

King County Water District No. 90 Plan Annex

Introduction

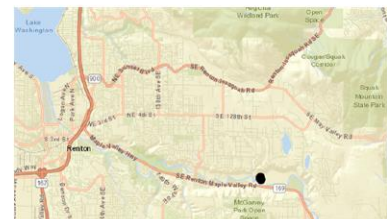
King County Water District No. 90 is located between the cities of Renton and Issaquah, Washington with Cougar Mountain to the north and the Cedar River to the south. The District was incorporated in 1952 with a service area of approximately five square miles and served the rural area outside of the Renton city limits. At the present time, the District; located in both unincorporated King County and the City of Renton, covers an area of 15.5 square miles and ranges in elevations between 100 to 1,400 feet. The District currently provides all domestic and fire protection needs to a population of approximately 20,000 customers or 7,888 households, 186-plus businesses, a portion of the Renton and Issaquah School Districts, and Fire Districts No. 10 and No. 25.

Water District No. 90 has been a rapidly growing suburban “bedroom community” of the City of Seattle with a diverse economic community. By area, the District is currently comprised of one-third urban and two-thirds rural. The District is governed by a Board of Commissioners with three members. The Board of Commissioners will assume responsibility for the adoption of this plan; the General Manager will oversee its implementation.

The present Board of Commissioners and management staff supporting the District recognize the need to improve the system operations and communications with other jurisdictions. In the past ten years, the District has invested approximately \$12 million to improve the system. In order to reduce the impact to our service community resulting from a disaster, the District maintains design standards, preventative maintenance and operational procedures, and emergency training programs. Funding for the District comes primarily through rates.

King County Water District No. 90 - District Profile

- Special Purpose District
- Residential Customers: 7,888
- Commercial/Fire/Irrigation Customers: 186
- Estimated Population: 20,000
- Area Served: 15.5 Sq. miles
- # of Miles of Main: 124
- Elevation: 100 to 1,400 feet
- 8 Pump Stations
- 8 Storage Tanks
- 20 Pressure Reducing Stations



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Development Trends

Growth Trends: After an extended season of historic growth at King County Water District No. 90, new development has begun to decrease. For ten years from 2007 to 2016, the District added on average 142 new services per year. Average revenue collected during this same period was \$530,000 per year for General Facility Charges (system buy-in charges). Since 2017, new development in the District has declined significantly to 28 new services in 2017 and 43 new services in 2018. This has, in turn, slowed the District's main replacement program as capital funding becomes more dependent on water rates.

On average, the District plans to complete about one mile of water main replacement, averaging about \$1.8 million, per year. Also, the District spends another \$0.5 to \$1.0 million annually on other system upgrades and improvements. The current trend in construction costs will make replacing one mile of main per year more difficult. In 2015, the District averaged water main construction costs of \$230 per foot for 8" ductile iron (DI) main replacements. Costs estimates per foot in 2019 are \$375 per foot.

This decrease in the District's growth is hastened by the City of Renton policies to focus growth in the downtown City Center.

City of Renton: The City of Renton covers about 60% of the District's service area. The City of Renton's 2015 Comp Plan zones this area as Residential Low-Density. The City is encouraging mixed-use development in the city centers and discouraging development in rural areas. Specifically, land use Policy L-2 states, "Support compact urban development to improve health outcomes, support transit use, maximize land use efficiency, and maximize public investment in infrastructure and services." In addition, environmental Goal L-S states, "Maintain Urban Separators to provide visual and physical distinction to the edges of Renton, protect critical areas, and provide a transition to the rural area." These policies will continue to encourage the slowdown of development in the rural areas abutting the City.

Change in the Urban Growth Boundary: The Growth Management Act (GMA) is a series of state statutes, first adopted in 1990, that requires fast-growing cities and counties to develop a comprehensive plan to manage their population growth. The comprehensive plan is the centerpiece of local planning and articulates a series of goals, objectives, policies, actions, and standards that are intended to guide day-to-day decisions by elected officials and local government staff. Part of a county's long-range planning process involves identifying urban growth areas (UGAs), areas where "urban growth shall be encouraged and outside of which growth can occur only if it is not urban in nature" (RCW 36.70A.110). Counties are responsible for designating, expanding, and reducing UGA boundaries, although they are required to consult with the cities in their determinations.

The Urban Growth Boundary nearly splits the District in half. Staff watches for changes in the Urban Growth Boundary line so that necessary infrastructure matches anticipated growth. In recent years there have been instances where the Urban Growth Areas have been reduced after infrastructure has been installed. This would be a costly and wasteful situation that the District seeks to avoid.

Well Production: The District has a water right of 450 gallons per minute. Currently, the District is only able to produce 270 gallons per minute. Since the installation of our wells, starting in 2001, the District has not been able to perfect our total water right. In 2009 and 2015, in an attempt to perfect our water right, the District added Well #2 and Well #3, respectively, to our Well Field (WF). In 2018 the District lost Well #2.

The District's primary water supply, providing 75% of our water, comes from Seattle Public Utilities (SPU). The District's WF provides the remaining 25% of the supply and acts as the District's emergency water supply. The District has one connection to SPU's transmission main. If this primary source were impacted, the District would rely entirely on our emergency source of water. To be able to provide potable water to our customers after a major

emergency, it is critical that the District be able to produce the full amount of the District's water rights (450 gpm). Adding an additional well (or wells) would be required to meet this goal.

Understanding of Local Seismic Activity: The Amount of information and mapping available related to the seismic activity of the Pacific Northwest has grown significantly in recent years. The end result is a better understanding of the possible impacts of a Cascadia Subduction Zone earthquake, which would most likely be very deep and offshore of the Washington coast. Although this quake could be very large (i.e. 9.0) it is less likely to have a damaging impact than a local fault quake, such as a quake with the Seattle of Tacoma fault lines. The Seattle fault line extends into the District boundaries along May Valley Road. An earthquake along this fault would most likely be shallower and would cause more ground movement even at a lower number on the Richter scale. In the past, utilities have been telling customers to be prepared to be without water for a minimum of 3 days. However, recent information has indicated that customers should have emergency preparedness supplies, including water, for 1 to 3 weeks.

Government Preparedness Expectations: There has been a growing trend in emergency preparedness that has shifted the responsibility for preparedness from the individual to the government entity. King County Water District No. 90 is nearly evenly split between urban and rural customers; however, the customers moving into the rural areas seem to expect services commiserate with urban levels of service. For example, there is a low tolerance for being without water for a day. Customers are not aware that they could be without water for multiple days or weeks after a major event such as an earthquake.

Green Space: On June 27, 2019, King County Press Office Executive News Release states, "King County purchasing land for parks/greenspace. Summary: King County Executive Constantine triples down on open space protection, takes action to ensure greenspace access for all King County residents. Executive Dow Constantine delivered to the King County Council today legislation that vigorously accelerates the pace of land conservation over the next year. The legislation would triple funding and invest in 61 open space projects." The amount of Wildlife Urban Interface (WUI) in the District has increased significantly as King County adds to the green space abutting the District boundaries. This change, along with climate change potentially leading to drier, hotter, and longer summers and to longer fire seasons coupled with a history of poor land management practices, has increased the risk of brushfires and wildfires developing within the District.

Tiny Houses/ADUs (Accessory Dwelling Unit): In the spring of 2019, Senate Bill S5383 was passed into law. In short, the bill encourages or at least clears a path for the development of more tiny homes in the state. The bill states, "Tiny houses have become a trend across the nation to address the shortage of affordable housing. As tiny houses become more acceptable, the Legislature finds that it is important to create space in the code for the regulation of tiny house siting. Individual cities and counties may allow tiny houses with wheels to be collected together as tiny house villages using the binding site plan method articulated in chapter 58.17 RCW." It is anticipated that there will be an increase in tiny houses and ADUs within the District boundaries in the next few years.

