football games Friday nights after 7 pm, but this time of the week seems unlikely to present competition for resources as there is unlikely to be construction activity during this time.

Recommendations

Horizon should make efforts to avoid large truck traffic on Main Street and Dearborn Street at the identified times when students are likely to be in transit and using street crossings.

III. Revenue from Property Taxes and other Revenue Sources

In this section, we analyze the potential impact of the Project on the value of property in the City and calculate how the revenues the City collects from property taxes could change in the future. We summarize the potential impact of the Project on property values based on relevant literature and briefly describe the potential future revenues from property taxes associated with four hypothetical scenarios, each assuming different growth rates for property value in the City. We conclude this section by describing the City's potential revenues, more generally, in the future based on past City budgets. Additional information supporting our analysis in the section is in Appendix D, including a detailed review of literature describing the potential impact of wind projects on property values, a description of Oregon's Measure 50 which restricts the growth rate of property taxes, and other specifications of the model we used to project property values and property tax revenue into the future.

A. Potential Impact of Project on Property Values

As a whole, the literature on the impact of wind-energy projects on residential property values remains largely inconclusive. Few researchers have subjected their studies to independent review or published them in peer-reviewed journals. As a result, the conclusions most of the studies are open to criticism or perceived as biased from proponents or opponents of wind farms. Many of the statistical analyses suffer from poor documentation, insufficient data, poor characterization of the data, and a lack of statistical significance in the results.[19] As Hoen et al. summarize, while survey analyses often predict that wind projects will negatively impact residential property values prior to construction, when market-transaction data become available post-construction,

[19] Hoen, B., R. Wiser, P. Cappers, M. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* Ernest Orlando Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. December.

"sizable, widespread, and statistically significant negative impacts have largely failed to materialize."[20]

Drawing conclusions from the literature to apply to the Project is even more challenging because few studies have evaluated wind-energy projects within a similar geographic context as the City. Impacts derived from wind farms in Illinois or Wisconsin may be transferrable to Union County, but there are many differences, such as the quality and characteristics of views and preferences of the local population that may confound such a comparison and lead to over- or under-estimating the actual impacts to property values in Union County.

With these caveats in mind, the available empirical evidence suggests it may be reasonable to draw these conclusions:

- The impacts on residential property values from wind-energy projects are most likely to materialize and persist for properties within the footprint of the project.
- Properties within one mile of a project may also be more likely to experience diminished property values, although the magnitude and persistence of the effect on these properties is likely highly site-specific.
- The impacts are most likely to occur during the period after the announcement of the facility and prior to construction, and likely will diminish after the project's completion.
- The impact on property value to properties that experience the greatest diminishment in amenities (those associated with nuisance stigma, within the footprint of the project) could be 40 percent or more.
- Most properties are unlikely to experience decreases in value of more than about 5 to 10 percent in the short run, and these impacts likely will disappear once the project becomes operational.
- Taking into consideration the unique scenic views enjoyed by the City's residents, which likely increase residential property values—perhaps by as much as 12 percent over what they would be without scenic views—the available empirical evidence suggests that diminishing the quality of the views may reduce property values by a few percentage points in the long run.

B. Potential Future Property Tax Revenues

In this section, we briefly describe the potential future revenues from property taxes collected under four different scenarios (using the City of Union's tax rate, 1.5752 per $1,000 of assessed value). For each scenario, we assume a different growth rate in the real market value (RMV) for properties in the City. Table 2 summarizes the results from our analysis. The first three rows show snapshots of property tax revenues, in nominal annual terms, in FY 2020-2021, FY 2030-2031, and FY 2060-2061 for each scenario. The bottom three rows show the present, discounted value of the future stream of revenues over the next 10 years, 20 years, and 50 years for each scenario.

[20] Hoen, B., R. Wiser, P. Cappers, M. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* Ernest Orlando Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. December.

Table 2. Nominal Annual and Net Present Value of Property Tax Revenue for each Growth Scenario

	Scenario 1 Base Case Growth	**Scenario 2** Low Growth	**Scenario 3** Drop with Future Base Case Growth	**Scenario 4** Drop with Future Low Growth
Revenue in FY 2020-2021	$149,000	$147,000	$144,000	$138,000
Revenue in FY 2030-2031	$200,000	$196,000	$196,000	$173,000
Revenue in FY 2060-2061	$485,000	$408,000	$483,000	$324,000
10-year stream	$1,107,000	$1,096,000	$1,072,000	$1,054,000
20-year stream	$2,023,000	$1,996,000	$1,965,000	$1,872,000
50-year stream	$4,177,000	$3,989,000	$4,096,000	$3,520,000

Source: ECONW with data from Union County and U.S. Office of Management and Budget. 2010. *Circular A-94 Appendix C*. Retrieved from http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c.

Notes: In calculating the net present value of the stream of projected revenues, we used the 10-year nominal interest rate on treasury notes and bonds (3.0 percent) for the value over the next 10 years, the 20-year nominal interest rate (3.9 percent) for the value over the next 20 years, and the 30-year nominal interest rate (4.2 percent) for the value over the next 50 years (the U.S. Office of Management and Budget does not provide nominal interest rates for periods greater than 30 years).

Scenario 1 – Base Case

For Scenario 1, we assume that the RMV for each property account increases by 3.5 percent each year. With growth rates consistently above Measure 50's three percent threshold, Scenario 1 ensures that the City should be able to continue to experience at least three percent growth each year. We have also assumed an additional one percent growth each year resulting from new development. The second column in Table 2 shows the results. Under this scenario, the City's property tax revenues would be about $149,000 in FY 2020-21.[21] The net present value of the stream of revenues the City would collect from property taxes would be about $1.1 million over the next 10 years, and about $4.2 million over the next 50 years.

Scenario 2 – Low Annual Growth

For Scenario 2, we assume that the RMV for each property account increases by two percent each year. With growth rates consistently below Measure 50's three percent threshold, not all properties in the City will be able to experience the full three percent annual growth in assessed value that is permitted by Measure 50. We have also assumed an additional 0.25 percent growth each year resulting from new development. The third column in Table 2 shows the results. Under this scenario, the City's property tax revenues would be about $147,000 in FY 2020-21. The net present value of the stream of revenues the City would collect from property taxes would be about $1.1 million over the next 10 years, and about $4.0 million over the next 50 years.

Scenario 3 – Short-Term Drop then Return to Base Case Growth

For Scenario 3, we assume that the RMV for each property account decreases by ten percent next year, followed by a five percent decline, and three years of no growth,

[21] The first three rows of the table show snapshots of property tax revenues in the future. These values have not been discounted for time preference or for inflation.

before returning to the Base Case assumptions with an annual rate of 3.5 percent per year. We have also assumed an additional one percent growth each year resulting from new development. The fourth column in Table 2 shows the results. Under this scenario, the City's property tax revenues would be about $144,000 in FY 2020-21. The net present value of the stream of revenues the City would collect from property taxes would be about $1.1 million over the next 10 years, and about $4.1 million over the next 50 years.

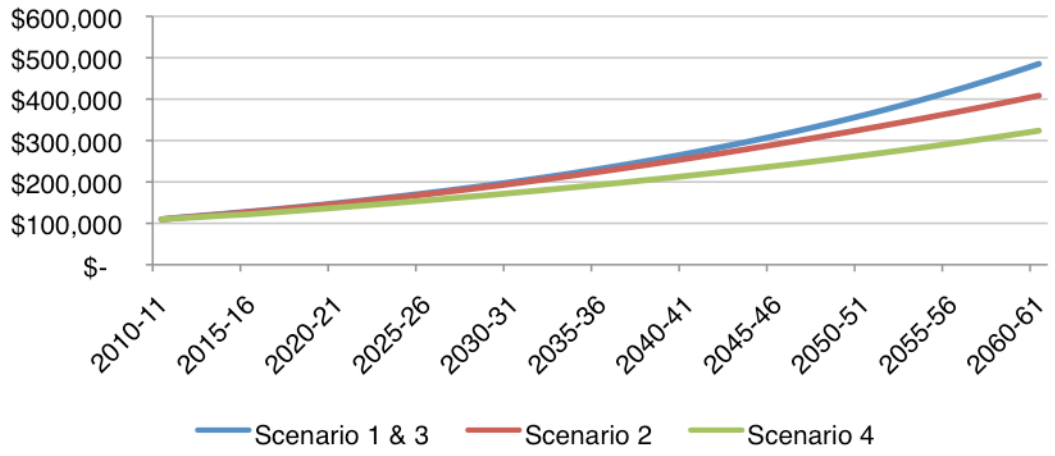
Scenario 4 – Short-Term Drop then Low Annual Growth

For Scenario 4, we assume that the RMV for each property account decreases by ten percent next year, followed by a five percent decline, and three years of no growth, before returning to the Low Annual Growth assumptions with an annual rate of two percent per year. We have also assumed an additional 0.25 percent growth each year resulting from new development. The fifth column in Table 2 shows the results. Under this scenario, the City's property tax revenues would be about $138,000 in FY 2020-21. The net present value of the stream of revenues the City would collect from property taxes would be about $3.5 million over the next 50 years.

