2022

Utah Seismic Safety Commission Recommendations

Dear Utah Policymakers,

The five recommendations presented by the Utah Seismic Safety Commission outlined in this report were developed after extensive collaboration with Envision Utah and a wide variety of stakeholders and enjoy our full support. Accomplishing these recommendations will significantly increase Utah's resilience to a seismic event and will help ensure Utah can quickly recover and remain a great place to live after the "Big One." While there are many other steps that can be taken to improve Utah's resilience, these five recommendations were selected as the most highly leveraged strategies at this time.

Seismic experts tell us that the Wasatch Front region has a 43% chance of experiencing a magnitude 6.75 or greater earthquake in the next 50 years. Should such an event happen, Utah's way of life could be impacted for many years. Without proactive measures, an expected M 7.0 earthquake on the Salt Lake City segment of the Wasatch fault ("The Big One") would be among the deadliest disasters in U.S. history. It would leave hundreds of thousands of Utahns without shelter and critical lifeline services for many months.

Utahns have worked for decades to build a high quality of life and strong economy. The loss of infrastructure and income in "The Big One" would result in short term economic losses estimated at $33.2 billion. Long-term losses would undoubtedly be much larger as people leave, many never to return, and businesses close, many never to reopen. Other places that have experienced this level of disaster, including New Orleans and Christchurch, still have not recovered.

Utahns are known for their focus on preparing for the future. For this reason, policymakers have already exercised foresight through, for example, creating the Utah Seismic Safety Commission and helping fund an inventory of seismically risky schools. **We urge all policymakers to build on this tradition by supporting, funding, and implementing the recommendations in this report.**

We are proud to be Utahns and want to ensure our state is resilient for future generations.

Thank you for your consideration,

Executive Summary

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FEMA has called the Wasatch Fault "one of the most catastrophic natural threat scenarios in the U.S."[1] With a significant risk of a major earthquake in the coming decades and projected impacts that would severely damage the Utah economy, Utah could face a disaster similar in magnitude to some of the most devastating hurricanes and earthquakes in U.S. history.

Because of this threat to the state, the Utah Legislature, ever interested in preparing Utah for the future, created the Utah Seismic Safety Commission (USSC) in 1994, and tasked it with reviewing earthquake-related hazards and risks, preparing and prioritizing recommendations to mitigate those hazards and risks, and presenting those recommendations to state and local governments.

This report contains the Commission's recommendations for targeted, prioritized steps that will mitigate the impacts of a major earthquake. While these actions will not eliminate all or even most of the severe damage that will occur, they have the potential to significantly reduce the initial devastation and enable the state to recover more quickly. These recommendations have been discussed and vetted with a variety of experts and key stakeholders and were coordinated with Envision Utah's disaster resilience working groups, with the Structural Engineers Association of Utah, with the Utah chapter of the Earthquake Engineering Research Institute, and with Utah's largest water conservancy districts.

1. https://www.fema.gov/sites/default/files/documents/fema_wasatch-front-urm-risk-reduction-strategy.pdf

What we can do to save lives and the economy

The USSC recommends the following prioritized actions:

1. KEEP WATER FLOWING

Invest in seismic improvements for the four major water aqueducts that serve over two million residents. These aqueducts were built generations ago and pass through landslide and/or hazardous fault areas. Should any one of these pipelines rupture in an earthquake, many hundreds of thousands of Utahns would be left without water for six months or even longer. The potential effects on Utah's economy are incalculable. The total cost of improving these four pipelines is approximately $192 million. This is less than the cost of expanding three miles of U.S. 89 in Layton into a freeway or of building three freeway interchanges on Bangerter Highway.[2]

2. KEEP OUR KIDS SAFE

Significantly limit the danger to tens of thousands of Utah children who attend school in seismically unsound buildings. Build on prior legislative funding for school inventory work by providing financial assistance to local education agencies (LEAs) to conduct feasibility studies for retrofitting or replacing URM buildings. Allocate $3.5 million for this purpose to the applicable LEAs over the next three years.

3. KEEP OUR COMMUNITIES AND MARKETS INFORMED

Increase public awareness of the high risk from Utah's 140,000 unreinforced masonry (URM) buildings. These buildings, built before 1976, are scattered across the state and include single-family homes, multifamily structures, and offices. The vast majority of deaths and injuries will happen in these buildings, yet public awareness of the risk is low. Improved public awareness will increase market function and efficiency and apply market pressure to upgrade more of these buildings. A good public awareness campaign would cost $200,000 over two years.

4. KEEP OUR BUILDINGS STANDING

Ensure adequate building code enforcement. Rigorous structural plan reviews by independent and qualified experts, particularly for larger, complex buildings, can improve seismic safety of structural systems and possibly prevent very expensive—and potentially deadly—issues in an earthquake. Inspections can catch calamitous mistakes and ensure building owners are getting a code compliant building. Specifically, the USSC recommends that every building classified as International Building Code Risk Category III or IV (e.g., a hospital, school, or police station) or larger than 200,000 square feet be required to undergo a plan review conducted by a Utah-licensed Professional Structural Engineer.

5. KEEP UTAH READY TO RESPOND

Invest in a feasibility study for an Earthquake Early Warning System. Allocation of funds will support the development of a feasibility study by the USSC on the possible implementation of an Earthquake Early Warning system in Utah. The early warning system can save lives and the economy by providing tens of seconds of warning time to shut off various industrial, utility, and transportation systems before ground shaking begins. Utahns would have enough time to prepare for ground shaking and seek shelter. The feasibility study would be a one time cost of $150,000 with the funds administered through the Utah Geological Survey.