Jurisdiction Risk Summary

Hazard Risk and Vulnerability Summary

HAZARD	RISK SUMMARY	VULNERABILITY SUMMARY	IMPACT SUMMARY
Avalanche	The District's highest elevation is less than 2,000 feet above sea level. It is therefore highly unlikely that an avalanche would impact the District.	N/A	N/A
Earthquake	<p>Earthquake risk within District boundaries is very high. The entire District is located in the Seismic Design Category of "D2", meaning the area "could experience extreme shaking. Damage slight in specially designed structures, considerable damage in ordinary buildings with partial collapse. Damage great in poorly built structures."</p> <p>The District is split by the Seattle Fault line that runs from the middle of Lake Washington, west to east, through the District, following SE May Valley Road for 7 miles. A Seattle Fault quake could be as massive as 7.5 on the Richter scale. An earthquake on the Seattle Fault would be relatively shallow (0-30KM near the earth's surface) and would include intense shaking, especially near the epicenter. There is not a lot of data on the frequency of activity on the Seattle quake. In addition, the District could have a deep quake</p>	<p>All of the District's assets could be impacted by intense shaking. Aside from the District's mains, especially those at or near the Seattle Fault (along SE May Valley Road), the most significant risk to the District are main breaks and pipe connections/gaskets/fittings that are likely to "pull apart" or separate from the shaking. When this happens, the District will depressurize very quickly. The District's Wellfield (WF) and Water Treatment Plant (WTP) are the District's secondary (emergency) source of water, providing about 25% of overall water production. The District's WF and WTP sits in a flood plain at the bottom of a 300-foot cliff. An earthquake could cause damage to this location directly (i.e., well casing shift) or indirectly (flood or landslide) or could damage the transmission main traveling from the WTP to the top of the cliff (about 635 feet). After the 2001 Nisqually Earthquake, the District experienced a landslide caused by water line failure and related mudslide.</p> <p>The District's primary source of water (75%) is received from Seattle Public Utilities (SPU) and is fed by a single transmission main traveling from the Cedar River through the City of Renton. SPU's transmission</p>	<p>A significant earthquake will most likely cause a large number of main leaks throughout the District. It may also cause the District to lose connection with the District's primary source of water supply from SPU, as well as the District's secondary source of supply from the District's WF. The District's best approach is to consider earthquake-resistant pipe and fittings when appropriate to harden the water system. Also, the District would like to find a new WF and WTP location in a less hazardous area. The District may also seek to harden tanks against earthquake damage and add an additional tank at or near the 804 Zone.</p>

	<p>in the Cascadia Subduction Zone off the Washington coast that could cause shaking of the entire region. Japan experienced a similar earthquake (M9.0) in 2011. Although the size of this quake could be more significant, it is estimated that the earthquake will be deeper and further out to sea and will not have as much of an impact on the District as a smaller Seattle Fault quake could have.</p>	<p>main travels through known liquefaction areas in the City of Renton's downtown area. This liquefaction zone dramatically increases the risk of the District losing primary water supply after an earthquake event.</p>	
Flood	<p>There is one sizeable flood-prone area in the District. This flood zone stretches along a 4.0-mile section of SE Jones Road, running east/west, following the Cedar River. The District has water main along 1.8 miles of this stretch of road. Several houses (50+) have been purchased and removed by King Conservation District due to repeated flooding. There are still roughly 250 pieces of property in this area. The District serves about 200 residential customers along SE Jones Road.</p>	<p>The District's WF is located in the 100-year flood plain. Water from the WF is required to operate the WTP. If the WF is inoperable, so is the WTP. The WF and WTP are the District's secondary (emergency) source and provide about 25% of the District's potable water. If the District's primary connection to SPU fails, the WF and WTP is the District's backup supply. There have been six major flooding events along the Cedar River since 1990. The flood in November of 1990 flowed at 10,300 CFS in the Cedar River and was equivalent to the 100-year flood. At this flow level, the District's WF would be under 2-3 feet of water and would be inoperable.</p>	<p>Since the WF is in the flood plain (and is also at risk from landslides), there is a higher probability of losing access to the site, power outages, flooding, equipment failure, and complete loss of the Wells and WTP.</p>
Landslide	<p>The District has two distinct areas that could be impacted by a landslide. The first is a 4.0 mile stretch along SE Jones Road next to the Cedar River. The cliffside (north side) above SE Jones Road, includes about 1,100 acres of land. The top of</p>	<p>There are about 75 residential customers served by the District that have homes on SE Jones Road along the Cedar River that would be at risk in the event of a landslide. Also, the District's WF and WTP are located on SE Jones Road, along the Cedar River. The District purchases 75% of its water supply from SPU and produces 25% from</p>	<p>The District has been impacted by two landslides from the hillside above SE Jones Road. The first in 1997 after a landslide and flooding took out a section of water main (at about 151st PL SE) and buried the house below. This house and water main were abandoned. The cause of the second landslide in 2006</p>

	<p>the cliff has an average elevation above sea level of 380 feet, and the bottom is 100 feet above sea level. King County has documented 15 landslides along the north side of the Cedar River within the District's service area. The Second landslide-prone area is 2.2 miles along SE May Valley Road. The hillside above this road is not as steep as that above Jones Road; however, the elevation ranges from 400 feet above sea level to 2034 feet at the top of Squak Mountain. The District serves water to the entrance of Squak Mountain State Park. Possible landslide risk would be increased in the event of wildfire activity in the area.</p>	<p>the District's Wells and WTP. The WF provides the secondary (emergency) source of potable water for the District. If the District's primary source of water from SPU were interrupted for any reason, the water produced from the District's wells and WTP would be the District's only source. A landslide in the second area; the steep hills above SE May Valley Road could impact access and water availability to the High Valley area of the District. This area only has one access point along SE 127th Street. There are approximately 200 residences in the High Valley area.</p>	<p>was an abundance of groundwater that had backed up in the area. A 465-foot section of 6-inch DI pipe, along SE 148th Street (from 157th PL SE to 160th AVE SE), was at risk of failing. The backup groundwater was able to be mitigated, and the water main remained intact. The cliffside along Jones Road has continued to recede in recent years as residential customers are losing progressively more of their yards to the cliff. The most significant risk to the District is losing the District's emergency water supply.</p>
<p>Severe Weather</p>	<p>Severe weather situations such as droughts, tornados, wind events, and lightning storms have become ever more commonplace in the Seattle region in recent years. In two years (June 2014 to June 2016), there were 79 wind advisories and 29 high wind warnings for the Seattle area. Also, there were three severe thunderstorm warnings during that same period. It is anticipated that climate change is increasing the frequency of severe weather events. In both 2018 and 2019, the region experienced tornados,</p>	<p>Severe weather can have a compelling impact on the District. Power and communication outages could be widespread. Roads and bridges could be blocked or washed out. Losing power to the District's pump stations for an extended period, especially in the more challenging to reach higher elevations, could mean that potable water is no longer supplied to these areas of the District. This would also impact the District's ability to provide water for firefighting. Further, access to the District's WF and WTP could be negatively impacted by severe weather.</p>	<p>Without communications and access to the District's secondary supply, the District would not have an emergency water source. The District can harden pump stations, tanks, wells, and the WTP against winter storms by adding redundant communications wherever possible. Also, the District has several generators (permanent and portable); however, permanent generators should be added to the pump stations at high elevations (i.e., High Valley and Licorice Fern) areas.</p>