1. Summary of Scenarios

Figure 3 shows the annual results from each of the scenarios over the next 50 years. The results from our model suggest that the City's property tax revenues would be similar under Scenarios 1 and 3, hence the results from both scenarios are represented by a single line in the figure. The City would collect the most property taxes under these two scenarios (Scenarios 1 and 3). The City would collect the least property taxes under Scenario 4. The difference between the net present value of property taxes collected over the next 50 years of the scenario with the highest revenues (Scenario 1) and the scenario with the lowest revenues (Scenario 4) is about $0.7 million.

Figure 3. Annual Property Tax Revenue for each Growth Scenario (Nominal Dollars)



2. Distribution of Changes in Property Tax Revenue

The analysis above describes how changes in property values would result in changes in revenue collected from the City of Union's property tax rate ($1.5752 per $1,000 in assessed value). In addition to this tax rate, property owners in the City pay property taxes on other tax rates. Table 3 contains a summary of those tax rates in FY 2010-2011 for Tax Code 0501, which is applicable to most property owners in the City. These rates apply proportionately to the revenues described above. For example, assuming these rates don't change over the next 50 years, the net present value of the stream of revenues over the next 50 years in Scenario 1 would be about $29.7 million.

Table 3. Tax Rates for Tax Code 0501 (per $1,000 in Assessed Value)

County	2.8515	School District #5	5.064
County Gap Bond	0.0795	Union Cemetery	0.3953
City of Union	1.5752	Vector Control	0.0239
City of Union Bonds	0.1699	Vector Control Local Option	0.16
Union/Baker E.S.D.	0.7313	4H/Extension	0.1619
Total Rate			**11.2125**

The rates in Table 3, however, are not constant. In particular, tax rates for bonds change annually. These tax rates are calculated each year, based on property values, to ensure that the City and County generate enough revenue to pay for debt service on outstanding bonds. Some revenues collected through property taxes contribute to larger pools of funding. Schools, for example, are funded through local property taxes as well as State funding sources. The State of Oregon determines the level of funding for schools (dollars per student). If the revenue collected from school-related property taxes in any particular school district fails to reach those State-ordered funding goals, then the district receives a General Purpose Grant from the State School Fund to make up the difference.[22] In other words, if property values decrease and property tax revenues collected in the City for its schools decrease, the total funding for its schools would remain the same while the distribution of funding sources would change (the State's contribution would increase and the contribution from property taxes would decrease).

C. Discussion of Property Tax Results

The literature describing the impact of wind-energy projects on nearby property values is inconclusive. Some literature suggests that a wind-energy project could result in a decrease in property values (a few percentage points) in an area like the City of Union. The literature also suggests that the decrease in property values likely would occur shortly after the announcement of a project, but that the negative impact would diminish once the project is constructed. We projected the City's revenues from property taxes over the next 50 years in four hypothetical scenarios. Two scenarios assumed

[22] Legislative Revenue Office. 2010. *K-12 and ESD School Finance: State School Fund Distribution*. Research Report #2-10. July.

constant growth rates in property value. The other two scenarios assumed property values would decrease for two years, then remain stagnant for three years, then grow at the constant annual rates assumed in the first two scenarios. Our analysis of these hypothetical scenarios sheds light on the project's potential impact on property tax revenues.

In our analysis, Scenario 1 resulted in the highest revenues from property taxes. This scenario assumes that property values increase by 3.5 percent per year. Scenario 4 resulted in the lowest revenues from property taxes. This scenario assumes that property values decrease by 10 percent in the first year, five percent in the second year, and zero percent in the third, fourth, and fifth years, after which property values begin to increase by 2.5 percent each year. Due to Measure 50, changes in a property's market value do not always impact the property taxes it generates. Since most properties in the City are currently paying property taxes on their Measure 50 value rather than their RMV, the impact of a decrease in RMV does not result in a proportionate decrease in revenues from property taxes. The net present value of property tax revenues over the next 50 years in Scenario 1 is about $4.2 million and in Scenario 4, the net present value of revenues is about $3.5 million. The difference, then, between the two scenarios is about $0.7 million over the next 50 years.

Our analysis and interpretation of results relies on a number of assumptions. The literature suggests that the impact of the Project on property values in the City likely would be less severe than the impacts considered in Scenario 4. It is, however, possible that the Project could have larger negative impacts on property values, in which case the City's revenues from property taxes would be lower than those suggested by Scenario 4. Furthermore, any number of other factors, aside from the Project, could impact property values in the City; our analysis does not account for many of these unforeseeable impacts.

D. Potential Future City Revenues

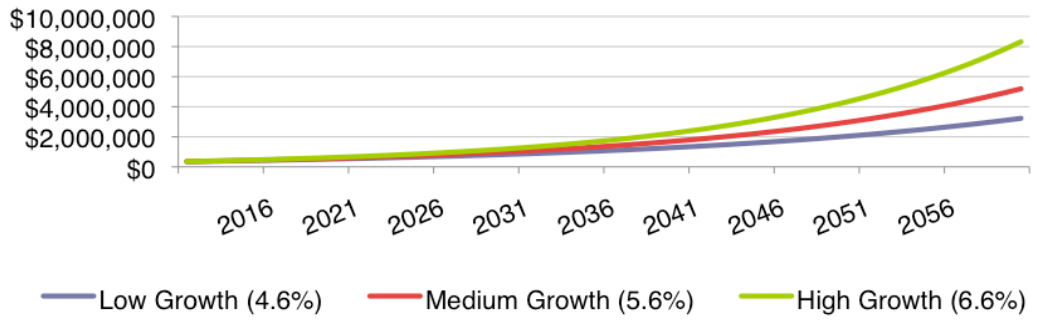
Here, we analyze the City's revenues from recent years and project them into the future. Our analysis of recent and potential future City revenues will help describe the context from which to consider the potential impact of the Project on the City's total revenues, as well as the revenues it collects from property taxes. In Table E-1 (in Appendix E), we present the City's itemized revenues from FY 2007-08 to FY 2010-11.

This past year (FY 2010-11), the City collected $337,860 in revenue. About a third of that revenue ($105,060) came from property taxes. Since FY 2007-08, the City's total revenue has varied between about $300,000 (in FY 2007-08) and $410,000 (in FY 2009-10). Over that same period, the share of the City's total revenue coming from property taxes has fluctuated between about 25 percent (in FY 2009-10) and 33 percent (in FY 2007-2008).

To project the City's revenues into the future, we calculated the average annual increase in revenues over the past four years. We used the nominal interest rate on 30-year treasury notes to calculate the nominal value of the City's revenues 50 years into the future. We projected these revenues under three scenarios: low growth, medium growth, and high growth. The medium growth scenario assumes the City's total revenue increases by 5.6 percent per year (the average annual increase in the City's revenues

since FY 2007-08). The low growth and high growth scenarios assume the City's total revenue increases by 4.6 percent and 6.6 percent per year, respectively. Figure 4 shows the City's projected total revenues over the next 50 years.

Figure 4. Projected Revenues for the City of Union (Nominal Dollars)



Source: ECONW with data from City of Union. 2010. *Budget FY 2010-11*. Retrieved from http://www.cityofunion.com /forms.php.

Table 4 summarizes the City's current and projected future revenues. The top row shows the City's total revenue in FY 2010-2011. The following three rows show snapshots of the nominal annual value of the City's revenues in future years. The bottom three rows show the net present value of the stream of the City's revenues over the next 10 years, 20 years, and 50 years under each of the hypothetical growth scenarios, in 2011 dollars. Over the next 50 years, we project the City's total revenue at $18.7 million – $32.0 million.

