2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

Utah Section of the American Society of Civil Engineers

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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EXECUTIVE SUMMARY

Infrastructure Matters

Utah is growing. Our State is home to the "Mighty Five" National Parks, and we are internationally recognized for our hiking, biking, skiing, and many other outdoor opportunities. Utahns enjoy a resilient and diverse economy supported by infrastructure from roads and trails to water treatment plants and airports that represents a commitment going back to the State's pioneer roots. If you live in Utah, you know this is a special place. While we should celebrate the success of our rapidly developing Wasatch Front, we Utahns recognize the importance of our rural communities to the continued success and prosperity of our great State. These rural communities need access to reliable clean water, functional roads, transit, flood control, and other necessities of life. Meanwhile, the more densely populated Wasatch Front is concerned about planning for the future and keeping Utah an affordable, accessible, and beautiful place to live.

The Utah Section of the American Society of Civil Engineers (ASCE) has produced this Infrastructure Report Card for the benefit of all Utahns. You are our families, our neighbors, our friends, and our fellow citizens and we view the responsibility of being good stewards of our State's infrastructure as a calling rather than just an occupation. We hope that you will take a moment to read our Infrastructure assessments, reflect on the role that infrastructure plays in your daily life, and consider contacting your representatives as well on issues that matter to you as well as actively participating in public forums to continue to make infrastructure matter in Utah. There is no doubt that your input is critical to developing a full understanding of community needs and prioritizing long-term investment and planning in infrastructure. When it comes to planning for our future, your voice matters!

About ASCE Utah Section

The Utah Section of the American Society of Civil Engineers (ASCE) was established in 1916. The Utah Section is a member of the Region 8 Board of Governors and is divided into four Branches across the state of Utah; Northern Utah, Wasatch Front, Central Utah and Southern Utah. The Utah Section also has an active Younger Member's Forum and Student Chapters at Utah State University, University of Utah, Brigham Young University and Utah Valley University. This extended history and experience has provided the Utah Section of ASCE a unique and in-depth understanding of infrastructure across the State. As of January 2020 the Utah Section had 1,675 members and is still growing.

A Note Regarding Covid-19

The COVID-19 health crises hit in the middle of this report card effort and was not included as discussion in the individual chapters. However, this pandemic caused great changes to our infrastructure use and funding. Transit ridership dropped, most commuters stayed off the roads and away from transit, and airports have been virtually empty. A sizable portion of the existing infrastructure systems just mentioned are supported with user generated revenue streams that significantly declined or vanished because of our "new normal." Additional demands continue to be placed on municipal and state budgets, leaving less support for parks, schools, and other publicly-owned infrastructure. These shortfalls in funding need to be rectified. At the time of this writing, the health crisis continues to place unprecedented strains on our economy. At the federal level, congress should make infrastructure investment a centerpiece of its immediate response and long-term economic recovery strategy. Now is the time to renew, modernize and invest in our infrastructure to maintain our great state and our country's competitiveness. Please use this 2020 ASCE Utah Report Card to better understand and advocate for the state of Utah's infrastructure.

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OVERALL GPA AND GRADES BY INFRASTRUCTURE CATEGORY

The 2020 Report Card for Utah's Infrastructure was written by a committee of civil engineers across Utah who volunteered their time to collect and analyze data, prepare and review their findings and present their conclusions. The committee worked with staff from ASCE and ASCE's Committee on America's Infrastructure to provide a snapshot of infrastructure, as it relates to us locally. Infrastructure is graded based on eight criteria: capacity, condition, funding, future need, operation and maintenance, public safety, resilience, and innovation. ASCE defines these grades as follows:

AVIATION	C
BRIDGES	B+
CANALS	D+
DAMS	C+
DRINKING WATER	B-
HAZORDOUS WASTE	C+
LEVEES	D-
ROADS	B+
SOLID WASTE	B-
STORMWATER	C+
TRANSIT	B+
WASTEWATER	C

UTAH GPA: C+

Earthquake Hazards Along the Wasatch Fault – A Synopsis for the ASCE Report Card

Earthquakes and Earthquake Activity

The State of Utah is located within the Intermountain Seismic Belt (ISB), a zone of pronounced seismicity in the interior western United States. The Wasatch Fault, a major feature of the ISB, is one of the longest and most active normal faults in the world (USSC, 2008). The fault traverses through broad swaths of residential housing, commercial developments, transportation networks, and critical lifelines. It should be noted that there are many other active faults in Utah, but the Wasatch Fault is of particular importance because more than 80% of Utah's population and 75% of the state economy is located with 15 miles of the Wasatch Fault Zone (UDEM, 2019).

Utah experiences approximately 700 earthquakes each year, however, many of these events are generally not felt (UUSS, 2020b). It is believed that the maximum size earthquake capable of being generated by Utah faults is about magnitude 7.5. Geologic studies show that on average, an earthquake large enough to result in surface rupture occurs somewhere along the Wasatch Fault every 300 to 400 years (USSC, 2008). The central portion of the fault is estimated to produce a 7.0 earthquake roughly every 300 years, with the last one occurring about 350 years ago (UDEM, 2019). Large earthquakes produce significant movement and displacements, which are particularly devastating to buried utilities. Significant sections of the Wasatch Fault have been traced across communities throughout the Wasatch Front, with mapped vertical displacements between opposing sides of the fault from past earthquakes up to 15 feet (DuRoss et al., 2015). Utah is undoubtedly seismically active – damaging earthquakes have occurred in the past and will occur again in the future.

The Wasatch Front is particularly susceptible to seismic hazards because of local geologic conditions (e.g., soft lake and young stream alluvium deposits), areas of shallow ground water subject to liquefaction, and mountain reservoirs up narrow canyons separated by faults from major population centers. Historic construction also poses additional life safety risks as it is estimated that roughly 165,000 buildings along the Wasatch front are particularly susceptible to significant failure or collapse given their unreinforced masonry (e.g., brick) historic construction (UDEM, 2019). The importance of improved seismic design has also recently been recognized with changes in how building codes develop seismic ground motions (ICC, 2017). These changes were recently voted into State law through acceptance of the 2018 version of the International Building Code on July 1, 2019.

Earthquake Risk and Estimated Losses

Earthquake risk relates probability of occurrence to losses, both in terms of lives and dollars. The financial liabilities associated with earthquake damage can be catastrophic for communities. While damage in housing and critical infrastructure will create an immediate challenge, long-term loss of jobs and general infrastructure create financial liabilities that can last decades. As a point of reference, the Magna event, which occurred on March 18, 2020 would be considered only a 'moderate' earthquake and fortunately occurred near a section of the Salt Lake Valley that is not densely populated. All this considered, this earthquake impacted local business (see Figure 1), displaced residents from homes, and resulted in more than $62 million (MM) in structural damage, $70MM in public infrastructure damages and $629MM in economic losses (KSL News, 2020). For comparison, an earthquake on the Wasatch Fault along the east valley benches would likely be over 60 times stronger and result in billions of dollars of losses. In light of this recent, moderate seismic event, the following is provided as examples, albeit on a much smaller scale, of what may occur during a larger earthquake event:

- Utah Schools – In a seismic event, schools will likely provide shelter to one of our more vulnerable demographics: children. Schools that meet seismic code requirements will provide shelter and community support during earthquake recovery as well as significantly reduce demands on emergency teams otherwise responding to large groups of children. During the Magna event, two schools were significantly impacted - West Lake STEM Junior High in West Valley City (because of recent remodeling it likely remained standing) and Cyprus High School which suffered more than a million dollars in damage (Desert News, 2020a). Fortunately, no children were in the buildings at the time due to COVID-19 closures.

- Unreinforced masonry buildings – Traditional building design practices for more than 100 years provided minimal resistance to seismic demands. Geographic concentrations of unreinforced masonry buildings (mostly older brick homes) can be found across the state. These buildings and their owners are further exposed financially by the lack of or inability to obtain affordable earthquake insurance. Programs such as Salt Lake City's Fix the Bricks program help residents afford seismic improvements to homes by paying up to 75% of seismic retrofit, which can help save lives during the next major Wasatch event (UUSS, 2020b). However, it should still be recognized that providing for life safety does not mean that significant building damage will not occur; minimally designed/retrofitted buildings may unfortunately still present a total economic loss.

Figure 1 – Photo of damaged masonry structure that shutdown local business (Deseret News, 2020b).)

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

AVIATION C

Executive Summary

Aviation is critical to the Utah economy because well maintained public use facilities are important for attracting and supporting businesses. Utah's aviation infrastructure includes 36 public use airports serving both commercial and general aviation needs with runway surfaces characterized in very good condition. The busiest airport in Utah is the Salt Lake City International Airport (SLC) that is responsible for 98% of enplanements in the state. In recent years, SLC has invested nearly $4 billion in passenger capacity and cargo volume. However, it is anticipated that there will be a funding gap over the coming years.
Furthermore, as airspace becomes increasingly congested leading to flight delays, new technologies, process improvements, and operational efficiencies are coming online to reduce arrival capacity constraints.

Introduction

Aviation in Utah contributes significantly to the state's economy. Airport infrastructure, such as cargo facilities, passenger terminals, runways, parking garages, and more, supports tourism and businesses. The roles the airports currently serve in the national airport system and the types and quantities of airport development eligible for federal funding under the Airport Improvement Program (AIP) over a five-year period are identified by NPIAS (National Plan of Integrated Airport Systems). NPIAS airport categories are as follows:

• **COMMERCIAL SERVICE AIRPORTS**: Publicly owned airports that receive a minimum of 2,500 scheduled passenger service boarding each calendar year. Commercial Service Airports include large, medium, small hub, and non-hub primary airports as well as non-primary commercial service airports.

• **CARGO SERVICE AIRPORTS**: Airports that, in addition to any other air transportation services that may be available, are served by aircraft providing air transportation of only cargo with a total annual landed weight of greater than 100 million pounds. An airport may be both a commercial service and a cargo service airport.

• **RELIEVER AIRPORTS**: Publicly or privately-owned FAA-designated airports that relieve congestion at Commercial Service Airports, as well as provide improved general aviation access.

• **GENERAL AVIATION AIRPORTS**: Public use airports that do not have scheduled service or have less than 2,500 annual passenger boarding.

There are 36 airports in Utah that are open to the public. There are five airports that offer commercial air service including Salt Lake City International Airport (SLC), Ogden (OGD), Provo (PVU), Saint George and Cedar City (CDC). The Vernal Regional (VEL) Airport and the Canyonlands Field offer commercial air service as non-primary airports (Figure 1).

Figure 1. Location of airports in Utah

The SLC airport plays an important role in supporting business and economic growth in the state. Its operations are a key component in providing affordable access to worldwide destinations for business and individuals. The SLC airport is in the middle of a redevelopment program. To that end, improved operations of the airport will offer more efficient access to global markets and an opportunity to continue to add value

to Utah's economy by strengthening the ties of local institutions to their global peers (such as universities, hospitals, the arts, etc.), sustaining existing business, providing access to new business opportunities outside of the state and attracting new business to the state. Further, tourism benefits from improved air access in an increasingly competitive industry. As estimated in this report, the 13-year impact of new construction for the Airport Redevelopment Program, increasing visitor capacity as well as convenience and sustainability, is estimated at $5.5 billion total output to the economy of Utah and 3,300 annual jobs during the life of the project. The vastly more important contribution of airport services to business location, success and expansion—though difficult to measure—puts the airport at the center of successful growth for the state of Utah.

Capacity

A statewide aviation system should include sufficient airside and landside facilities to meet current and future demand. SLC ranks 23rd busiest in the nation and 85th busiest airport in the world in terms of passenger numbers and ranks at 25th for cargo tonnage landed at U.S. airports. The FAA has determined that as an airport's annual demand reaches 60% or more of the airport's calculated airfield operating capacity, delays to aircraft on the ground and in the air begin to increase and capacity-enhancing capital projects should be planned. As annual demand equals or exceeds 80% of an airport's operation capacity, delays can increase dramatically, and capacity projects should be implemented. According to the most recent data available from the Salt Lake City international air statistics, SLC served over 26.8 million passengers in 2019. This was an overall increase of 1% from the previous year. This facility was constructed more than 50 years ago and was designed to handle half as many travelers. SLC is now a hub airport with many flights arriving and departing around the same time.

Security needs are vastly different from when the airport was originally constructed, and buildings no longer meet earthquake safety standards. The city of Salt Lake has a great partnership with the airlines that serve the Salt Lake City Airport. Delta Air Lines, the airport's largest user, is very supportive of the Airport Redevelopment Program, as are other airlines. The $4 billion program saw initial phases of construction begin in July 2014 and will continue in subsequent phases through 2024. The parking garage, terminal building and west portions of the north and south concourses will be completed in 2020. In general, about 98 percent of the enplanements in the state of Utah has occurred at SLC airport.

Condition, Operation and Maintenance

UDOT Division of Aeronautics tracks conditions of airport pavements for the general aviation airports in Utah. The International and National Airports all have their own operations and maintenance departments and plans.

For the general aviation airports UDOT has a conditions assessment performed every 3 years. The only airport owned by The State of Utah is the Hanksville Airport. The rest of the airports are owned and operated by counties or municipalities. Currently UDOT classifies all airport pavements as being in good or better (very good or excellent) condition.

Currently the Salt Lake International Airport is in the middle of an almost $4 billion Terminal Redevelopment Program that includes replacement and reconstruction of taxiways and aprons around the new terminal and concourse buildings. Ongoing Masterplan work is still occurring with reconstruction of Taxiway E in process this summer.

St. George Municipal Airport was closed for part of 2019 to remove and reconstruct the main runway which had soil subgrade issues that damaged the runway. This runway is now back in service. The airport has a Strategic Plan developed in 2011-2012. According to published media reports an updated Master Plan for the airport is in development

Provo Municipal Airport has upgraded their terminal facilities. It is serviced by one commercial airline. Provo Municipal Master Plan is several years old and needs updating.
Ogden Hinkley Municipal Airport is in the process of developing a new master plan; the final draft was released in March of 2020. Ongoing facility needs were identified in the report. Generally, the report listed runway pavement in good condition and taxiways and aprons in good to poor conditions. Some hangers are old and outdated and the report discusses removal and replacement of these hangers.

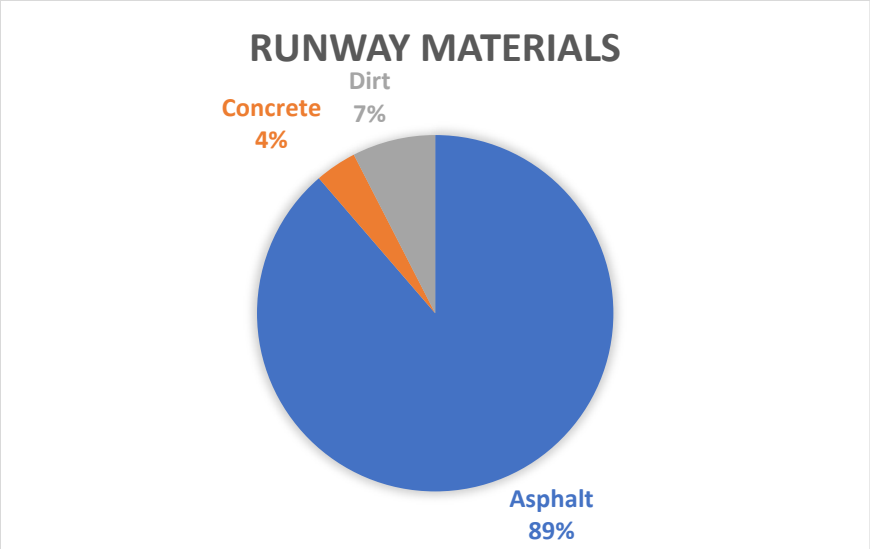
Funding and Future Need

Most of the airport monies are from Federal Government Sources. Historically, each year $17 million has been invested in the Utah airport system. Past studies have indicated that total funding should be on the order of $27 million excluding the Salt Lake international Airport.
The COVID -19 virus has greatly reduce passenger traffic for commercial airlines and many airlines are looking at their route systems to determine if changes are needed. In May of 2020 passenger traffic was at 15% of traffic volumes pre-COVID. While the magnitude of the negative impact on airport budgets is unknown at this time, the aviation sector projects a slow return to pre-COVID numbers, perhaps not until the second or third quarter of 2023. Temporarily buoying the sector, the Federal Government has provided supplemental grants. and it is possible that Infrastructure spending by the Federal and State governments could provide funding sources for future planned projects as part of an economic stimulus program.

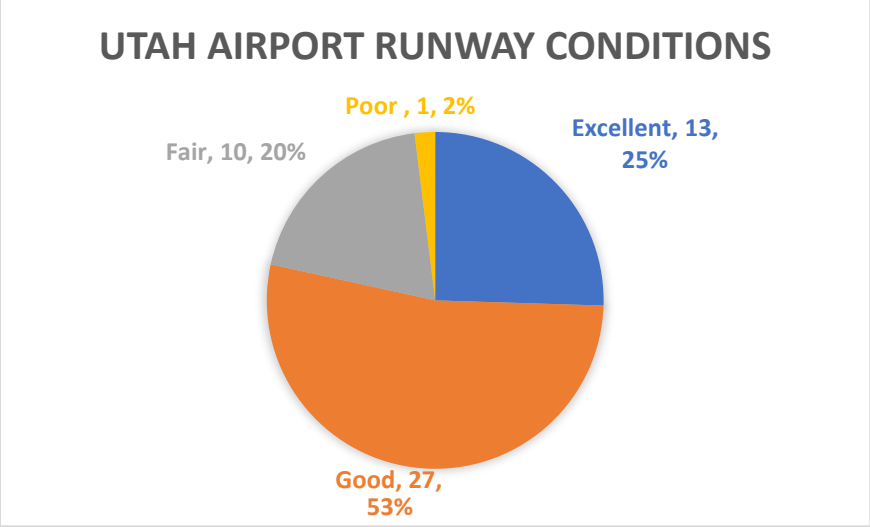
With the current expansion project in Salt Lake City International Airport, it is anticipated that future travelling needs in 5-10 years can be met. In the State of Utah, the total improvements funding budget is over $350 million that will provide necessary maintenance and upgrades in between 2019-2023.