2. https://www.ksl.com/article/46739257/udot-announces-top-10-construction-projects-for-2020

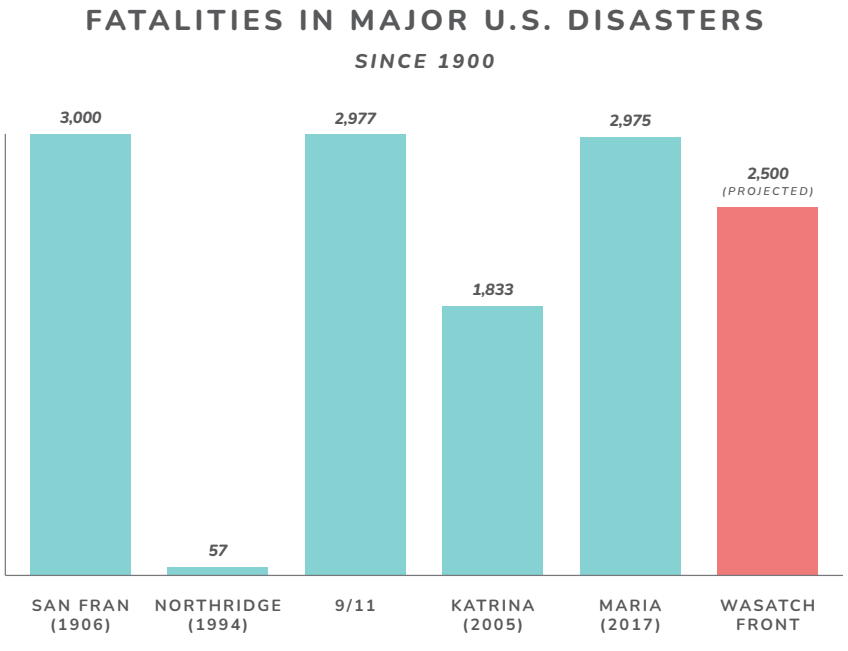
Introduction & Background

The Salt Lake Temple is currently undergoing a major seismic upgrade to prepare for the "Big One."

Utah's economy and way of life may never fully recover from the "Big One." Utahns have worked for decades to build a strong economy and high quality of life, but three known risks could quickly halt our success in its tracks, setting our economy back decades. The first two, a deadly pandemic and a dire drought, are occurring now, although arguably at non-catastrophic levels. The third, a major earthquake along the Wasatch Front, is not unlikely in the coming years. As of 2017, the Wasatch Front region has a 43% chance of experiencing a magnitude 6.75 or greater earthquake in the next 50 years.[3] In other words, the Wasatch Front's odds of experiencing "the Big One" are essentially equivalent to a coin toss. Should such an event happen, Utah's economy and way of life could be impacted for many, many years. Other places that have experienced this level of disaster in recent decades, including New Orleans and Christchurch, still have not recovered.

Experts project that a magnitude 7.0 earthquake along the Wasatch Front region would be among the deadliest disasters in U.S. history. "The Big One" would also leave hundreds of thousands of Utahns without shelter and disrupt critical lifeline services—including water, sewer, electricity, natural gas, and transportation—for large portions of the population. **The loss of infrastructure and income in "The Big One" would result in short term economic losses estimated at $33.2 billion in 2015, and significantly higher if estimated today.**[4] Long-term losses would undoubtedly be much larger, as people leave, many never to return, and businesses close, many never to reopen.

Investing in Utah's disaster resilience now helps to decrease the risk of true catastrophe, and it also makes clear economic sense. Recent research by the Federal Emergency Management Agency (FEMA) shows that, on average, **every dollar spent on disaster mitigation now avoids six dollars in future disaster costs.**[5] Few other types of investments can boast that kind of economic payoff.



3. https://eeri.org/images/regional/2016-Utah-Chapter.pdf
4. https://utah.eeri.org/wp-content/uploads/2015/08/EERI_Scenario_-_FINAL_VERSION_July_16_2015.pdf
5. https://www.fema.gov/sites/default/files/2020-10/fema_national-

Recommendations

Upgrade Water Infrastructure

Water infrastructure resilience is one of Utah's most critical needs in the face of an expected large earthquake.[6] **In the event of a major earthquake on the Wasatch fault, water and sewer service across the Wasatch Front is projected to be disrupted for more than a million people for many months**. Unlike freeway infrastructure, which is rebuilt far more often (at a much higher cost), much of Utah's major water instructure is over 50 years old. The Wasatch Front's most important aqueducts are located across and along major hazardous faults, landslide areas, high ground shaking areas, and liquefaction areas, putting them at high risk for significant damage.

A plausible modeling scenario estimated that around 330,000 homes, or roughly one million people, will still be without water three months after a major Wasatch fault earthquake event.[7] Not only is water essential for life and for disaster response on the Wasatch Front, but it is essential for Utah's economy.[8] Businesses along the Wasatch Front that are at risk of losing water contribute to more than 75% of Utah's economy.[9] Moreover, water is a critical aspect of other infrastructure and services, including power, medical care, and fire response. Without water, interdependent systems and infrastructure will remain offline.

The impacts will extend to the rest of Utah, as well as the greater Intermountain West, which is reliant on food, fuel, and other supplies sourced in the Wasatch Front. If Utah's communities are without water for months, businesses will collapse and families will relocate. As a result, Utah's economy would take years, even decades, to recover.

Unlike our freeways, much of Utah's aqueduct infrastructure has not been updated for generations.

mitigation-investment-strategy.pdf

6. https://ussc.utah.gov/pages/view.php?ref=1288#
7. https://utah.eeri.org/wp-content/uploads/2015/08/EERI_Scenario_-_FINAL_VERSION_July_16_2015.pdf
8. https://utah.eeri.org/wp-content/uploads/2015/08/EERI_Scenario_-_FINAL_VERSION_July_16_2015.pdf

PROPOSED WATER PROJECTS

The USSC recommends four critical water projects for protecting the supply of water to the Wasatch Front following an earthquake and subsequent aftershocks. The four projects on the following pages relate to large pipelines, called aqueducts, that carry water across the Wasatch fault or through high ground shaking and liquefaction areas. They provide a majority of the water for our most populated areas.