Table 4. Nominal Annual and Net Present Value of Total Revenue

	Total Revenue		
Revenue in 2010-11	$337,860		
	Low Growth	**Medium Growth**	**High Growth**
Revenue in FY 2020-2021	$531,000	$584,000	$641,000
Revenue in FY 2030-2031	$833,000	$1,008,000	$1,217,000
Revenue in FY 2060-2061	$3,228,000	$5,195,000	$8,321,000
10-year stream	$3,685,000	$3,889,000	$4,105,000
20-year stream	$7,269,000	$8,063,000	$8,960,000
50-year stream	$18,738,000	$24,299,000	$32,007,000

Source: ECONW with data from City of Union. 2010. *Budget FY 2010-11*. Retrieved from http://www.cityofunion.com /forms.php; and U.S. Office of Management and Budget. 2010. *Circular A-94 Appendix C*. Retrieved from http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c.

Notes: To calculating the net present value of the stream of the City's projected revenues, we used the 10-year nominal interest rate on treasury notes and bonds (3.0 percent) for the value over the next 10 years, the 20-year nominal interest rate (3.9 percent) for the value over the next 20 years, and the 30-year nominal interest rate (4.2 percent) for the value over the next 50 years.

IV. CONCLUSIONS

The Project, in our findings and based on the potential areas of impact considered in this report, is unlikely to have a major impact on the ability of the City to provide services to its people, or fund these services via property tax revenues. There are several areas where effects on services and costs to the City are unlikely to occur but still possible. Because the City's resources that are already below those required to meet current needs in some of these areas, namely emergency services, any increased demand could impact the City's residents and consequently be significant. Table 5 summarizes our results. It is important to note that in most cases the likelihoods of impacts, the probabilities of occurrence, are low, but the severity, the cost of impacts, is relatively high.

Table 5. Summary of Impacts on City of Union Services and Property Tax Revenue

Service	Impact*	Description
Water	High likelihood High cost *($140,000 - $180,000)*	The City may need to develop a truck fill station at the existing Catherine Creek surface water pump house or undertake necessary control system work at well pump stations to reduce reservoir operational storage. The City should provide standby power capabilities at Well No. 2 and monitor water-use activities.
Sewer, Stormwater, and Waste	Low to no likelihood	Levels of waste would increase during construction but likely would have negligible impacts on workforce requirements and costs.
Traffic Safety	Low likelihood Low cost	Minimal construction traffic, including Project-related commuter traffic, would travel through the City.
Police	Low likelihood Moderate cost	We estimate there may be about one Project-related incident requiring police services during construction. If more incidents materialize, the existing shortfall in police coverage could be made worse.
Fire	Low likelihood High cost	We estimate there likely would be about three Project-related fire incidents during construction, but the number could be higher, especially if a significant portion of the workforce lives in the City. These incidents might temporarily restrict the City's ability to serve its existing population.
Emergency	Low likelihood Moderate cost *(~$35,000)*	We estimate there likely would be about 1-2 Project-related medical incidents associated, half of which may require emergency services). Furthermore, the prospect of potential emergencies may require that the purchase a new Jaws of Life and other materials.
Schools	Low likelihood Low cost	Traffic avoidance while children crossing the street requested.
Property Value	Low likelihood *(Up to 12% decline.)*	The literature suggests that the wind facilities may potentially diminish property values. Most studies of existing facilities, however, find the impacts on property values have been small, and temporary.
Property Tax Revenue	Low likelihood High cost *(Up to $0.7 million.)*	Our analysis of growth scenarios suggests that the Project could cause the net present value of revenue from property taxes to decline by up to $0.7 million over the next 50 years.

* Impact includes the **likelihood** (probability) that an effect of the Project will occur, and the **severity** (cost) of the impact if it does occur. Both should be considered when assessing significance of the effect.

The City services likely to experience demands have identifiable and unidentifiable costs. Some costs, such as those for water supply, are relatively straightforward to identify. Others, namely emergency-related services (fire, police, and ambulance) are difficult to predict because the actual occurrence of emergencies cannot be predicted because Horizon plans to handle most emergencies on its own, and the actual level of use of the City by the workforce during construction during the day and for lodging also cannot be predicted because again Horizon plans to make efforts to avoid high usage. Emergency services are already underprovided in the City though, so any additional demand would impact the ability to serve the City's population.

Property value impacts and associated property tax revenues have seen some short-term impacts in other communities, but the actual precise level of impact for the City cannot be narrowly predicted. There is a potential net impact on City revenue in the $100,000s. Experience elsewhere does not suggest that there is any way to predict the actual level, and that the actual percent decrease in property value, and the time period for the decrease, are likely to be relatively small.

APPENDIX A – WATER

In this Appendix, we provide additional information supporting the analysis and conclusions summarized in Section II.A. Here, we describe the City's water service area as well as the water system's components. We also describe water rights associated with the City's various water sources, historical demand for the City's water supply, and the reliability of the City's water supply.

Water System Service Area

Service Area. The term "service area" refers to the area being served with water from the City's water system. The present service area consists of the developed land within the Urban Growth Boundary and City limits (See Figure A-1). In general, the service area is south of Willowdale Lane, west of the Livestock Show grounds and golf course clubhouse, north of Ramo Flat Road, and east of the sewage treatment plant.

Water Service Accounts. We summarize the City's water service accounts at the end of 2010 in Table A-1. We also show the total water use for each main account category for comparison purposes. At this time, there are no industrial water users in the City.

Table A-1. 2010 Water Account Information

Account Type	Number of Accounts	Typical Percentage of Total Water Use
Residential	906	82
Commercial	59	18
Totals	**965**	**100**

Residential accounts include some connections with more than one service unit, such as duplexes or other multiple resident locations. Commercial accounts include individual businesses with small meters through larger services for schools, churches, and mobile home parks. As the water account information table shows, residential water use accounts for the majority of the City's water use.

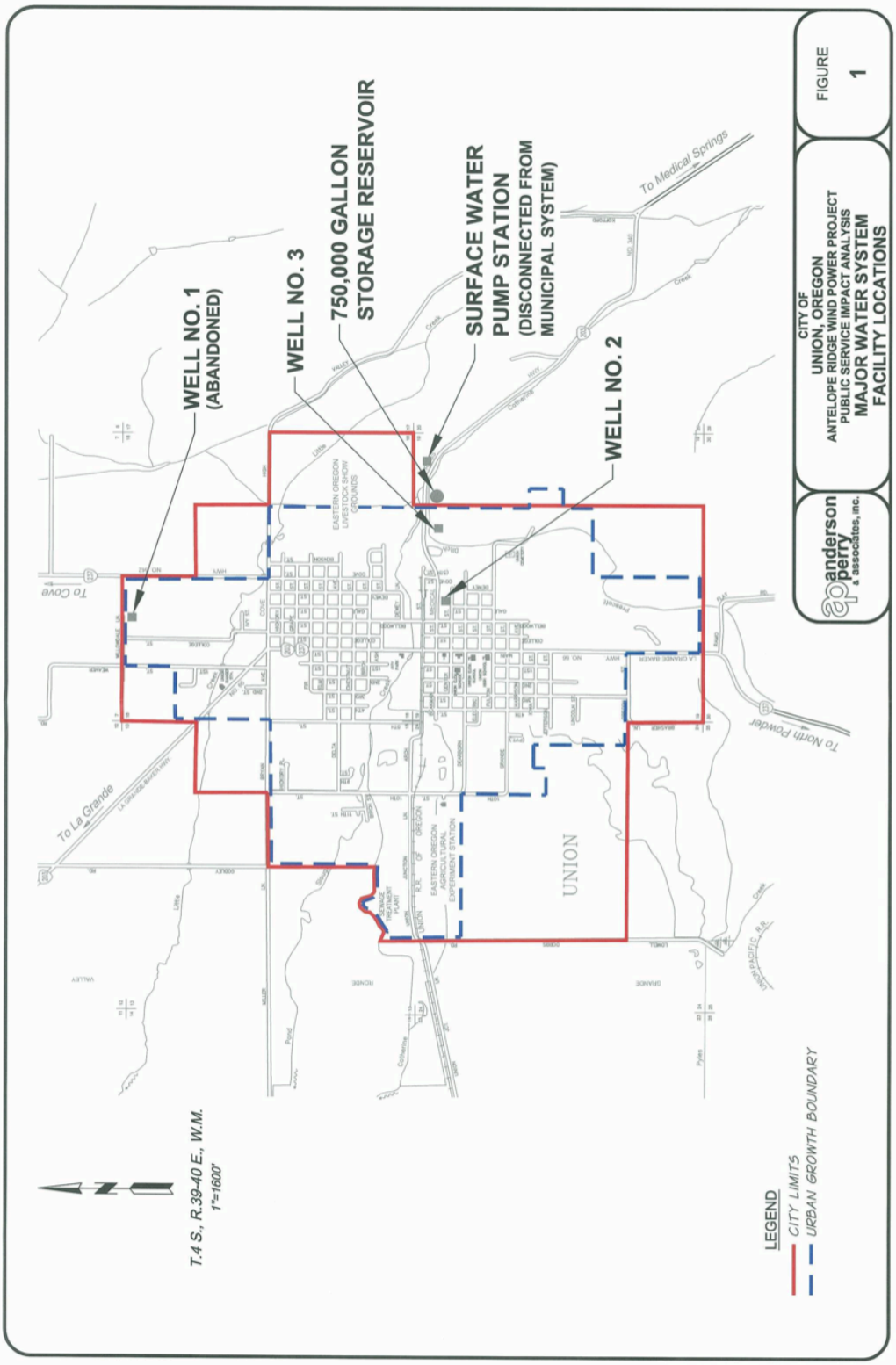
Water System Component Overview

This section provides an overview of the City's water supply wells, storage reservoir, and distribution system. In general, the entire City is served by two wells and one reservoir. The locations of the primary water system components are shown on Figure A-1.