Public Safety and Resiliency

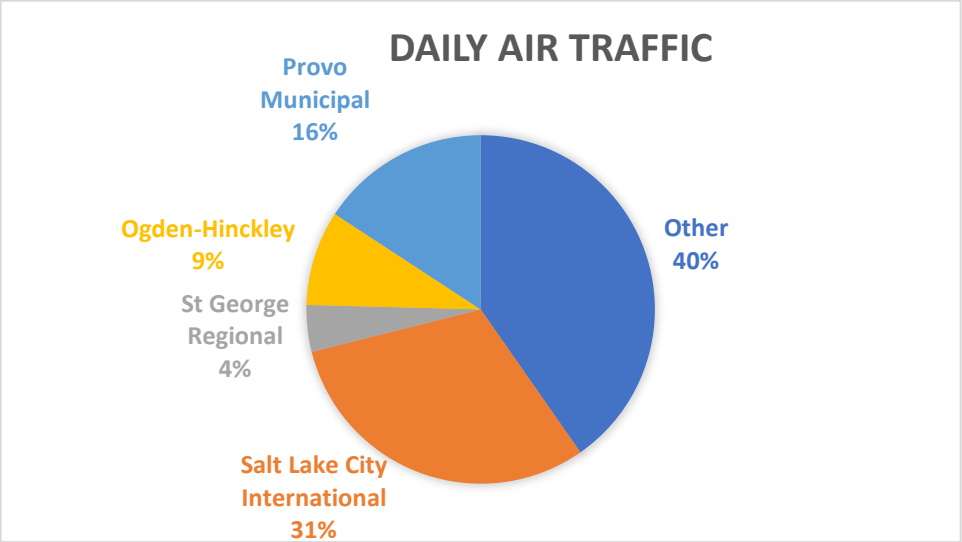
There are several aspects involved with public safety and resiliency, including runway length and conditions, air traffic control tower, terminals, and security systems.
Runway condition is an indicator of safety because a failed structure may cause damages on aircrafts during take-off and landing. In the State of Utah, there are 53 runways located in 36 airports, as per NPIAS. The majority of them (47) are asphalt runways. There are two concrete runways, both of them located in Salt Lake City International Airport. Also, four dirt runways exist in four regional airports, serving as the backups for asphalt runways.



Runway condition assessments were conducted by Federal Aviation Association (FAA). Nearly 80% of runways are classified in Excellent or Good conditions, while only 1 runway is considered Poor. Utah Department of Transportation (UDOT) also performed an assessment on the runway conditions and labeled them all Good or Excellent. Although there is a slight discrepancy between the FAA and UDOT assessments, Utah's runway conditions are generally characterized as Very Good.



For most airports in Utah, daily air traffic is less than 10 planes/day. Prior to 2013, there were four air traffic control towers for the busiest airports, Salt Lake City International Airport, Provo Municipal Airport, Ogden-Hinckley Airport, and the St. George Airport. These four airports make up 60% of the total daily air traffic for all airports, so air traffic control towers direct nearby aircraft to prevent crashes. However, the FAA closed Ogden-Hinckley airport and Provo Municipal airport air traffic control towers in 2013, raising safety concerns for pilots and the public. One air traffic control center currently serves the remaining airports. Airspace has become increasingly congested and airlines can now observe that en-route capacity constraints are the fastest growing source of flight delays. Some of the more congested airspace has been helped with Federal Aviation Administration-mandated technology and process improvements, as well as increased efficiencies in aircraft operational movement.



Terminals and airport security are very challenging for commercial airports. The needs of additional security to address the threats posed to airports, aircrafts, and fuel tanks have had an impact on the operation of commercial aviation system. Considering the Salt Lake City International airport is taking 31% of all air traffic, or nearly 26 million passengers in 2019, security is definitely an important consideration. Another public safety challenge facing the aviation sector is the COVID-19 pandemic. As one of the most crowded indoor areas, to the challenge of keeping passengers distanced to prevent the transmission of the virus is significant.

Innovation

Airspace has become increasingly congested and airlines can now observe that en-route capacity constraints are the fastest growing source of flight delays. Some of the more congested airspace has been helped with Federal Aviation Administration-mandated technology and process improvements, as well as increased efficiencies in aircraft operational movement. In particular, implementation of high technology systems are necessary to improve the ability of controllers to reduce separation between aircraft and to improve arrival capacity.

Recommendations to Raise the Grade

- Maintain airports at their current or greater service levels: The aviation industry is vital to Utah's economy and is a critical component of the State's economy and the new Salt Lake International Airport will benefit the State for years to come.
- Determine and monitor performance metrics to evaluate progress and need: Evaluating the current conditions will provide data points on deterioration over time that are helpful metrics that guide policies, planning, resource allocation, and project prioritization.
- Identify additional funding to meet funding gap for regional airports
- Additional funding could be generated by increasing the fuel tax as a percentage per gallon to offset reduced gas prices and increasing the Passenger Facility Charge to provide airport modernization and additional capacity.
- Provide training to reduce runway incidents.

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BRIDGES B+

Executive Summary

Highway bridges are a critical component to Utah's surface transportation systems. Bridges in poor condition can significantly impact traffic flow, economic development, and emergency services along a roadway corridor. Over the past 5 years, Utah has seen more than a 40% decrease in structurally deficient bridges, going from 2.9% in 2015 to 1.7% in 2020 resulting in the state's bridge inventory being ranked as fourth in the nation for the lowest percentage of structurally deficient bridges. Utah also has the lowest percent of structurally deficient bridges in the United States based on deck areas (0.4% for Utah and 4.5% for the U.S). This success is due, in part, to the significant increase in funding of the Utah Department of Transportation Structures Division, up from $26.5 million in 2016 to $48 million annually from 2018 to 2020. However, there are still unmet needs as almost 1 in 3 Utah bridges are older than their intended 50-year design life. As the average age of the bridges in the state increases, so must the commitment to preservation, rehabilitation, and replacement of deteriorated structures. Utah has demonstrated national leadership by expanding bridge capacity to accommodate population growth and by advancing the use of innovative materials like Lightweight Cellular Concrete in new infrastructure.

Condition and Capacity

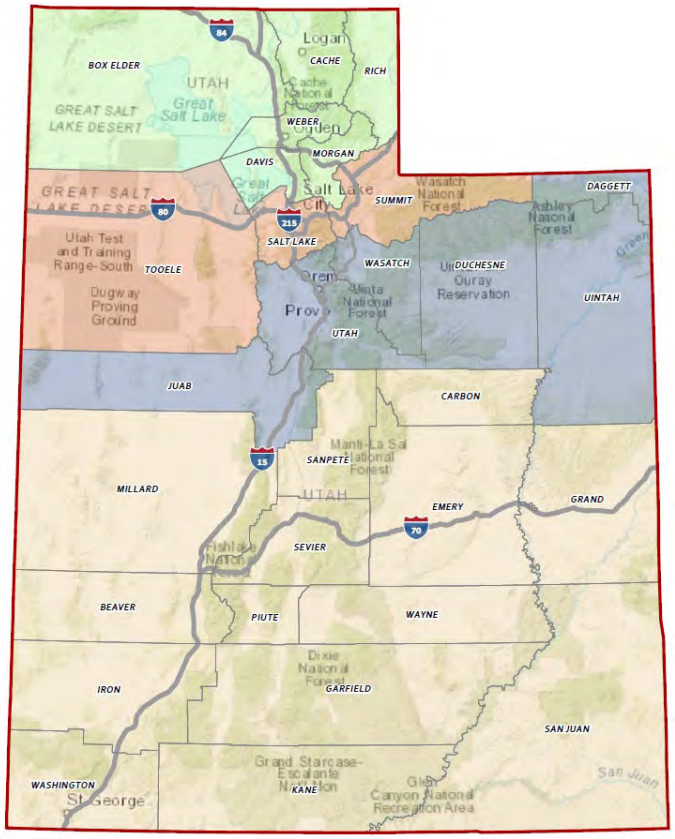
There are over 3,000 highway bridges in the state of Utah. Of these, 50 bridges, approximately 1.7%, are structurally deficient and an additional 61 bridges need minor repairs. A structurally deficient bridge is a structure with one or more key structural components rated as being in poor condition. A structurally deficient bridge is not inherently unsafe, but it does mean that it requires significant rehabilitation or replacement. As mentioned, the number of structurally deficient bridges in Utah has been reduced from 2.9% in 2015 to 1.7% in 2020. This reduction demonstrates the tremendous progress the Utah Department of Transportation (UDOT) and other agencies and municipalities have made in making repairs and replacing bridges where necessary.

REGION 1: 2.4% SD
583 Bridges (14 Structurally Deficient)

REGION 2: 1.9% SD
873 Bridges (17 Structurally Deficient)

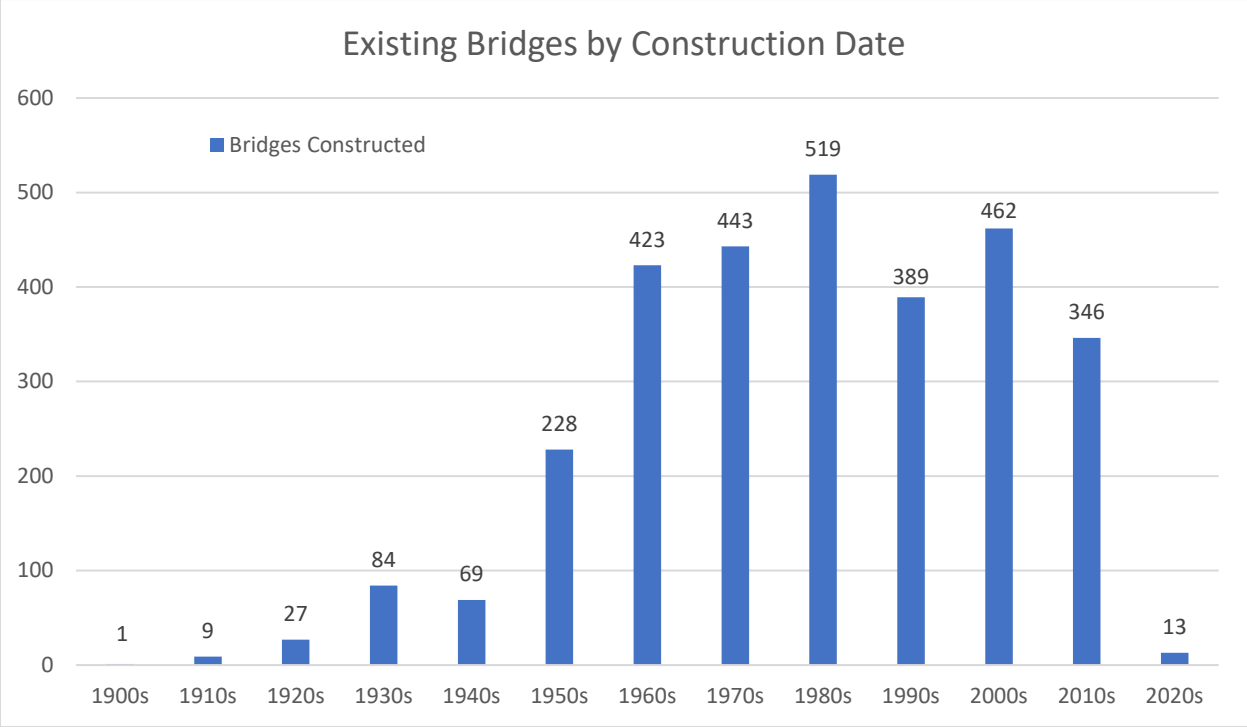
REGION 3: 1.6% SD
496 Bridges (8 Structurally Deficient)

REGION 4: 1.0% SD
1,061 Bridges (11 Structurally Deficient)



The average age of bridges in Utah is 37 years old. About 28% are approaching their 50-year design life and within the next ten years this number will increase to 43%. In recent years, many of the interstate bridges along the Wasatch Front have been replaced through major construction projects to address capacity needs. This is important because interstate and freeway bridges in the state support over 52,500,000 daily crossings by commuters and transport trucks that maintain Utah's economy. Currently, the number of daily

crossings across structurally deficient interstate bridges is approximately 160,000 trips which represents just 0.3% of all daily bridge crossings in the state.



Funding and Future Need

Financing of bridge projects in Utah comes from a variety of federal, state, and local sources. Recently, the UDOT Structures Program has been appropriated $48 million per year. This amount consists of $33 million of Federal funds and $15 million of State funds, dedicated to the preservation, rehabilitation, and replacement of Utah's bridges. In 2016, this funding was only $26.5 million. Funding was increased for the purpose of eliminating structurally deficient bridges in the state. In 2017, the funding was increased to $40 million. The funding was further increased to $48 million per year in 2018, 2019, and 2020. The program has used these resources well, as was made apparent in the Condition and Capacity section.

State transportation funds are generated by sales and use taxes, fuel tax, and voter-approved bonds. In addition, bridge preservation, rehabilitation, and replacement activities may also be funded through inclusion on major reconstruction projects. State funding comes in the form of Utah's Transportation Investment Fund, which finances large projects that typically improve or optimize capacity. Regional Metropolitan Planning Organizations have similar funds that primarily serve the same purpose.

The estimated cost to replace the 50 bridges identified as being structurally deficient is approximately $98 million. While not all bridges that are older than their intended design life need to be rehabilitated or replaced, the cost to replace all 841 bridges that are currently past their design life is approximately $1.9 billion. The cost to repair each of those structures is approximately $1.3 billion. In the next decade, approximately 450 additional bridges will be reaching their 50-year design life. These bridges have a combined replacement cost of approximately $900 million and a combined rehabilitation cost of approximately $600 million.

According to a recent study by The Kem C. Gardner Policy Institute, Utah has one of the fastest growing populations in the country. Over the next decade, the population is expected to grow over 20%. To

accommodate this growth, approximately 30-40 new bridges are constructed per year. Balancing the needs of maintaining existing infrastructure against the needs of a booming population will be critical moving forward.

Operations and Maintenance

Operating, preserving, and improving existing bridges is a vital part of asset management. UDOT employs two programs to keep its bridges in a state of good repair. First, the Bridge Preservation Program reduces deterioration of structures that are presently in Good or Fair condition, as defined by the National Bridge Inspection Standards, extending service life. Some preservation practices include deck pothole patching, repair of other concrete elements, repainting of steel elements, replacing expansion joints, and adding or repairing deck overlays.

Second, bridges in Poor condition are prioritized for inclusion within the UDOT Bridge Replacement/Rehabilitation Program. Whether poor condition bridges are rehabilitated or replaced is based on several considerations including project cost, daily traffic, rehabilitation alternatives, and current overall condition.

New and replacement bridges in the state are constructed with long-term durability and maintenance in mind. New bridge decks receive overlays to help extend service life. These overlays typically include a thin-bonded polymer overlay or polyester concrete overlay placed over a bare concrete deck.

Public Safety

Safe bridges are critical to the state's infrastructure system, and Utah has some of the safest bridges in the country due to a proactive preservation program, extensive focus on in-service bridge inspections, and a robust rehabilitation and replacement program.

UDOT follows federal guidelines for in-service bridge inspections and maintains a comprehensive inventory of the condition of state and locally owned bridges. UDOT has a data-driven approach to developing the Preservation and Rehabilitation/Replacement programs, in order to keep bridges in a safe and operable condition.

With technologies constantly improving and changing, UDOT's inspection techniques and inspection records continue to improve. The implementation of UAS (unmanned aerial systems) armed with tools including GPS, high-resolution visual imaging, infrared thermography, and high-speed ground penetrating radar have been considered to better characterize billions of dollars of State assets.

Resilience

An earthquake resilient bridge can withstand the effects of an earthquake or can quickly be repaired with minimal cost and effort. Utah has a strong need for resilient bridges due to the proximity of these structures to active faults along major population corridors. Since 2010, Utah has been using performance-based seismic design, which uses energy dissipation, as the primary seismic bridge design method. This design strategy creates bridges that are likely to perform better during and remain functional after a catastrophic event. Recently designed bridges have high levels of resilience because they incorporate this newer design standard. However, older bridges still pose a risk of unsatisfactory seismic performance.

On the morning of March 18, 2020, a 5.7 magnitude earthquake occurred in Magna, UT, approximately 10 miles west of Downtown Salt Lake City. While this was a moderate event with ground accelerations lower than what is used for design, the response to this seismic event provides some insight into the resiliency of bridges in Utah. UDOT's emergency response team has prepared for events such as this and was able to

inspect hundreds of bridges within just a few days. Only one bridge was temporarily closed pending further inspection and repair, demonstrating the resiliency of the bridges in the Salt Lake area.

Innovation

UDOT is recognized as a national leader in the areas of alternative project delivery, which uses innovative contracting and teaming approaches to address challenges in schedule, cost, constructability, impacts to public, and technical risk in delivery of transportation projects. This commitment to innovation in project delivery extends back to the original reconstruction of I-15 in the late 1990s and continues today. UDOT is in the process of completing the first Progressive Design-Build (PBD) delivery project in the state. This project used innovative approaches and partnering to address schedule, right-of-way, utility, and a number of technical risks for seven interstate bridges, three pedestrian crossings, and several miles of retaining walls through an active urban corridor.

UDOT has been innovative in implementing materials in new applications. The agency has used its research and Structures Division to further advance the use of Lightweight Cellular Concrete (LCC) in embankments and retaining walls with recognition on a national level.

UDOT, in coordination with the Utah Division of Wildlife Resources, Salt Lake City, Salt Lake County, and Summit County, recently completed the first wildlife bridge of its kind in the State of Utah to reduce animal-vehicle collisions. The bridge is unique in that it was constructed specifically and only to link animal habitats separated by I-80 at Parleys Summit; a location that has experienced hundreds of such collisions over the past 10 years. As a result, wildlife can migrate without completing a dangerous interstate crossing, drivers can travel more safely, and delays associated with these collisions have been reduced. Frequent animal crossings and improvements in safety have already been observed.