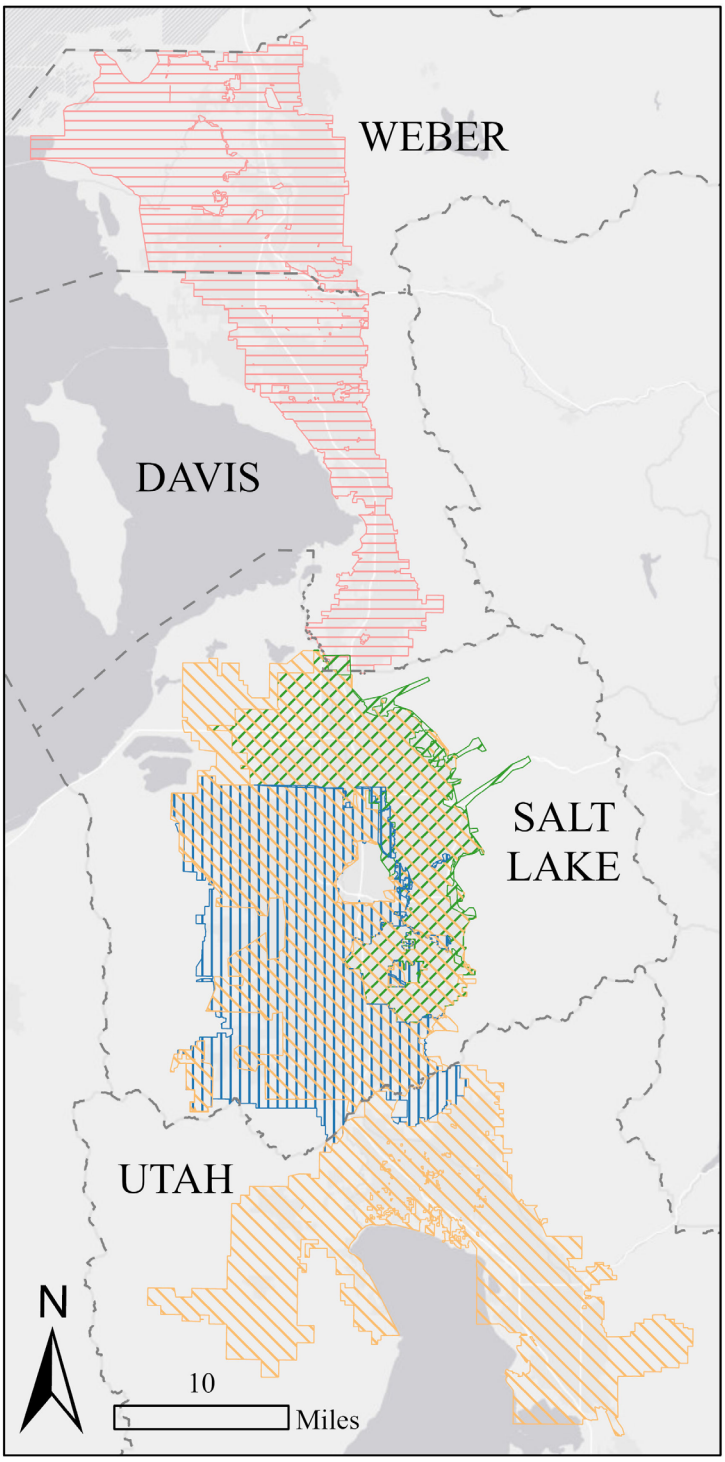
Without water from these four main aqueducts, other seismic upgrades to the water and sewer system will have negligible impact because there will be no water in the network. Additionally, if an aqueduct were to rupture, flooding would follow, although the specific impacts have yet to be modeled.

From a water supply standpoint, the Wasatch Front is a unique metropolitan area. We are far more at risk from a major seismic event. Not only does much of Wasatch Front water come from a great distance through the dams, tunnels and aqueducts of the Central Utah Project, the Provo River Project, and the Weber Basin Project, the vast majority of this water crosses the Wasatch Fault in three major aqueducts as it enters our urban valleys. The fourth aqueduct in this list does not cross the fault; however, it is located in a predicted high ground shaking and liquefaction area.

These massive aqueducts were built three generations ago, before the seismic risks of the Wasatch fault were understood, and it is unlikely that they will withstand the “Big One.” These four projects have been identified by their respective water districts, who have estimated upgrade costs. Some of these projects are also included in the Prepare 60, but funding limitations have delayed a launch. **Each of the listed aqueduct projects can be completed at a cost that is equivalent or less to building roughly one freeway interchange.**

Funding upgrades now will greatly reduce the repair time and costs in the future. A barrier to recovery time is that spare parts cannot be kept on hand or in storage for these aqueduct projects, and would have to be custom manufactured and brought in from outside the state after the earthquake. These aqueduct projects will reduce the chance that major repairs are needed, making them a key element of accelerating Utah’s recovery.

Areas Served by Aqueduct Projects

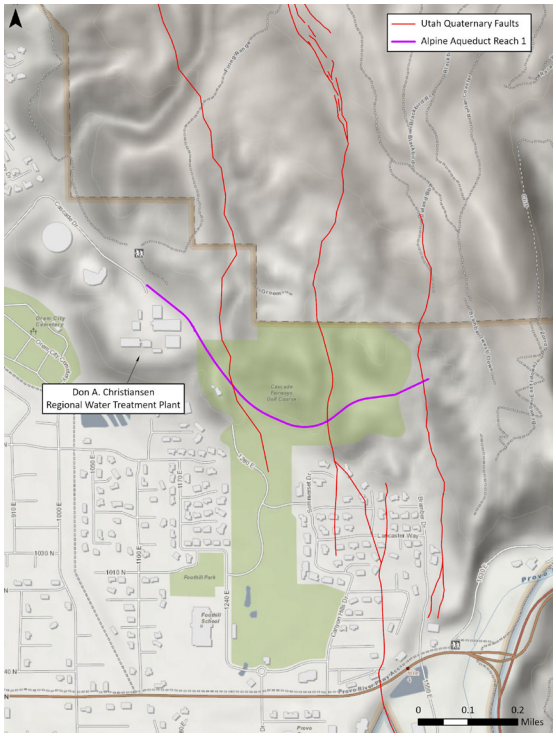


ALPINE AQUEDUCT RELOCATION | CENTRAL UTAH WATER CONSERVANCY DISTRICT

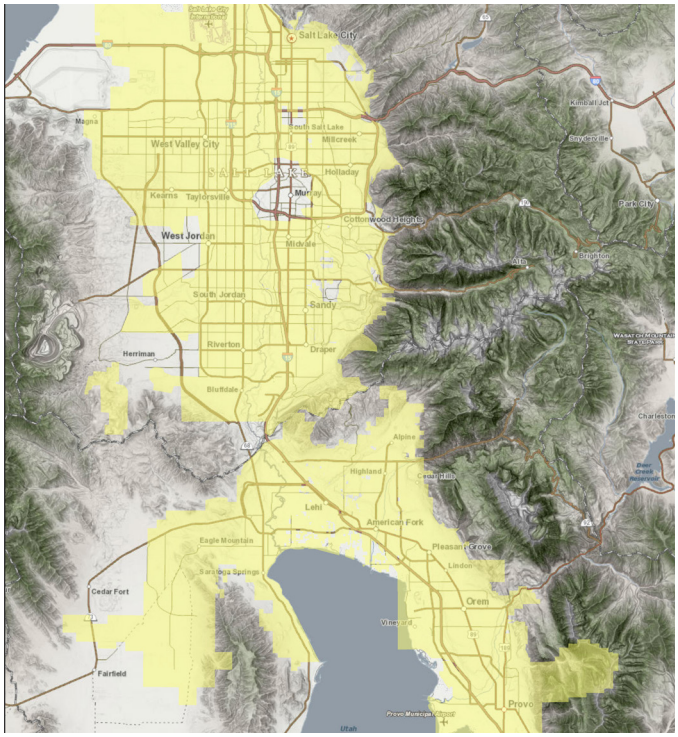
The Alpine Aqueduct brings water from the Central Utah Project to Utah and Salt Lake Counties, **serving more than one million people**. Reach 1 of the aqueduct is critical to delivering water to the Don A. Christensen Regional Water Treatment Plant for Salt Lake County and northern Utah County. The aqueduct runs close to and across the mapped traces of the Wasatch fault and through active landslide areas that have already damaged the pipeline. A large magnitude earthquake would likely rupture the ground beneath the aqueduct, and strong shaking from aftershocks could continually weaken infrastructure and slow repairs.

