Chapter 8
Severe Weather Events

(Hazard Analysis Score = 86)

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This chapter is concerned with severe weather events and focuses on severe winter storms and windstorms. Flooding is not included in this chapter, as it has been covered separately in Chapter 7.

Why is Severe Weather a Threat to Beaverton?

Severe weather events pose a significant threat to life, property, and the local economy in Beaverton by creating conditions that disrupt essential regional services such as public utilities, telecommunications, and transportation routes. Such storms can produce rain, freezing rain, ice, snow, cold temperatures, and high winds. High winds, especially when accompanies by ice storms, can destroy trees and power lines, potentially interrupting utility services. A windstorm in 1995 damaged numerous homes, businesses, and public facilities, and generated tons of disaster-related debris. Washington County sought and received a Presidential Disaster Declaration to recover from the event.

Historical Severe Winter and Windstorm Events

Regional Severe Weather Events

Destructive storms, producing heavy snow, ice, and high winds have occurred throughout Northwestern Oregon's history. The region's largest winter storms occurred in 1937 and 1950, while the most destructive windstorm occurred in 1962.

The Columbus Day storm in 1962 was the most destructive windstorm ever recorded in Oregon, in terms of both loss of life and property damage. Damage was the most severe in the Willamette Valley. The storm killed thirty-eight people and caused over $200 million in damage. Hundreds of thousands of homes were without power for short periods, while others were without power for two to three weeks. The storm left more than 50,000 homes damaged, and nearly 100 destroyed. Entire fruit and nut orchards were destroyed and livestock killed as barns collapsed and trees blew over. Intense wind speeds were recorded in the metropolitan areas with gusts of 116 mph on the Portland Morrison Bridge and 90 mph peak gusts in Hillsboro.

While relatively rare, tornados can and do occur in the Portland metropolitan area. A small, short-lived tornado near Forest Grove in June 1966 moved from the southwest to northwest through a corn field and prune orchard, uprooting 20 to 25 prune trees. The tornado occurred during the late afternoon, had a path length of one-fourth mile and was 60 yards in width at the widest point. There was no other significant damage reported with the tornado. Heavy rain occurred at the same time, but no hail or lightning was reported.

Three back-to-back storms in January 1950 severely affected infrastructure, residents, and businesses across the state. Deep snow drifts closed all highways west of the Cascades and through the Columbia River Gorge. Sleet that turned to freezing rain caused unsafe conditions on highways and damaged trees and power lines. During a severe sleet event on January 18, hundreds of motorists were stranded in the Columbia River

Gorge. Freezing rain downed many trees and power lines, creating widespread power outages across northwestern Oregon. Hundreds of thousands of dollars in damage to public and private property occurred. Hillsboro reported 42.4 inches of snowfall during this event.

A serious storm in February 1937 resulted in the death of five people in the Portland area. Record snowfalls in Portland created snowdrifts up to 25 feet in height, and a low temperature of 17 degrees Fahrenheit. Schools and businesses were closed and flood damage was reported in downtown Portland basements as the snow melted. All major highways were closed, shutting off the main transportation arteries for travel and business.

A December 1919 snowstorm was the third heaviest snowfall-producing storm to hit Oregon on record. The Columbia River froze over, closing the river to navigation from the confluence with the Willamette River upstream. The snowstorm affected nearly every part of the state, with heavy snow falling over a widespread area.

A six-day storm in January 1909 brought many locations more snow than is normally accumulated in an entire year.

Between December 20 and 23, 1892, substantial snow fell across most of northern Oregon, with the greatest snowfall reported over northwestern Oregon, where storm totals ranged from 15 to 30 inches.

(New 03/2011) A windstorm packing hurricane force winds battered the coasts of Washington and Oregon during December 1-3, 2007. Winds with this storm were second only to that of the 1962 Columbus Day Storm with a recorded gust of 129 mph at Bay City, Oregon (reports of as much as 147 mph at unpopulated areas); however, the longevity of winds with this storm far exceeded the Columbus Day Storm with sustained winds in excess of 50 mph for over 2 days. This led to the closure of all east-west roads through the Coast Range into the Willamette Valley and cut power to the area for at least 4 days. Portions of the Willamette Valley and Metro area were also impacted by the storm, resulting in trees blocking road ways and damages to homes and businesses.