Recommendations to Raise the Grade

- Continue to make transportation a funding priority in the state. To increase public safety, UDOT and local municipalities will need continued resources to preserve and rehabilitate the State's portfolio of bridges.
- Prepare for the necessary increase in capacity due to a large population increases without decreasing funding for rehabilitation and replacement of existing aging bridges. This will require the creation of a plan to balance costs associated with growth against costs associated with bridges nearing the end of their service lives. Maintaining this balance through additional funding will be critical to "Keeping Utah Moving."
- Replace or rehabilitate seismically deficient bridges to maintain resiliency and service after a potentially catastrophic seismic event.
- Provide UDOT and local municipalities the resources to continue to place itself on the leading edge of innovative solutions to transportation challenges.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

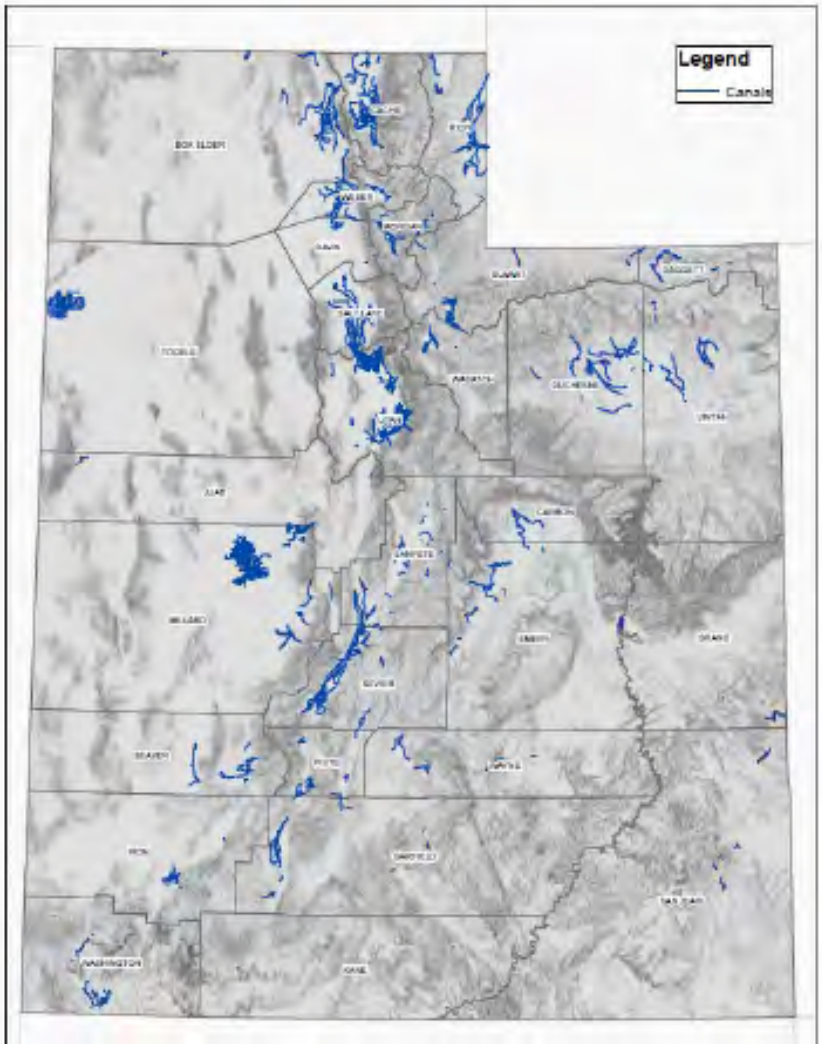
CANALS D+

Executive Summary

Canals have served a critical role in Utah's communities with an estimated 5,300 to 8,000 miles across the state largely consisting of earthen embankments and cut ditches. Many in operation today were constructed over 100 years ago representing engineering marvels that contribute to the growth and prosperity of Utah. However, the canal system was not designed or constructed to modern standards, so poor performance or failures that once resulted in flooded fields now threaten cities, public infrastructure, and developments that have encroached upon the canals. While state leadership initiated and funded an inventory of Utah's canals, the condition or risk of over 1,600 entities remains largely unknown, namely risks from extreme weather or events. Furthermore, nearly all canals are owned and maintained by local entities that operate with diminishing funds and have limited access to increasingly competitive state-level resources.

Condition & Capacity

It is estimated that there are between 5,300 to 8,000 miles of canals in Utah, which exist with very limited regulation. Most of these canals pre-date modern construction (over 100-years in age) and face continued pressure from urban encroachment and water rights management. Such pressure shifts the importance of these assets increasingly towards a high risk category.



Canals are largely self-regulated by over 1,140 canal companies and 200 private owners. Canals face significant changes in management and ownership as urbanization often requires canal owners to evolve from water conveyance for farming to flood management conduits for municipalities. As agricultural land is developed, much of the permeable surfaces that previously allowed for stormwater infiltration, no longer allow for water collection. Instead runoff from asphalt, concrete, and buildings are concentrated. This collection increases the amount of surface runoff as it moves downstream. Stated simply, canals were never intended for this purpose and were designed for opposite flow movements; to get smaller downstream as water is distributed to users rather than increasing in size as water is collected. This use of canals can result in overtopping of banks, flooding, and damage to downstream properties and infrastructure. Canal owners, municipalities, and state entities risk liability in the case of failure as legal precedent is relatively unknown. As a result of these challenges, Utah's canals remain some of the highest risk infrastructure assets in the State.

The Utah legislature and state officials have recognized the risk that unmanaged and unfunded canals pose to Utahns and have moved forward with two important pieces of legislation to begin to address these pressing issues. The first, House Bill (HB) 370 was voted into law in 2014 and required the Division of Water Rights (DWR) to create and maintain an inventory of all canals with a minimum design capacity of 5 cubic feet per second (CFS) in the state by July 2017. It required documentation of the canal alignment, contact information, maximum flow capacity, and if the canal was used for flood or stormwater management. Although this legislative action did not create a formal oversight position or long-term funding to manage canals, it provided funding to assist canal owners and irrigation companies to develop a safety management plan for their systems as required in Utah Code Section 73-10-33. Additionally, HB 370 provided the State Engineer the authority to examine and inspect any ditch or other diverting works and order additions or alterations to assure public safety. This process identified over 4,500 miles of canal, previously unmapped, throughout the State of Utah. These canals are shown relative to county maps in Figure 1.

In 2017 the legislature took further action through the passing of HB 301, which requires improved coordination between municipalities/counties, and canal companies/operators, and also that municipalities and counties notify canal companies of proposed land developments near their canals. It also expanded the inventory to include all enclosed segments of water conveyance systems in first- or second-class counties (i.e., Washington, Utah, Salt Lake, Davis, Weber, and Cache).

O&M, Funding and Future Needs

Nearly all canals within the State are owned, managed, and maintained by local canal and irrigation companies, or municipalities. These systems are operated with diminishing funds and resources as the densely populated portions of the state transition away from operation as agrarian communities, that operated and maintained existing canals, to urban centers where the use and maintenance programs change.

Given the age and historic construction of these systems, typically no operation requirements or maintenance programs are established. Competing for resources with other types of public infrastructure and spending priorities, the canal systems have been minimally maintained. However, the State legislature is to be applauded for their efforts with HB 301 which expanded funding to these systems and developed a database of canal information and action plans. However, the condition or risks of over 1,600 canal entities remain largely unknown. In absence of any data on operation, maintenance, conditions or risk, the performance and reliability of these canal systems during extreme events (e.g., extreme weather, flooding or seismic) may pose threats to other critical infrastructure and/or the public.

Public Safety, Resilience & Innovation

From the late 1990s to date, there have been several notable canal failures across densely populated corridors leading to costly damages, legal contests and even fatalities. The Bureau of Reclamation recently recognized the magnitude of these risks confronting Utah and responded by completing studies of its portfolio of urban canals across the Western United States. The following is a summary of publicly available canal distresses:

Figure - North Jordan Canal

- North Jordan Canal - Murray (2013). The City participated in paying for some of the canal repairs.
- Mendon Canal (Exact Year Unknown)
- Provo Canal (Exact Year Unknown)
- Draper Irrigation Canal (Early 2000's)
- Logan Northern Canal (Logan-Hyde Park) Canal (July 2009):
  - Three Dead with over a million-dollar settlement (Salt Lake Tribune, 2011)
- Davis/Weber Canal – the largest in state's history (July 1999 and April 2006)
- Vernal Canal (Exact Year Unknown)

Several successful mitigation and enclosure projects have been completed over the last decade. Examples include the Logan–Hyde Park Canal Enclosure and Provo Reservoir (Murdock) Canal Enclosure Project (PRCEP). Additional information on these projects are summarized below.

- Cache Water Restoration Project (CWRP). The project was a collaborative effort between multiple funding sources: NRCS, Cache County, Cache Highline Water Association (CHWA) and Logan, North Logan, Hyde Park and Smithfield Cities. The CWRP enclosed six miles of open canal in box culvert, concrete pipe, HDPE pipe and PVC Pipe to restore water to irrigation shareholders lost in 2009 from a canal breach.

- The PRCEP addressed over 21 miles of canal by enclosing it into a 126-inch steel pipe that carries more than 400 million gallons of water daily. The PRCEP begins at the mouth of Provo Canyon in Orem, Utah, and runs to the Point of the Mountain in Salt Lake County, Utah. The Provo Reservoir Canal supplements the Salt Lake Aqueduct (SLA) and the Jordan Aqueduct (JA) and is one of the main water delivery arteries along the Wasatch Front; this project represents the largest state funded canal projects in Utah history.

Figure 3 – PRCEP construction (PRWUA, 2020)

RECOMMENDATIONS TO RAISE THE GRADE

- Many canal owners function on shoestring budgets for which regular funding is limited or not available and typically covers only basic maintenance and occasional, limited upgrades. At a State level there needs to be consistent, funding or additional loan opportunities for these conveyance systems. The availability of these resources should be prioritized to reduce risk to high value infrastructure and preserve public safety by completing risk assessments, maintenance, or capital improvements. Additional state resources and a division, specific to canal safety, should be established to provide the necessary support and oversight of the State's canal systems.
- HB 370 required the development of safety management plans but did not require the identification of high risk or poorly performing canals and canal segments, repair plans, improvements to reduce risks, or stockpiling of materials for emergency repair. The State should develop and implement a long-term plan for operation, maintenance and if necessary, transfer of canal assets that addresses urbanization, risk profiling, and coordinates historic and future use of water rights.
- A statewide risk assessment framework should be developed. Canals that are identified as 'high risk' or with significant impacts to nearby communities should be prioritized for study and be required to complete annual inspections. As canals require considerations by multi-disciplinary teams, these studies and inspections must include hydraulic, geotechnical, and structural engineers as well canal maintenance and operations.
- Assign or further clarify jurisdictional authority at a State level to coordinate canal condition assessments, resources, funding, costs for mitigation, repair, and development, and emergency action plans. Operation and maintenance plans should cover all aspects of a complex, interconnected regional and statewide canal system. Additionally, these canals will require updated hydrology and hydraulic analyses that incorporate the impact of urbanization and climate change.
- The largest canal hazards are at crossings with other infrastructure, particularly if they were not constructed properly. At a minimum, these crossings should be assessed and engineered to modern standards following requirements of project stakeholders.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

DAMS C+

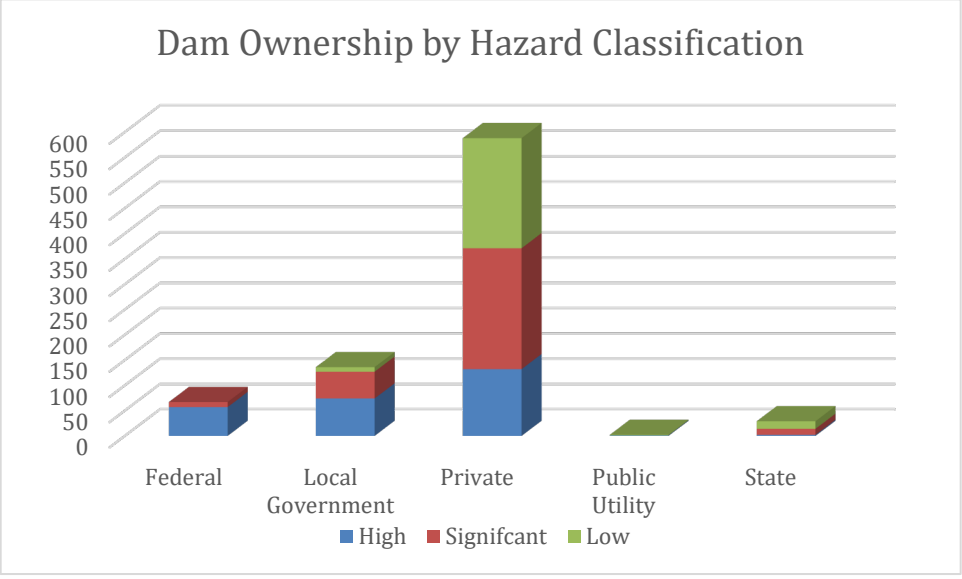
Executive Summary

There are more than 900 dams in the State of Utah, 860 of which are on the National Inventory of Dams. While earthquakes and severe weather pose perennial threats to dams, Utah faces unique dam safety challenges regarding the dam's ages, seismic risks near major population centers, and a continuing trend of urban growth near breach zones. The life expectancy of dams is approximately 100 years. Many of the dams within the State are between 50 and 70 years old.

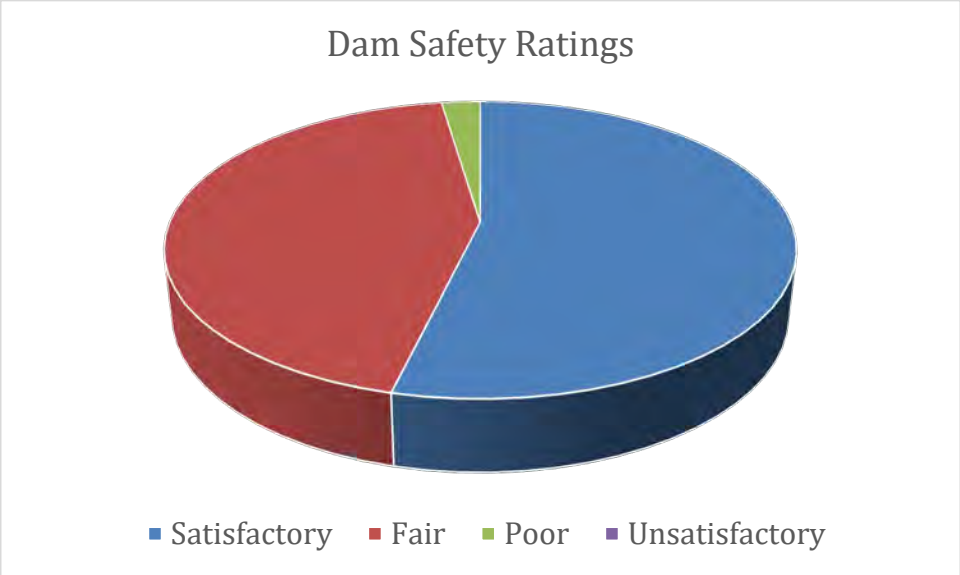
As dams approach the end of their design lives, the downstream demand and development increases, current low risk dams are gradually becoming high risk dams through urban encroachment. At the same time, as the risks associated with dam failures increase, their necessity becomes even more critical. The western region of the United States continues to receive pressure to provide stable water resources amidst challenges associated with dramatic growth, drought, and climatic changes. Neighboring states are undertaking ambitious and expansive efforts to meet future water demand through a renaissance in dam construction.

Condition & Capacity

There are more than 860 dams in the State of Utah on the National Inventory of Dams with approximately 100 in need of rehabilitation to meet current standards. Of these 860 dams, 266 are considered high hazard with 212 managed by the state and 54 under federal jurisdiction. The ownership of the dams is shown in the figure below for high, significant, and low impact dams.



Approximately 54% of high hazard dams meet current safety standards and are classified as being in satisfactory condition with another 44% being classified as in fair condition needing rehabilitation to meet current seismic and flood standards. Impressively, 100% of the state regulated dams have emergency action plans in place. The following graphic shows the current status of the high hazard dams' ratings in the state.



O&M and Future Funding Needs

Utah provides approximately $3.8 million of funding per year for routine dam rehabilitation projects. The rehabilitation program has been in effect for over 20 years and 45 dams have been rehabilitated to meet current safety standards. Over the last two decades, an additional eleven dams have been partially rehabilitated but need another phase of rehabilitation to complete the work. Ninety-eight dams still need rehabilitation to meet current standards. As the condition assessment evaluations of the 15 unrated dams are completed, additional repair needs could be added to the list. As the infrastructure ages, more funding will be needed to keep these dams operational due to sediment accumulation, wear and tear on outlet systems, and upgrades to meet seismic and construction standards.

Year after year, the State of Utah Department of Water Rights and Resources has been remarkably successful in making these improvements to the status and reliability of dam infrastructure. Essentially, the state has had to do more with less, because current funding remains steady and does not take inflation into account which drives up construction costs. This lack of dam rehabilitation funding is a key consideration in the condition of dam infrastructure. The program needs additional support to complete work in progress and to maintain additional dams transitioning to high hazard classification as a result of urban encroachment.

Many medium to low impact dams are owned by private individuals or entities. The cost of their O&M and/or repair and rehabilitation is very difficult to estimate. These owners often struggle to make needed repairs without the help of state/federal funds.

Historically, the cost of each dam safety project has averaged about $2-3 million. The cost varies depending on the size of the dam and the extent of the deficiencies. At the current level of funding, the state can fund approximately one or two dam safety projects each year. Upcoming projects slated for 2021, 2022 and 2024 have cost estimates of $11, $3 and $7 million, respectively. With each passing year, inflation chips away at the dollar's buying power and the ability to complete projects and protect public safety in a timely manner diminishes.

An estimated $250 million is needed to bring the remaining high hazard dams up to minimum safety standards. At the current funding rate, the rehabilitation will take over 60 years. If funding were increased from $3.8 million to $10 million per year, the dams could be upgraded in approximately 25 years.

Another issue of concern is the maintenance and operation of medium and low hazard dams. ASCE is currently investigating the possibility of including these dams on the national inventory, which may eventually lead to requirements for operations and maintenance procedures. It is likely that there are hundreds to thousands of these smaller dams within the State. Adding these dams to a national registry will allow evaluation of the condition of the dams and help identify risks associated with these facilities. Information will also allow better decision making related to public safety and water supply reliability.

Public Safety, Resilience & Innovation

The Utah Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. These dams are assigned to one of three general classifications: high, moderate, and low. High hazard dams are classified as such because of a high probability for possible loss of life in a failure event. Moderate hazard dams are associated with significant property loss in a breach event. Low hazard dams are expected to pose no significant property loss in a dam failure. Due to increasing water demands by municipalities and irrigation districts, dam construction continues at a steady pace with current replacement values estimated at over $1.5 billion. The assessment condition for high hazard dams regulated by the state is as follows:

A key component of managing risk associated with Dams is an Emergency Action Plan (EAP). The EAP is a formal plan that identifies potential emergency conditions and provides prescriptive procedures to minimize property damage and loss of life in a catastrophic event. Utah's Dam Safety Program has an equivalent of six full-time employees, with each person overseeing more than 116 dams on average. In-spite of limited resources, 100% of state regulated dams have emergency action plans in place (211 out of 212 of Utah's high-risk dams and 166 out of 192 moderate hazard dams have EAP's). Low risk dams do not require EAPs. Utah's Dam Safety Program has an annual budget of $800,000

The Division of Safety of Dams (DSOD) currently has 3 dams being rehabilitated with a 4th that is approved but not yet started. Two additional projects should begin construction following spring runoff. Two more small, partial rehabilitation projects will be completed in 2020 to address some problems where funds were insufficient to do a full rehabilitation.