	something not typically encountered in the Seattle area.		
Severe Winter Weather	Since 1950, there have been 11 snowfall events dropping at least 10" of snow around the Seattle region. The worst of these storms was in February of 2019, which dropped over 30" of snow within the District boundaries. The District office was shut down for three days due to the inaccessibility of the area. In some cases, substantial snowfall is followed by rain that leads to flooding and landslide hazards.	A number of the District's staff live more than 30 minutes (and up to 1 hour) south of the District's offices. Heavy snowfall events or other severe winter storms can cause District staff not to be able to make it to the District office. Lack of staff will significantly delay the District response after a storm.	The most significant impact to the District from severe winter weather most likely would be the lack of available staff. Repairs, access to sites, transporting generators, clearing roads, etc. would all be delayed by a lack of available staff.
Tsunami	Tsunamis generated in the Pacific Ocean off Washington's coast will not have as great an effect in Seattle as they will on the Pacific Coast, but low-lying areas may experience flooding. Tsunamis can also be generated in the Puget Sound by both landslides and earthquakes. However, due to the District's location, approximately 12 miles directly east and inland of Puget Sound, it is not anticipated that a tsunami will impact the District.	N/A	N/A
Volcano	Washington State is home to five active volcanos in the Cascade Range. The biggest of these is Mount Rainier. Seattle is too far from any volcanoes to receive damage from blast or pyroclastic flows. Ashfall could reach	If heavy ash were to fall in Seattle, it would create public health problems, paralyze the transportation system, and destroy many mechanical objects. Also, SPU (the District primary supplier of water (75%)), may not be able to filter ash out of the water, which could disrupt the District's main	The District would be dependent on its WF and WTP to supply emergency water to the District's customers. It would be unlikely that a Volcano would impact the District's WF directly. However, the District has not been able to produce the full amount of the

	Seattle, but prevailing weather patterns would typically blow ash away from Seattle to the east side of the State.	supply of water.	District's Water Rights (450 gpm) and would require another Well to do so. Having the ability to produce as much water as we are allowed to take from the District's aquifer would provide more water to District customers in the event of an emergency.
Wildfire	<p>The risk of wildfire has increased dramatically in the Seattle Region. Climate change has caused more fluctuation in the region's weather patterns. In recent years, the average air temperature has increased, the amount of rain in the summer has decreased, and the snowpack has melted sooner. This has led to a much drier forest, and these trends are expected to continue. In addition, the past 100 years of fire prevention have led to an unprecedented amount of undergrowth (fuel) ready to burn. It is estimated that 50% of fires between 1984 and 2005 are due to climate change. The wildfire season is starting earlier and lasting longer than in the past. The Pacific Northwest is experiencing more frequent periods of drought, and more drought equals more wildfire risk.</p>	<p>The District has experienced extensive growth in the past 20 years. Much of this growth is located in the Wildlife Urban Interface (WUI). About 60% of the District's service area is located in the rural area of unincorporated King County. Second growth forests (80-100-year-old trees) are prevalent around the residences in this area.</p> <p>There are two large "green spaces" abutting the District boundaries. The first is the Cougar Mountain Regional Wildland Park that abuts the north boundary of the District and includes 3,115 acres of forested land and 38 miles of hiking trails. Second is the Squak Mountain State Park, which abuts the east boundary of the District. This State Park includes over 1,500 acres of forest lands and trails. King County has actively been expanding open space around the county. These parks significantly increase the WUI between District customers and the "green space."</p> <p>Additionally, the Squak Mountain State Park is located one-half mile from Seattle Public Utility's (SPU's) Cedar River Watershed, a heavily wooded area of just under 80,000 acres.</p>	<p>The risk of wildfire within the District boundaries has increased significantly in recent years due to climate change. AL Westerling, in the 2016 report "Increasing Western US Forest Wildfire Activity" (Sierra Nevada Research Institute, UofC, Merced) states, "In the Pacific Northwest specifically, the area burned, the fire season length, the number of fires greater than 1,000 acres has increased since 1973. Looking to the future, the average area burned each year in the Pacific Northwest is expected to triple by 2040 (relative to 1916-2006) if greenhouse gas emissions continue at a moderate rate."</p> <p>The risk to the District's assets from wildfire is steadily increasing. The facilities most at risk from wildfire are the pump stations (PS #4-#8) and tanks in High Valley and Licorice Ferns (Reservoirs #4-#7). However, wildfire is possible throughout the District's service area.</p>
Civil Disturbance	Civil Disturbance is a public disorder by a group of people involving acts of violence that cause immediate danger,	It is unlikely that Civil Disturbance would be widespread within the District's boundaries. The District is 98% single-family residences with no downtown or central gathering	If the primary water supply from SPU were impacted, the District would be dependent on its WF and WTP to supply emergency water to its customers. The District needs

	<p>damage to others, or their property. Civil Disturbance can either be harmful to others or harm to property. By nature, it is both illegal and violent. Civil disturbances most often occur in dense areas where people naturally gather. Looting and arson are the most common civil disturbance events.</p>	<p>location. The primary risk to the District would be the impact to SPU if a prolonged civil disturbance disrupted the SPU's ability to function.</p>	<p>to be able to produce the full amount of the District's water rights (450 gpm) and would require another well to do so. Having the ability to produce as much water as we are allowed to take from the District's aquifer would provide more water to District customers in the event of an emergency.</p>
Cyber Attack	<p>A Cyber-attack is a strike against the computer system, network, or internet-enabled application or device. Hackers use a variety of tools to launch attacks, including malware, ransomware, exploits kits, and other methods. Cyber-attacks are geared at particular organizations, services, and individuals to obtain private, technical, and institutional information and other intellectual assets for vandalism or monetary gain. Cyber-attacks have been steadily increasing around the globe and are estimated to cost \$1.5 trillion in 2018.</p>	<p>A Cyber-attack, such as ransomware, on the District's computer network, or SCADA network, would cause significant disruption and expense to the District. Without access to the system, the District would not be able to: process payments, answer customer service questions, process work orders, collect meter reads, and would lose access to history and current information. According to the Justice Department, there have been 176 of ransomware attacks on state and local governments so far in 2019.</p>	<p>The District needs to complete a risk assessment to identify any additional required controls and generate a plan based on that assessment. Further, the District can use that plan to implement the identified controls along with updates to policy and procedures to support the plan (i.e., backup policy, password policy, etc.). The District also needs ongoing training and staff education to minimize the risk of a cyber-attack.</p>
Dam Failure	<p>There are no dams located within the District boundaries. Dam Failure could impact the District's wholesaler, SPU. If the dam at Chester Morse Lake in the Cedar River Water Shed failed, the District could lose most or all of its water supply from SPU.</p>	<p>The primary source of water from SPU could be entirely or partially lost. It is possible that SPU could provide a limited amount of water from its north supply on the Tolt River. If long enough, the loss of the wholesale supply would affect firefighting ability due to reduced flow.</p>	<p>If the primary water supply from SPU were impacted, the District would be dependent on its WF and WTP to supply emergency water to its customers. The District needs to be able to produce the full amount of the District's water rights (450 gpm) and would require another well to do so. Having the ability to produce as much water as we are allowed to take from the District's aquifer would</p>

			provide more water to District customers in the event of an emergency,
Hazardous Materials Incident	Hazardous materials come in the form of explosives, flammable or combustible substances, poisons, and radioactive material. Hazards can occur during production, storage, transportation, use, or disposal. Hazardous Materials incidents could also happen on any of the roadways throughout the District as chemicals are transported on local roads.	The District uses several chemicals in its day-to-day operations, including, fluoride, chlorine, arsenic, etc. Damage to the District's WTP by earthquake, landslide, or flooding could cause a spill of hazardous materials. Also, a hazardous materials incident could be caused if a chemical supply truck was involved in an accident during chemical delivery or transportation.	Access to parts of the District, especially the WF and WTP could be blocked for extended periods and could cause the Wells and WTP to be inoperable. Chemical spills on the roadway could block access to part of the District for some time.
Public Health Emergency	A public health emergency is an emergency need for healthcare services to respond to a disaster, significant outbreak, or infectious disease bioterrorist attack or other significant or catastrophic event. Recent examples include flooding, severe weather, and the 2009 H1N1 influenza outbreak.	The District's most significant vulnerability would most likely be caused by a water quality issue creating a public health emergency. Outbreaks can be caused by water contaminated with pathogens, chemicals, or toxins, which can be spread through ingestion of, contact with, or breathing contaminated water. In addition, on-site storage of chemicals, gas and/or diesel could lead to a water quality or public health emergency. Proper storage, strapping and containment are required.	A public health emergency could expose people to non-potable water making them sick. A water quality event leading to customers becoming sick or a boil water notice could negatively impact the District's reputation and the trust that customers have in the District to provide them with safe water. A significant outbreak event could require a secondary (emergency) supply of water to District customers.
Structure Fire	A Structure fire is a fire involving the structural components of various types of residential, commercial, or industrial buildings. Between 2012 and 2016, on average, there were 88,850 structural fires per year. About seven people per day die in the United States from Structural fires.	All significant District structures would be at risk. These would include the District's buildings, including Administration, Operations, WTP, and eight pump stations are mostly at risk of damage from structural fire.	Loss of any of the District's buildings potentially impacts the District's ability to supply potable water to its customers. Damage could be either in an area of the District (i.e., a Pump Station fire) or to the entire District (i.e., Administration and Operations buildings). Damage to one of the District's main buildings would require operating out of a temporary location for an