(New 03/2011) A series of three winter storms swept across the Pacific Northwest during the December 14-22, 2008 time period producing significant snowfall amounts across the region. An arctic air mass moved into the region on December 14 and persisted through Dec 22. During this period, valley temperatures in the teens to mid 20s were common.

City Severe Weather Storms

Historically, Beaverton has been affected by severe weather including, snow, ice, and high winds. Much the same as the rest of the state of Oregon, Beaverton has suffered significant loses over the years in property damage and loss of life from these storms.

The Columbus Day Storm of 1962 brought extensive damage to Beaverton, as it did to the rest of the state. During the storm, School District 48 (which includes Beaverton) suffered damage totaling approximately $194,600, in 1962 dollars. The storm significantly damaged many other structures throughout the City and caused multiple injuries.

Another storm impacted Beaverton on October 2, 1967. Again, this storm caused significant damage in the city due to high winds, much like the Columbus Day Storm. Many of the same victims of the Columbus Day Storm were once again affected by the 1967 storm. Front windows at Jennie's Yardstick on Canyon Road blew out at about 9:20 p.m., convincing Owner Robert Well that "lightning can strike twice." Possibly hardest hit in the Beaverton area was Grace Brethren Church at NW 180th Avenue and Walker Road, which sustained an estimated $4,000 to $5,000 in wind damage when a newly-roofed south gable blew off. One portion of the roof, weighing approximately 300 pounds, was hurled over the north side of the church and landed 150 feet from the building.

In January 1969 one of the fiercest winter storms in recent history occurred causing heavy icing on Beaverton streets and sidewalks. Canyon Road closed briefly as the storm continued through the end of January. As the movement of traffic in and out of the Portland Metro area was severely limited, livestock shipments were delayed, causing beef to become unavailable in stores for a short period. The storm was also responsible for one death.

In early January 1979 severe winter storm struck, causing the closure of several schools and business due to broken pipes. Pipes also ruptured in several homes throughout Beaverton. A 1,500 gallon oil truck lost control on icy roads, spilling its entire contents. The storm's freezing rain lead to several minor accidents throughout Beaverton. Later in mid-January 1979, 10,000 Washington County residents lost power due to broken limbs and downed trees brought down by freezing rain. An ice generated electrical short led to a fire causing $35,000 in damages to one Beaverton home.

In early January of 1980 a snowstorm hit Beaverton, and several businesses reported a sharp drop in business due to traffic difficulties.

A severe wind storm in November of 1981 brought yet another reminder to Beaverton's residents of the damage high winds can bring. The winds, which reminded many of the Columbus Day Storm of 1962, left two Washington County men dead, thousands of homes temporarily without power, and many yards and buildings damaged by falling trees. The storm caused damage to infrastructure as well, including the two-million-gallon water tank on Cooper Mountain.

In February 1989 and December 1990, severe storms caused school closings, accidents, and widespread incidence of broken pipes and downed power lines. Approximately 14,000 residents of Beaverton lost power in February 1989. A section of Highway 217 closed briefly due to the hazardous conditions caused by the storm of December 1990.

A more recent storm in December 1995 caused Beaverton to be one of the hardest hit communities in the Portland-Metro area. Locally, gusts topped 60 mph and exceeded 100 mph on the Oregon Coast. The winds caused a high risk to residents in the area. Emergency officials reported more than 40 injuries associated with the storm.

The last severe freeze that affected the City occurred in December 1998. This freeze significantly affected the Tualatin Valley Water District water system by causing multiple breaks in the mainline water system.

(New 03/2011) In December 2006 the region was hit by high winds. The City

experienced a large number of trees falling during this event and established a debris collection area for residents and business to drop off storm generated debris from the trees that fell.

(New 03/2011) In 2008, three different weather systems brought snow to the area at different periods of time from December 14 to 26. The majority of the snow fell from Saturday December 20 through Monday December 22. During that 3-day period Beaverton received over 16 inches of snow greatly surpassing the previous record of 5 inches that occurred 24 years before.

Characteristics of Severe Winter and Windstorms in Beaverton

Weather patterns

Severe storms affecting Beaverton with snow and ice typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March. A majority of the destructive surface winds in Oregon and, specifically, Beaverton, are from the southwest. Some winds blow from the east, but most often do not carry the same destructive force as those from the Pacific Ocean.