Water Supply. The City's water system is believed to have been initially constructed between 1912 and 1922, with the City obtaining its water supply directly from Catherine Creek. The original intake structure consisted of a diversion structure followed by two settling ponds and is located approximately 2 miles southeast and upstream of the City. This system is still operable although it has been physically disconnected from the water system and has not been used as a community water supply source since Well No. 2 was constructed in the mid-1980s. The surface water source is now maintained only as a

water source for emergency use, stock watering, and to occasionally help meet community irrigation needs.

Figure A-1. City of Union Major Water System Facility Locations



In 1964, the City constructed **Well No. 1** to augment the water supply from Catherine Creek. Due to several problems with the well, the City has since removed the pump, electrical, and piping within the pump station, removing Well No. 1 from service.

In 1983, the City constructed a second well to provide a more dependable water supply source. **Well No. 2** is a fully cased, 1,200-foot deep basalt well and is currently providing flows of approximately 1,780 gallons per minute (gpm) when pumped.

To develop a backup water supply to Well No. 2, the City constructed **Well No. 3** in 1989. Well No. 3 is a fully cased, 1,686-foot deep basalt well and is currently providing flows of approximately 1,265 gpm when pumped.

Currently, the City obtains its water supply from Well No. 2 and Well No. 3. The City alternates its primary use between these two wells with the water from both wells pumping directly into the 750,000-gallon storage reservoir via separate transmission lines. A gas chlorination system located in the Well No. 3 pump station has lines to inject chlorine solution into the individual well transmission lines for disinfection prior to water entering the reservoir.

Emergency power is available for Well No. 3 from a 250 kilowatt, manually activated, trailer mounted, diesel powered generator that is parked adjacent to the well house. An electrical connection to the facility is available with a manual transfer switch that completes connection to the pump control system. During an extended period of power outage, City staff perform the necessary actions to bring the system on line.

The last five years of records show that Well No. 2 has provided 20 to 48 percent of the City's water demand with an average of 39 percent for the period. Well No. 3 has filled the majority of the demand for a total of 61 percent of the water for the period.

Storage Reservoir. The City has one 750,000-gallon, ground level, welded steel storage reservoir that maintains necessary reserves for the City and sustains system pressures in the distribution system. Referring to Figure 2, the reservoir is located on the hill east of the City just south of Highway 203 heading toward Medical Springs. From this elevated position, water is gravity fed into the distribution system via the Arch Street transmission line.

Distribution System. The original water distribution system is believed to have been constructed between 1912 and 1922 and consists of relatively small diameter steel water lines. Over the years, multiple improvement projects have upgraded and expanded the system. The current distribution system consists of approximately 102,000 feet of pipe composed primarily of 42 percent PVC pipe. Approximately one-third of the system piping is asbestos concrete (AC), and about one-fifth of the system piping is steel dating back to the original system construction. The PVC pipe has been installed since the early 1980s, and the AC pipe is believed to have been installed in the 1950s through the 1970s and still appears to be in good condition. Much of the remaining steel pipe is believed to be nearing the end of its effective service life and has been identified for future replacement.

Water Rights

The City holds three groundwater rights issued by the State of Oregon for its municipal water wells. Well No. 1, while not currently in use, has a water right for 0.446 cubic feet per second (cfs) (200 gpm), with a priority date of December 9, 1963. The water right for Well No. 2 is 4.01 cfs (1,800 gpm) with a priority date of April 21, 1983. Well No. 3 has a water permit of 5.57 cfs (2,500 gpm) and a priority date of October 12, 1989. An application to partially perfect the Well No. 3 water right is currently being reviewed by the Oregon Water Resources Department. The total combined water rights and permits for the City's active wells, Well No. 2 and Well No. 3, are 9.58 cfs, or approximately 4,300 gpm. The current average capacity of the pumps installed in Wells No. 2 and 3 is approximately 1,780 gpm (3.97 cfs) and 1,265 gpm (2.82 cfs), respectively. These flow rates are within the flows allowed by their associated water rights.

The City also holds a surface water right to Catherine Creek for the surface water diversion system that once supplied the City's water. This water right is for 3.0 cfs (1,345 gpm) and has a priority date of December 31, 1893. The City plans to continue to maintain this municipal water right in order to serve the City as an emergency backup water supply, to provide supplemental water to the golf course when needed, for bulk water sales (such as tanker truck filling), and in case future needs require an additional water source when groundwater sources become limited in capacity or are no longer available.

Historic Water System Demands

To determine current water demands, the City's 2004 Water System Master Plan (WSMP) was reviewed in conjunction with more recent production records for the City's wells. Table A-2 contains a summary of the City of Union's average annual production for each calendar year from 2002 through 2010.

Table A-2. Annual Water Production

Water Year	Total Water Delivered from Wells No. 2 and 3 (gallons)
2002-03	158,200,000
2003-04	156,500,000
2004-05	164,200,000
2005-06	175,700,000
2006-07*	205,100,000
2007-08	165,000,000
2008-09	163,700,000
2009-10	130,600,000
Average	**164,875,000**

Notes: The 2006-07 total water delivery includes water usage delivery associated with the Elkhorn Valley Wind Farm.

Average Water Demands. Based on the water delivery data for 2002 through 2010, the City's average water delivery has varied from a low of 130,600,000 gallons in 2009-10 to a high of 205,100,000 gallons in 2006-07. The average water delivery over this period was 164,875,000 gallons. Demands were higher in 2006-07 due to direct water sales to the

Elkhorn Project (estimated to be approximately 12,000,000 gallons) and indirect increased water use in the community associated with increased construction activity, water use at area lodging facilities, etc. The 2006-07 water demand was approximately 24 percent higher during the Elkhorn Project's construction period than the 8-year average water demand.

Peak Daily Demands. Peak daily demands usually occur during a particular day from June through September, which is when water use is normally at its greatest due to irrigation and other summer uses. Peak daily flows can occur in other months, but normally occur during the hottest period of the year. The City obtains daily readings of flow into the storage reservoir from the meters at each well site. From these readings, historic peak day demand can be obtained. Historic peak day demand data from 2005 through 2010 were reviewed in conjunction with the 2004 WSMP data.

Based on the data reviewed, the highest water use day (1,741,000 gallons per day) occurred on July 12, 2007. Assuming a population of 1,960 in 2007, the peak daily demand was 888 gallons per capita per day (gpcd). The estimated peak daily flow of 888 gpcd is higher than typically observed in eastern Oregon cities of comparable populations. This is likely attributable to both direct water sales made on that date and indirect construction activity related to the Elkhorn Project.

Typical average and peak daily demands are summarized in Table A-3. These demands have also been converted to a flow rate to provide the basis for comparison to water supply capacity. The assumed population for determining the actual daily flow rates is 1,960 (2009 population estimate).

Table A-3. Average and Peak Daily Demand Summary

Parameter	Demand (gpd)	Demand (gpm)	Percentage of Well Capacity*
Average Daily Demand	452,000	315	10
Peak Daily Demand	1,741,000	1,210	40

* Assuming the combined capacity of both Well No. 1 and Well No. 2 is 3,045 gpm

As shown in Table A-3, the water supply system is operating at about 40 percent of the current capacity of both wells running to meet peak day demands. However, for the purpose of maintaining backup supply capacity, it is important for the City to be able to meet system demands with only one well in operation, as discussed in the following section.