<p>Terrorism</p>	<p>Terrorism is the unlawful use of violence and intimidation, especially against civilians in pursuit of political aims. Unlike other hazards, successful terrorist attacks reduce everyone's quality of life. They demoralize the population, and they restrict normal activities and interactions. Drinking water supply systems are vulnerable targets for terrorism. A spokesman for al-Qaeda has told an Arabic-language news magazine that the terror group will try to use poisons to attack the United States, specifically threatening to contaminate the nation's water supply. (The Washington Times, 2003 al-Qaeda warns of threat to the water supply.)</p>	<p>A drinking water contamination incident or the denial of drinking water services would have far-reaching public health, economic, environmental, and psychological impacts. Other critical services such as fire protection, healthcare, and heating and cooling processes would also be disrupted by the interruption or cessation of drinking water service, resulting in significant consequences to the national or regional economies (The Department of Homeland Security and US EPA, 2015). Impacts of water contamination can be substantial. A contamination event in a water system can adversely affect the people, the businesses, and the community it serves due to fear, loss of water service, high economic costs for decontamination and recovery, and the magnitude of adverse public health effects (Clark & Hakim, 2014).</p>	<p>extended period. Physical damage has consequences mainly related to the interruption of service and may also cause enormous economic harms. Vulnerable characteristics of water systems include their physical attributes, e.g., reservoirs, tanks, and pump stations. In addition to physical attributes, a water utility's SCADA could be vulnerable to cyber-attacks, for example, turning pumps on or off, filling, or emptying tanks inappropriately, or causing Water Hammer events (Clark & Hakim, 2014).</p>
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Earthquake Risk

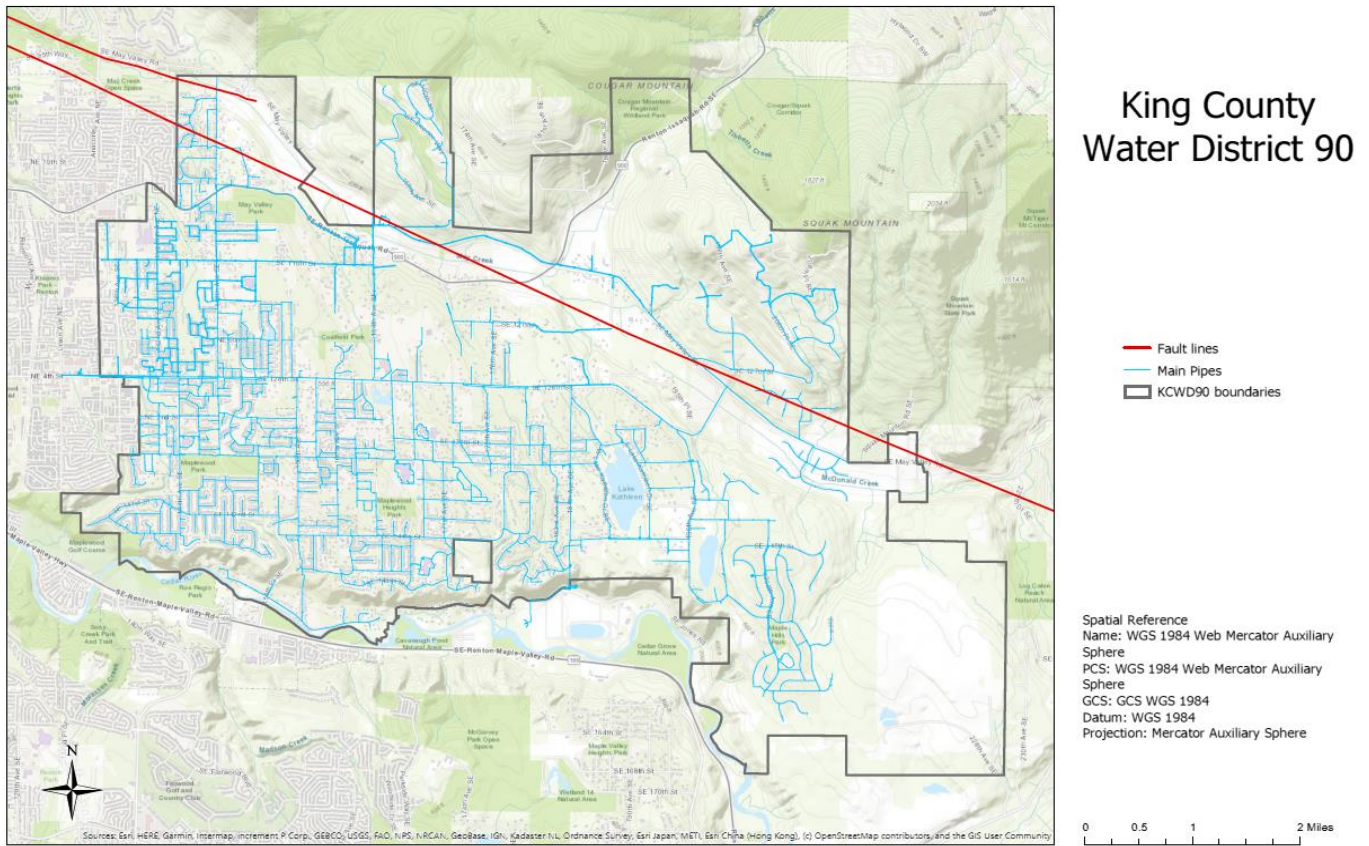


Figure 1: Earthquake Fault lines within King County Water District No. 90 boundaries