Beaverton's average rainfall is approximately 39.4 inches a year. The National Climatic Data Center has established climate zones in the US for areas that have similar temperature and precipitation characteristics. Oregon's latitude, topography, and proximity to the Pacific Ocean give the state diversified climates. Beaverton is in Zone 2 as seen in Figure 8-1. The climate in Zone 2, including Beaverton and surrounding areas, generally consists of wet winters and dry summers. In 2001, 89 percent of the precipitation occurred between October and May; eleven percent of the annual rainfall occurred between June and September, and four percent occurred in July and August. There is an average of only five days per year of measurable snow with snowfall accumulations rarely measuring more than two inches.

Figure 8-1. Oregon Climate Zones

Source: Taylor, George H. and Hannan, Chris, *The Oregon Weather Book*, OSU Press (1999)

Snow

While snow is relatively rare in western Oregon, the Columbia Gorge provides a low-level passage through the mountains. Cold air, which lies east of the Cascades, often moves westward through the Gorge, and funnels cold air into the Portland Area. If a wet Pacific storm happens to reach the area at the same time, larger than average snow events may result.

An example of this type of snowstorm is the previously described storm of January 1980, when strong storms, accompanied by snow, ice, wind, and freezing rain hit Oregon statewide. Impacts in the Portland area alone included 200,000 customers without power or phone service for several days. Over 100 boats, with a combined value of over $3 million dollars, sunk in the Gorge and Portland, resulting in one fatality.

Ice

Ice storms occasionally occur in northern areas of Oregon, resulting from cold air flowing westward through the Columbia Gorge. Like snow storms, ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation, including freezing rain, sleet, and hail.

Freezing rain can be the most damaging of ice formations. While sleet and hail can create hazards for motorists when it accumulates, freezing rain can cause the most dangerous conditions within a community. As described earlier, ice buildup can bring down trees, communication towers, and wires creating hazards for property owners, motorists, and pedestrians alike. The most common freezing rain problems occur near the Columbia Gorge. As noted above, the Gorge is the most significant east-west air passage through the Cascades. Rain arriving from the west can fall on frozen streets, cars, and other sub-freezing surfaces, creating dangerous conditions.

Wind

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. Most of the winds that come from the west are subdued by the time they reach the Beaverton area because of the influence of the Coast Range. The most destructive winds are those which blow from the south, parallel to the major mountain ranges. Windstorms affect areas of Beaverton with significant tree stands, as well as areas with exposed property, major infrastructure, and above ground utility lines. The lower wind speeds typical in the lower valleys are still high enough to knock down trees, bring down power lines, and cause other property damage. The Columbus Day Storm of 1962 was a classic example of a south windstorm. The storm developed well off the coast of California and moved from the southwest, then turned and came directly from the south toward the Oregon Coast. Atmospheric pressure fell rapidly ahead of the storm center and rose rapidly once the storm center passed, creating very tight and sharp pressure gradients. When the strong surface winds are further reinforced by upper airflow in the same direction, as was the case in the Columbus Day Storm, the surface wind speed is enhanced.

Severe Weather Community Issues

Life and Property

Severe weather can be a deceptive killer. Storms, which bring snow, ice, and high winds, can have a significant impact on life and property. Many severe winter storm deaths occur as a result of traffic accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to the cold. Debris carried along by extreme winds can contribute directly to loss of life and indirectly through the failure of protective structures (i.e., buildings) and infrastructure.

Property is at risk due to flooding (see Chapter 7) and landslides (see Chapter 9) resulting from heavy snowmelt. Additionally, ice, wind, and snow can affect the stability of trees, power lines, telephone lines, and television and radio antennas. Falling trees and limbs affected by these events and saturated soils can become hazards for houses, cars, utilities and other property. These conditions can be major hindrances to emergency response and disaster recovery.

Windstorms have the ability to cause damage over 100 miles from the center of storm activity. Wind pressure can create a direct frontal assault on a structure, pushing walls, doors, and windows inward. Conversely, passing currents can create lift and suction forces that act to pull building components and surfaces outward. The effects of winds are magnified in the upper levels of multi-story structures. The forces applied by the wind to the building's protective envelope (doors, windows, and walls) can cause the failure of some of the building's components resulting in considerable structural damage. The effects of wind speed are shown in Table 8.1.