Water Supply Reliability

Wells. It is preferable to have at least one backup well during high demand periods in the event problems occur with the lead supply source. At the current population and peak day demand, Well No. 2 can meet demand with Well No. 3 ready as a backup source. However, if Well No. 2 were to become inoperable, Well No. 3 would require operation beyond the desired 18-hour per day pump operation and would barely match

the peak day demand with 24 hours of operation in a given day. This would over-tax Well No. 3. City crews would need to monitor City water use for a reduced capacity condition and be ready to initiate appropriate curtailment actions before emergency measures became necessary. In the event one or both of the well sources are down, the reservoir would continue to gravity feed the distribution system, maintaining system pressure. With sufficient water levels in the reservoir, the reserve is capable of meeting short-term demands (for approximately a day) while water supply issues are resolved.

As recommended in the 2004 WSMP, the City is considering providing standby power capabilities at Well No. 2. This would expand the City's options for dealing with power or equipment failures for those one-time events that could occur and leave the City without sufficient water supply, such as during high summer demand periods.

Catherine Creek Surface Water Supply. The adequacy and reliability of the Catherine Creek water supply as a backup supply source for the City is generally good. The intake is adequately screened to help prevent impacts to fish species. Continuous flow through the system is maintained and excess water is currently discharged back to Catherine Creek approximately 2 miles downstream at the surface water pump station site. This supply source is particularly beneficial to the community for stock watering, irrigation, bulk water sales, road dust maintenance, etc., (i.e., for applications not requiring disinfection for human consumption). The capacity of the source is generally believed to be adequate to meet average City demands. However, during hot summer months and/or drought periods, some restrictions on withdrawals from Catherine Creek may occur.

APPENDIX B – TRAFFIC SAFETY

In this Appendix, we provide additional information supporting the analysis and conclusions summarized in Section II.B. Here, we describe the potential traffic impacts associated with the Project during the construction phase.

Construction Traffic

The majority of the traffic discussion in the ASC is focused on construction traffic. This is because construction traffic is expected to be significantly higher than the traffic generated by the permanent staff employed to maintain and operate the facility. A draft Construction Traffic Management Plan is included as an appendix to the ASC. This plan focuses on traffic related to deliveries of equipment and materials. Traffic related to temporary construction employees traveling to and from the facility is said to not have significant negative impacts and is therefore not considered in the plan.

The ASC and accompanying traffic management plan consider three types of construction-related deliveries: 1) facility components and equipment (e.g. turbines, transformers), 2) gravel (for concrete mixing and road construction), and 3) water (for concrete mixing and dust control). Deliveries are anticipated to take place on weekdays from 8 a.m. to 4:30 p.m. The ASC anticipates approximately 4,800 total component and equipment deliveries, 7,480 total gravel deliveries, and 7,200 total water truck deliveries over the duration of construction.

Facility components and related equipment are to be transported to the facility from the south and west via I-84 and are not expected to pass through the City due to areas of OR 237 south of the City being unable to accommodate the large delivery trucks.

The exact gravel delivery routes have not yet been determined, since bids have not been received from suppliers. One potential site is north of the City (Site 1) and the other is west of I-84 (Site 2). Gravel coming from Site 1 would potentially pass through the City on OR 237 to access the eastern portion of the facility. These trucks would not leave the State highway system within the City. According to the plan, gravel trucks traveling from Site 1 to the western side of the facility will be routed so as to avoid the City altogether, "to the extent practical." This would involve routing trucks west on OR 203 and Hot Lake Lane to I-84 before they reach City limits. Gravel trucks traveling to and from Site 2 would have no need to pass through the City, due to its location south of the City.

Similarly to gravel, the exact location of the water source for construction has not yet been determined. Of the potential sources identified in the ASC, the Union Fire Station is the only one where traffic would need to be routed through the City. The traffic management plan notes that the Union Fire Station directly accesses a State highway (OR 203) and water trucks would remain on the State system while traveling through the City.

Ultimately the ASC concludes that there will be no significant negative impacts to the roads along the transport routes because there is adequate available capacity to accommodate the temporary increase in traffic that will occur during construction.

APPENDIX C – POLICE, FIRE, AND EMERGENCY SERVICES

In this Appendix, we provide additional information supporting the analysis and conclusions we summarized in Section II.D. Our analysis of the impacts on fire, police, and emergency services has two parts. First we analyze incident reports from past wind projects completed by Horizon to determine the potential frequency of police, fire, and other emergency incidents related to the Project. Second, we describe Horizon's approach to dealing with these issues during the construction and operations phases of all of its projects.

Analysis of Past Horizon Projects

Horizon has completed four wind projects in the Pacific Northwest. Table C-1 lists Horizon's projects in the area, the size of each project, and the dates of the construction and operations phases.

Table C-1. Description of Horizon Wind Projects in the Pacific Northwest

Project Name	Project Size	Construction Phase	Operations Phase
Elkhorn Valley	100 MW	4/2007-12/2007	12/2007-Present
Rattlesnake Road	103 MW	4/2008-11/2008	11/2008-Present
Wheat Field	97 MW	10/2008-6/2009	6/2009-Present
Kittitas Valley	100 MW	4/2010-12/2010	12/2010-Present

Source: Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

Horizon provided incident reports from each of its past projects in the area. We summarize the incidents in Table C-2. In summary, there were four fire incidents, three of which required support from the fire department, none of which resulted in structural damages. There was one event that required minimal support from the police department. There were six medical incidents involving seven individuals, four emergency room visits, three medical center visits, and one helicopter life flight.

Table C-2. Fire, Police, and Medical Incidents during Construction and Operations Phases of Past Horizon Wind Projects

Fire Incidents	
Rattlesnake Rd. (Operations)	During road maintenance, workers noticed white smoke coming from a grass fire near the road. The contractor put out the fire with water from the water truck on site, created a firebreak with dirt nearby, and notified the landowner. About 2,000-3,000 square feet of grass was lightly burned. No fire support was called in.
Rattlesnake Rd. (Operations)	Fire support went to the O&M building on two occasions stemming from false alarms from the fire suppression system.
Wheat Field (Operations)	Fire support went to O&M building after an employee smelled smoke. The electrical connection responsible for the smell was fixed.
Police Incidents	
Elkhorn Valley (Operations)	Two bullet holes were found in a turbine nacelle. A police report was filed but no police personnel went to site.

Medical Incidents	
Kittitas Valley (Construction)	Employee went to emergency room after slipping on a turbine's foundation. Initial diagnosis was a minor injury. After re-examination, employee underwent surgery for a ton meniscus. Construction staff provided transportation.
Kittitas Valley (Construction)	Employee went to the emergency room after pinching a nerve while working on the site. Employee was put on no-work status. Family provided transportation.
Wheat Field (Construction)	Employee went to medical center after straining his back. Family provided transportation.
Wheat Field (Operations)	Employee went to medical center after injuring his hand. Construction staff provided transportation
Rattlesnake Rd. (Construction)	Employee went to medical center after injuring finger. Employee drove himself to medical center.
Rattlesnake Rd. (Operations)	Two employees were injured by contact with high voltage lines. Employees were treated by Arlington EMTs. Flight for life was called in from Mid Columbia Medical Center in The Dalles.

Source: Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

Using incident data from Horizon's past projects, we project the likelihood of each type of incident for the Project. First, we present our results regarding the construction phase of the Project. The first column in Table C-3 breaks down the incident types into the types of services each incident required, the second column lists the number of each type of incident recorded in Horizon's past projects, the third column estimates the number of each type of incident per MW. In the final column we project the number of incidents associated with the construction phases of Horizon's past projects to estimate the number of each type of incident associated with the Project.

Table C-3. Incidents during Construction Phase of Past Horizon Projects and Projection of Incidents for the Project

Type of Incident	Number of Incidents	Incidents per MW	Projected Number of Incidents
Fire Incidents	**0**	**0**	**0**
Incidents requiring site visit by fire support	0	0	0
Incidents not requiring support	0	0	0
Incidents with fire damage	0	0	0
Police Incidents	**0**	**0**	**0**
Incidents requiring site visit by police support	0	0	0
Incidents not requiring support	0	0	0
Medical Incidents	**4**	**0.01**	**3**
Emergency room visits	2	0.005	1.5
Medical center visits	2	0.005	1.5
Incidents requiring site visit by EMTs	0	0	0
Incidents requiring flight for life	0	0	0

Source: Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

Our analysis suggests that the Project's construction phase is unlikely to have fire or police incidents. Furthermore, we find that the Project is more likely to have medical incidents, although visits by EMTs are unlikely as well. The medical incidents would likely be split between emergency room visits and medical center visits.