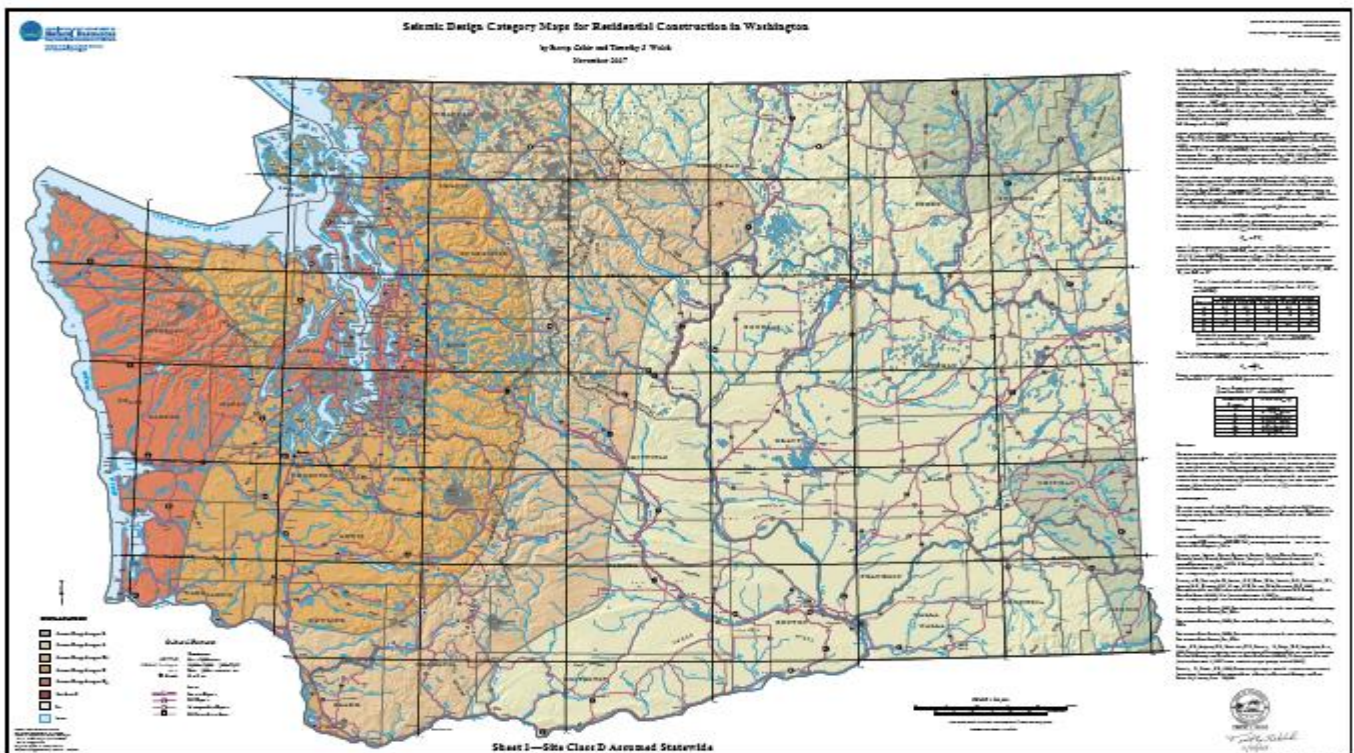


Figure 2: Earthquake Fault Zones within the State of Washington

Liquefaction Zones

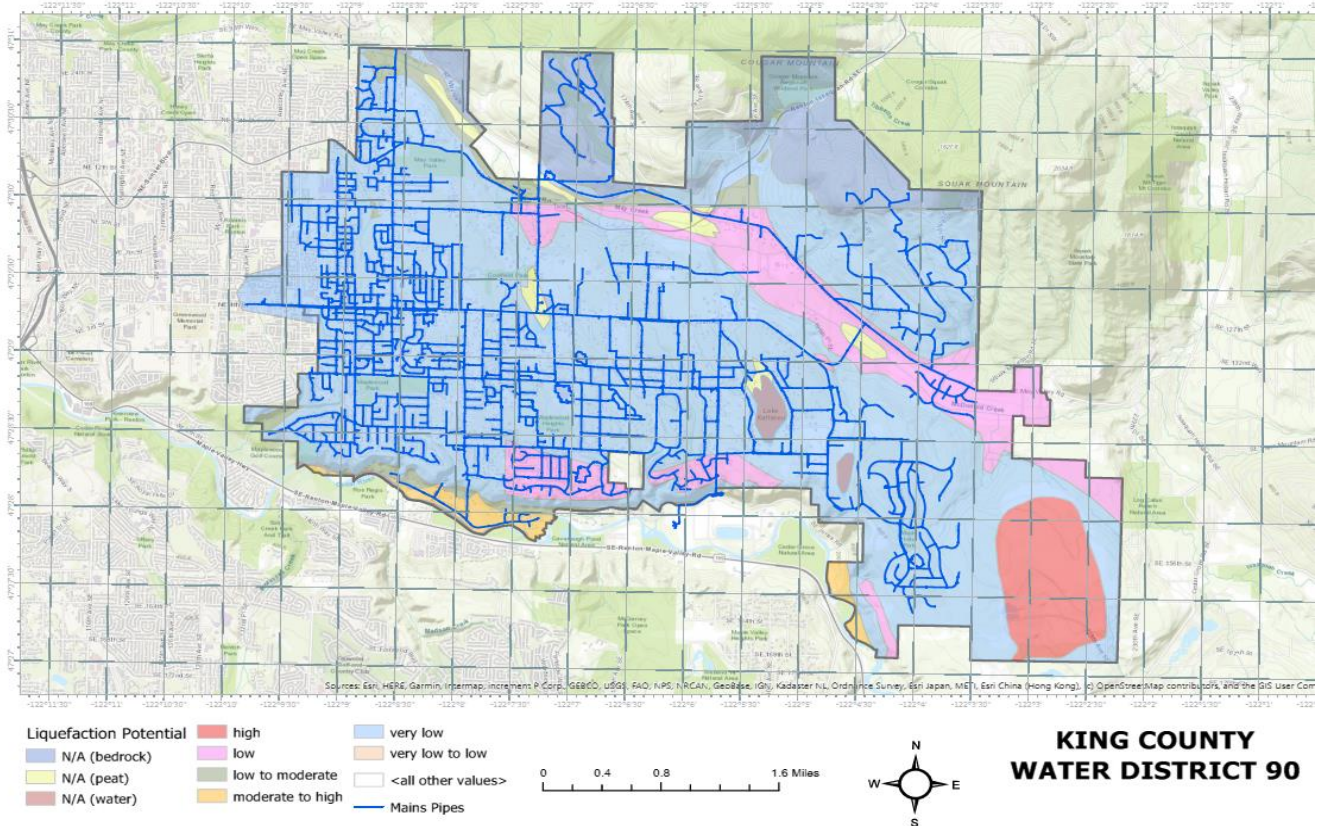


Figure 3: Liquefaction Risk within King County Water District No. 90 boundaries

Flood and Landslide Risk

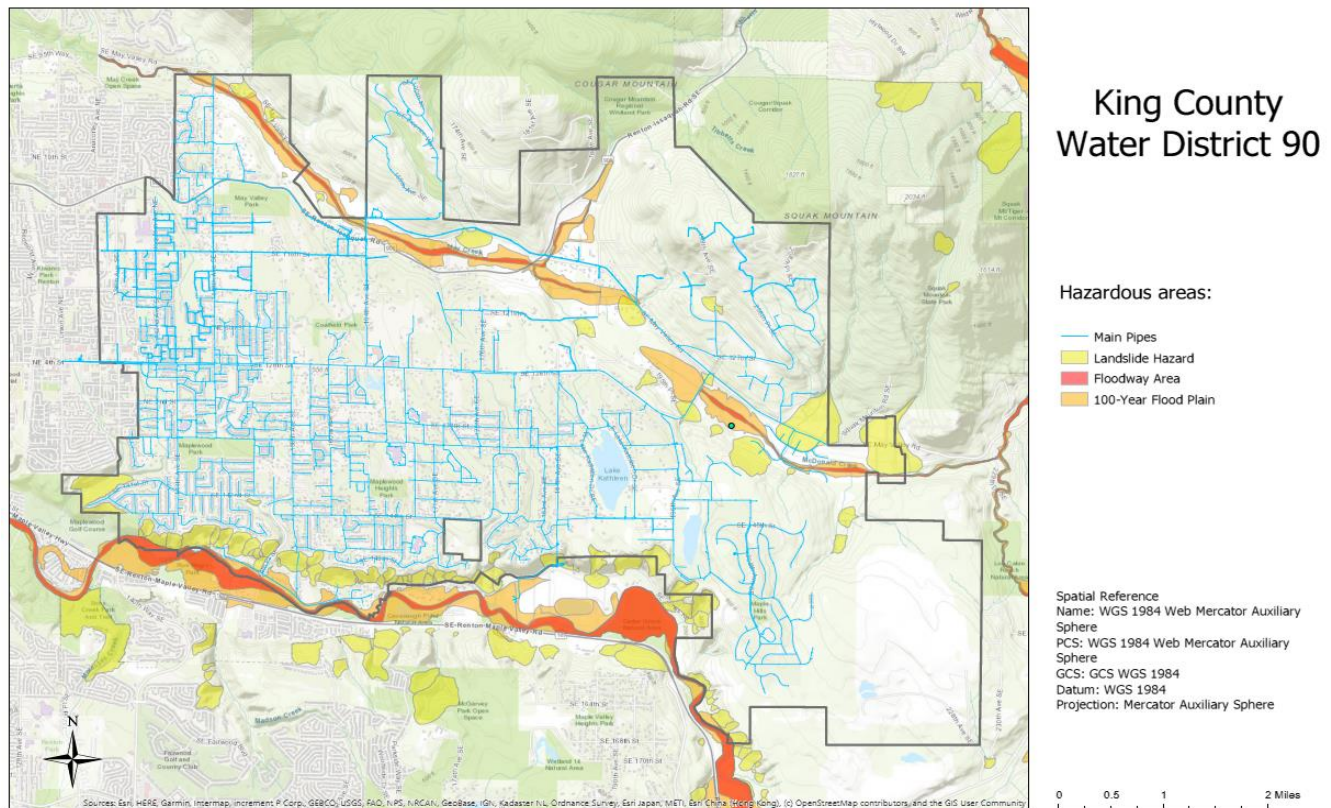


Figure 4: Flood and Landslide Risk within King County Water District No. 90 boundaries

Assets at Risk

ASSET	VALUE (\$)	RISK SUMMARY	VULNERABILITY SUMMARY	IMPACT SUMMARY
Water Treatment Plant	\$ 2,500,000	The Water Treatment Plant is the District's emergency water supply and is at risk of failure after a major event due to its location.	The District WTP is venerable to landslides from Earthquakes or rain events, flooding, and wildfires.	The wells and Water treatment Plant are the District's emergency supply, providing about 25% of total water consumption. The District's emergency supply is critical if its source from SPU is not available after an event.
Well Field	\$ 3,000,000	The District's Well Field and WTP work in conjunction. If water from the WF is limited, then the WTP will not function and the District would have no emergency supply of water.	The District WF is in the 100-year flood plain. EQ activity could shift the well casing and decrease the level of production.	The wells and Water treatment Plant are the District's emergency supply, providing about 25% of total water consumption. The District's emergency supply is critical if its source from SPU is not available after an event.
8 Pump Stations	\$ 6,500,000	The District provides water service for customers 316 feet to 1363 feet above sea level. It requires a number of Pump Stations to move this water from the valley to the tops of the many hills in the District.	Any of the pump stations are vulnerable to threats such as Wildfire, Terrorism, or Earthquake. Pump Stations at higher elevations (PS #4-#8) are at higher elevations and can be easily cut off from service if the road is not accessible.	If a Pump Station is out, customers within a particular zone or zones will not have potable water. It is possible that District tanks and pipes could depressurize and run dry.
8 Storage Reservoirs	\$ 13,000,000	Any one of the District's 8 reservoirs could depressurize and lose all of its stored water.	The District's reservoirs are very vulnerable to ground movement related to an Earthquake. Only Reservoir #1 has been seismically retrofitted.	Leaks in water mains or inlet/outlets on reservoirs could cause them to depressurize and lose all of the stored water. This would greatly reduce the amount of water available for people and firefighting. This could also create water quality concerns.

<p>124 Miles of water main</p>	<p>\$220,000,000</p>	<p>Water main breaks in any of the Districts transmission or distribution mains would mean that water would not be available to customers served by that water main.</p>	<p>All of the Districts water mains are vulnerable to ground movement from earthquakes. The District has about 12 miles of steel water main and 24 miles of asbestos cement water main that are more at risk than ductile iron water main. All fittings, regardless of main type, are at risk for movement and dislocation.</p>	<p>Main leaks would mean that water is unavailable to a certain portion of the system until the main is repaired. After a large event, such as an earthquake, there could be numerous mains in need of repair and lots of customers could be without water for an extended period of time.</p>
<p>800 Fire Hydrants</p>	<p>\$ 6,000,000</p>	<p>Fire hydrants are critical to the Fire department to fight fires. After a large earthquake it is expected that there would be numerous fires throughout the District.</p>	<p>The biggest risk to fire hydrant would be if there is no water in the main to serve the hydrants. In that case, there would be no water to fight a structure or wildfire event. Typically damage to just one fire hydrant can be mitigated with additional hoses to span the longer distance.</p>	<p>Customers and structures could be at risk of total loss if there is no water to fight fires.</p>