Table 8.1 Effect of Wind Speed

Source: Washington County Office of Consolidated Emergency Management

Infrastructure

Traffic

Severe weather can cause prolonged and extreme traffic disruptions. The importance of transportation is never more noticeable than in situations where travel is difficult or dangerous. Both property damage and loss of life are risks to those who must drive. Additionally, traffic delays or blockages can seriously hinder the ability of emergency service providers.

Economic concerns rise during storms that cause dangerous road conditions, since many people choose to stay home in these situations. During the 1980 storm, several business owners reported a severe drop in sales. Increased traffic loads on Beaverton streets and highways due to development will add to the potential risk of accidents during severe weather events. To address these concerns, Beaverton has participated in the designation of emergency transportation routes with Washington, Multnomah, Clackamas, and Columbia Counties in Oregon, as well as Clark County in Washington State. These emergency transportation routes

will receive high priority for assessment, clearance, and restoration following a natural hazard event. These routes will be used to move personnel and supplies throughout the region and to bring in support from outside the area.

Utilities

Historically, falling trees have been the major cause of power outages resulting in interruption of services and damaged property. The issue of weather related power outages should be addressed, since many Beaverton residents rely on electricity for heat. Even homes using natural gas typically require electricity for the system to operate, to run the circulation fans and thermostats. Natural gas distribution systems also rely to some degree on electrical service to keep the system operational and widespread power outages, can interrupt that service. Additionally, when severe weather causes problems with phone lines, it becomes difficult for utility providers to receive and respond to reports of outages and service problems in a timely manner.

Power loss is also a concern economically, since businesses may have to close during power outages. About 78% of Beaverton business owners indicated that loss of electricity would have a serious or moderate impact on their business, while 92.4% of them indicated that electricity was critical or very important to their business (see Appendix D).

Many overhead wires are at risk from snow and ice accumulations that are beyond the design specifications. High winds can create flying debris and down utility lines. For example, tree limbs breaking in winds of only 45 mph can be thrown over 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events. Some utility lines could be placed underground, but the expense of such projects can be prohibitive. In terms of energy production, Beaverton does not produce any electric power or have any electric generating facilities itself. Instead, the City has a series of substations and distribution stations. These stations are also susceptible to damage from severe weather events.

Increasing population and new infrastructure in the city means that more lives and property are exposed to risk; this situation creates a higher probability that damage will occur from severe weather events.

Water Lines

The most frequent water system problem related to cold weather are breaks in the service lines. Breaks frequently occur during severe freeze events, as well as during extreme cooling periods during the months of October, November, and December. In almost every severe winter storm described earlier, broken pipes led to the closures of schools and business throughout Beaverton. The last severe freeze that affected the area occurred in December of 1998. Over a period of nine days, the water systems in Washington County experienced several mainline breaks. The most extensive damage occurred in Tualatin Valley Water District water system, which resulted from a 10-inch main break near the intersection of SW 185th and the Tualatin Valley Highway. The break resulted in temporary loss of service to several houses, including some within the city and approximately $60,000 in street and pipe repairs.

Another common problem during severe freeze events is the failure of

commercial and residential water lines. Inadequately insulated potable water and fire sprinkler pipes can rupture and cause extensive damage to property. During the December 1998 freeze, local fire agencies were kept busy for days responding to waterline breaks and assisting homeowners and businesses with water removal.

Tree Failure and Resulting Power Line Outages

According to Portland General Electric (PGE), trees are the leading cause of storm-related power outages in PGE's service area. Tables 8.2 and 8.3 are Tree Failure Profiles developed by PGE for two of the most common tree failures in the PGE service territory. The profiles are developed from the data collected and used by PGE foresters in targeting "at-risk" trees during routine vegetation maintenance cycles.

Table 8.2. Tree Failure Profile - Species: Bigleaf Maple *(Acer macrophyllum)*

Source: Portland General Electric, Forester's Office, 2001; © Portland General Electric Co.

Table 8.3. Tree Failure Profile - Species: Douglas fir *(Psuedotsuga menziesii)*

Source: Portland General Electric, Forester's Office, 2001; © Portland General Electric Co.