The district keeps some spare materials on hand for minor repairs over a short length of the aqueduct, but it is not feasible to store materials for repairing a long section. As a result, repairing damage from a minor earthquake could take days to weeks. If the aqueduct were to suffer major damage over a longer length, the materials would need to be custom manufactured and could take six months or more to secure materials and make the repairs.

A portion of this aqueduct needs to be relocated to a new alignment to ensure water deliveries through the Alpine Aqueduct Reach 1 continue without incident. The approximate cost for this project is $50M.

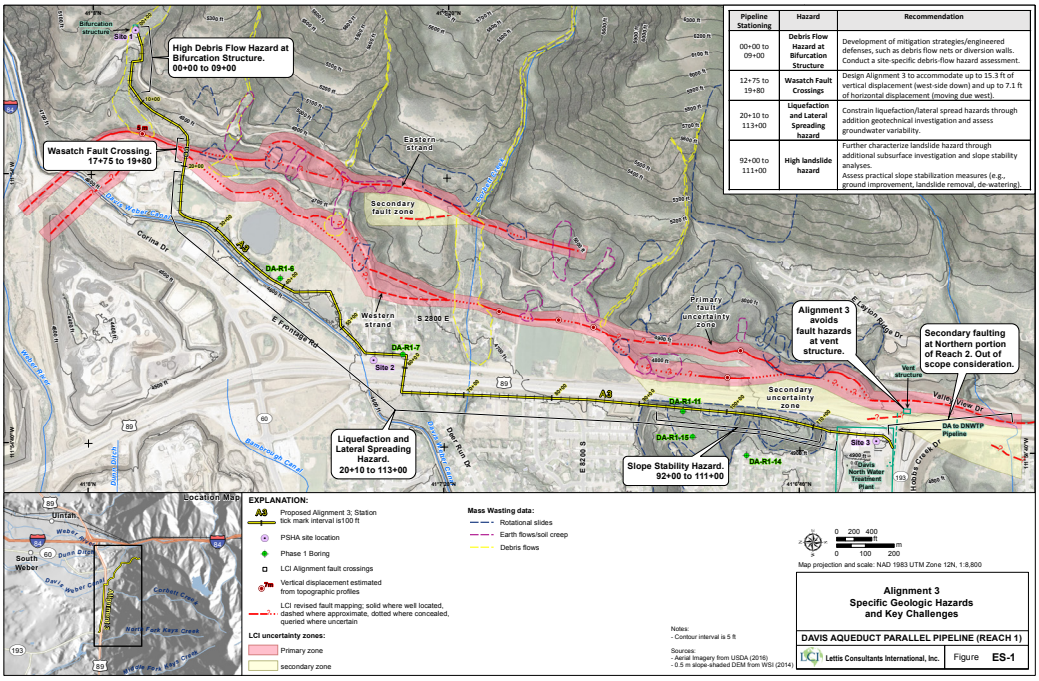


The Alpine Aqueduct (purple) crosses faults (red) in multiple locations as well as a known landslide area.



The Alpine Aqueduct serves over one million people in both Salt Lake and Utah counties.

DAVIS AQUEDUCT REDUNDANT PIPELINE | WEBER BASIN WATER CONSERVANCY DISTRICT



The Davis Aqueduct cross the fault in multiple locations as well as a known landslide area.

One of the primary water sources in northern Utah is the Weber River. A diversion off this river directs water through a tunnel known as the Gateway Tunnel. After the outlet of the tunnel, a bifurcation structure directs water north through the Weber Aqueduct and south through the Davis Aqueduct. The Davis and Weber Aqueducts provide raw water for agriculture and culinary water **used by approximately 621,000** people along the Wasatch Front.

The Davis Aqueduct is highly vulnerable to seismic and other geologic hazards. If the Davis Aqueduct were ruptured, the entire system, including the Weber Aqueduct, would have to be shut down at the bifurcation structure because splash-over within the bifurcation structure would allow water to flow into the damaged Davis Aqueduct. As a result, water supply to the entire population of 621,000 would be disrupted.

Due to the age, size, and complexity of installation associated with the aqueduct, as well as the anticipated damage from an earthquake, significant spare parts are not readily available. The ultimate downtime associated with aqueduct failure is difficult to determine as there are multiple factors impacting repair, such as the extent of damage to the aqueduct, labor availability, potential flooding or other degradation of access to the aqueduct, and material availability in Utah. It is reasonable to assume that the downtime could easily exceed six months.

The Weber Basin Water Conservancy District has studied the construction of a parallel aqueduct project in Davis County. This project consists of the construction of a parallel water aqueduct and associated appurtenances to increase seismic and geologic hazard resilience of the overall Davis Aqueduct system. The parallel aqueduct would include 12,000 feet of steel piping, beginning near the bifurcation structure and continuing west and south to the Davis North Water Treatment Plant. The total estimated cost of this project is $45,455,227, which includes construction and engineering costs.[10]