<p>20 Pressure Reducing Stations</p>	<p>\$ 3,200,000</p>	<p>Pressure Reducing Stations may stop working causing over pressurization of a Zone.</p>	<p>The areas that have only one pressure reducing stations would not have any potable water.</p>	<p>No potable water and no firefighting capacity in zones served by only one pressure reducing stations. Zones with two or more stations would have a decreased risk overall but can still fail and disrupt service.</p>
<p>Administrati on/Operatio ns buildings (Headquart ers)</p>	<p>\$ 5,500,000</p>	<p>It would be very difficult for the District to operate effectively if the Administration or Operations Buildings were impacted.</p>	<p>The District's Headquarters is where all of the financial, administrative, planning, and customer service functions take place. The HQ site could be vulnerable to earthquake, fire, severe weather or prolonged power outage.</p>	<p>Loss of one or both of the HQ's buildings would severely impact the District's operations. While the District's emergency response plan includes a secondary location to operate from if necessary, this would be very limited and slow operation until a more permanent location is available.</p>

Vactor Truck, Dump Truck & Backhoe	\$ 1,340,000	The District depends on large equipment like the Vactor, Dump Truck and Backhoe to make repairs to District infrastructure. Losing any of these pieces of equipment would slow down the recovery and repair process.	District large equipment assets could be impacted if there was not access to gas/diesel for an extended period of time, and/or if roads were not accessible.	It is critical after a major event that the District has the tools, the staff and the inventory to complete system repairs as quickly as possible. Losing some, or all, of these large pieces of equipment would slow down the repair process.
8 Generators	\$ 750,000	Generators are critical to extending service to areas that are cut off from power.	Generators that are damaged are not working, or that we cannot get to a specific location would decrease the District's ability to respond and recover after an event.	The generators allow the District to continue to provide water to a specific zone after a major event. It is a major component of the District's emergency response plan. Failure to deploy generators or damage to generators would mean that customers could be without water for much longer periods of time.

Plan Update Process

King County Water District No. 90 participated in the multijurisdictional planning process led by King County. The District's General Manager, Darcey Peterson, and Operations Manager, Joshua Drummond, participated in seven events, from December 2018 through August 2019, with King County representatives to prepare this Regional Hazard Mitigation Plan. Events included meetings with regional participants, such as other special purpose districts, cities, and county and state emergency personnel. Events also included work sessions, webinars, and a one-on-one work session with Derrick Hiebert, Hazard Mitigation Strategist with King County Emergency Management.

Internally the District prepared this Hazard Mitigation Plan by forming an internal planning team to discuss hazards and mitigation options. This team consisted of District staff, including the General Manager, the Operations Manager, the Field Foreman, Tim Johnson, and Tech 2, Gus Flather. The internal planning team met during June, July, and August 2019, on eight separate occasions dealing with one or two hazards per meeting. During these meetings, assets were identified, maps were reviewed, and potential hazards were discussed. This risk assessment process helped the team identify assets exposed or vulnerable to hazards. As each hazard was reviewed the internal planning team asked the following 7 questions related to assets impacted:

1. What is the hazard?
2. What assets are at risk due to this hazard?
3. What is the risk to those assets?
4. What other assets rely on that asset?
5. What affect does the loss of that asset have on my organization?
6. What affect does the loss of that asset have on my community?
7. What can I do to reduce or eliminate the risk to that asset from this hazard?