Severe Weather Hazard Assessment

Severe Weather Hazard Identification

Severe weather is generally a prolonged event involving snow, ice, or wind. The characteristics of severe weather are determined by a number of meteorological factors including the amount and extent of snow or ice, air temperature, wind speed, and event duration. The severe weather events that affect the city typically come from the northwest, the southeast, and through the Columbia River Gorge.

Precipitation, an additional element of severe weather, is measured in addition to wind speed by gauging stations located in Hillsboro and Forest Grove. The National Weather Service, Portland Bureau monitors the stations and provides public warnings on storm, snow, ice, and wind events as appropriate. The Oregon Climate Service collects precipitation data at one station in Beaverton.

New areas of development are often more at risk from natural hazards. New homes and development are pushed into hazard prone areas and new "development leaves some stands of trees vulnerable to 'windthrow' by removing the edges of the stand."

(New 12/2010) There is a high probability that the City will be impacted by severe weather events over the next several years. A high probability incident can be expected once within a 10 to 35 year period and based on the City's history of ten notable severe weather events in the last 25 years, there is a high probability that such events will continue to occur fairly frequently.

Vulnerability Assessment

Vulnerability assessment is the second phase of a hazard assessment. It combines the information generated through severe weather identification with an inventory of the existing development exposed to this hazard, assisting in the prediction of how different types of property and population groups will be affected by a hazard. Data including the areas exposed to severe weather in Beaverton can be used to assess the population and total value of property at risk from severe storms.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for Beaverton severe weather storm events, there are many qualitative factors (issues relating to what is in danger within a community) that point to potential vulnerability. Severe weather can cause power outages and transportation and economic disruptions, and pose a high risk for injuries and loss of life. The events can also be typified by a need to shelter and care for adversely impacted individuals. Beaverton has suffered severe weather in the past that brought economic hardship and affected the life safety of City residents. Future severe weather events may cause similar impacts citywide.

Risk Analysis

Risk analysis is the third, and most advanced phase of a hazard assessment. It is conducted by use of mathematical models and relies on information compiled during hazard identification and vulnerability assessments. Factors included in assessing severe weather risk include population and property distribution in the hazard area, the frequency of severe weather storm events, and information on tree type, failure rates most susceptible to storm events, utilities, and infrastructure that may be impacted by severe weather. When sufficient data is collected for hazard identification and vulnerability assessment, a risk analysis can be completed. Insufficient data currently exists to complete a risk analysis.

Mitigation Plan Goals and Existing Activities

The mitigation plan goals and action items are derived from a review of city, county, regional, state, and national natural hazards mitigation plans and planning literature, guidance from the Beaverton Natural Hazards Mitigation Steering Committee, and interviews with both Beaverton and Washington County stakeholders. Goals for this mitigation plan address four categories:

1. Protect Human Life, Commerce, Property and Natural Systems
2. Improve Partnerships for Communication and Coordination
3. Enhance Emergency Services
4. Ensure Implementation of Mitigation Activities

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, county, regional, state, federal agencies, utilities or other organizations

City Programs

Capital Improvement Plan

The City of Beaverton's Capital Improvements Plan (CIP) is a dynamic document that lists and prioritizes needed improvements and expansions of the City's infrastructure system to maintain adequate service levels to existing City residents and businesses, and to accommodate population growth and land development. The CIP reflects the needs and priorities established by the City and the resources available to the City. The CIP can be modified during the fiscal year (through the supplemental budget process) as needs, priorities, and resources change. The CIP can assist the City of Beaverton in mitigating against severe weather events by improving infrastructure most prone to damage.

Emergency Operation Center (EOC)

The Emergency Operations Center is an established location/facility in which City staff and officials can receive information pertaining to an incident and from which they can provide direction, coordination, and support to emergency operations. City personnel who are assigned to and trained for specific positions within the EOC organizational structure staff the EOC. The structure is based on the National Interagency Incident

Command System (ICS). The EOC staff provides information and recommendations to the Mayor, through the Incident Commander or as directed, to develop a course of action to respond to and contain, control, and recover from an emergency. Some of the primary functions that are performed at the EOC include: coordination, operations management, planning, information tracking and dissemination, logistical support, financial management and support, and emergency public information.