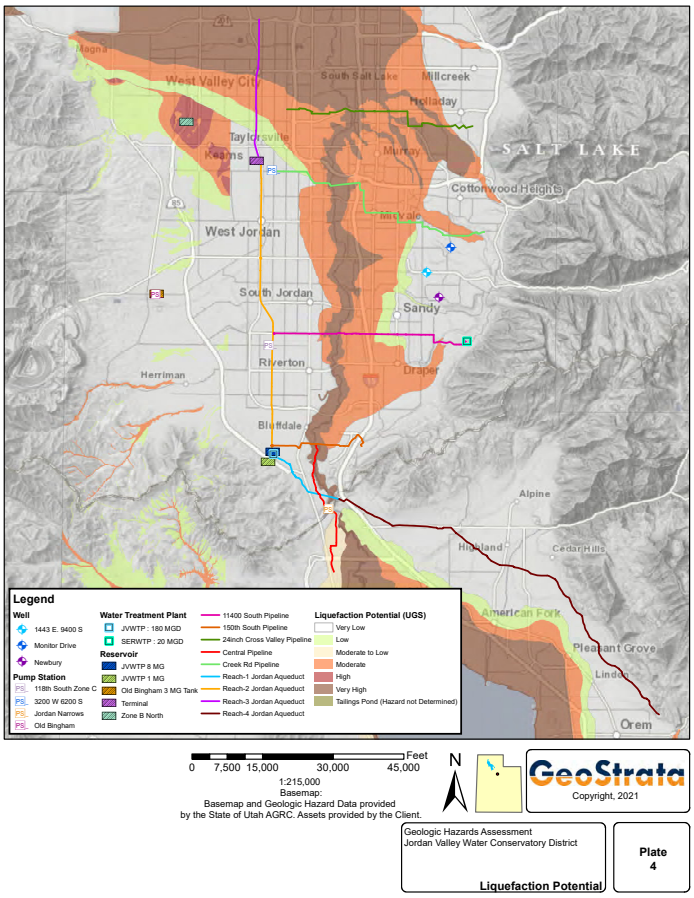
SALT LAKE AQUEDUCT HARDENING | METROPOLITAN WATER DISTRICT OF SALT LAKE AND SANDY

The Salt Lake Aqueduct is a 42-mile, mostly reinforced concrete pipe that begins at the base of Deer Creek Dam in Wasatch County, runs through Utah County, and terminates in Salt Lake County near the mouth of Parleys Canyon. The pipeline, which **serves around 450,000 people**, was built in the 1940s and has several segments that are subject to earthquake damage where they cross the Wasatch fault. A recent risk assessment identified a high risk of joint failure during an earthquake due to ground deformation and ground shaking. Failed joints on an active aqueduct pose a secondary risk of landslides caused by saturated soils and flooding with the aqueduct location along the bench areas in Utah and Salt Lake Counties.

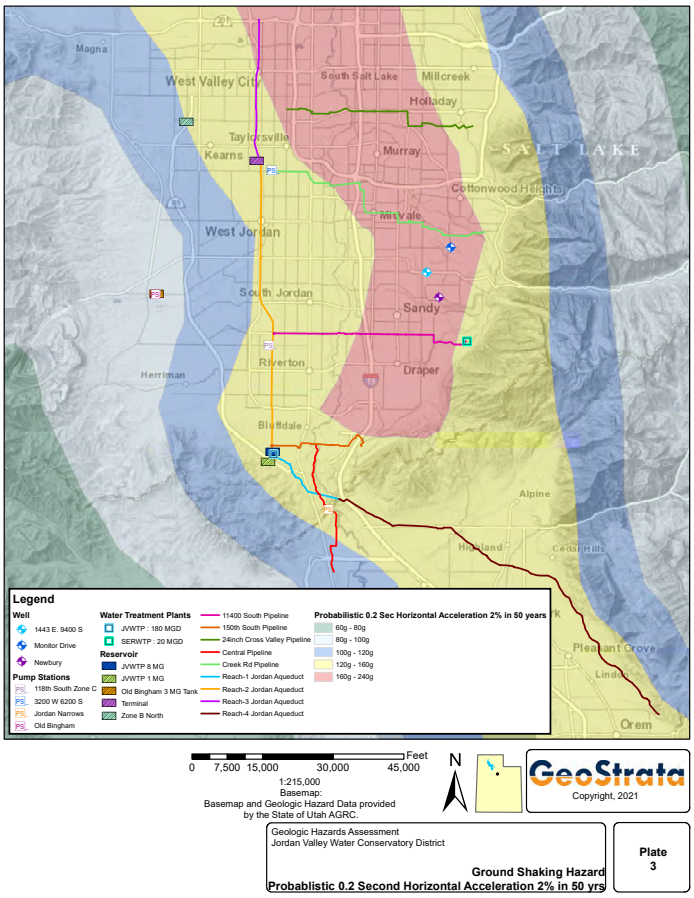
The risk assessment identified four segments in Pleasant Grove, Cedar Hills, Draper, and Cottonwood Heights as being the most critical. These would cost approximately $87.5M to harden. The economic benefit is approximately $203M per segment at a cost-benefit ratio of 5.5 to 10. Currently, construction for one segment is set to begin in 2041, and the other three are scheduled to begin construction in 2045.

JORDAN AQUEDUCT REACHES 1-4 | JORDAN VALLEY WATER CONSERVANCY DISTRICT

While the Jordan Aqueduct Reaches 1-4 does not cross major fault lines like the three aqueducts above, it is located in a predicted high ground acceleration and liquefaction potential area. **The aqueduct serves drinking water to over one million people.** Most of the Jordan Aqueduct Reaches 1-4 is steel pipe with unrestrained joints. These unrestrained joints have a high potential to separate when subjected to high ground acceleration and/or liquefaction. Repair of a large number of separated joints would likely take at least 2-3 months. Welding or otherwise restraining the joints in high vulnerability areas could prevent separation. Hardening pipe joints is estimated to cost $10 million.



The Jordan Aqueduct has multiple segments that pass through liquefaction zones, which will likely displace the pipeline.



The Jordan Aqueduct has multiple segments that pass through ground acceleration zones. A large earthquake could damage and seperate the pipeline.

Improving the seismic resilience of these aqueducts will not guarantee that a Wasatch Front resident will have water service shortly after an earthquake. An earthquake could damage treatment or distribution infrastructure, the connection from a house to the distribution line in the street, and/or sewage transport and treatment facilities. However, these projects will substantially increase the likelihood that water is in the system and potentially available nearby for each resident. The projects will also significantly reduce the timeline for restoring full water service.

Reduce Risk of URM Schools

Many of Utah's schools are URMs. **The State of Utah is currently generating a statewide inventory of unreinforced masonry construction in public K-12 schools. Early numbers from the inventory suggest that at least 130 school campuses include URMs where at least 76,000 Utah children spend much of their time**. Some school districts have been very proactive at renovating or replacing URMs over the years, but many still remain. It's essential to continue to retrofit or rebuild those remaining buildings. If a large magnitude earthquake were to occur during school hours, tens of thousands of Utah school children would be at risk of death or serious injury in a government-owned building. The moderate magnitude 5.7 Magna earthquake caused significant damage to Westlake Junior High School, a partial URM building. Students and staff would have likely been injured or killed if students had been in school. A magnitude 7 earthquake would release more than 150 times as much energy and be far more devastating to the many schools constructed in a similar manner.