Jurisdiction Planning Team

Name	Title	Organization	Contribution
Darcey Peterson	General Manager	King County Water District No. 90	Data analysis & review, identification of strategies
Joshua Drummond	Operations Manager	King County Water District No. 90	Data analysis & review, identification of strategies
Tim Johnson	Field Foreman	King County Water District No. 90	Data analysis & review, identification of strategies
Gus Flather	Field Tech 2	King County Water District No. 90	Data analysis & review, identification of strategies
Kallibek Kazbekov	GIS Intern	King County Water District No. 90	Data analysis & review, identification of strategies
Byron Murgatroyd	Commissioner	King County Water District No. 90	Plan & Strategy review
Sam Amira	Commissioner	King County Water District No. 90	Plan & Strategy review
Richard Gidner	Commissioner	King County Water District No. 90	Plan & Strategy review

The answers to these questions were used to create a spreadsheet of impacts and possible mitigation strategies per hazard type. From these documents, Hazard Mitigation Strategies were developed. Frequently strategies for mitigation cover more than one hazard.

Additional meetings were held with SPU utilities regarding earthquake risk, Renton Regional Fire Authority regarding wildfire risk, City of Renton Emergency Management Personnel, and the District’s Board of Commissioners. The Commissioners met to discuss the draft plan and provide input on 5 separate occasions.

The District also engaged in public outreach as it prepared this Hazard Mitigation Plan. The District participated in King County Town Hall on June 19, 2019. At this meeting District staff took the opportunity to ask customers what hazards they were most concerned about. We also asked customers to participate in a survey that would be emailed to them at a later date. The second event was the National Night Out event on August 6, 2019. Again, District staff asked customers to indicate what hazards concerned them and then collected their email addresses so that customers could participate in the Districts emergency preparedness survey. The following tables detail the District’s public outreach program as it relates to this Hazard Mitigation Update.

Public Outreach Events

EVENT	DATE	SUMMARY	ATTENDEES
Public Outreach	6/19/2018	King County Town Hall	Management Team and Public
Public Outreach	7/1/2019 - 8/15/19	Customer Survey	District Customers
Public Outreach	8/6/2019	National Night Out (2 locations)	Management Team, Commissioners and Public

The District sent out a “Regional Hazard Mitigation Survey” to about 1,200 customers during the summer of 2019. Of these, 196 (16%) completed surveys were returned. The survey queried customers about what hazards they had personally experienced, what hazards they were most concerned about, how prepared for a major event their household is, and who they believe is responsible for preparing for a major hazard. The responses were reviewed by the internal planning team and the Board of Commissioners.

Meetings with other jurisdictions, map/data reviews, extensive research, meetings with the internal planning team, and input from District customers have helped District staff develop and prioritize potential mitigation strategies.

Going forward, successful completion of developed strategies will be contingent on grants and/or loans received, available District funding, staff and partner (i.e. engineering) workload, and the completion of needed information or studies. Strategies may be reprioritized or canceled completely based on these and other factors. The project list will be reviewed annually with the Capital Budget review.

The following “Plan Update Timeline” chart details the training, meetings, and work sessions necessary to complete this Hazard Mitigation Update.

Plan Update Timeline

Planning Activity	Date	Summary	Attendees
Regional Hazard Mitigation Workshop	12/13/2018	Risk Assessments	Regional Participants
KC RHMP Jurisdiction Meetings	2/20/2019	Plan update requirements	Management Team and King County Contact
Planning Process Webinar	6/3/2019	Planning Process Webinar	Management Team and King County Contact
Regional Hazard Mitigation Workshop	6/10/2019	HMP Workshop	Regional Participants
Hazard Identification / Strategy Meeting	6/13/2019	Earthquakes	District Team
Hazard Identification / Strategy Meeting	6/18/2019	Landslide and Flooding	District Team
Smoke, Heat, and Wildfire Risk	6/18/2019	Wildfire	Regional Participants
King County - Smoke, Heat & Wildfire Risk	6/19/2019	Wildfire	District General and Operations Manager
EPA Webinar - Utility Examples to Mitigate Earthquake Impacts	6/19/2019	Earthquakes	District General and Operations Manager
Seattle Public Utilities - Earthquake Research	6/25/2019	Earthquakes	District Commissioners, Team, Engineer
Hazard Identification / Strategy Meeting	6/25/2019	Severe Weather	District Team
Hazard Identification / Strategy Meeting	7/9/2019	Wildfire and Volcano	District Team, Fire Chief City of Renton
Hazard Identification / Strategy Meeting	7/10/2019	All Hazards - Brainstorming	All District Staff
Hazard Identification / Strategy Meeting	7/16/2019	Civil Disturbance, Cyber Attack, Dam Failure	District Team
Hazard Identification / Strategy Meeting	7/23/2019	Hazardous Materials & Public Health	District Team
Overview of Plan, Legal Requirements	7/23/2019	Outline and Legal Requirements	Management Team and Commissioners
Regional Hazard Mitigation Workshop	7/25/2019	Developing Good Strategies	Regional Participants
Hazard Identification / Strategy Meeting	7/30/2019	Structure Fire and Terrorism	District Team
City of Renton - Emergency Management Group	8/1/2019	COR Hazard Mitigation Plan	City of Renton Emergency Management Team (including Renton Fire), Coal Creek Utility District.
Hazards and Problem Statement Review	8/5/2019	Strategy Review	Management Team and Commissioners
Hazard Identification / Strategy Meeting	8/13/2019	Reviewing other plans	District Team
Hazard Identification / Strategy Meeting	8/14/2019	Prioritization of Strategies	Management Team and Commissioners
Regional Hazard Mitigation Workshop	8/22/2019	Grant Applications	Regional Participants
Plan Review and Consistency	8/27/2019	Reviewing other plans	Management Team and Commissioners
Hazards and Problem Statement Review	8/28/2019	Final Draft Review	Management Team and Commissioners

Jurisdiction Hazard Mitigation Program

Hazard mitigation strategies were developed through a two-step process. Each jurisdiction met with an internal planning team to identify a comprehensive range of mitigation strategies. These strategies were then prioritized using a process established at the county level and documented in the base plan.

Plan Monitoring, Implementation, and Future Updates

King County leads the mitigation plan monitoring and update process and schedules the annual plan check-ins and bi-annual mitigation strategy updates. Updates on mitigation projects are solicited by the county for inclusion in the county-wide annual report. As part of participating in the 2020 update to the Regional Hazard Mitigation Plan, every jurisdiction agrees to convene their internal planning team at least annually to review their progress on hazard mitigation strategies and to update the plan based on new data or recent disasters.

As part of leading a county-wide planning effort, King County Emergency Management will send to planning partners any federal notices of funding opportunities for the Hazard Mitigation Assistance Grant Program. Proposals from partners will be assessed according the prioritization process identified in this plan and the county will, where possible, support those partners submitting grant proposals. This will be a key strategy to implement the plan.

The next plan update is expected to be due in April 2025. All jurisdictions will submit letters of intent by 2023, at least two years prior to plan expiration. The county will lead the next regional planning effort, beginning at least 18 months before the expiration of the 2020 plan.

Continued Public Participation

King County and its partner cities already maintain substantial public outreach capabilities, focusing on personal preparedness and education. Information on ongoing progress in implementing the hazard mitigation plan will be integrated into public outreach efforts. This will provide King County residents who are already engaged in personal preparedness efforts with context and the opportunity to provide feedback on the county's progress and priorities in large-scale mitigation. In the vertical integration of risk-reduction activities from personal to local to state and federal, it is important that the public understand how its activities support and are supported by larger-scale efforts.

The outreach and mitigation teams will also continue to work with media and other agency partners to publicize mitigation success stories and help explain how vulnerabilities are being fixed. When possible, public tours of mitigation projects will be organized to allow community members to see successful mitigation in action.