Table C-4 shows the results of our analysis regarding incidents during the operations phase. The first column in Table C0-4 breaks down the incident types into the types of services each incident required, the second column lists the number of each type of incident recorded in Horizon's past projects, the third column estimates the number of each type of incident per MW per year. In the final column we project the number of incidents associated with the operations phases of Horizon's past projects based on MW to estimate the number of each type of incident associated with the Project per year.

Our analysis suggests that the Project's operations phase may have fire incidents, potentially requiring site visits from local fire departments. In the past, however, all site visits were precautionary and none of those incidents resulted in fire damages. Furthermore, we find that the Project may require police support, and may have medical incidents during its operations phase. Some of the medical incidents may require site visits by EMTs.

Table C-4. Incidents during Operations Phase of Past Horizon Projects and Projection of Incidents for the Project

Type of Incident	Number of Incidents	Incidents per MW per year	Projected Number of Incidents per year
Fire Incidents	**4**	**0.01**	**3**
Incidents requiring site visit by fire support	3	0.0075	2.25
Incidents not requiring support	1	0.0025	0.75
Incidents with fire damage	1	0.0025	0.75
Police Incidents	**1**	**0.0025**	**0.75**
Incidents requiring site visit by police support	0	0	0
Incidents not requiring support	1	0.0025	0.75
Medical Incidents	**2**	**0.005**	**1.5**
Emergency room visits	1	0.0025	0.75
Medical center visits	1	0.0025	0.75
Incidents requiring site visit by EMTs	1	0.0025	0.75
Incidents requiring flight for life	1	0.0025	0.75

Source: Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

Horizon's Approach to Fire, Police, and other Emergency Incidents

With each of its wind projects in the region, Horizon has implemented a protocol that seeks to minimize the need for public services related to fire, police, and other emergency incidents. Horizon is likely learning from past experiences as well and has every reason to attempt to prevent and minimize these incidents. Below is a list of precautions Horizon takes to reduce its demand for these public services:

- Horizon provides site security from a private security contractor during the construction phase of all their projects and all access roads constructed for their projects are gated. In some situations, the private security firm may call local police support, but none of Horizon's past projects in the area have required this.[23]
- Horizon provides trained EMT staff on the site during the construction phase. They indicated that some emergencies might require additional EMTs from local emergency departments.[24]
- Horizon provides water wagons on site for use in fires during construction and operations phases of their projects. In some instances, Horizon's projects may benefit local fire and emergency services insofar as workers on the site may report fires or emergencies to emergency staff faster than would be the case otherwise.[25] This was the case in 2008 when Horizon staff reported and put out a fire near Arlington as reported in the local paper: "The residents of Arlington, the truck drivers, and the many individuals who fought the blaze of June 30, 2008 would like to thank Horizon Wind Energy for covering the expenses incurred for water, fuel and manpower. Horizon has proven again to be a great community partner."[26]

Experience of Milton Freewater

Rick Saager, Fire Chief for the Milton Freewater Rural Fire Department reported no major incidents related to the various wind farms in the area. Saager estimated there are about 300 turbines in his area, and at least some of those turbines have been around for about 18 years. In those 18 years, Saager noted that the wind projects have helped create fire blocks and have improved access (with the access roads) to fires that would have otherwise been inaccessible. Furthermore, he noted that the neighboring projects increased his department's budget. Saager also noted his confidence in the capacity of workers and staff at the wind farms during both the construction and operations phases to handle most emergency incidents on their own without the assistance of local service providers.

In addition to the preventative measures described above, the activity around the Project area may increase the speed with which emergency services can reach emergencies that would have occurred regardless of the Project. Access roads, for example, constructed

[23] Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

[24] Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

[25] Franklin, Valerie. 2011. Personal Communication. February 18, 2011.

[26] Times-Journal. Condon, Oregon. June 30, 2008.

for the Project may provide better access for emergency respondents to reach fires and emergencies throughout the area that would otherwise be inaccessible. The Project may also assist in reporting incidents that would have otherwise gone unnoticed. Activity around the Project may, for example, result in an increase in reports of trespassing on adjacent land simply because workers and staff at the site would be there to witness and report the incidents to police.

APPENDIX D – REVENUE FROM PROPERTY TAXES

In this Appendix, we provide additional information supporting the analysis and conclusions summarized in Section III. To analyze the Project's potential impacts on property values and property tax revenue, we apply a two-step approach:

- We review the literature describing the potential impacts of wind farms on property values in neighboring communities and the literature describing the impact of scenic views on nearby property values. We use the results of this review to better understand the context of property valuation in the City and the range of potential impacts of the Project on property values (and revenues derived from property taxes) in the City.
- We use assessor data to project future revenues from property taxes under four hypothetical scenarios (each assuming different annual growth rates for property value). Our projections provide a range of potential revenues from property taxes that include the potential impact of the Project on property values.

Here, we discuss the relevant literature describing the potential impact of wind projects on property values as well as the impact of scenic views on property values in detail. Then, we describe the model we created to project property values and property tax revenues into the future, and provide a brief description of Measure 50's role in our projection.

A. Potential Impact of the Project on Property Value-Related City Revenue

As wind-energy projects have proliferated over the landscape in the last few decades, researchers have conducted dozens of studies to identify their impact on the value of nearby property. Researchers have also studied the contribution of scenic views and other amenities to property values. While unrelated to wind-energy projects specifically, this research provides an indication of the loss of value when wind-energy projects diminish these amenities. We examine and summarize both areas of literature to describe the potential impact of the Project on residential property values in the City—property values that have historically been influenced by the scenic views surrounding the City. This analysis is intended to assess whether or not the Project would influence property values sufficient to change City property tax revenue.

1. Impact of the Wind Project on Property Values

Two broad types of analyses seek to document the impact of wind-energy projects on residential property values: surveys and statistical analyses. Researchers have conducted surveys of homeowners and experts, such as appraisers and real estate agents, to document their impressions and professional experience of the effect of wind farms on residential property values. Researchers also have used statistical techniques, such as hedonic analysis, to analyze the effect of wind farms on surrounding residential property values.

In describing the potential effects of wind-energy projects on property values, most studies characterize effects with respect to two variables: location and time. Identifying

the timing of when the effect is measured is important because the potential effect may vary from the point a wind-energy project is announced (officially or unofficially), through construction, until after the Project is complete and operating. The effect is likely to vary with time as the level of uncertainty and perception of risk change during the lifespan of a project.[27] Likewise, the proximity of the property being measured to the wind-energy project is also important, because the effects are largely driven by spatial characteristics: visual, auditory, and physical disturbance. Distinguishing among different types of locational effects that vary with proximity, researchers at the Lawrence Berkeley National Laboratory organized their analysis into three potential mechanisms through which wind-energy projects may impact residential property values:[28]

- **Area stigma**: concern that projects will adversely affect the characteristics of the surrounding landscape and diminish demand for residences in the area, reducing their market value. This effect is most relevant to properties within 1 to 5 miles of wind projects.
- **Scenic vista stigma**: concern that projects will reduce the value of scenic amenities associated with residential properties, reducing their overall market value. This effect is relevant to properties with direct views of wind projects.
- **Nuisance stigma:** concern that projects will create disamenities, such as noise, light pollution, and shadow flicker, for residential properties in close proximity, reducing their overall market value. This effect is relevant to properties within 1 mile of wind projects.

The analyses based on surveys of real-estate professionals and homeowners more often—but not always—suggest that wind-energy projects have a negative impact on property values. This is especially true of analyses that describe or measure the potential impacts of a wind-energy project on residential properties prior to construction.[29] For those studies that actually estimated the expected diminishment in value, the range was 4 percent (estimated by homeowners on Martha's Vineyard without ocean views), to 43 percent (estimated by realtors considering 1 to 5 acre properties bordering a wind farm in Dodge and Fond Du Lac Counties in Wisconsin). Surveys of both homeowners and real estate professionals conducted after wind-energy projects are operational generally identify no effect or weaker effects than those identified in the early stages of a project.[30]

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[27] Hinman, J.L. 2010. *Wind Farm Proximity and Property Values: A Pooled Hedonic Regression Analysis of Property Values in Central Illinois.* Illinois State University. May.

[28] Hoen, B., R. Wiser, P. Cappers, M. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* Ernest Orlando Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. December.

[29] Haughton, J., Giuffre, D., Barrett, J., Tuerck, D.G. 2004. *An Economic Analysis of a Wind Farm in Nantucket Sound*. Beacon Hill Institute at Suffolk University. May.; Khatri, M. 2004. *RICS Wind Farm Research: Impact of Wind Farms on the Value of Residential Property and Agricultural Land*. Royal Institution of Chartered Surveyors. November 3.; Kielisch, K. 2009. *Wind Turbine Impact Study: Dodge and Fond Du Lac Counties, WI. Appraisal Group One.* Calumet County Citizens for Responsible Energy (CCCRE). September 9.