DSOD has leveraged state-level funding through partnership with federal agencies to accomplish much more than the state funding alone would have allowed. DSOD has accomplished, and continues to accomplish, a significant amount of work that results in a tremendous risk reduction to the people of the state.

Recommendations to Raise the Grade

- Evaluation of the 15 unrated dams is needed to determine the condition of all high hazard dams within the State. Without the ratings on 10-15 percent of the high hazard dams in the state, the true state of the system is still unknown.

- The rate of rehabilitation for dams within the State is lower than needed due to current funding levels. A time frame of over 60 years to complete rehabilitation is too long. This time frame creates a situation where dams that have been rehabilitated will relapse back onto the list before

the first round of repairs are completed. This relapse will occur due to changes in standards or long-term use of the systems.

- The life expectancy of dams is approximately 100 years. Many of the dams within the State are between 50 and 70 years old. As the infrastructure ages, more funding will be needed to keep these dams operational due to sediment accumulation, wear and tear on outlet systems, and upgrades to meet seismic and construction standards. DSOD has accomplished, and continues to accomplish, a significant amount of work that results in a tremendous risk reduction to the people of the state. Funding at a higher level is required to maintain or improve the grade.

- The upgrades to existing dam systems to maintain operations and meet safety requirements should aim to achieve satisfactory ratings within the next 25 years. Funding for this program must be secured. When all systems are to the satisfactory level, a funding program to maintain this rating level can be implemented.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

Executive Summary

Most of Utah's growing population is served by drinking water networks that operate under multiple threats. With a population that is projected to reach 5 million people by 2050, Utah not only faces water supply challenges, but significant funding needs and seismic concerns. However, to provide guidance to the public water systems on monitoring critical drinking water assets and networks, the Utah Legislature now requires that the state's Conservancy Districts develop and maintain System Asset Management Programs (SAMPs). Aside from streamlining asset management, these plans also improve the resilience of the Utah's drinking water infrastructure because some areas have developed seismic event contingency plans that include processes for responding, repairing, and restoring system functionality as expeditiously as reasonably possible. Earthquakes are the third major threat to Utah's water supply networks. A Mag-7 earthquake would cripple Utah's major water supply systems by damaging the transmission lines from the water sources that cross the Wasatch Fault to bring water from the mountains to the densely populated valleys. Through efforts initiated by the Utah Division of Water Resources (DWRe) and other state, regional, and local agencies, residential per capita water use has decreased by about 20% over the past two decades. Utah's Prepare 60 drinking water plan has laid out a well-supported path for optimization of water sources and conservation.

Introduction

The provision of water for residential, commercial, and industrial customers falls largely within the service areas of the following agencies:
Central Utah Water Conservancy District **(CUWCD)***
Jordan Valley Water Conservancy District **(JVWCD)***
Weber Basin Water Conservancy District **(WBWCD)***
Washington County Water Conservancy District **(WCWCD)**
Metropolitan Water District of Salt Lake and Sandy
Salt Lake City Public Utilities Department* (Supplies drinking water to many areas outside of the Salt Lake City Limits)
**Indicates entities that were interviewed for this section of the Utah Infrastructure Report Card*
Conservancy districts own significant transmission infrastructure which conveys water from remote sources to the population centers, which are mainly located in the northern part of the state. The "last mile" of water distribution is generally covered by public water utilities. The Utah Division of Drinking Water (DDW) is engaged in a variety of activities related to the design and operation of Utah's public drinking water systems – those parts of water systems that directly interface with the consumer.

Capacity

Utah is one of the most arid states in the nation and water supply is a major issue. Most water supplies generally originates in remote locations, including snowpack and snowmelt from mountains. In Northern Utah, water supply sources extend from the adjacent Wasatch Range to the mountains of Eastern Utah. Some of the latter involve trans-basin diversions from the Colorado River watershed.
Building and maintaining the infrastructure to move water supplies is a critical part of Utah's water conservancy districts' missions. Success is critical, as about 90% of Utah's urban population lives in the northern part of the state, away from the water supply sources.

This arrangement is the basis of a major threat: climate change. Although the effects of climate change on Northern Utah's water supply are not yet fully characterized, a generally accepted model forecast says that climate regimes in the Southwestern United States are generally moving north. This translates to climate conditions shifting northward, with attendant reductions in snowpack. Hence, potentially reduced water supplies in Northern Utah[1].

Southern Utah is already encountering limitations on water supply. The most significant factor is population growth, which will impose impossible-to-fulfill demands on currently available water supplies. Fortunately water conservancy districts across the state are prioritizing future planning. For example, to alleviate limitations on water supply, the Washington County Water Conservancy District proposes to construct a project that will import water from Lake Powell on the Colorado River[2] to Washington County.

Northern Utah's water supply situation is not yet as critical as that of Washington County. However, Utah's population growth rate is among the highest in the U.S. Qualified sources estimate that Northern Utah will grow by about 72%, or 2 million people, by 2065.[3] Population growth will exert demands on water supplies (increasing by more than 110,000 Acre-Feet/Year) that will result in similar challenges as those being experienced in Southern Utah. The Bear River Development study project, initiated in 1991 by the Bear River Development Act to develop surface water of the Bear River and its tributaries, represents critical infrastructure for the future water security of northern Utah.

Water conservation is helping to postpone the need for new sources of water and transmission infrastructure. Through efforts initiated by the Utah Division of Water Resources (DWRe) and other state, regional and local agencies, conservation has resulted in significant reductions in water use[4,5]. Residential per capita water use has decreased by about 20% in the past two decades. A collaborative effort by Utah's Division of Water Resources and major WCD's, entitled ***Prepare 60*** has laid out a well-supported path for optimization of water sources and conservation[6].

Condition

Utah's public works professionals have been building and operating drinking water pipes and associated infrastructure for nearly 150 years. Many pipes in systems across the state are 50 years old or older. While aging infrastructure is a concern, transmission and distribution infrastructure is generally newer in Utah than it is in drinking water systems on the east coast.

It's important to note that Utah water conservation districts and public utility systems are investing in their infrastructure to improve and maintain conditions. For example, according to Ogden City, they have the oldest water system in the state, but have been replacing 1.2% of their entire pipe infrastructure system every year, at a cost of $5.6 million/year. In 2015, they also upgraded their water treatment plant in Ogden Canyon to a microfiltration facility capable of producing 13.5 MGPD and upgradeable to 17 MGPD. The Jordan Valley Water Conservancy District reports replacing distribution pipelines that were installed in the 1960s and are breaking at increased rates. These two examples are indicative of proactive and responsible maintenance and replacement taking place across the state.

O & M

Because water supply is such a critical issue in Utah, adequate planning and associated infrastructure maintenance is critical. The Utah State Legislature has done an exemplary job of incentivizing and requiring responsible operation and maintenance of drinking water infrastructure. GIS water modeling and plans at the utility level are required by state mandate and complement large-scale planning done by the Water Conservancy Districts, discussed below. Additionally, every city that serves 500 residents or more must develop conservation plants.

The Utah Legislature enacted a requirement that the Conservancy Districts develop and maintain System Asset Management Programs (SAMPs). Further, the Districts must provide guidance to the public water systems within their service area for the establishment of local SAMPs. Because of this mandate, Utah's major public water systems all execute systematic monitoring and the **3 R's,** mostly through the implementation of SAMPs. Portions of the systems might be old, but they are periodically evaluated, and appropriate maintenance and replacements are scheduled.

SAMPs require the estimation of future expenditures for each of the system's components. By adhering to this practice Utah's drinking water entities should be prepared to technically and economically deal with current and future maintenance of their systems.

It should be noted that smaller systems often lack adequate planning, management, operation and financing, the lack of which can and does lead to undesirable results. One of the reasons for this situation is that Utah's requirements for basic Operator Certification appear to be insufficient to assure competent water system operation and maintenance. Another factor includes a lack of system maintenance caused by inadequate funding from user rates that have not kept pace with the systems' cost requirements.

Funding and Future Needs

According to the U.S. Environmental Protection Agency (EPA)'s 6th Drinking Water Infrastructure Needs Survey, Utah drinking water infrastructure will need $4.35 billion over the next 20 years. The biggest category of needs is in transmission and distribution; $2.354 billion is reported. The Utah Statewide Water Infrastructure Plan finds that $25.7 billion should be spent over the next 50 years, including $11.7 billion for repair and replacement, $6.6 billion for new supply development, and $7.4 billion for conservation.

Funding for the planning, management, operation, and maintenance of Utah's water supply systems comes from a variety of sources: local – including rates and property taxes, regional (conservancy districts), state and a little federal. It should be noted that Utah water rates are lower than the national average; however, large metropolitan areas including Salt Lake City are routinely assessing needs and raising rates when necessary.

Much of the federal funding is for the Central Utah Project Completion Act activities. The Central Utah Project moves water from the eastern Utah Colorado River Basin to the Wasatch Mountain range where most of the state's population is located. Water is provided for municipal and industrial use, recreation, and irrigation, to name a few.

Many localities bond to invest in their water facilities – these bonds are frequently paid back by user fees. For example, the Jordan Valley Water Conservation District issued a $65 million in water revenue bonds and $25 million in water revenue refunding bonds, which are used to finance construction and capital assessments for the Central Utah Water Project, construction of a 12-million gallon reservoir, and various other projects.

Research for our previous Infrastructure report showed that about half of the 20-year future expenditures will be in the private sector, i.e., construction related to new developments by the developers. The other half will be normal SAMPs-expenditures by water supply entities, derived from a variety of user fees. It is not likely that future funding will be an issue, except in the case of a major seismic event. That situation could require substantial injections of funds from public entities, very much like current government subsidies to address some of the financial impacts of the COVID-19 pandemic.

Public Safety

DDW regularly monitors of all Utah's public water systems. If necessary, specifications of remedial measures are made. The most important functions of the state and local entities are the maintenance of system integrity and the safety of the water supply – physical, chemical and biological.

The Utah Department of Environmental Quality reports that over 90 percent of the 978 public water systems have an approved rating. Occasionally, smaller systems have trouble meeting monitoring frequency standards. 99.9 percent of community water systems also have source protection plans.

Resilience

A major earthquake associated with the Wasatch Fault would cripple water supply systems, and possibly cause some systems to be unable to provide their residents with potable drinking water for a very long time. The threat has three major system components: damages, response and restoration time, and costs thereof. Again, in response to legislative mandate, the Conservancy Districts and some of the public water systems in their areas have developed contingency plans that cover their most likely seismic event scenarios. These plans include not only dealing with potential damages, but also with the human factors like transportation, response and communications by their personnel. Further, they have assembled equipment and needed materials to readily respond, repair and restore (again, 3 Rs) as expeditiously as reasonably possible. However, many smaller systems remain unprepared in this area.

Innovation

The **CUWCD's** North Fork Siphon Replacement Project is a multi-year initiative that contends with severe weather constraints in the winter months. The project, which is due to be completed in 2021, includes a cableway crane imported from Austria that can transport multiple pipe segments, pour all concrete, and assist in rock anchor drilling. This innovative method of project delivery is expediating the project despite terrain and weather challenges.

Recommendations

1. The State of Utah should **continue to** invest in systems that will provide for future water supply needs. Our state's explosive population growth significantly shortens the usual advance planning time for water supply development.
2. The long-term effects of climate change are not fully understood, and our major snow-based water supplies may be more negatively impacted than currently anticipated. The state should appropriate specific funding to consider more long-range alternatives to future options, such as out-of-state sources from areas that might be less negatively impacted by climate change.
3. The disastrous impacts of a major seismic event should be more strongly considered. The state should support and fund not only contingency planning and preparation activities, but also consider the construction of certain measures that could minimize, or in fact, possibly eliminate, damage/ displacement of major water supply conduits that are susceptible to a major seismic event. Example: San Francisco Public Utilities work on the Hetch Hetchy conduit where it crosses the Hayward Fault.
4. The state should **promote and fund** the extension of SAMPs programs for smaller water systems, including the provision of technical support.
5. The state should fund and support an analytical analysis of future water system financial requirements (how much and by whom), given the rapid growth of population and urban development. Further, the state should consider financially supporting water supply and distribution entities, such as is currently practiced with transportation, e.g., UDOT's freeway construction.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

Executive Summary

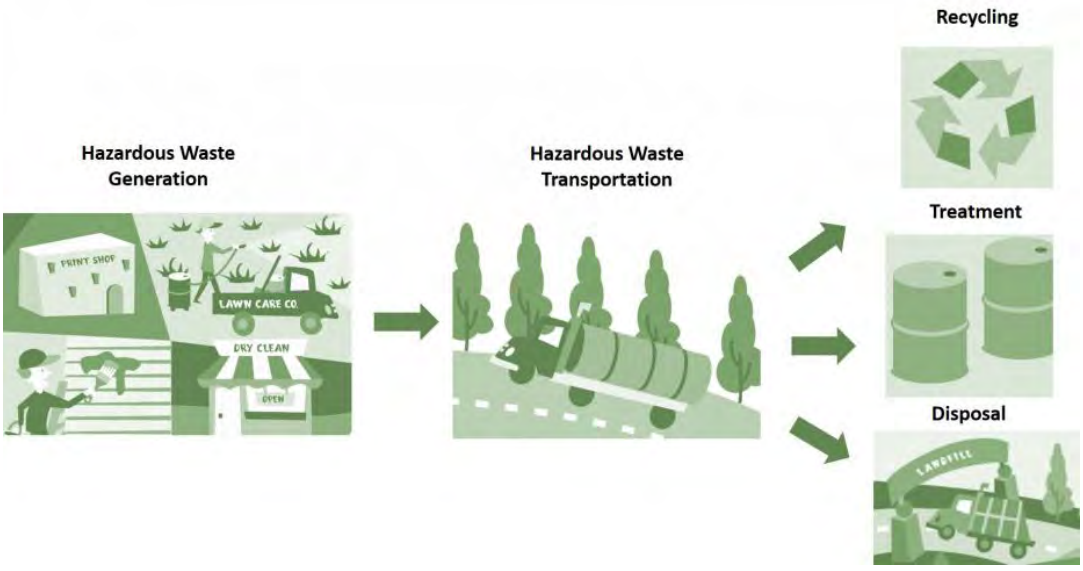
Hazardous wastes, such as byproducts of mining and manufacturing, present complex management and potential cleanup challenges to communities throughout Utah. Furthermore, electronic wastes containing lead and other heavy metals represent a growing concern when improperly disposed of in landfills. Ongoing cleanup concerns and no clear policy on banning e-waste from landfills is holding Utah back. However, Utah has a unique opportunity to leverage strong partnerships between state agencies and private industry to accomplish important goals in the management of hazardous waste, resource recovery and reuse, and land cleanup and redevelopment. Current public-private partnerships throughout the State are making a sustainable manufacturing industry and a circular economy part of a promising future for Utahns. One such project investigating a method of recovering precious metals, located in Utah and funded by the REMADE Institute, could provide the economic incentive to dramatically increase e-waste recycling by as much as 20%. Coordinated policy support for similar proven initiatives could lower waste management costs, reduce pollution from hazardous and e-wastes, create jobs, and immediately raise Utah's Hazardous Waste infrastructure grade.

Background

Hazardous waste infrastructure in Utah includes small and large quantity generators, handlers, and transporters of hazardous waste that are regulated by the federal Resource Conservation and Recovery Act (RCRA). The Utah Department of Environmental Quality (Utah DEQ) is the primary state agency overseeing rulemaking and cleanup of hazardous waste. Within the DEQ, the Division of Waste Management and Radiation Control (DWMRC) supports entities to enhance understanding of what is required to properly manage hazardous waste streams, including treatment, storage, transport, and disposal (UDEQ DWMRC, 2019). Additionally, the Division of Environmental Response and Remediation is charged with protecting public health and the environment through environmental cleanup of chemically contaminated sites, ensuring the proper use of underground storage tanks, and by providing chemical usage and emission information to the public and local response agencies (UDEQ DERR, 2019). In (YEAR?), Utah was the second state in the nation to receive approval from the EPA to manage an underground storage tank program which allows the DEQ to regulate at the state level (UDEQ DERR, 2020).

Condition & Capacity

Nationally, Utah ranked **36th** in hazardous waste generation (34,355 tons), **20th** in hazardous waste management (152,744 tons), and **12th** in quantity of imported hazardous wastes despite accepting just 3% of the total interstate movements of these wastes in 2017 (UDEQ DWMRC, 2017). Trends in hazardous waste generation and movement are subject to local and national economic cycles, though hazardous waste generation in Utah has decreased dramatically in the last decade: from 82,259 tons in 2007 to 34,355 tons in 2017, **a reduction of nearly 48,000 tons or 58% less waste** (UDEQ DWMRC, 2017). However, the state and region's population growth could reverse this recent downward trend in the future, but pollution prevention practices including modifying processes to produce less waste and choosing less toxic or non-toxic chemicals as cleansers may in turn offset the effects of an expanding state population.



O&M, Funding and Future Needs

Operation and maintenance costs of existing hazardous waste facilities are typically paid by private or local government entities, while state agencies are responsible for facility permitting, educational outreach, inspection, and regulatory oversight. These operations are technically complex and are designed to both mitigate the hazardous nature of the wastes and to store or manage them in such a way that they represent reduced risks to the public and the environment.

Existing funding sources for the UDEQ Divisions that are responsible for regulating hazardous waste include the Environmental Quality Restricted Account (EQRA) and the Hazardous Substance Mitigation Fund (used for the 10% state Superfund match requirement). The EQRA is funded through disposal fees paid by operators of commercial solid, hazardous, and radioactive waste facilities and municipal solid waste landfills. **The significant decrease in the Utah volume of waste between 2007 and 2017 resulted in reduced revenues for the fund, so a corresponding increase in disposal fees was levied on solid, hazardous, and radioactive wastes.** Without additional funding streams, expected shortages in the EQRA could negatively impact DEQ oversight and outreach programs that serve as a critical means for ensuring broad public compliance with state and federal regulations.

Cleanup and remediation of potentially contaminated "brownfield" sites can be costly. One notable Superfund site in Ogden, Utah resulted in the EPA cleaning up **more than 97,000 containers of hazardous materials in order to remediate the site and demolish the building for redevelopment at a reported cost to the city of more than $3 million** (The Salt Lake Tribune, 2019; Standard-Examiner, 2020). While such expenses may sound extraordinary, there are still gains to be realized from brownfield redevelopment. Every $1 spent on brownfields cleanup activities produces $2.48 in private investment and each single acre of brownfield redevelopment preserves 4.5 acres of undeveloped "greenfield" (Wasatch Brownfield Coalition, 2020).