West High School is a URM school that was retrofitted in 1996.

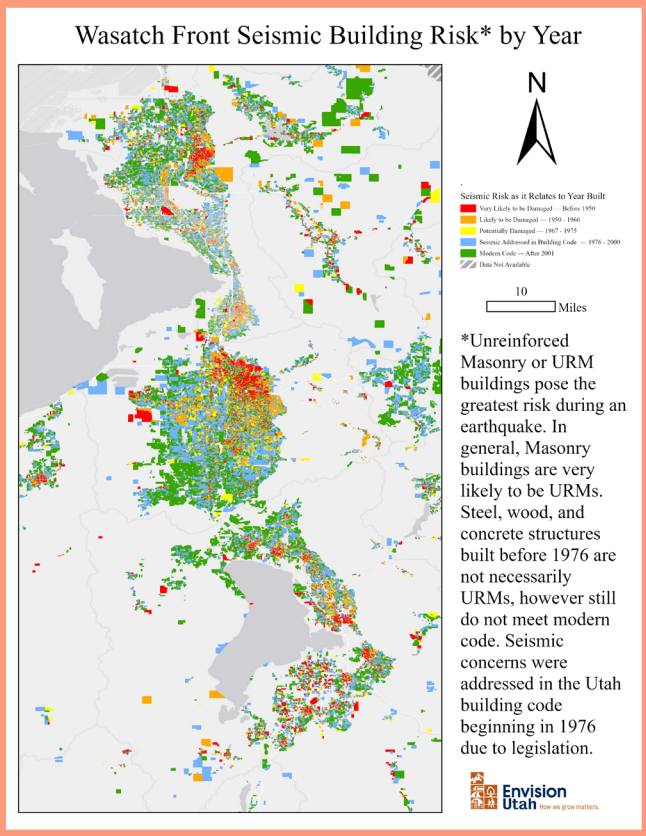
In addition to protecting Utah's students, addressing URM school buildings is important for recovery from the disaster. For these schools to function as emergency shelters or gathering places during and after a disaster, they need to withstand the disaster itself. Moreover, the sooner schools can reopen, the sooner parents can go back to work, the sooner our economy can recover, and the sooner society can go back to normal.

URMs: UTAH'S MOST VULNERABLE BUILDINGS

In Utah, unreinforced masonry buildings (URMs) pose the greatest risk to life in the event of a major earthquake. These are buildings constructed of brick or block without reinforcing steel, which makes them extremely susceptible to damage from earthquake ground shaking.

While Utah's adopted building codes have not allowed this kind of construction since 1976, it has been estimated that more than 140,000 URMs are still standing today,[10] including single family homes, apartment buildings, schools, and offices—far more than in the entire state of California. URMs make up roughly 20% of our occupied buildings.

URMs will be the primary source of deaths and injuries from a major earthquake. Further, these buildings will likely be uninhabitable and unusable after the earthquake, and many will require complete reconstruction or demolition. After the 2011 Christchurch earthquake and aftershocks, tens of thousands of buildings were unsafe to reenter, and many of them were eventually demolished.



9. https://eeri.org/images/regional/2016-Utah-Chapter.pdf

FEMA, the State of Utah, and many other stakeholders collaborated to create the Wasatch Front Unreinforced Masonry Risk Reduction Strategy, which identifies mitigation strategies that would greatly reduce the URM risk in Utah. The strategy highlights five key recommendations to reduce URM seismic risk - the first priority being a URM School Risk Reduction Program.

Since the release of the strategy document in March 2021, the Utah Division of Emergency Management (DEM) has undertaken the first step in the URM School Risk Reduction Program, an inventory of Utah public K-12 schools, continuing previous inventory work funded in 2015 by the State Legislature. Due to DEM and FEMA funding, validating and finalizing the statewide inventory of URM school buildings is nearing completion. To continue moving this effort forward, the USSC recommends that the Legislature provide financial assistance to local education agencies (LEAs) to conduct feasibility studies for retrofitting or replacing URM buildings. This could be done by allocating $3,500,000 to LEAs for multidisciplinary feasibility studies, including a detailed seismic evaluation, for each of the 130 school campuses with URMs over the course of the next three years ending in 2025. The $3,500,000 would be distributed as follows:

- $20,000 per elementary school campus, 88 in total
- $30,000 per middle school campus, 22 in total
- $50,000 per high school campus, 22 in total

Qualifying feasibility studies should include an analysis of the educational program; a seismic evaluation (ASCE 41 Tier 1 or ASCE 41 Tier 1 and 3); proposed retrofit schemes; and mechanical, electrical, and plumbing evaluations by licensed architects and engineers sufficient to generate a cost estimate.

This feasibility study funding would enable LEAs to examine at-risk schools and develop cost estimates for replacing these structures or retrofitting them to modern seismic safety standards. Three years provides enough time for all Utah LEAs to examine their buildings and plan and prioritize construction projects.

Once LEAs have examined their buildings over the next three years, the USSC can provide additional recommendations to the Legislature about helping schools fund retrofits or rebuilds. A national goal supported by the Earthquake Engineering Research Institute is for schools to be URM free by 2033. The State of Utah can meet this challenge and improve the safety of schools.

West Lake Junior High suffered extensive damage during the Magna 5.7 earthquake of 2020. If remote learning due to the COVID-19 pandemic had not kept students home, it's likely that this damage would have caused injuries or even death.

Increase Public Awareness of Risks

Even though Utah's 140,000 URMs are scattered throughout our historic pioneer communities, public awareness of the risk is low. Many people live or work in these buildings but do not understand their vulnerability. As a result, few upgrades happen, and the market does not adequately take seismic soundness into account when setting prices or evaluating risk.

Salt Lake City's "Fix the Bricks" program is leveraging federal grant money to fund upgrades to single-family homes. There is currently a long waiting list for grants, and the program is seeking to affect 200 homes per year. Given the estimate that there are 140,000 URMs in Utah, at this rate it will take 700 years to complete them all. Currently this popular program does not extend to the majority of the URM homes outside Salt Lake City. For this reason, DEM sought and received federal funding to conduct a feasibility study for a statewide program. This analysis could take a year or two, but there is no need to wait for study completion to begin increasing awareness. Because of inevitable limitations on funding for any such program, it's essential that market forces be brought to bear.