[30] Grover, S. 2006. *Economic Impacts of the Kittitas Valley Wind Project: A Report to the Economic Development Group of Ellensburg, WA.* August 14..; Goldman, J.C., Goldman. 2006. *A Study in the Impact of Windmills on Property Values in Tucker County, West Virginia for the Proposed Beech Ridge Energy, L.L.C. project in Greenbrier County, West Virginia*. Goldman Associates Inc. and Spilman Thomas & Battle, P.L.L.C.

Statistical analyses have sought to establish an empirical basis for understanding the effects of wind-energy projects on residential property values. The analyses have become more sophisticated and extensive over the last few years, as more robust data sets have become available. In the most extensive statistical analysis to date, researchers at the Lawrence Berkeley National Laboratory released a study of the impact of wind projects on residential property values that included a hedonic analysis of properties surrounding 24 wind-power facilities in different parts of the United States.[31] They found little evidence of a correlation between distance from the wind project and sale price, or that houses within 5 miles of a wind project systematically sold for less than houses more than 5 miles from a project. The researchers also found little conclusive evidence that residential properties with a view of wind projects sold for less than those without a view, even when controlling for the quality of the background scenic amenities. For properties within 1 mile of a wind project, the researchers found a non-statistically-significant reduction in value of about 5 percent. In their conclusions, the researchers are careful to point out that *absence of evidence* is not equivalent to *evidence of absence*.[32] While they recognize that their study does not identify conclusive evidence of widespread and systematic diminution of residential property values nearby wind projects, they cannot dismiss the possibility that some homes have been or could be negatively affected. They suggest that if effects do exist, however, they are likely to be relatively small or infrequent and in close proximity to wind projects. The largest effects are likely to exist during the period after the announcement of the facility and prior to construction, but likely will diminish after the project's completion.

Critics of the Hoen et al. study emphasize that the sample size for residential properties very close to wind projects is too small to produce statistically significant results, and their application of the hedonic technique had several methodological shortcomings. Moreover, they note that the hedonic technique does not capture properties that don't actually sell because the seller is unwilling or unable to accept a price the market is willing to pay, or where the project is such a deterrent that there are no willing buyers.[33]

Other statistical analyses, including the only two published in peer-reviewed journals, largely agree with the findings of Hoen et al.[34] In a comprehensive survey of the literature, Hinman documented 86 separate statistical analyses of property values

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[31] Hoen, B., R. Wiser, P. Cappers, M. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* Ernest Orlando Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. December.

[32] Hoen, B. 2010. *Impacts on Residential Property Values Near Wind Turbines: An Overview of Research Findings and Where to Go from Here.* Lawrence Berkeley National Laboratory. NEWEEP Webinar. May 5.

[33] McCann Appraisal, LLC. 2009. Letter to Mr. Ben Hoen Re: The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis. December 14; Gulden, W. *Critique of The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* February 16.

[34] Hoen, B., R. Wiser, P. Cappers, M. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* Ernest Orlando Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. December.

around wind farms and determined that 82 found no effect or a positive effect.[35] Since Hoen et al. published their study in 2009, two additional statistical analyses have come to similar conclusions. Canning and Simmons found no effect on residential property values from a wind farm in Chatham-Kent, Ontario.[36] Hinman (2010), who attempted to improve the hedonic technique Hoen et al. employed, found that properties near a wind-energy project in Illinois experienced devaluation prior to construction, but property values rebounded and increased in real terms after the project was completed and went into operation.

The studies in the literature focus on wind-energy projects in the mid-west and on the east coast of the United States, central Canada, and the United Kingdom. No studies in the literature reported specific results for the impacts of wind-energy projects in Oregon, although two studies considered wind-energy projects in Walla Walla County, Washington. In interviews with tax assessors in counties where wind-energy projects were constructed, assessors in Walla Walla County, Washington found no evidence that the installation of turbines across the county led to decreases in property values.[37] The Hoen et al. study included four wind-energy facilities in Walla Walla and Benton Counties in Washington and Umatilla County in Oregon, but the researchers did not evaluate the data from those facilities independent of the data from the 20 other sites in the study.

2. Impact of Scenic Views on Property Values

Researchers have consistently found that scenic views contribute positively to property value. The range of the impact varies considerably, from no impact (or a non-statistically-significant positive impact) to an increase of almost 90 percent of the value of the property.[38] Most early studies only distinguished between view or no view, but recent studies have sought to identify how the type or quality of the view influences the impact on property value. The Lawrence Berkeley National Laboratory study described above identified the effects of different qualities of views. It found that properties with premium views sold for 13 percent more than properties with average views, while properties with poor-quality views sold for 21 percent less than those with average views and properties.[39] The studies that focus on a specific kind of view have overwhelmingly focused on water-related amenities. The impact of these types of views

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[35] Hinman, J.L. 2010. *Wind Farm Proximity and Property Values: A Pooled Hedonic Regression Analysis of Property Values in Central Illinois.* Illinois State University. May.

[36] Canning, G., Simmons, L.J. 2010. *Wind Energy Study – Effect on Real Estate Values in the Municipality of Chatham-Kent, Ontario.* Canadian Wind Energy Association. February.

[37] Grover, S. 2006. *Economic Impacts of the Kittitas Valley Wind Project: A Report to the Economic Development Group of Ellensburg, WA.* August 14..; Goldman, J.C., Goldman. 2006. *A Study in the Impact of Windmills on Property Values in Tucker County, West Virginia for the Proposed Beech Ridge Energy, L.L.C. project in Greenbrier County, West Virginia*. Goldman Associates Inc. and Spilman Thomas & Battle, P.L.L.C.

[38] Behrer, P. 2010. *Building in the Mountains: A Hedonic Analysis of the Value of Degraded Mountain Views Using GIS Modeling*. Harvard Environmental Economics Program. Discussion Paper 10-15.

[39] Hoen, B., R. Wiser, P. Cappers, M. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis.* Ernest Orlando Lawrence Berkeley National Laboratory, Environmental Energy Technologies Division. December.

range from 3 to almost 90 percent increase in value, depending on location, scope of visibility, and whether the view is of an ocean, lake, or river.[40]

Fewer studies have focused on mountain views, and the results suggest a more limited impact on property values than other types of views. Benson et al. found that unobstructed views of snow-covered mountains in Bellingham, Washington provided a positive, but not statistically significant benefit to the properties in the analysis.[41] Boxall et al. found, in an analysis of the effect of oil and natural gas facilities on rural residential properties in the Rocky Mountains, that a view of the Rocky Mountains increased property values by about 3 percent.[42] Franklin and Wadell analyzed home prices in King County, Washington, and found that mountain views added almost 2 percent to the property value.[43] In a study that attempted to describe how increased development in the mountains of North Carolina affected the value of existing residential properties, Behrer found that a mountain view adds a 12-percent premium to the value of a home.[44] The study also suggests that increasing residential development in a mountain viewshed has a negative effect on existing property values, though the result—a 3-percent decline in value—is not statistically significant.

B. Potential Revenues from Property Taxes

In this section, we analyze the City's potential future revenues from property taxes by applying a series of assumptions and growth scenarios on property within the City. We retrieved assessor data from the County, and isolated all parcels that are within the City. For each parcel, the assessor data contain the type of land use (which we consolidated to six groups including commercial, industrial, residential, manufactured, personal, utility, and other), assessed value (AV), and real market value (RMV). To project the potential future property taxes paid by each of these property accounts, we created a model that accounts for state regulations (Measure 50) on property tax calculations, assumes a variety of scenarios with different growth rates for property value, and summarizes future revenue from property taxes.

1. Description of Measure 50

Since 1997, the calculation of property taxes in Oregon has been dictated by Measure 50. Figure D-1 describes how Measure 50 works. The RMV of a property account fluctuates, with the overall market, over time. Measure 50 established an AV for each property

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[40] Jim, C.Y. and W.Y. Chen. 2009. "Value of Scenic Views: Hedonic Assessment of Private Housing in Hong Kong." *Landscape and Urban Planning*. 91: 226-234.; Bond, M.T, V.L Seiler and M.J. Seiler. 2002. "Residential Real Estate Prices: A Room with a View." *Journal of Real Estate Research* 23(1/2) 129-137.