The Voluntary Cleanup Program (VUP), established in 1997 and administered by the Department of Environmental Quality, is designed to mitigate risks to human health and the environment while removing stigma from potentially contaminated brownfield sites (UDEQ DERR, 2017). This program creates a mechanism and incentive for regulatory-friendly, streamlined cleanups to occur to return land to a beneficial use. A brownfields toolbox developed in 2006 by the nonprofit public/private partnership Envision Utah, while useful, has not been revised in 14 years. An updated toolbox would be beneficial to better serve the unique needs of economically disadvantaged or distressed communities through the

inclusion of updated case studies and resources (Envision Utah, 2006).

Public Safety, Resilience and Public Safety

Public safety and resilience in managing hazardous wastes stored in both public and privately-owned facilities is governed through a combination of federal and state regulations and requirements. The emphasis on coordination and partnering between private industry and regulators for reporting and emergency management is necessary to ensure the public welfare. Utah's history of strong public-private partnerships and government accountability provides an excellent framework for current emergency management and preparedness, innovative approaches to recycling and managing electronic and hazardous wastes, and a future where Utah could achieve a sustainable circular economy.

In Utah, emergency response to potentially hazardous chemical or toxics releases is coordinated between the Department of Public Safety (DPS), Department of Environmental Quality Division of Environmental Response and Remediation, and the Division of Emergency Management to assist Local Emergency Planning Committees (LEPCs). LEPCs consist at a minimum of both local officials and representatives of facilities subject to emergency planning requirements. LEPCs must develop an emergency response plan, review it at least annually, and provide information about chemicals in the community to citizens. According to the Utah Department of Public Safety's 2019 Annual Report, "[Department of Emergency Management] liaisons supported a total of 102 Local Emergency Planning Committee (LEPC) meetings within their regions, while logging over 80,571 miles traveling statewide to support incidents, disasters, as well as to attend meetings, training and exercises." Funding for pre-disaster mitigation and planning also increased from $7 million in 2018 to $10 million in 2019.

Electronic waste is a rapidly growing component of the national waste stream. According to a World Economic Forum report, "E-waste may represent only 2% of solid waste streams, yet it can represent 70% of the hazardous waste that ends up in landfill" (UNEC, 2019). Just one cathode-ray tube (CRT) television or computer monitor may contain between four and eight pounds of hazardous lead (BAN, 2015). While the Utah legislature passed a manufacturer education law in 2011, electronic wastes are neither banned from being housed in landfills nor subject to additional disposal regulations or fees. Utah is home to a particularly poignant case study in what can go wrong when electronic wastes are mismanaged.

A recycler once operated three locations in Clearfield, Parowan, and Cedar City which accepted a variety of electronics, including cathode-ray tube (CRT) televisions which contained leaded glass vacuum tubes. In March 2014, a fire at the Parowan facility destroyed a large pile of these televisions and their potentially toxic components and later initiated an EPA cleanup action. The Clearfield site, alone, is still home to 3.5 million pounds of hazardous waste in a 40,000 square foot building (Standard-Examiner, 2019). While the Department of Environmental Quality Division of Solid and Hazardous Waste attempted to work with the owner to address the identified regulatory and environmental concerns, the company failed to comply and instead abandoned the hazardous materials. According to the most recent information provided by the Department of Environmental Quality, there are currently no plans to clean up the Clearfield and Cedar City locations (UDEQ DWMRC, August 2019). Problems of hazardous electronic waste abandonment, regulatory noncompliance, and recycler bankruptcy when needs and business models change present a potential challenge to managing these materials in Utah and across the nation.

Local recycling has also become increasingly expensive in Utah. According to research published by WasteDive.com, "After reporting minimal effects in 2017, Utah now appears to be feeling many of the same issues as its regional neighbors as municipalities debate whether [recycling] programs should be continued in spite of increased costs. The state's Department of Environmental Quality reported in

summer 2019 that commodity market changes had caused a surplus of recyclables in storage, which the agency was allowing facilities to dispose of as needed." Efforts to develop a strong and sustainable local recycling market would pay dividends for manufacturers which require reliable services, encourage recycling business entrepreneurship, and provide municipalities with more competitive local options.

Despite the challenges in e-waste recycling and managing hazardous wastes, Utah is also at the center of exciting pilot projects and initiatives to develop a sustainable circular economy. One Utah company, founded in Salt Lake City in 2002 and featured by the Governor's Office of Management and Budget in 2017, reportedly created 357 new jobs in the sustainable manufacturing sector. Furthermore, public-private partnerships with State Universities have also yielded the ability to recycle devices that would normally enter the Registered Medical Waste (RMW) stream. In 2014, one such collaborative effort between the University of Utah, Ethicon, and Intermountain Healthcare reportedly resulted in:

- **260,966 units of devices diverted from landfills;**
- **59,964 pounds of waste reduced from landfills;**
- **35,978 pounds of carbon dioxide emissions reduced;**
- **1,858 gallons of gasoline saved.**

Another collaborative project at the University of Utah, sponsored by the REMADE Institute, seeks to adapt "relatively low-cost and low-energy leaching technologies to directly recover copper and other precious metals from e-waste." According to the REMADE Institute, this project will provide the economic incentive to dramatically increase e-waste recycling by as much as 20%. The potential energy and emissions reduction are estimated at 21PJ per year and 1.2 million MT of CO2eq per year.

The circular economy, while being quietly developed and realized in Utah through separate initiatives, would benefit from additional coordinated State support and recognition designed to attract similar opportunities for all Utah manufacturers and entrepreneurs.

Recommendations to Raise the Grade

- Enact legislation prohibiting the disposal of electronic wastes in landfills.
- Make a coordinated public commitment to achieving sustainable, circular electronics and manufacturing lifecycles which reduce waste, increase opportunities for manufacturers to recycle and reuse valuable materials, and eliminate toxic processes and byproducts whenever possible.
- Leverage Utah's strong culture of public-private partnerships and entrepreneurship to grow "re-manufacturing" jobs within the State of Utah to achieve a sustainable, circular economy.
- Engage electronics manufacturers, retailers, and recycling service providers to develop a robust electronics takeback and recycling program available statewide.
- Require toxic material and chemical reduction or substitution in consumer products and industrial processes as soon as suitable alternatives can be identified.
- Maintain or expand funding for innovative brownfields redevelopment programs which prioritize serving low-income or otherwise historically disadvantaged communities.
- Continue to engage private partners in voluntary cleanup and monitoring of potentially contaminated property before resale, redevelopment, or transfer.
- Set policies which help to develop strong local recycling markets in Utah.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

LEVEES D-

Executive Summary

Utah's geography rapidly transitions from high elevation, mountainous terrain to low-lying basins or lakes, which puts communities in the path of potential flooding. Levees are instrumental to Utah's flood control system. There are a between 102 and 112 miles of levees statewide with approximately 252 individual segments averaging nearly 60 years old. It's estimated that over 125,000 residents are protected by the state's levee infrastructure and the total risk to property should failure occur exceeds $10 billion. While little to no construction documentation or condition data are available for existing levees, public safety information regarding floods in Utah includes 23 recorded injuries and 30 recorded deaths since 2000, with 17 flood-related deaths in 2017 alone. Given the Utah's flood-prone areas and community encroachment on levees, the public safety consequences or costs of failure have and will continue to increase over time. However, in much of the state, limited to no planning exists for emergencies such as levee breaches. Changes to federal flood mapping, which will increase insurance costs, may mean that many owners cannot afford coverage and would therefore not be eligible for federal recovery funding if flooding occurs. Absent available state and federal funding, local municipalities have taken action to address changes in flood mapping and levee deficiencies. These projects have included levee improvements in Cache, Weber, Iron, and Salt Lake Counties.

Condition & Capacity

After failures of flood protection systems (e.g., Hurricane Katrina) and changes in flood mapping, the National Flood Insurance Program has had an increased focus on levee condition assessment across the country. In 2014, Congress created the National Levee Safety Program and with it the National Levee Database. Currently, the database is the only portion of the program receiving funds. If fully funded, this program would provide funding assistance to states and regional districts for establishing participating levee safety programs and for levee repair/rehab. Information regarding the condition of most of the levees across the State is largely unknown. As flood mapping is being updated by the Federal Emergency Management Agency (FEMA), municipalities, counties, and private property owners are finding that existing levees are not meeting basic elevation standards for flood control of a 100-year design flood event (i.e. a flood event that has a 1% likelihood of occurring in a given year). As FEMA designates these areas as floodplains, property owners with mortgages will likely be required to purchase expensive flood insurance and not be eligible for federal recovery funding if flooding occurs.

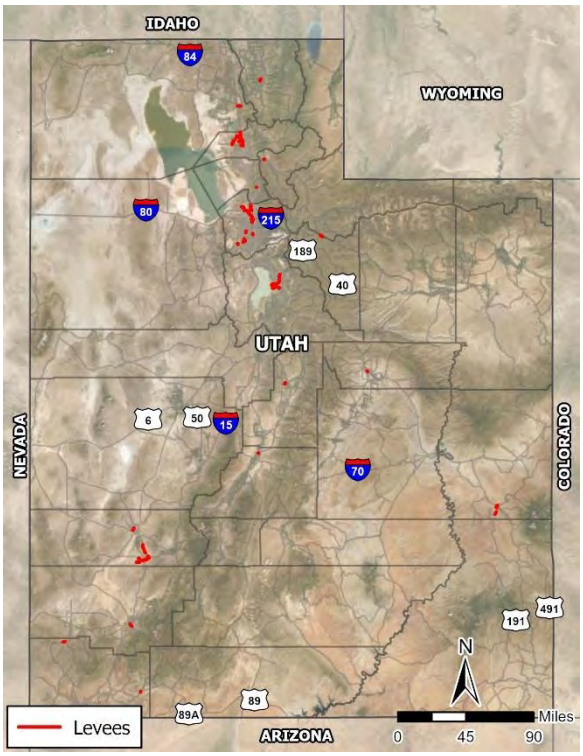

Figure – Mapped levees across the State of Utah (USACE, 2020)

The exact number and length of levees within the State is largely unknown. Figure 1 summarizes data sources shown in the US Army Corps of Engineers (USACE) National Levee Database (NLD) and FEMA Statewide National Flood Hazard Layer. These maps have been processed into a single map layer and overlapping/duplicate features removed in favor of the USACE layer. Additionally, features that were not considered true levees, based on a review of aerial imagery, were removed. Acknowledging possible limitations of the data, the total length of levees statewide is estimated to be between 102 and 112 miles (about 252 individual features).

Given the historical impacts of an extended wet cycle, as seen in the early 1980s, another such period would be even more financially devastating to Utah as a result of continued development along and near flood management infrastructure. Levees and canals form the backbone of flood management and conveyance throughout the State and their systemic performance is critical in Utah's water future. As a result of development, near Utah waterways, the risk and potential damages will be higher during a future wet cycle than they were in the early 1980s.

While the levees tracked by the USACE represent only a subset of the total number of levees in Utah, the estimated average levee age is nearly 60 years. This means that Utah's levees were largely not constructed using modern methods or to modern standards. For most existing levees, little to no documentation of means or methods of construction are available. Levee construction across the State has largely consisted of non-engineered earthen embankments, constructed by rural property owners, at a time when failure resulted in relatively low-cost damages such as a loss of farmland and crops. As populations have increased and urban encroachment has occurred, costs from levee failure, maintenance, and addressing right of way issues has increased exponentially from development. As information on levee conditions is limited or unknown, and damages from poor performance have increased, the condition of many of the levees in the state may be considered high risk.

O&M

Nearly all levees within the State are owned, managed, and maintained by local municipalities such as cities and counties. Given the age and historic construction of these levee systems, no operation requirements or maintenance programs were established. As a result and given competing priorities for resources with other types of public infrastructure, levee systems have been minimally maintained. Performance and reliability of these levee systems under extreme events is presently unknown.

Funding & Future Needs

There have been nearly a thousand recorded flood events in Utah from 1996 to 2017. The years with the highest number of recorded flood events since 1996 are 2010, 2011, 2012, 2013, and 2014. Over this same time period, there has been a total of nearly $1 million of recorded damage and over $400 million in property damage. These increased costs further demonstrate how much more expensive flood events are in developed versus undeveloped areas.

As the condition and location of many of the state's levees are largely unknown, no formal estimates of funding demands or costs are available. As FEMA flood mapping is being finalized, local municipalities are developing estimates of impacts on a localized basis. However, these local estimates are not being tracked on a state level to develop an overall "picture" of the levee system funding needs.

On a national level there is an estimated $80 billion needed in the next 10 years to maintain and improve the nation's levees. Federal funding is available only for USACE-owned levees, leaving more than half of the nation's levees which are owned by states and local governments and operate on limited budgets without additional resources for repairs and maintenance. Currently, very limited, to no funding is available on a State level to address potential levee deficiencies and provide levee improvements for communities that may be impacted by the revised mapping.

Public Safety, Resilience and Innovation

Flood control design and management is largely managed by local municipalities and property owners. Coordination at a State level is largely not overseen by a particular organization, but instead defers oversight to FEMA and the flood insurance program, which rely almost exclusively on federal funding. The USACE NLD provides an estimate of population at risk (PAR) from levees in Utah at over 125,000 residents and the total risk of structural damages (buildings, contents, and vehicles) of over $10 billion.

From Local Hazard Mitigation Plans (LHMP), the estimated flood vulnerabilities and loss estimates for Box Elder, Cache, Davis, Salt Lake, Weber, Tooele, and Washington Counties, which represent major population centers, is more than $4 billion. Noticeably missing from this list are Summit and Utah Counties, which would also include significant vulnerabilities and losses but were not reported.

Currently, limited, to no planning exists for emergency action plans from a levee breach in much of the State of Utah. This means that if a levee fails, no written or approved in-place plans and supplies are available for implementation. During a flood event, this absence of coordination means a greater impact to the public and increased costs of damages and repair. These flood events pose a significant hazard in terms of injury and even fatalities to Utahns. There have been 23 recorded injuries and 30 recorded deaths in Utah from floods since
2000. In 2017, there were 20 fatalities from floods, the most of any year in Utah. Figure 2 (Utah Division of Emergency Management, 2019) summarizes these risks and further illustrates how risks from flooding are growing over time. Considering the increase in frequency of extreme events in recent history and the potential for additional events related to climate change in the future, the risk and associated costs associated with flooding will only continue to escalate.

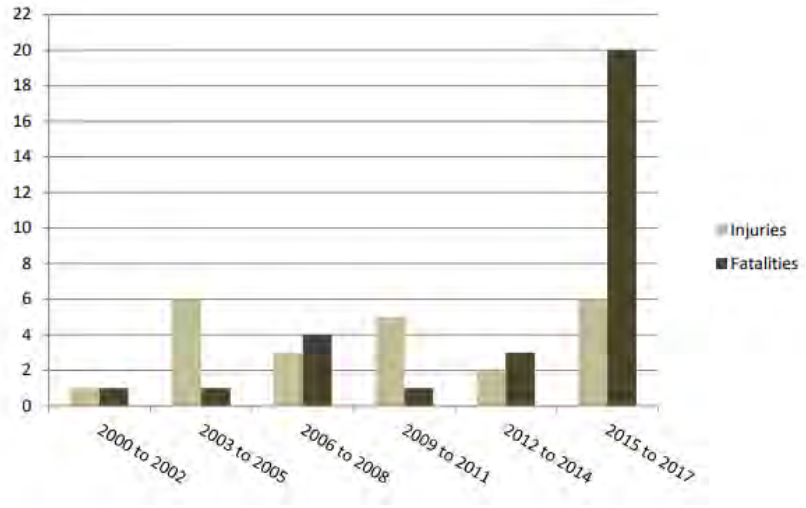

Figure 2 – Utah Flood Injuries and Fatalities from 2000 to 2017 (Utah Division of Emergency Management, 2019)

Recent success stories related to levees include:

- Salt Lake County – Surplus Canal: A significant effort has been made by Salt Lake County to address urban encroachment, deficiencies in maintenance, and to satisfy USACE levee standards for the Surplus Canal Levees. These efforts began in 2012, when the USACE Levee Safety Program completed a periodic safety inspection, which identified more than 300 deficiencies and categorized the levees as unacceptable. As a result, a large portion of the west side of Salt Lake City would be mapped by FEMA into a special flood area. The Surplus levees protects approximately 6,250 acres of land in Salt Lake County, including the Salt Lake International Airport. Salt Lake County has diligently and proactively worked to address the USACE classified issues by working to address encroachment to the levee system, relocating fencing / structures outside the USACE jurisdiction, and addressing a significant number of right-of-way conflicts from encroachment. Salt Lake County Flood Control has an approved Letter of Intent (LOI) from USACE to create a System-Wide Improvement Framework (SWIF) for the Surplus Levees. With the approval of the LOI, USACE has granted the Surplus Levee systems temporary, active rehabilitation assistance eligibility under Public Law 84-99. This eligibility will continue as Salt Lake County meets the milestones required by the

SWIF. USACE completed a routine inspection of the levees in 2019, at that time 53% of the unacceptable encroachment violations noted in the 2012 report have been resolved. The end goal of these efforts is to certify the levee system and eliminate the need for additional flood insurance with local businesses and residents.

- Weber County - As recently 2011 serious flooding has been observed as a result of inadequate levees in Weber County. A number of proposed improvements have been initiated as part of the Weber County Emergency Watershed Protection Project through a grant awarded through the NRCS Emergency Watershed Protection program to assist in flood management improvements. Many other municipalities are turning to federal funding (NRCS) to address the gap in State and local funding available to accredit levees to modern standards.
- Ogden City – Ogden River: Revisions to FEMA flood mapping impacted over 1.1 miles along the Ogden River. In response, Ogden City engaged with innovative solutions and community improvements to contain the 100-year storm. The flooding hazard was addressed by reconnecting the floodplain to the Ogden River, which had been disconnected and degraded by fill and littered with junk, providing limited habitat value and poor flood control. The result of these efforts was a five times increase in riparian habitat, 1.1 mile river trail community system, and seven constructed wetland stormwater return areas. Concentrated river access was developed at over 20 locations, including innovative river access ramps, which allowed for river recreation like fly fishing, kayaking, and swimming. In total the project removed over 6,000 tons of recyclable debris, 9,000 tons of trash, 9 whole cars, 2,500 tires and 200 batteries. As a result of these improvements, the restored river section has been identified as a Blue-Ribbon Fishery, which was the first such designation within an urban environment in Utah. At a total project cost of $6 million, flooding hazards have been addressed, wildlife habitat has been improved, river access and recreation have increased, and local businesses are seeing the benefits of a new city attraction.
- Cedar City – Coal Creek: Recently completed Letter of Map Revision (LOMR) to achieve levee accreditation with FEMA.