National Flood Insurance Program (NFIP)

As a Special Purpose District, King County Water District No. 90 is not subject to the NFIP.

Hazard Mitigation Capabilities

The District has created 14 Strategies to increase its resiliency to natural and man-made disasters throughout the Service Area. Each year, in conjunction with the annual Operating and Capital budget review, District staff and Commissioners will review and reprioritize projects, if necessary, identified by Hazard Mitigation Strategies.

Both budgets include projects identified in the Comp Plan and this Hazard Mitigation Plan. For example, the District has an ongoing water main replacement program with a goal of replacing, on average, one mile of water main per year.

Capital projects are currently funded by District rates, loans, and grant programs. The District is also able to get bond funding if necessary, to complete projects.

Goals are broad policy statements of the community's vision for the future. They help describe the contribution each strategy makes toward major objectives that reach beyond any individual department or discipline. In alignment of this and with the Plan's purpose, King County's Regional Hazard Mitigation Steering Committee adopted King County's Determinants of Equity as Mitigation Plan Goals:

1. Access to Affordable, Healthy Food
2. Access to Health and Human Services
3. Access to Parks and Natural Resources
4. Access to Safe and Efficient Transportation
5. Affordable, Safe, Quality Housing
6. Community and Public Safety
7. Early Childhood Development
8. Economic Development
9. Equitable Law and Justice System
10. Equity in Government Practices
11. Family Wage Jobs and Job Training
12. Healthy Built and Natural Environments
13. Quality Education
14. Strong, Vibrant Neighborhoods

Hazard Mitigation Authorities, Responsibilities, and Capabilities

Plans

When plans and planning processes are more integrated, it is possible to achieve greater impact through clearer definitions, smarter investment, and partnerships. Successful integration requires regular review of the District’s Planning documents.

The District has a history of combining Hazard Vulnerability Strategies with the annual update of the District’s Capital Infrastructure Plan and Capital Spending Plan (budget). The 2015 Hazard Mitigation Strategies were included in the 2015 Comp Plan. In addition, every Fall the District Board and Management Team review the strategies and incorporate them into Capital Program projects and goals. Some strategies are not feasible until there are additional grants or loans available.

Along with the plans below, the District is currently in the process of creating a Strategic Planning Plan, as well as an Asset Management Program that will be integrated with the plans below and the Hazard Mitigation Plan going forward.

PLAN TITLE	RESPONSIBLE AGENCY	POINT OF CONTACT	RELATIONSHIP TO HAZARD MITIGATION PLAN
Comprehensive Plan	KCWD 90 & Washington Department of Health	Darcey Peterson	The District's most recent Comp Plan was finalized in 2015. The Plan identifies critical District assets, anticipated growth and system demand, and the long-term CIP program. The Plan data was used to inform the Hazard Mitigation Plan. Strategies developed are consistent with Comp Plan goals and future capital spending plans.
Comprehensive Emergency Management Plan	KCWD 90	Joshua Drummond	The District's Emergency Response Plan (ERP) is currently in the process of being updated. The strategies developed in the Hazard Mitigation update will be used to further update the ERP.
Capital Facilities Plan	KCWD 90	Darcey Peterson	The District's Capital Plan is reviewed in January of every year. Changes to priorities and needs are translated to a six-year Capital Spending Plan. The goals and strategies developed in the Hazard Mitigation Plan are approved and funded through the Capital Facilities Plan.

Hazard Mitigation Strategies

2015 Hazard Mitigation Strategy Status

STRATEGY	DESCRIPTION	PRIORITY	STATUS
WD90-1—Continue to support county-wide initiatives identified in part 3 volume 1 of this plan.	County-wide initiatives	Low	Ongoing
WD90-2—Participate in the plan maintenance identified in part 3 volume 1 of this plan.	County-wide initiatives	Low	Ongoing
WD90-3—Seismic upgrades/retrofits to District Pump Stations 4,5,6,7, and 8 including building, electrical systems with variable frequency drivers and auto transfer switches.	Applied for FEMA grant for High Valley Pump Stations (PS #4, 5 & 6) in Sept 2016. Total estimated cost is \$725,000 to upgrade. FEMA is still considering our application	Medium	Ongoing
WD90-4—Training and Testing of Emergency Power System.	Monthly testing, quarterly training.	Low	Ongoing
WD90-5—Harden Water System – Replace 14,000+’ of 10” AC Pipe with 12” DI Pipe – 550 & 744 Zones.	No current main replacements are for A/C main	Medium	No Progress
WD90-6—Harden Water System – Replace 18,000+’ AC & Steel Pipe with 8’ DI Pipe – 744 & 804 Zones.	1) Zone 744 “Lake McDonald Project” Replace 3,800’ of AC pipe with 8” & 12” pipe DI Pipe – 2017. 2) “West Lake Kathleen Project” Loan Approved – Replace 5,500’ of AC and Steel Pipe with 8” DI Pipe, also install 2,900’ of 12” DI pipe – 2019 Total of 12,200 Feet of Pipe.	High	Ongoing
WD90-7—Public Awareness and Emergency Preparedness Program.	Increased community outreach significantly.	Low	Ongoing
WD90-8—Enhance Communications with UHF Radio System.	Added additional CB radios to vehicles & equipment. The District has determined that participation in PSERN (Puget Sound Emergency Response Network) is a more effective solution.	Low	On Hold
WD90-9—Harden Telemetry System and Communications with Radio/Cellular – Pump Stations 1, 2, 3, 4, 5,6,7,8, Well and Water Treatment Plant.	Completed Telemetry Strategic Plan 2016. Upgrade Communications at PS#1 in 2019. Wells, WTP, PS #2 planned for 2020.	Low	Ongoing
WD90-10—Pump Stations Bypass System – Pump Stations 4, 5, 6, 7, and 8 – Provides the ability to pump around a pump station after a full failure of the Electrical system.	No work completed.	Low	Ongoing

<p>WD90-11—Install 2,300’ for 8” DI water main and PRV station on 154th PL SE from Jones Rd to SE 142nd PL (Only main serving this area is in a landslide prone area).</p>	<p>No work completed</p>	<p>Medium</p>	<p>On Hold</p>
<p>WD90-12—Install Third Pump with variable frequency drive at Pump Station #2 for emergency supply to 744 and 804 zones, Landfill and Co-Generation Plant.</p>	<p>Contract for Engineering Services approved June 2019. Construction anticipated by end of 2019.</p>	<p>Medium</p>	<p>Ongoing</p>
<p>WD90-13—Install 500,000-Gal Storage Tank Maple Hills for 744 and 804 zones for emergency supply.</p>	<p>Growth in the area has slowed considerably. Additional Storage Tank is not needed at this time.</p>	<p>Medium</p>	<p>On Hold</p>

2020 Hazard Mitigation Strategies

Strategy	Lead Agency/POC	Timeline	Priority
Relocate Well Field and Water Treatment Plant	King County Water District No. 90	2019-2023	1
Add Intertie with City of Renton and/or Coal Creek	King County Water District No. 90	2020-2024	2
Site Specific Community Survey	Department of Natural Resources	2019-2020	3
Harden Water System	King County Water District No. 90	2020-2024	4
Emergency Response Training and Exercises	King County Water District No. 90	2019-2024	5
Seismic Upgrades / PS#4 - #8	King County Water District No. 90	2021-2022	6
EOC & Emergency Water Distribution	King County Water District No. 90	2022-2026	7
Cyber Resiliency	King County Water District No. 90	2019-2021	8
Seismic upgrades to District Tanks	King County Water District No. 90	2022-2026	9
Communication Resiliency	King County Water District No. 90	2019-2021	10
Wildfire Resiliency	King County Water District No. 90	2019-2024	11
New Garage / EOC	King County Water District No. 90	2022-2028	12
Increase Security at District Locations	King County Water District No. 90	2020-2024	13
Harden Existing Well and Water Treatment Plant	King County Water District No. 90	2023-2028	14