Ensuring the market functions appropriately with respect to seismic risk requires increased public awareness. With increased awareness, more Utahns will voluntarily improve or rebuild their homes, ask realtors and sellers whether a home being sold is a URM, request upgrades during a transaction, and put pressure on landlords.

The USSC proposes a public awareness campaign in order to (1) help Utah residents better appreciate Utah's earthquake risk and understand the need for greater risk mitigation, (2) educate Utahns about URMs and their risk, and (3) motivate individuals to take measures to retrofit their URMs. This campaign would include the following:

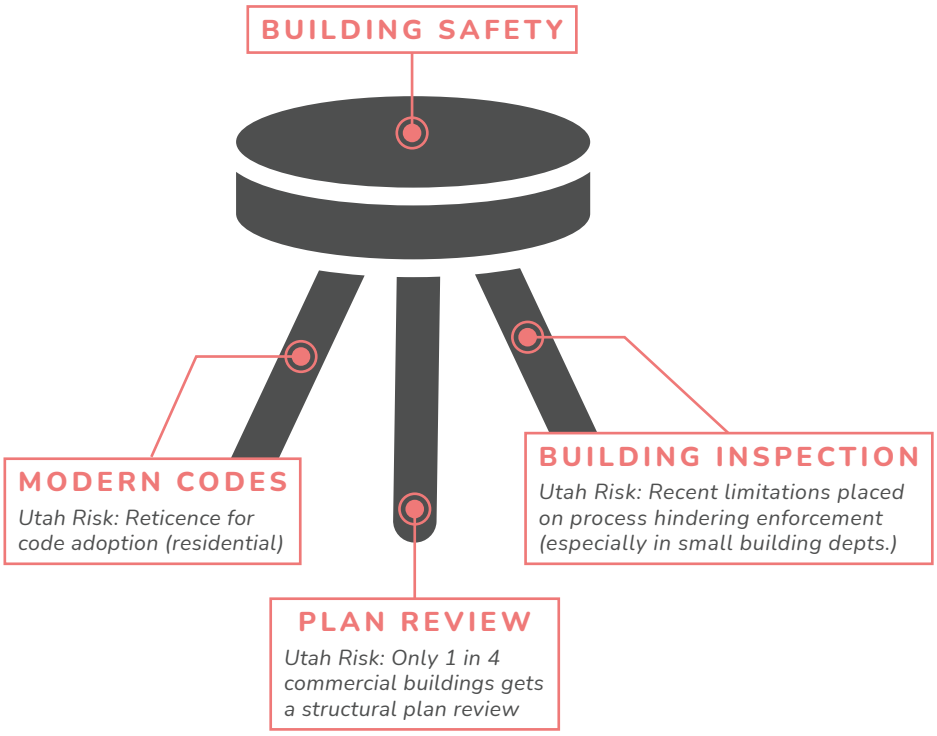
- Creating a website where Utahns can find information about URMs. The website will help people understand the risks from URMs, identify whether their home is a URM, and connect to resources for upgrading seismic resilience.
- Creating videos, pamphlets, and other assets that can be used to educate Utahns and invite them to visit the website.
- Running a public awareness campaign utilizing the assets that have been created. Much of the campaign will utilize digital advertising that targets residents in areas with older construction or who are searching for information about refinancing or remodeling. Flyers will be distributed to residents who are seeking remodeling permits. Postcards will be mailed to residents of homes built prior to 1976.

The total cost of this campaign over the next two years is estimated to be $200,000. Funding for this campaign could be coupled with funding that is likely to come from FEMA to support an outreach campaign with some shared goals and objectives.

Seismic Structural Plan Reviews for Utah's Largest and Most Important Buildings

Due to Utah's rapid population and economic growth, almost half of the buildings that will exist in 2060 have not yet been built,[11] and many of our existing buildings will be rebuilt in that same timeframe. Ensuring these new buildings quickly return to functionality following a large magnitude earthquake is key to keeping Utahns in their homes, at their jobs, and continuing life as normal. Utah's building code is an important tool, requiring that seismic protection be incorporated into building design and construction.

Ensuring building seismic safety is like a three-legged stool. One leg is adoption of comprehensive building codes, the second is quality structural plan reviews, and the third is building inspection. Without all three legs, seismic resilience is not guaranteed in our communities.



While it is essential for building codes to have appropriate standards, when plans are not adequately reviewed or buildings are not appropriately inspected, many buildings can still be unsafe, as was seen with the recent Surfside condominium tower collapse in Florida. Plan reviews and inspections are particularly important for larger, more complex structures, yet the Structural Engineers Association of Utah (SEAU) has estimated that only 32 percent of the commercial buildings in Utah receive a structural plan review from a qualified reviewer.[12]

New construction provides an opportunity to build resilient communities in Utah.

10. https://www.fema.gov/sites/default/files/documents/fema_wasatch-front-urm-risk-reduction-strategy.pdf
11. https://yourutahyourfuture.org/topics/air-quality