Recommendations to Raise the Grade

- Define, inventory and identify levees across the State of Utah into a single database (similar to what was accomplished for canals in House Bill 301 in 2017 and 370 in 2014). Given the forthcoming change in flood mapping, this legislative action should be completed within 5 years.
- Fulling funding the National Levee Safety Program, which would provide more reliable levee systems and funding to provide an integrated approach to protect people and property from floods.
- Assign or further clarify jurisdictional authority or watershed committee at a State level to coordinate levee condition assessments, resources, funding, costs for mitigation, repair, development, and emergency action plans. Require that operation and maintenance plans cover all aspects of a complex regional and statewide levee system.
- Assess levees using updated hydrology and hydraulic analyses that incorporate the impact of urbanization and climate change.
- Increase funding at all levels of government and leverage private funds to address structural and nonstructural solutions that reduce risk to people and property from flooding hazards.
- Consider alternative funding sources, and other risk reduction measures such as better outreach/education and warning and evacuation systems.

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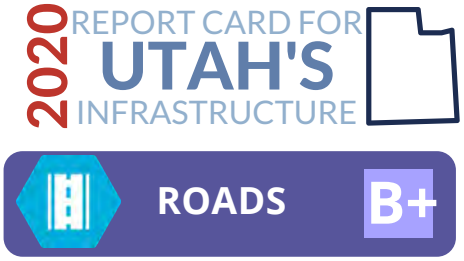

Executive Summary

On May 10, 1869 the first Transcontinental Railroad was officially completed at Promontory, Utah; a monumental feat for the country and Utah resulting in the nickname of the Crossroads of the West. Since that time Utah has continued to grow, now with a comprehensive roadway network of approximately 49,290 miles (73% local, 2% Interstate, 25% State), 40% of which are in mediocre or poor condition. For Utah to remain a modern-day Crossroads serving extensive freight traffic from regional ports, funding has increased from $1.2 billion in 2017 to $1.7 billion in 2020 and major capacity investments continue. Utah also embraces innovation and asserts fiscal leadership through the 2020 institution of a Road Usage Charge (RUC) for electric and hybrid vehicle owners and the 2021 gas tax increase from $0.311 to $0.314 per gallon. Finally, in recent years the state has also streamlined Transportation Asset Management Plans (TAMP) and project risk analysis to preserve roadway infrastructure, increase its adaptability amid extreme events, and maintain its functionality after extreme events occur.

Capacity

According to the United States Census Bureau, the 2019 population estimate approximately 3.2 million people. By the year 2050 the State population is estimated to reach 5 million people. Utah's transportation system must strategically grow with the population. Utah's transportation system must provide capacity not only for residents but for the robust trucking industry. Since 2012, Utah has increased the roadway miles by approximately 680 miles per year to keep up with the population growth. According to the U.S. Department of Transportation, Utah had approximately 49,290 miles of roadways (73% local, 2% Interstate, 25% State) and is ranked 36th in the country for the most road miles. Utah also has approximately 74 miles of Express Lanes on I-15 spanning from Spanish Fork to Layton. Congestion through the Utah Interstate and Highway network has a negative effect on the Utah economy and the Utah Department of Transportation (UDOT) has invested in major capacity improvement projects on the interstates. UDOT has completed, or is close to completing, several capacity projects on the Interstate system since 2015: I-15 CORE from Payson to Lehi; I-15 Technology Corridor from Lehi Main Street to SR-92; Northbound I-15 from Bangerter Highway to I-215; Southbound I-15 from SR-201 to 12300 South; and I-15 Express Lanes in Weber and Davis County, to name a few. According to Utah's Unified Transportation Plan, UDOT plans to improve several freeway interchanges along the Wasatch Front and construct nine new interchanges on I-15 by 2050.

Condition

In November 2020 the Reason Foundation released a study ranking every State's highway system. Utah ranks No. 17 nationally in overall cost-effectiveness and condition. Utah's best ranking is in urban arterial pavement condition (4th). In 2018, 24/7 Wall St., LLC, a Delaware corporation which runs a financial news and opinion company, created an index with the help of the Army Corps of Engineers to see how Utah and other states stack up when it comes to infrastructure. Utah was ranked 21st lowest in the country for road condition. Meanwhile, it appeared that Utah was using its transportation funding effectively and was ranked 14th lowest in the nation for spending on state highways at $399/driver.
A similar study was completed by Consumer Affairs in 2019 to determine the states with the best and worst roads in the country. The study determined that Utah has the eighth-best road conditions in the country. The study considered four factors to make this determination:

- Amount spent per mile of road
- Motor crash fatalities on roads per mile
- Percentage of roads in poor, fair and good condition
- Email survey asking residents to rate their roads.

According to the study, Utah spends about $23,000 per mile of road.

Operation & Maintenance

UDOT developed the Transportation Asset Management Plan (TAMP) in 2019 to achieve its strategic goal to "preserve infrastructure." The objectives of the plan are to:

- Formalize a data driven performance-based approach for allocating transportation funds to manage pavements, bridges, Advanced Traffic Management System (ATMS) and signal devices
- Incorporate asset management into the intermediate and long-range planning processes
- Incorporate risk management into resource allocation decisions
- Provide a valuable asset management tool with real time data

UDOT developed an Asset Register as part of the TAMP to depict the value of the state's major roadway assets (See Figure 1). The value of these assets reflects the cost to replace and construct the asset including costs for design, construction and oversight. The total value of UDOT's assets is estimated to be over $45 Billion.

Figure 1 – UDOT Asset Register

ASSET TYPE	QUANTITY	VALUE
Pavement & Bridge Assets		
Pavement NHS	115,694,396 SY	$20,000,000,000
Pavement Non-NHS	57,850,911 SY	$8,000,000,000
Bridges NHS	14,451,169 SF	$8,000,000,000
Bridges Non-NHS	6,258,935 SF	$3,000,000,000
Other Assets		
ATMS Devices	Lump	$479,000,000
Signal System	1255 Each	$314,000,000
Walls	71,820,494 SF	$3,400,000,000
Pipe Culverts	16,553 Each	$1,000,000,000
Barrier	7,347,574 FT	$450,000,000
Signs	96,160 Each	$300,000,000
Pavement Markings	26,000 Miles	$42,000,000
Rumble Strips	26,287,969 FT	$6,000,000
Fences	1,890 Miles	$70,000,000
Cattle Guards	895 Each	$20,000,000

UDOT allocates transportation funding to its assets using a three tiered system: Tier 1 – Performance based management, Tier 2 – Condition based management and Tier 3 Reactive management. UDOT's pavements are included in Tier 1 – Performance based management and historically have exceeded the target levels for good and poor conditions. The TAMP also defines investment strategies throughout the state to maintain the condition of the state's roadways.

In addition to the TAMP, UDOT works closely with the Metropolitan Planning Organizations (CMPO, WFRC, MAG and DMPO) to develop and maintain a long-range plan for the state's transportation infrastructure. Roadways are a major component of the transportation plan and UDOT evaluates the plan each year as it develops the Statewide Transportation Improvement Plan (STIP) and decides which projects are to be funded.

Funding and Future Need

With the state's population projected to increase more than 56 percent by 2050 according to the U.S. Census Bureau, there is a significant need for new roads and highways, as well as for mass transit and other methods of transportation. The FY 2020 budget contains approximately $1.7 billion for the

Department of Transportation (UDOT) to help ensure that Utahns continue to enjoy a high degree of mobility. The State transportation budget was $1.6 billion in 2018 and 2019, and $1.2 billion in 2017. This funding is on top of approximately $250 million in highway bonding that was programmed to be spent in FY 2019. Utah's state and local resources make up approximately 80% of the funds used for transportation projects, and the State only relies on Federal funding for approximately 20%.

A significant portion of Utah's revenue for transportation projects comes from the gas tax. The current Utah gas tax is $0.311 per gallon and will increase to $0.314 per gallon on January 1, 2021. Utah ranks #24 for the state with the highest gas tax. Historically drivers have increased the miles driven, thus creating more demand on the State highways. Typically, the more miles driven means more fuel is consumed creating a revenue stream from the gas tax. With the technological advancement in vehicles, the average fuel efficiency in newer cars is increasing thereby reducing the amount of gas tax revenue. Electric cars are becoming more available and affordable which also affects the state's revenue for transportation projects. Utah has implemented annual fees for electric and hybrid vehicles to collect revenue to maintain the highway system. In 2020, Utah instituted a Road Usage Charge (RUC) which gives owners of electric and hybrid vehicles the choice of paying an annual flat fee or a usage-based fee. The RUC is intended to replace the gas tax revenue lost from these vehicles, allowing the State to continue to provide a high-quality transportation system.

Public Safety

Utah is proactively working to improve the safety of the State's roadways through the "Zero Fatalities" initiative. In 2019 there were 248 fatalities on Utah's roadways, a 6% decrease from 2018. The number of fatalities has been dropping since 2016 and Utah is using that momentum to continue their efforts until they reach their goal of zero. Utah made significant steps in 2019 toward this goal and had 203 days with zero fatalities. Now that is a goal we can all live with.

Utah has developed a Highway Safety Plan that emphasizes the "Three E's" – Engineering, Education and Enforcement. Engineering consists of infrastructure on the state's roadways to protect drivers and includes barriers, signals, intersection improvements, shoulder improvements, and other innovative solutions. Utah understands the role education plays in helping the public understand what they should and should not do while driving. The State makes significant investments in sharing this message with the public to ultimately change poor driving habits. Despite the best safety education programs and safely executed roadways, enforcement is still needed to remind people of the laws associated with the use of our transportation systems. Utah's law enforcement professionals work extremely hard to enforce safe driving laws to save lives.

Resilience

On March 18, 2020, a 5.7 magnitude earthquake hit Salt Lake City. This was the largest earthquake to hit Utah since a 5.9 magnitude quake struck in 1992. By Friday March 20, 2020 Structural Engineers from UDOT inspected 705 structures to evaluate them for any type of damage. There was only one bridge that was damaged enough to be closed. These thorough and quick inspections helped Utah keep its roadways open and demonstrated the resilience of the State. Utah also embraces resilience by using project risk analysis to increase the adaptability of the roadway system while maintaining functionality. When UDOT does a roadway project their engineers look at potential risks to the project that could have a negative effect on the roadway. These risks could include unique soil conditions, utility conflicts, or environmental factors , to name a few. Their team of experienced engineers and contractors develop plans to reduce or avoid such risks so that a resilience of the transportation system can be maintained.

Innovation

Utah is one of the leading states in the country for using innovation to find solutions to the State's transportation needs. Utah uses innovation in design, construction and operations. Utah has constructed several innovative intersection and interchanges on the State's transportation system. UDOT has constructed Continuous Flow Intersections (CFI) on state highways to significantly increase the capacity of the intersection and reduce wait times at traffic signals. In addition to CFIs UDOT has constructed several Diverging Diamond Interchanges (DDI) to reduce congestion and reduce travel times through the interchange.

Utah continues to innovate on project delivery programs such as Design-Build (DB) and Construction Manager/General Contractor (CMGC) to deliver projects in a way that provides value through cost savings and accelerated schedules. UDOT continues to streamline the application of these project delivery programs, while also allowing contractors to propose innovative solutions to projects.

Recommendations

- Continue to use state funding for transportation projects from sustainable and appropriate funding sources.
- Increase the gas tax and continue to find alternative transportation revenue such as the Road Usage Charge program.
- Continue to improve life cycle costs assessments to determine a project's true cost and use this information to select projects that provide the best value to the State and its residents.
- Continue to invest in research to identify technologies and innovative transportation systems to improve congestion and safety.
- Invest in infrastructure to facilitate the use of autonomous vehicles and vehicle to vehicle communications.

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Executive Summary

Solid waste management is essential to Utah's public and environmental health and is overseen by the Department of Environmental Quality (DEQ). Since 2013, the number of solid waste landfills has increased from 107 to 122 while only 5% of the state's total usable landfill area has been used. While the system's capacity is increasing, the current condition of the state's solid waste sector is somewhat unknown as Utah's Solid Waste Master Plan has not been updated in nearly 15 years While capacity and economic resources are sufficient for now, a glaring challenge and potential opportunity is the state's low recycling rate, less than 2% per year as compared to the national average of ~35% annually; educational initiatives and expanded access are current efforts underway.

Capacity and Condition

According to the Resource Conservation and Recovery Act (RCRA), solid waste includes garbage, refuse, sludge from wastewater treatment plants, water supply treatment plants, or air pollution control facilities and other discarded material, resulting from industrial, commercial, mining, and agricultural operations, and from community activities, and industrial wastes.

Landfills are the most commonly used method to manage solid waste in the State of Utah, followed by incinerators, land spreading, and recycling. Landfill facilities are divided into six categories/classes (Table 1).

Table 1 Landfill Facilities Classification and Definition

Classification	**Definition**
Class I Facilities	facilities that process more than 20 tons per day
Class II Facilities	facilities that process less than 20 tons per day
Class III Facilities	facilities that process industrial solid waste
Class IV Facilities	facilities that process construction and demolition (C&D) waste
Class V Facilities	private facilities
Class VI Facilities	private facilities that process C&D waste

The State of Utah currently has 122 public facilities for landfilling waste, increased from 107 since 2013. The transfer stations (15) have decreased 13, while recycling stations (11) have remained the same compared with 2013. There is no general solid waste incinerators currently as the number has changed from 2 to 0, but a few incinerators for special waste are still in operation. The data also shows landfilling is still the state's most widely used solid waste processing method.

Figure 1 shows the spreading of solid waste in different facilities with a recycling ratio in each facility class. Although the ratio for Class IV facilities is over 30%, the total municipal solid waste recycling is only 1.45%, as shown in Figure 2, while the national recycling ratio (Figure 3) is over 35%, respectively.