[41] Benson, E.D., J.L. Hansen, A. L. Schwartz, Jr., and G.T. Smersh. 1998. "Pricing Residential Amenities: The Value of a View." *Journal of Real Estate Finance and Economics*. 16:1 55-73.

[42] Boxall, P.C., W.H. Chan, and M.L. McMillan. 2005. "The Impact of Oil and Natural Gas Facilities on Rural Residential Property Values: A Spatial Hedonic Analysis." *Resources and Energy Economics*. 27: 248-269.

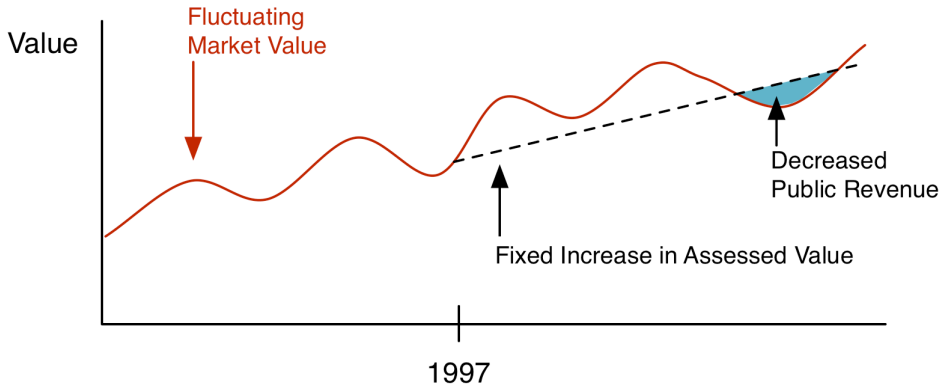
[43] Franklin, J.P. and P. Waddell. 2002. *A Hedonic Regression of Home Prices in King County, Washington, Using Activity-Specific Accessibility Measures*. TRB 2003 Annual Meeting. July 31.

[44] Behrer, P. 2010. *Building in the Mountains: A Hedonic Analysis of the Value of Degraded Mountain Views Using GIS Modeling*. Harvard Environmental Economics Program. Discussion Paper 10-15.

account based on its 1995 RMV. Measure 50 restricts the amount by which the AV is allowed to increase to no more than three percent per year. Measure 50 also states that, each year, property taxes are calculated based on the lower of the AV and the RMV. Since the RMV of most property accounts has increased by more than three percent per year since 1995, Measure 50 decreased property taxes for most accounts, and hence decreased property tax revenues for local governments, relative to what they would have been, if calculated using RMV.

It is possible, however, for the RMV to decrease below the AV. If this occurs, property taxes would be based on the RMV rather than the higher AV, which would decrease revenues generated from property taxes. This scenario is represented by the blue portion in Figure D-1.

Figure D-1. How the Project May Impact Public Revenue from Property Taxes



2. Analysis of Future Property Tax Revenues

To analyze future revenue from property taxes, we created a model (based on assessor data from the county) that projects AV and RMV for each parcel, while accounting for Measure 50, under a variety of scenarios. These scenarios offer a range of potential revenues from property taxes that the City may collect, both with and without the Project. The model we created to project property values and potential revenue from property taxes contains several assumptions. Below, we list and describe some of these assumptions.

- Our model requires three types of property values for each property account: the RMV, the AV, and the Measure 50 value. The AV is equal to the lower of the RMV or the Measure 50 value.[45]
- We included only property accounts paying taxes to tax code 0501 (the City of Union's tax code).
- We assumed the Measure 50 value of each property account will grow at an annual rate of three percent.

[45] Since the assessor data contained only the RMV and the AV for each property account, we assumed the Measure 50 value in FY 2010-2011 was equal to the AV.

- The City collects property taxes from both a permanent limited tax rate (equal to 1.5752 per $1,000 of assessed value), and from general obligation (GO) bonds. The tax rates for GO bonds are calculated each year to raise sufficient revenue to pay for debt service on outstanding bonds. Therefore changes in assessed value only affect GO bond rates, and not overall property tax revenues for GO Bonds. Thus, our analysis excludes the GO bond rates, and only includes the City's permanent rate. We assumed the City's permanent tax rate would remain unchanged over the next 50 years, and that no local option levies apply.
- In addition to appreciation of existing property, we included annual growth from new development. The annual growth in assessed value from new development varies for the four scenarios we analyzed.
- We assume six percent annual reductions in property tax revenues to account for discounts, delinquencies, compression losses and other reductions.
- Although our model is set up to handle different growth assumptions for different land uses, we used the same set of RMV growth assumptions for all land uses. If the proposed wind farm only impacted residential development, rather than all types of property, then the impacts on property tax revenue would be even less than what we forecast in our four scenarios.
- We calculated all our projections in nominal dollars (i.e., not adjusted for inflation).

3. Analysis of Measure 50's Role

As Table D-1 shows, over 80 percent of the property accounts (in terms of their AVs) have an AV:RMV ratio of less than 60 percent. This means that the RMVs of these property accounts have increased at rates higher than three percent per year (the AV in these cases is less than the RMV because Measure 50 caps the annual increase in property taxes at three percent). Since so many property accounts are paying property taxes based on their Measure 50 value rather than their RMV, it is not surprising that it takes a relatively large decrease in property values along with a relatively low future growth rate to decrease the City's future property tax revenues relative to revenues assuming no decrease in property values.

Table D-1. FY 2010-11 AV and RMV Relationships (2011$)

AV as a Percent of RMV	AV of Property	Percent of Total	Cumulative Percent of Total
Less than 20%	$900,000	1.2%	1.2%
20% - 40%	$8,917,000	12.0%	13.2%
40% - 60%	$49,622,000	67.0%	80.2%
60% - 80%	$106,000	0.1%	80.3%
More than 80%	$14,483,000	19.6%	100.0%

APPENDIX E – CITY OF UNION REVENUE (2007-2011)

Table E-1: City of Union's Total Revenue, FY 2007-08 to FY 2010-11

Description	FY 2007-08	FY 2008-09	FY 2009-10	FY 2010-11
Beginning Fund Balance	$9,802	$107,242	$50,000	$81,000
Franchise: Electricity	$46,128	$46,699	$45,000	$44,000
Franchise: Cable TV	$5,519	$6,050	$6,000	$6,000
Franchise: Telephone	$9,404	$7,716	$8,000	$8,000
Franchise: Natural Gas	$35,568	$34,884	$36,000	$35,000
Delinquent Property Taxes	$3,065	$3,341	$4,000	$4,000
Property Taxes	**$97,590**	**$100,631**	**$102,000**	**$105,060**
Oregon Liquor Revenue	$25,109	$23,038	$23,500	$23,000
Cigarette Tax Revenue	$3,011	$3,367	$3,000	$3,000
Oregon Revenue Sharing	$14,073	$13,586	$12,500	$12,500
911 Taxes	$12,658	$7,890	--	--
Liquor License Fees	$90	$135	$100	$100
Gaming Licenses	$83	--	$100	$100
Licenses/Permits	$50	$98	$100	$400
Dog Licenses	$1,115	$760	$1,000	--
Land Use Fees	$3,735	$1,195	$1,000	$1,000
Burning Permits	$1,930	--	--	$1,500
Miscellaneous Fees	-$86	-$30	--	$1,500
Transfer Station Revenue	$4,661	$3,011	$5,000	$2,000
RBEG Grant	$5,000	--	--	--
Grants	--	--	$1,000	$1,000
ACT Oregon Grant	--	--	$1,630	$1,000
DLCD Tech Grant Assist	--	--	$30,000	$1,000
Ready to Read Grant	$1,275	$1,275	$1,225	--
Dept. Bathroom Grant New	--	--	$36,740	--
District Court Fees	$124	--	$100	$200
Municipal Court Fines	$3,436	$812	$1,000	$1,500
Gazebo Rent	$70	$50	$80	$1,500
Donations	$3,426	$100	$500	--
Library Donations	--	$3,000	--	--
Misc. Revenue	$9,007	$3,316	$2,000	$2,500
Misc. Revenue General Fund	--	$598	--	--
Sean Ward Development	--	$3,226	$33,600	$3,000
Miscellaneous Fees	--	-$10	--	--
Interest Income	$4,357	$3,121	$800	$800
Reimbursement	$4	$75	$5,424	$200
City Surplus Equip Sales	--	--	$1,500	$1,000
Total Department Revenues	**$300,204**	**$375,126**	**$412,899**	**$337,860**

Source: City of Union. 2010. *Budget FY 2010-11*. Retrieved from http://www.cityofunion.com /forms.php.