Emergency Response and Recovery Plan (ERRP)

The Emergency Response and Recovery Plan (ERRP) describes the roles and responsibilities of the departments and personnel for the City of Beaverton during major emergencies or disasters.

The Plan sets forth a strategy and operating guidelines using the National Interagency Incident Management System's ICS adopted by the City for managing its response and recovery activities during disasters and emergencies.

The ERRP's development and maintenance is the basis of the City's emergency response and recovery operations, and includes the following sections and supporting materials:

1. **Basic Plan** - Provides an overview of the City's emergency response organization and policies. It cites the legal authority for emergency operations, summarizes the situations addressed by the plan, explains the general concept of operations, and assigns general responsibilities for emergency planning and operations.
2. **Functional Annexes** - Each annex focuses on one of the critical emergency functions that are typically common for all hazards, which the City will perform in response to an emergency. The type and scope of an incident will dictate which functional annexes will be needed.
3. **Hazard Specific Appendices** - The appendices provide additional detailed information and special considerations that are applicable to specific hazards. The appendices are to be used in conjunction with the Basic Plan and the Functional Annexes.

Tree Inventory Map - Scenic Tree Program

A map of hazardous trees in Beaverton provides information useful for targeting measures that mitigate against the effects of falling trees. Further to this goal, "The City of Beaverton Planning Department is currently working on long range tree preservation planning. This will help drive development away from hazard prone areas, and attempt to increase City's ability to mitigate for disasters."

Incident Command System

The Incident Command System (ICS) is a management system that may be used during any hazard event; it has three main components:

Command - A designated lead person responsible for:

- Assessing the situation and resources
- Developing and implementing an appropriate action plan
- Monitoring the effectiveness of the plan

- Reviewing/modifying the plan as changes occur

Resource Control - Resources must be properly directed to maximize their utilization.

Communication - In order to orchestrate and coordinate the use of resources at an incident, all members of the incident response team must be linked by:

- A well-defined organizational structure
- Clear lines of communication

Transportation Plan

The City of Beaverton's adopted transportation plan is the Transportation Element of the City's Comprehensive Plan. It identifies the transportation improvements needed to accommodate existing and future development in the Beaverton area. The plan projects needs and improvements through 2015.

Beaverton's adopted transportation plan is based on an analysis contained in the Transportation System Plan (TSP), which was developed through a public participation process. The development of the TSP and thereafter the more concise Transportation Element, Chapter Six of the Comprehensive Plan, (a summary of the analysis, goals and policies, and improvements) are closely coordinated and intended to be consistent with other jurisdictions' transportation plans. These include Washington County's Transportation Plan, Metro's Regional Transportation Plan and Urban Growth Management Framework Plan, TriMet's short and long-range transit plans, and the State of Oregon Transportation Plan. Coordination with these and other jurisdictions and service agencies is continuous.

County Programs

Tualatin Valley Water District

To assist in protecting customers from the impacts of cold weather, the Tualatin Valley Water District (TVWD), which serves a small percentage of Beaverton, provides press releases to major media outlets to inform residents of predicted cold weather events, and to provide tips on how to avoid damage to plumbing systems.

Tualatin Valley Water District's (TVWD) exposure to windstorms is primarily limited to power loss. In the 1995 windstorm, TVWD's main operations station lost power for approximately twelve hours. During storms in 1996, TVWD lost power to pump stations. The main operations center and most pump stations have back-up generators to provide emergency power. However, if power is not available, pumps and gauges cannot function, and the system operators cannot accurately determine the amount of water available for use. Additionally, during the storms of 1996, TVWD paid visits to approximately ten-percent of its customers. Many of the visits were weather related. Rolling blackouts can pose serious problems to the water system. During summer, when water use is extremely high, emergency generators may provide power to meet peak demand.

Portland General Electric

Through the Right Tree-Right Place program, Portland General Electric

(PGE) educates homeowners, landscapers, and tree propagators on tree species that will not be subject to ongoing stress by constant trimming. PGE distributes brochures that list low-growing trees that fit within the utility right-of-way and are compatible with small urban planting strips. The brochure includes information on how to select the correct tree, the energy-saving benefits of trees, and proper planting and pruning techniques. PGE offers tree owners a certificate to help defray the cost of a new tree that replaces one that is inappropriate.