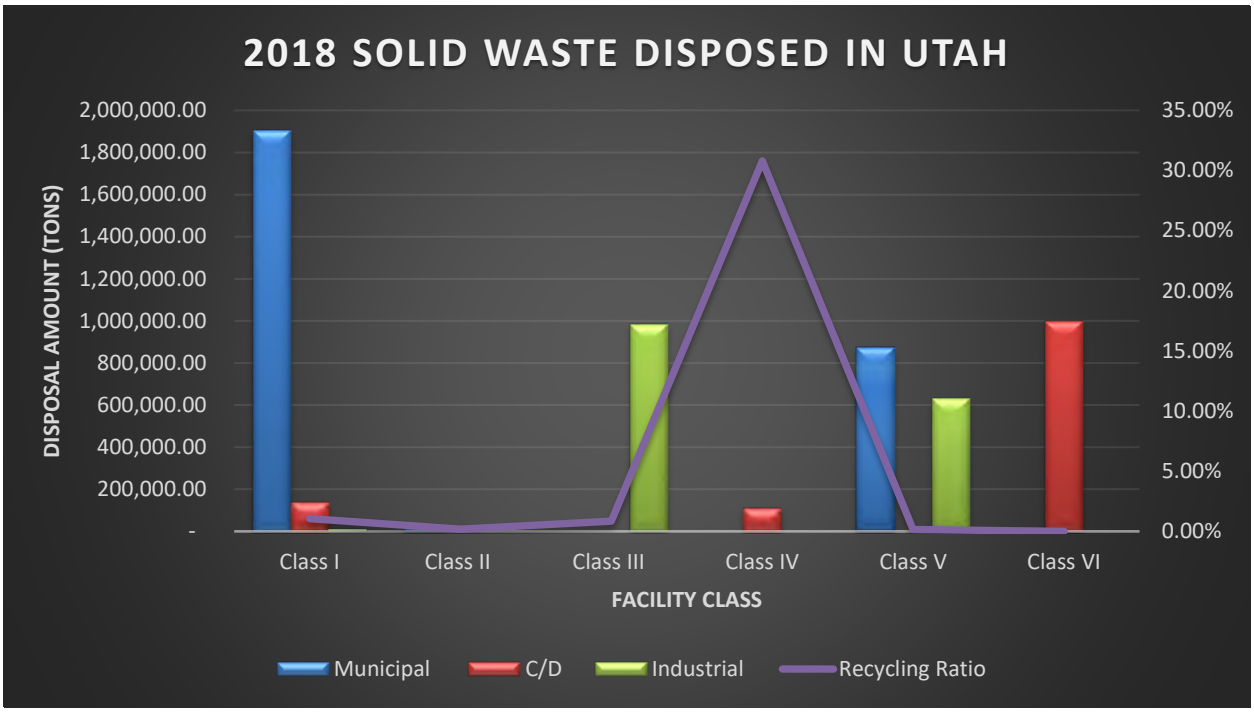

Figure 1 2018 Solid Waste Disposed in Utah by Landfill Facilities

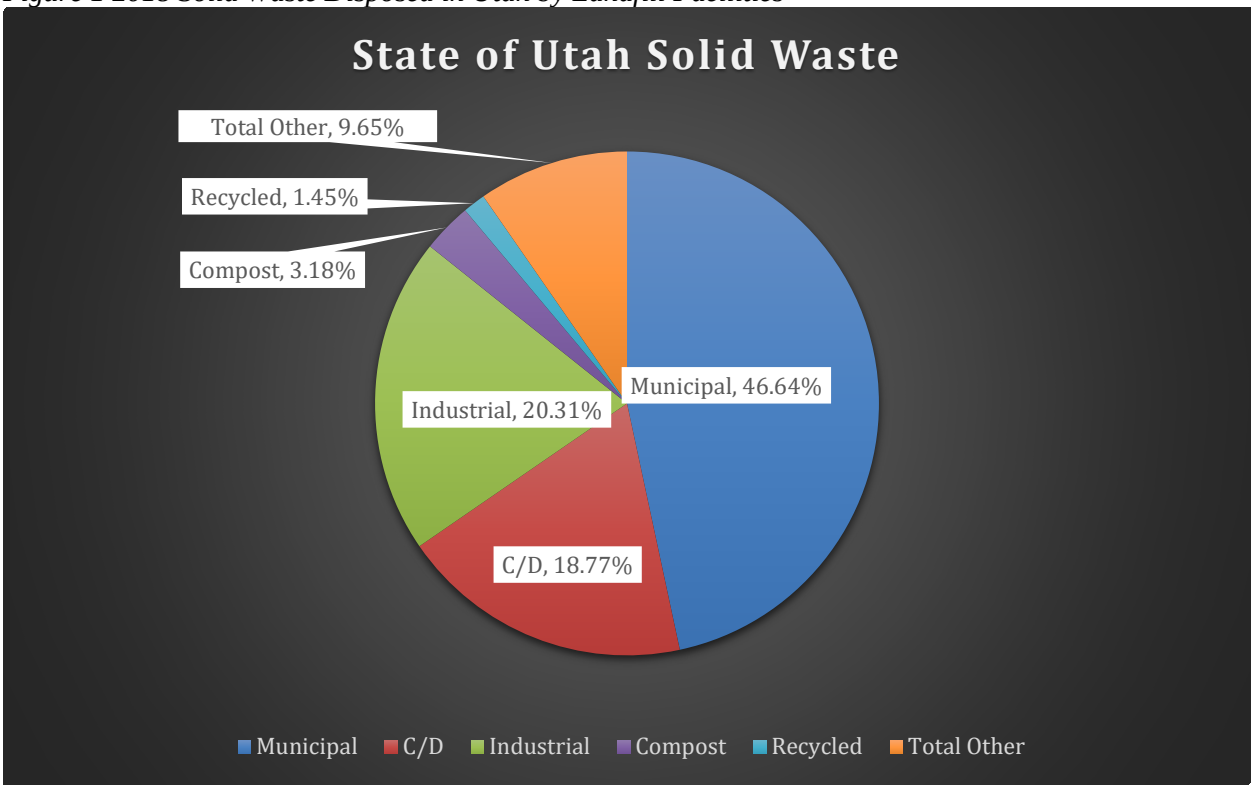

Figure 2 State of Utah Solid Waste Composition in 2018

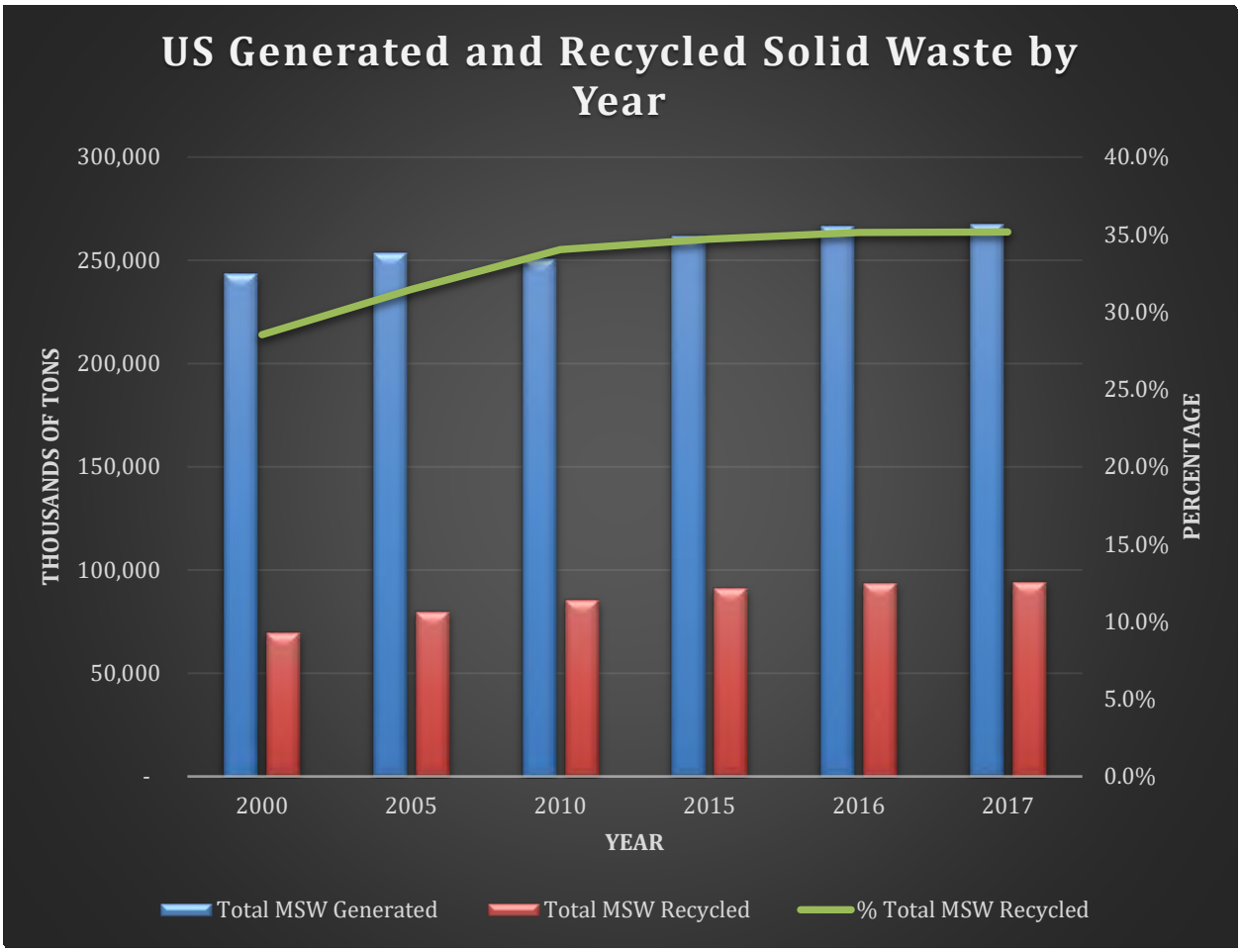

Figure 3 US Generated and Recycled Solid Waste by Year

The condition of existing capacity is changing over years. Overall, the State of Utah is in a good standing in regards landfill, since it is estimated that only 5% area has been used across the state.

In the 2018 Legislative Session, HB 373 on self-inspecting landfill facilities was signed by the Governor. The bill was pushed by local landfills for a proper training and certifications for their employees, as well as a possible future fee reduction. Despite it is written into the law, DEQ is still doing inspections regularly.

There is also a recycling and education outreach team in Salt Lake City to keep solid waste out of the landfill's recycling and green waste facilities, and educate residents on solid waste recycling.

O&M

Overall, the State of Utah has a great Operations and Maintenance program, as detailed in Utah Administrative Code Section R315, which set the criteria for the daily operations and maintenance in different areas depend on the populations. For example, the owner or operator shall maintain the Plan of Operation approved by the division manager and make sure their daily operations are as per the approved plan. The plan shall include: a description of on-site solid waste handling procedures; a schedule for conducting inspections and monitoring for the facility; contingency plans in the event of a fire or explosion; corrective action programs to be initiated if ground water is contaminated; contingency plans for other contaminates release; a plan to control fugitive dust generated from roads, construction, general operations, and covering the waste; a description of maintenance of installed equipment including leachate and gas

collection systems, and ground water monitoring systems; procedures for controlling disease vectors; and other requirements as listed in Utah Administrative Code Section R315.
Legislation is also playing an important role in operations and maintenance. In the past 5 years, at least nine bills regarding solid waste have been passed and written into law. From a legal standpoint, Utah has been doing well in establishing/amending new/existing legislation.

Funding

The current funding sources for Utah DEQ Solid Waste are the Solid Waste Facility Fees and permit/inspection fees. There is no federal or state grants available Solid Waste Division. The Utah DEQ follows the Utah Solid and Hazardous Waste Management Act 19-6-119(7) for its quarterly reports and fee schedule, which requires $0.11/ton for transfer stations and $0.21/ton for landfills/incinerators with a minimum charge of $125 quarterly. This fee schedule was amended in 2017 and effective on July 1st, 2018, with the state legislature amendment, and will remain unchanged in FY2021 and FY2022. Before 2017, Solid Waste Facility Fees were not imposed.

Future Needs

Utah's estimated population in 2023 is projected to be about 3.4 million, and it is projected to increase more than 40 percent by 2040. With the increasing population and no behavior change in recycling pattern, an increase in the total tonnage of solid waste is expected. From the forecast, there will be roughly 7.8 million tons of solid waste generated by 2023 asserting more capacity demands on the state's existing landfills.
As of today, only 5% of total usable landfill area has been used, and the State is increasing its landfill sites every year (5 more in 2020, with 3 brand new sites being under review). However, improvements can still be made in recycling:

1. Recycling enforcement;
2. Recycling education.

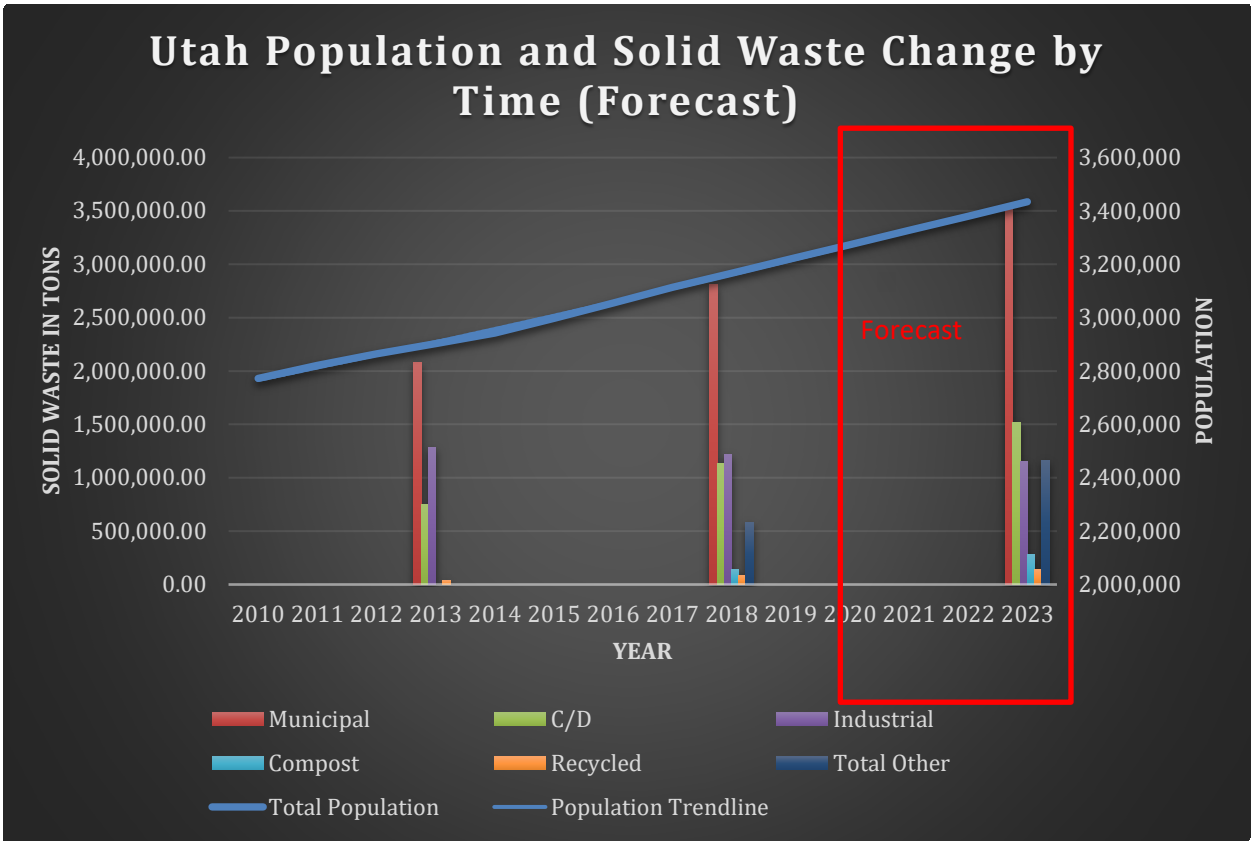

Figure 4 Utah Solid Waste Forecast

Resilience, Innovation, and Public Safety

Resilience is defined as the ability of the infrastructure to provide services in the case of catastrophes. With the number and access of disposal facilities contributing to redundancy within the system, should catastrophes occur, the resilience for Solid Waste in Utah is considered sufficient.

Innovation is defined as a new method, idea, and product. In Utah, although anaerobic digesters are cutting edge in some states, they have been deployed and used for decades to general biogas, which is then used onsite for power. A possible improvement on the sector's innovation is to transfer the application of drone inspection which are being widely used for engineering surveys.

Public safety is always important for any infrastructure, particularly solid waste as it may have negative impact to the environment and human health. In Utah, the Public Safety is well protected due to the State's very strict laws and regulations regarding the transportation, classification, management, and employee training for solid waste.

Recommendations

Education

More education about solid waste recycling on Utah residents is recommended. It can utilize online videos, flyers, or brochures. The main content should be on waste that can be recycled. With proper education, a big increase in recycling percentage should be achieved.

Landfill Inspections

DEQ is conducting regular landfill facility inspections, although self-inspections are legal for landfill facilities. As an innovation measure, drone inspections can be conducted to reduce the manpower.

Solid Waste Master Plan

The current State of Utah Solid Waste Master Plan has not been updated in nearly 15 years. Any updates or amendments will be beneficial to the municipal governments, private companies, and the public.

Conclusion

In general, solid waste facilities are sufficient and legislation has been set in place in Utah, although recycling has been an issue. With proper education to the residents, solid waste recycling percentages should increase.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

Executive Summary

Stormwater systems protect urban and rural communities from flooding. Stormwater quality regulations through the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (NPDES MS4) program have created a system of best management practices including bioswales, retention basins, wetlands, and other infrastructure to treat stormwater quality. In Utah, storm drain systems are owned and operated by state, private, and municipal agencies and include between 5,000 to 10,000 miles of channels, drainpipes and culverts along with detention systems. There are currently 95 MS4 permit holders within the state. With aging systems, some implemented in the early 1900s, it is important to perform maintenance and repair to ensure appropriate operation; however, not all of the state's stormwater systems have and exercise asset management. Dependent on stormwater utility fees and limited state-level funding and financing resources, ongoing upkeep to avoid system failures and to comply with new stormwater standards may become more challenging. However, addressing the increasingly stringent standards will likely fall onto stormwater system owners as the state only has $1 million to contribute to innovative stormwater projects.

Condition & Capacity

It is estimated that there are between 5,000 to 10,000 miles of storm drains in Utah. These systems range in age from the early 1900s to current development projects being completed each month across the state. Systems are being converted to storm drains as urbanization is increasingly requiring canal owners to evolve from water conveyance for farming to flood management conduits for municipalities. However, canals are not the best type of stormwater conveyance infrastructure due to the decreasing capacity as they move downstream. Storm drains are built to increase as they move downstream to capture more water from a larger area. Design of stormwater systems is not standardized across the state and is dependent on the local entity that owns and maintains the system.

O&M, Funding, and Future Needs

Nearly all storm drains within the State are owned, managed, and maintained by municipalities. There are over 40 stormwater utilities in the state that charge monthly user fees ranging from $3 to $12 per month for residents. Commercial and industrial users are charged higher amounts based on impervious area equivalent to a residential lot. The fees are comparable to many areas across the country. The differences in fee structures between the utilities are based on location specific decisions.

Operation and maintenance of these facilities may include periodic inspections, repair, and replacement. Many systems are given little thought unless there is a flooding concern. Asset management systems may be used in larger municipalities to track system life and performance, but most storm drain infrastructure have limited or non-existent management systems. Given the age and historic construction of these systems, limited operation requirements or maintenance programs are established. Competing priorities for resources with other public infrastructure often result in minimal maintenance of the underground structures. In absence of any data on operation, maintenance, conditions or risk, the performance and reliability of these systems under extreme events is questionable at best and at worst poses a threat to infrastructure and the public.

Many of the BMPs for stormwater quality and runoff control are privately owned with no information on maintenance or performance. Increasing regulation of stormwater quality will impact funding resources, potentially redistributing the existing funding and/or siphoning off funding needed to maintain existing infrastructure over the long-term as more requirements come online to protect and preserve environmental

quality of receiving waters throughout the State. This will lead to a larger funding gap for providing preventive maintenance and rehabilitation work, possibly leading to system failures over the long run.

The Utah Department of Environmental Quality recently modified the Utah Pollutant Discharge Elimination Permit (UPDES) requirement to include a stormwater retention standard. The permit requirements will be accomplished using Low Impact Development (LID) practices designed, constructed, and maintained to infiltrate, evapotranspirate, and/or harvest and reuse rainwater. Potential LID BMPs include site design practices that minimize impervious surfaces and retain vegetation, bioretention swales or rain gardens , green roofs, permeable pavement surfaces, and rainwater harvesting and reuse. These requirements have trickle down effects and costs for stormwater agencies.

DEQ has done the following to implement the retention standard:

- Formed a Long-Term Stormwater Management Work Group made up of contractors, developers, MS4 representatives, DWQ staff, and consultants to discuss stormwater management in accordance with the standard as well as opportunities and obstacles to implementation.
- Developed a Scope of Work for an LID Design Manual. The manual will aid MS4s and the development community with selecting LID BMPs for specific site conditions.
- Made available low-cost and no-cost funding for water-quality improvement projects that incorporate an LID approach through the State Revolving Loan Fund (SRF) and Nonpoint Source (NPS) funding. DEQ is currently requesting LID projects from its partners and plans to distribute $1 million for construction of innovative stormwater projects that will improve the quality of the state's waters.
- The Utah Division of Water Quality's (DWQ) Clean Water State Revolving Fund Loan Program (SRF) on average, receives a combined $9 million dollars a year from State and Federal funding and, on average, an additional $15 million in funding each year from loan repayments. This money is to be used to fund water quality and wastewater infrastructure projects in Utah.

Urbanization is currently resulting in new storm drain systems being implemented throughout the state. However, funding for maintaining these systems must be implemented. As more systems are added to upstream ends of existing infrastructure, hydrologic and hydraulic conditions for the downstream system must be considered to prevent downstream impacts. Increased flow rates and decreased infiltration often lead to higher peak flows and volumes being delivered to downstream systems, potentially resulting in instances of urban flooding.

Public Safety, Resilience and Future Needs

In recent years, there have not been any notable storm drain failures across the state. However, storm drains are not resilient systems, with one drain serving each drainage area. Damage to a system can result in long-term damage that is beyond the financial capabilities of a municipality to fund. No recent innovation has occurred in the design or funding systems for storm drain infrastructure in the State. Stormwater quality regulations are increasing, however, funding for the large scale implementation will fall on developers and then municipalities for operation and maintenance. The potential for climate change to influence stormwater runoff exists in the state. Milder winters with more precipitation as rainfall may result in higher flow rates that previous designs account for, leading to deficient systems.