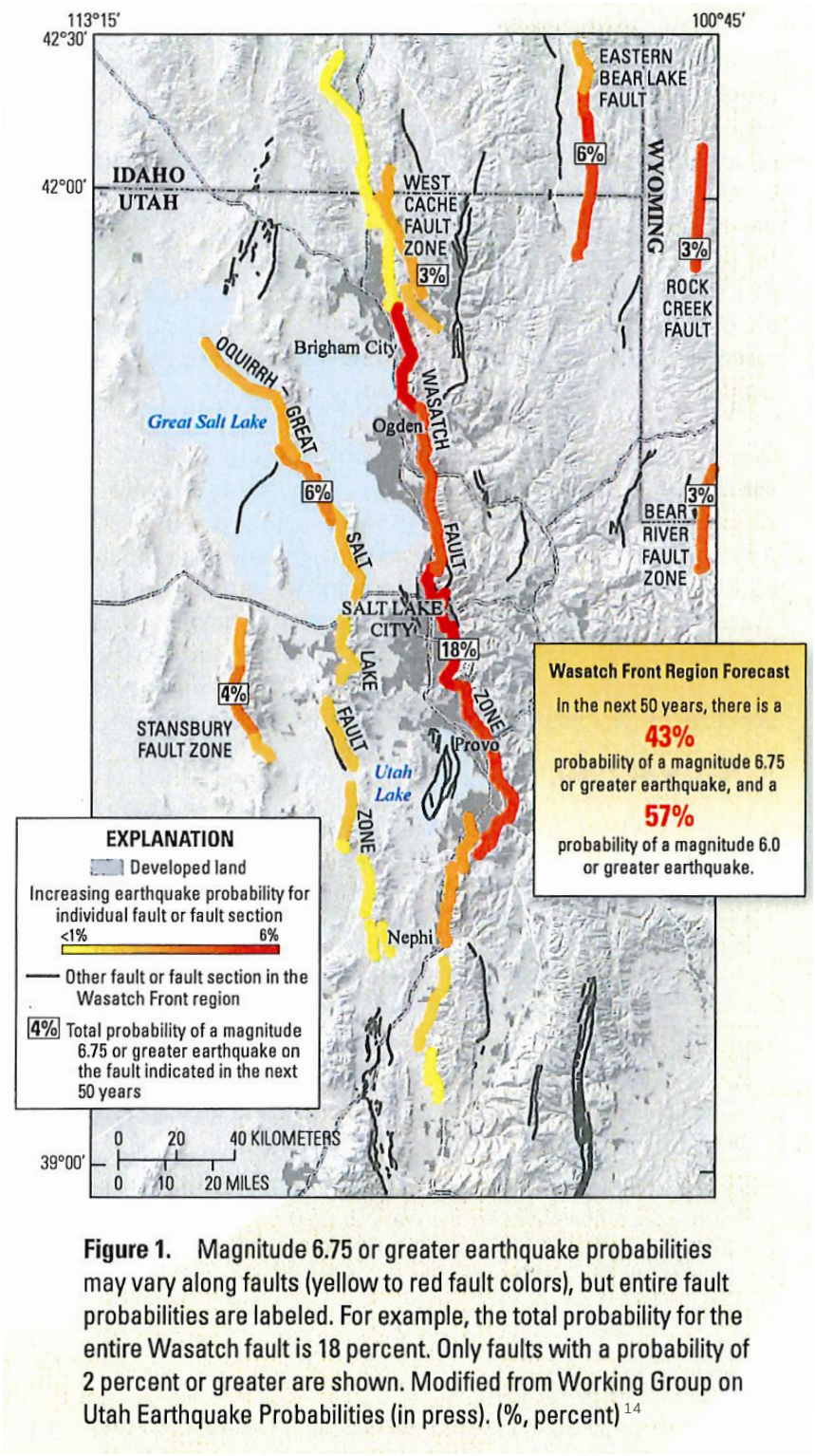


Figure 1. Magnitude 6.75 or greater earthquake probabilities may vary along faults (yellow to red fault colors), but entire fault probabilities are labeled. For example, the total probability for the entire Wasatch fault is 18 percent. Only faults with a probability of 2 percent or greater are shown. Modified from Working Group on Utah Earthquake Probabilities (in press). (%, percent)[14]

FEMA takes Utah's adopted building codes and enforcement into account when evaluating Utah grant requests. In other words, Utah's ability to access millions of dollars in federal funding for disaster mitigation depends on ensuring codes are up to date and enforced. The state of Utah regularly reports on the status of code adoption and building inspection to determine our eligibility. As a result, adopting and enforcing the latest version of the International Building Code (IBC) is important to obtaining federal grants.

Currently, many buildings undergo plan reviews for fire, egress, and other life safety measures, but structural engineering reviews are often neglected or performed by individuals without sufficient technical knowledge of structural seismic codes. It is more likely that many buildings could underperform during and after a major earthquake—particularly larger, more complex buildings.

The IBC assigns risk categories to buildings based on the consequences and risks in the event of building failure. The intent is to assign higher risk categories, and hence higher design criteria, to buildings or structures that provide essential community services necessary to cope with an emergency situation or that have grave consequences to either the building occupants or the population around the building in the event of a structural failure.

The highest risk categories—Categories III and IV—include buildings occupied by large numbers of people, police stations, schools, hospitals, and utility infrastructure like power stations. Because of the importance of these buildings, as well as their structural complexity, the USSC recommends plan reviews be required to be conducted by a Utah-licensed Professional Structural Engineer for structures classified as Risk Categories III and IV and buildings occupied by people that are greater than 200,000 gross square feet.[13]

People in our communities expect to be safe in their homes, schools, and places of business. Only by ensuring that new construction meets the standards of modern building codes, through plan review and building inspection, can we meet this expectation and ensure that we make a full economic recovery after a seismic disaster.

12. Survey by the Structural Engineers of Utah (SEAU) Seismic Committee in 2012.

13. These guidelines are a rough approximation of the boundary used by the Professional Engineers and Professional Land Surveyors Licensing

Provide Utah With an Early Earthquake Warning System

An Earthquake Early Warning (EEW) system for Utah's Wasatch Front would help reduce economic losses and casualties from a major earthquake. While EEW systems in other parts of the world are often used to directly notify nearby people, the Wasatch Front presents a unique situation where over 85% of Utah's population lives directly on or very near the Wasatch fault and other faults capable of generating major earthquakes. Due to the short time interval between detection of a major earthquake and the impact of ground shaking, an EEW system in Utah will likely be most useful for the automated shutdown of various industrial, utility, and transportation systems.

These automated shutdowns would be useful for the Utah Transit Authority's FrontRunner and TRAX light rail systems, oil refineries near North Salt Lake City, natural gas distribution systems, and other systems susceptible to earthquake ground shaking. In some scenarios, EEW would also provide tens of seconds of warning to the public ahead of strong ground shaking, allowing students to get under desks, medical professionals to halt delicate medical procedures, people to exit elevators, and so on.

The USSC recommends providing $150,000 in funding for Utah Geological Survey to administer a feasibility study for an EEW in Utah, to be spent as follows:

- University of Utah Seismograph Stations ($100,000)

  The University of Utah Seismograph Stations will perform an EEW pilot study using their existing seismograph network and data along the Wasatch Front to determine the existing instrumentation, backhaul communication network, and data processing and analysis gaps and shortcomings and estimate the costs for a functioning EEW system in Utah.

- Utah Geological Survey ($25,000)

  The Utah Geological Survey, in collaboration with the University of Utah Seismograph Stations and the Utah Division of Emergency Management, will write the EEW feasibility report, along with assisting in the EEW pilot study and end-user outreach.

- Utah Division of Emergency Management ($25,000)

  The Utah Division of Emergency Management will work with various industrial, utility, and transportation organizations to determine the organization end-users of EEW warnings, such as the Utah Transit Authority, Utah Department of Transportation, Dominion Energy, Rocky Mountain Power, local oil refineries (Big West Oil, Chevron, and Marathon Petroleum), Northrup Grumman Bacchus Explosives Plant, municipal utilities, and industrial operations susceptible to earthquake ground shaking.