PGE also runs a tree-trimming program and keeps a database of information in order to build profiles of trees that cause power line outages. PGE foresters work with local government and the public to assess and identify situations in which trees or power lines put life and property at risk. Calls and faxes to PGE's tree-trimming program result in immediate response by PGE to clear roads of fallen trees. PGE's database of tree failures intends to identify those trees that are at an above average risk.

Federal Programs

National Weather Service

The Portland Office of the National Weather Service issues severe weather watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over NOAA weather radio and are forwarded to the local media for retransmission using the Emergency Alert System.

Severe Weather Mitigation Action Items (Rev 9/2010)

(Not Including Flood)

The severe weather mitigation action items provide direction on specific activities that the City, organizations and residents can undertake to reduce risk and prevent loss from severe weather events. There are two short-term and five long-term severe weather action items described below. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

ST-SW #1: Maintain public awareness of the hazard and the benefits of mitigation through education aimed at households and businesses and increase targeting of special needs populations.

- **Completed** – This is part of the City's overall emergency preparedness education and information activities

Plan Goals Addressed: Protect Human Life, Commerce, Property and Natural Systems; Improve Partnerships for Communication and Coordination; Enhance Emergency Services

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ST-SW#2: Maintain tree trimming for above ground power lines.

- **Completed** – The City and PGE have effective tree management

programs.

Plan Goals Addressed: Protect Human Life, Commerce, Property and Natural Systems

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LT-SW #1: Identify trees that are potentially susceptible to wind-throw.

Possible Actions

- Analyze current map of trees from the Scenic Tree Program, Tree Preservation Plan Map, Street Trees, and other sources.
- Develop education material on tree species that are susceptible to wind-throw.
- Locate hazardous trees and add to map.

Coordinating Organization: City of Beaverton
Internal Partners: Public Works, Urban Forestry, Information Systems Department – Geographic Information System
External Partners: Washington County, Overhead Utilities
Timeline: Current Plan Cycle
Plan Goals Addressed: Create a Disaster Resistant and Resilient Community

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LT-SW #2: Develop and implement programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.

Possible Actions

- Develop landscape and street tree standards that have fewer impacts on above ground utility lines and roads.
- Develop partnerships between utility providers, City and County agencies to document known hazard areas and minimize risks.
- Coordinate with overhead utilities in developing GIS layers for power lines and at risk trees.
- Collaborate with overhead utilities on "Right Tree – Right Place Program"

Coordinating Organization: City of Beaverton
Internal Partners: Information Systems Department – Geographic Information System, Public Works, Urban Forestry, Community Development
External Partners: Washington County, Overhead Utilities
Timeline: Current Plan Cycle
Plan Goals Addressed: Protect Human Life, Commerce, Property and Natural Systems

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LT-SW #3: Develop and maintain comprehensive impact database and when possible, map historical severe weather events in Beaverton.

Possible Actions

- Research and analyze historic windstorm damage in Beaverton.
- Identify reoccurring patterns
- Map reoccurring hazard sites.
- Document future events including impacts and losses.
- Develop partnerships between utility providers, City and County public works agencies to document known hazard areas and minimize risks.

Coordinating Organization: City of Beaverton
Internal Partners: Community Development, Information Systems Department – Geographic Information System.
External Partners: Washington County, National Weather Service, National Oceanic and Atmospheric Administration, Oregon Climate Service, Overhead Utilities
Timeline: On-going
Plan Goals Addressed: Protect Human Life, Commerce, Property and Natural Systems; Improve Partnerships for Communication and Coordination

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LT-SW #4: Support underground utility construction through public incentives and partnerships.

- **Completed** – The issue of undergrounding utilities for new development and redevelopment is addressed in State Statute and City Code.

Plan Goals Addressed: Protect Human Life, Commerce, Property and Natural Systems

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LT-SW #5: Develop strategies for better debris removal after a windstorm.

- **Completed** – Strategies were implemented in the 2007 windstorm including a centralized drop off location for woody debris.

Plan Goals Addressed: Protect Human Life, Commerce, Property and Natural Systems

Severe Weather Resource Directory

(Revised 03/2011) – See Appendix G: Consolidated Resource Directory.

Endnotes