Recommendations to Raise the Grade

- Long-term funding strategies are needed for inspection and maintenance of storm drains across the State at the municipal level. This funding should also provide funding for asset management systems and period inspections.
- Methods of funding long-term replacement of storm drain infrastructure above capital improvement programs tied to fixed rate storm utility payments should be considered.
- Additionally, updated hydrology and hydraulic analyses should incorporate the impact of urbanization and climate change on existing systems during future master plan activities. The studies should also evaluate the impacts of the LID program on reducing runoff from urban infill areas on existing systems.
- Many municipalities function on resource limited budgets for which regular available funding is limited and typically covers only basic maintenance and occasional, limited upgrades. At a State level there needs to be consistent, repeating funding or additional loan opportunities for these systems. This will be required as more detention systems come online, age, and require maintenance and improvement.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

Executive Summary

Over the past 30 years, transit networks in Utah have significantly improved. Currently, there are over 100 miles of fixed guideway services and over 48 million annual riders, up an additional 2 million in the last five years. Since 2015, the transit system has seen expanded services including a connection between two major universities. While these transit improvements have made the system more convenient and user friendly, there are still pressing needs for system enhancement, expansion, and financial stabilization. Sales taxes from local service district support 65% of the transit system's funding, with the remainder coming from federal sources. Overall, many of Utah's urban residents are experiencing affordable types and sufficient levels of transit service that have not been experienced in their lifetimes, particularly in cities of The Wasatch Front. In contrast, rural areas face more challenges with public transit due to their population density, location and lack of available funding.

Condition & Capacity

Utah's largest provider of public transportation services and facilities is the Utah Transit Authority (UTA). UTA provides services throughout the Wasatch front including Box Elder, Davis, Salt Lake, Summit, Tooele, Utah and Weber Counties. UTA's service area covers nearly 80% of Utah's population and the areas with greatest transit demand. Other transit systems include:

- The University of Utah's Shuttle System
- SunTran in St. George City
- Cache Valley Transit District in Logan
- Park City Transit in the Park City area
- Cedar Area Transportation Service in Cedar City
- Basin Transit Authority in Vernal and
- The Ute Tribe in Fort Duchesne

All transit service planning is coordinated through one of Utah's four Metropolitan Planning Organizations. UTA provides several varied services including: Light Rail (TRAX), Commuter Rail (FrontRunner), Streetcar, Bus Rapid Transit (BRT), Bus and Paratransit services. Additionally, UTA provides carpool and vanpool services.

Service Statistics (2018)

Mode	Annual Riders (unlinked trips)	Fleet	Operating cost per revenue mile	Cost of service per passenger trip
Commuter Bus	563,536	43	$8.10	$15.32
Commuter Rail	55,082,168	50	$8.00	$8.54
Demand Response	394,816	67	$6.68	$47.35
Light Rail	17,899,716	92	$10.73	$3.99
Bus	19,061,372	412	$8.31	$7.34
Vanpool	1,174,696	398	$2.96	$15.99
Total	44,176,331			

Source: www.transit.dot.gov/ntd

Although the other transit systems in Utah do not operate at nearly the same scale as UTA, they are still an important element in the overall transit picture and health of the state.

Operator	Estimated Annual Rider
Cache Valley Transit District	1,533,185
City of St. George	430,887
Park City Municipal Corporation	2,331,398
Basin Transit Association	45,120
Cedar Area Transportation Service	21,166
Ute Tribe	4,593
Total Excluding UTA	4,366,349
Total Including UTA	48,542,680

Source: APTA Fact Book Appendix B, https://www.apta.com/research-technical-resources/transit-statistics/public-transportation-fact-book/

Since 2015, ridership has increased by approximately 2 million riders. Some of that growth is likely attributed to the Provo-Orem BRT (UVX) service that launched in 2018. This service line connects two major universities in the region and has proven to be popular with students and non-students alike. On the other hand, slower growth than expected in the transit system can be attributed to economic sluggishness and the slow progress of land use changes throughout the region. In spite of these slow growth factors, Utah has plans to increase services with the addition of a new BRT line in Ogden connecting the Ogden FrontRunner station with McKay Dee Hospital and Weber State University. Additionally, construction of a new pedestrian bridge located in Orem is underway which will allow pedestrians to cross over Interstate 15 (I-15), a major multi-lane interstate freeway in the region, and will connect Utah Valley University (UVU) students to the Orem FrontRunner Station. These projects, along with others, are anticipated to provide key expansions of services linking universities, hospitals, urban centers, high density housing, transit hubs, and other population centers which will contribute to ridership growth throughout the region.

Targeted efforts throughout the state to boost transit ridership have been implemented and have seen positive results. For example, development has improved as higher density housing is planned and constructed with amenities more suited towards transit, bicycles, and pedestrians. Additionally, a public-private partnership between Salt Lake City, the University of Utah, and several major employers have partnered for years to improve transit access to major traffic generating areas. The University of Utah offers discounted transit passes in expectation of more riders. The new Provo-Orem UVX BRT project has partnered with the Federal Highway Administration's "Congestion Mitigation and Air Quality" grant program to provide free fare on the UVX line through 2021 to encourage transit ridership and improve air quality. In 2018, Brigham Young University (BYU) and UVU joined the ranks of universities that partnered with UTA to provide increased access to transit services. Corresponding with the official opening of the UVX line, BYU and UVU partnered with UTA to provide their students and employees with free annual UTA transit passes. The program is intended to encourage new riders and make public transportation part of their regular travel. This free pass program is anticipated to remain in place for 10 years, starting in 2018. The goal of these efforts is to drive longer-term trends that will have positive

impacts on transportation, air quality, and community efficiency over time, especially as the population of Utah grows.

O&M, Funding and Future Need

One of the greatest challenges facing transit statewide is funding. Federal funding sources including federal preventative maintenance, federal grants, federal planning assistance and preventative maintenance grants for capital expenses have been decreasing in recent years and show no sign of returning to previous levels. As of 2019, UTA's annual budget was $456.8 million, with the sales taxes in the service district providing the largest funding portion of 65%. The rest of the funding is covered through federal funding, passenger fares, and advertising revenue.

UTA funded its rail construction program through sales tax revenue bonds, and debt service payments will be a drain on resources for years to come. Financial pressure will make UTA's goals of restoring, maintaining and increasing services very challenging unless alternative funding sources are found. In addition, controlling operating costs will be a challenge as costs increase. UTA must manage internal cost structures and balance its goals for fare revenue. UTA partnerships with universities and businesses have provided more of the population with access to deeply discounted passes. Currently, UTA base fares are comparable to larger cities and exceed the levels of peer agencies. The average monthly bus pass cost nationwide is $67.07 while a UTA monthly pass is $83.75. While everyone must pay a fair price to use the system, UTA must face the challenge of balancing the perception of value with passenger payment.

Maintaining UTA's system and its facilities requires a large amount of funds. As UTA's facilities age, maintenance costs increase. For instance, UTA maintains 83 rail bridge structures. Each year, UTA bridge engineering personnel are required to inspect each of their bridges to verify that they are safe to cross. As UTA's bridges age, the funds needed to maintain those bridges increase. The rail infrastructure is also subject to the adverse effects of age and the need to replace old rail with new rail. Since 2015, maintenance costs have increased. As we progress into future years, those costs will continue to increase requiring access to a greater amount of funds in order to avoid the potential operational and safety pitfalls that will result from an aged infrastructure.

Public Safety

Since 2010, there have been approximately 7 fatalities each year from a collision involving a bus, TRAX train, or FrontRunner train. This number has not significantly changed over time. Most of these fatalities were non passenger deaths. According to UTA data, suicides contribute to 25% of fatal collisions. At-grade rail crossings are one of the highest risk areas for a fatal collision and there are many at-grade rail crossings throughout UTA's rail system. UTA prioritizes pedestrian safety and has put in place pedestrian warnings at grade crossings. Additionally, UTA has a system in place to report safety concerns.

Resilience

UTA has taken a proactive approach to environmental management. Clean air is a significant concern in Utah, especially during the winter months. Although operating automobiles have inherent pollution concerns, UTA has implemented several policies such as an environmental management system, land recycling, and air quality idling program designed to minimize the effect of their exhaust emissions on the environment. Additionally, UTA is committed to keeping up with advancements in fuel technology, including using a bio-diesel fuel mixture in all its buses, as well as using hybrid-electric busses and compressed natural gas buses.

Innovation

UTA has implemented innovations such as vehicle location services into their system, creating a much more user-friendly experience. With a streamlined user experience, riders are enabled to more easily plan trips.

Recent innovations, such as Bus Rapid Transit (BRT) systems, provide increased and consistent service without requiring extensive infrastructure additions. Bus Rapid Transit systems combine bus fleets with dedicated lanes to create a system similar to a light rail or a metro system without the large infrastructure cost. UTA is also partnering with the Utah Department of Transportation (UDOT) to test connected bus technology on UTA Route 217. The vision of this system is to monitor individual buses' on-time performance and real-time information to dynamically adjust traffic signals so that additional traffic signal green time is given to the bus in an effort to assist the bus with staying on schedule. The pilot program is ongoing, but if it is successful, it will be expanded to other bus routes.

Recommendations to Raise the Grade

Overall, transit in Utah is becoming increasingly relevant and vital in communities as they are currently experiencing unprecedented growth. Transit is slowly overcoming land use and planning inertia and is starting to establish market relevance that is increasingly critical. In preparing for Utah's future transportation needs, we recommend that transit providers locate additional funding sources to increase the regularity and improve the accessibility of service to both urban and rural users.

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2020 REPORT CARD FOR UTAH'S INFRASTRUCTURE

Executive Summary

Wastewater infrastructure systems in Utah are meeting baseline technology limits, but new nutrient regulations are requiring older facilities to implement costly upgrades. Estimates project $15 billion in funding will be required over the next 40 years to meet water quality standards. Additionally, a growing number are at risk of losing treatment capacity as their infrastructure ages beyond its expected 40-year useful life. In addition, there is an ongoing deterioration of sewage collection systems that are 65-75 years old and beyond their expected useful life. Many Districts and Cities in Utah are currently upgrading their water reclamation facilities and collection systems. However, numerous wastewater agencies are struggling to keep up with repair and replacement of facilities, along with addressing ever more stringent regulations and accelerating population growth.

Condition & Capacity

Aging infrastructure is a top concern of utility managers around the country and in Utah. Within the category of aging infrastructure, rehabilitation and replacement of buried assets is an expensive and difficult task. Many Districts and Municipalities have implemented extensive asset management programs and are systematically replacing or rehabilitating, using trenchless technologies, their collection system infrastructure. Salt Lake City Public Utilities is currently working on eight wastewater related projects that are expected to be completed by 2024. However, the severity of the problem is increasing, and spending has not kept pace with the need.

The majority of Utah's publicly owned treatment works (POTWs) are operating within hydraulic and treatment design capacities. However, many facilities in Utah were not originally designed to accommodate nutrient removal. The Utah Division of Water Quality (DWQ) recently promulgated a Technology Based Effluent Phosphorus Limit (TBPEL) of 1 mg/L for all mechanical wastewater treatment facilities in Utah. Salt Lake City Department of Public Utilities (SLCDPU) is building a new Water Reclamation Facility to meet the new phosphorus regulation as well as anticipated future regulations. The existing Water Reclamation Facility, which is 55 years old and nearing the end of its useful life. Construction work began in March 2020 and is planned to continue through 2025. The estimated cost of the new facility is $700 million. Additionally, all lagoon facilities were allocated a phosphorus "load cap" to limit discharge of phosphorus into water bodies. These new regulations required compliance by January 1, 2020, unless a variance was granted by DWQ. Additionally, other facilities have more stringent discharge limits if they discharge to a location where a Total Maximum Daily Load (TMDL) has been implemented. Additional TMDLs are currently in development by DWQ, including a high-profile study at Utah Lake. Furthermore, it is anticipated that treatment for nitrogen will be required in the next 10-15 years, which will require an extensive overhaul or replacement of most of the older treatment facilities in Utah. These new nutrient regulations, for phosphorus (existing) and nitrogen (future), have resulted in many agencies making the decision to implement costly improvements for their treatment infrastructure. There are several large projects currently under construction to upgrade the wastewater treatment plants in Logan, Provo, Central Valley, South Davis, and Salt Lake City. These ongoing projects will address the removal of phosphorus and nitrogen, in addition to increasing treatment capacity. Other facilities in Park City, Moab, St George, and other locations have also recently implemented costly upgrades to meet new nutrient requirements and capacity increases. Many other facilities are in the planning and design stages and will begin construction in the near future. It is anticipated it will cost billions of dollars in new treatment infrastructure to comply with existing and future permit limits for nitrogen and phosphorus in Utah.

Operation and Maintenance

Operation and maintenance (O & M) has long been a significant issue facing wastewater utility managers. Factors include the aging workforce, lack of skilled workers entering the marketplace, increasingly strict regulations, disengaged consumers, and rates that do not reflect the actual full cost of wastewater service. Nationally, the average monthly sewer rate for 7,500 gallons is slightly more than $55. However, in a 2010 study, Utah's average water and wastewater utility rates were 43% lower than the national average These rates will likely need to increase significantly to cover the actual cost of operations and maintenance.

Future Needs and Funding

Replacing or rehabilitating aging wastewater collection and treatment systems, addressing increasingly strict regulations for nutrient removal, and adding additional capacity to address population growth will be expensive. In a report titled Reclaim60, Utah's 40 Year Water Quality Cost Assessment, the total cost for sewer system renewal, replacement, and expansion, including regulatory changes in Utah, is addressed. This report estimates that $15 billion in funding will be required over the next 40 years to meet water quality requirements.

In order to pay these costs, agencies will need a combination of increased sewer rates, municipal bonds, and loans from the State and Federal Governments. For example, Salt Lake City Department of Public Utilities (SLCDPU) is proposing an 18 percent rate increase to pay for the $700 million replacement of its Water Reclamation Facility. The Utah Division of Water Quality and Water Quality Board has traditionally been an important resource for funding projects using the U.S. Environmental Protection Agency's (EPA) Clean Water State Revolving Fund to provide low interest loans and grant money. However, the recent influx of treatment facility improvement projects as a response to newly implemented nutrient limits has resulted in a depletion of available DWQ funds despite additional projects on the horizon. For smaller communities, the United States Department of Agricultural – Rural Development (USDA-RD) has also been a reliable funding partner for providing grants and loans for new wastewater treatment projects. Meeting future infrastructure needs can only be achieved through creative and committed partnerships at all levels of government, and by fully engaging the citizens that live and play in Utah.

Public Safety

Issues that impact the public safety are emerging and have not been adequately addressed due to lack of permanent and adequate funding mechanisms. Drought can cause groundwater levels to drop, allowing wastewater to leak out of sewers (exfiltrate), degrading groundwater quality. Also, there is a need to supplement drinking water supplies in arid climates and non-traditional sources of purified water, including wastewater recycling, are being considered. If direct potable reuse of treated wastewater was to become a reality, it would be subject to strict regulation and rigorous public outreach and education, and it would be very costly. Alternatively, highly treated effluent can be utilized in a non-potable pressure irrigation system to water lawns and fields, saving higher quality water sources for drinking water.

Resilience

It is critical that the wastewater industry work closely with the public and legislature to develop permanent funding programs. If there is sufficient political will, we can make significant progress toward ensuring that the Utah wastewater infrastructure is brought to a level of service that is befitting of a State that recognizes the benefits of maintaining infrastructure systems that fully support a top tier economy and superior quality of life.

Wastewater facilities can be vulnerable to ground movements due to earthquakes and landslides. Recovery from damage caused by ground movement will need to be a priority after a disaster to ensure the health and safety of the public. Wastewater utilities in Utah must be aware of these disaster risks and mitigate the risk to a manageable degree.

Innovation

Utility managers and trustees are now placing renewed emphasis on asset management and business analytics. New understanding by political and citizen decision makers on prioritizing expenditures offers hope for lower-cost (best value) solutions to treatment and water quality challenges.
Emerging wastewater challenges present opportunities that can be solved by creative thinking where a perceived problem can be turned into a viable resource. The high level of treatment needed to address pharmaceutical and personal care products (PPCPs) requires the same technologies that can create purified water to supplement secondary (non-potable) water supplies. Using recycled wastewater that has been treated to a high level for irrigation of landscaping, crops, etc., can free up potable water for culinary uses. Increasing the production of biogas from digesters and fuel from algae, represent innovative ideas being explored by agencies in conjunction with Universities in Utah. More of these innovative ideas will need to be discovered to ensure efficient wastewater treatment and reuse in the future. There will be a continuing challenge to the question of ownership of recycled wastewater and the impacts caused by reducing return flows to the environment.

Recommendations

Given the challenges ahead, significant owner and management will, and capacity will be required to work through solutions on a steady and persistent basis. When utilities partner with oversight agencies and stakeholders, recent history has demonstrated that no challenge is too difficult to overcome. Here are some ways to work on, raising the Wastewater Grade:

- Continue to implement condition and performance assessments
- Expand asset management and maintenance management programs
- Focus on extending the life cycle of infrastructure in keeping with the goals of the ASCE Grand Challenge
- Communicate the value of wastewater infrastructure to our community, policy makers and legislators
- Identify opportunities to improve efficiencies, including administrative and bureaucratic systems, management, engineering, construction, and operations and maintenance
- Seek increased funding for infrastructure improvements to keep Utah’s water healthy

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A MESSAGE FROM THE ASCE UTAH SECTION PRESIDENT

To Whom It May Concern,

The Utah Section of ASCE was founded in 1916 and today is proud to count nearly 1560 members from all disciplines and sectors of civil engineering. This report is the culmination of a multi-year effort, by volunteers donating countless hours with the conviction that we, as civil engineers, are stewards of our infrastructure. Civil engineers are responsible for the planning, design, construction, operation, and maintenance of our vital public works. With that responsibility comes the obligation to periodically assess the state of our infrastructure, report on its condition and performance, and advise on the steps necessary to improve it.

Our state is home to one of the highest rates of population growth in the country, the quality of our infrastructure is essential to continued sustainable growth. We rely on infrastructure to keep us safe from extreme events that are becoming increasingly likely due to more frequent occurrences than we have historically seen. We also know that strong infrastructure is beneficial to the economy by enabling goods to travel over our bridges and highways, allowing employees to reach their offices in a timely and safe manner, and keeping businesses operational through extreme weather or seismic events. This commitment of continuing to develop and maintain functional and resilient infrastructure is the reason we have prepared this report.

In this report we have detailed the final findings from the ASCE Report Card for Utah's Infrastructure. This report is a snapshot tool for residents, municipalities, businesses, and policymakers to reference as they engage in conversation about where we are and where we want to be related to infrastructure. We hope that this information provides additional insights and rekindles these conversations.

Sincerely,

J Darren Burton

J. Darren Burton P.E. | President '20-'21 | Utah Section

ASCE UTAH SECTION