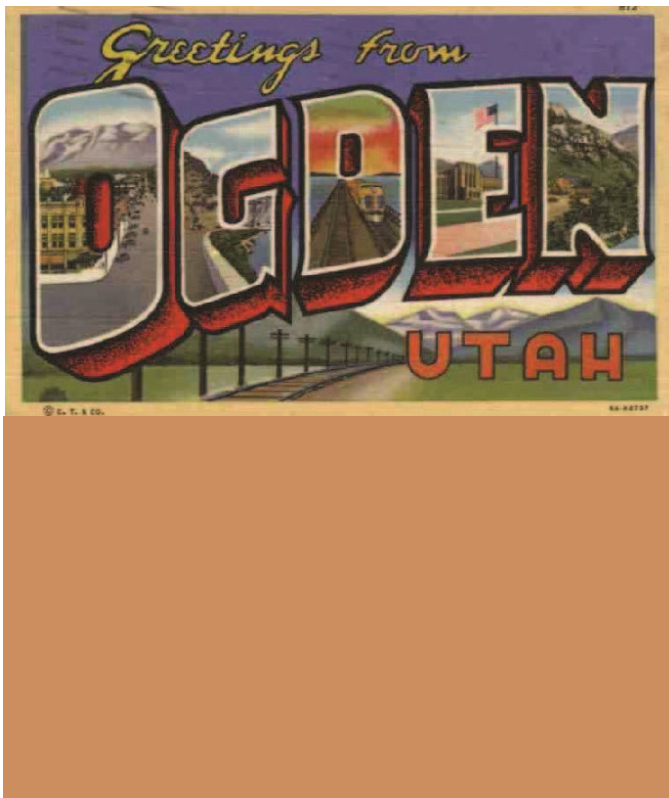


APPENDIX B11

Floodplains Technical Report



Floodplains Technical Report

**Ogden/Weber State University
Transit Project**

Ogden, Weber County, Utah

October 10, 2018



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1.0 Introduction

This technical report describes the floodplains in the floodplain evaluation area for the Ogden/Weber State University Transit Project and evaluates how these floodplains would be affected by the Action Alternative. The Action Alternative is the Bus Rapid Transit on 25th Street Alternative, which was selected by the Ogden/Weber State University Transit Project partners and adopted by the Ogden City Council as the Locally Preferred Alternative.

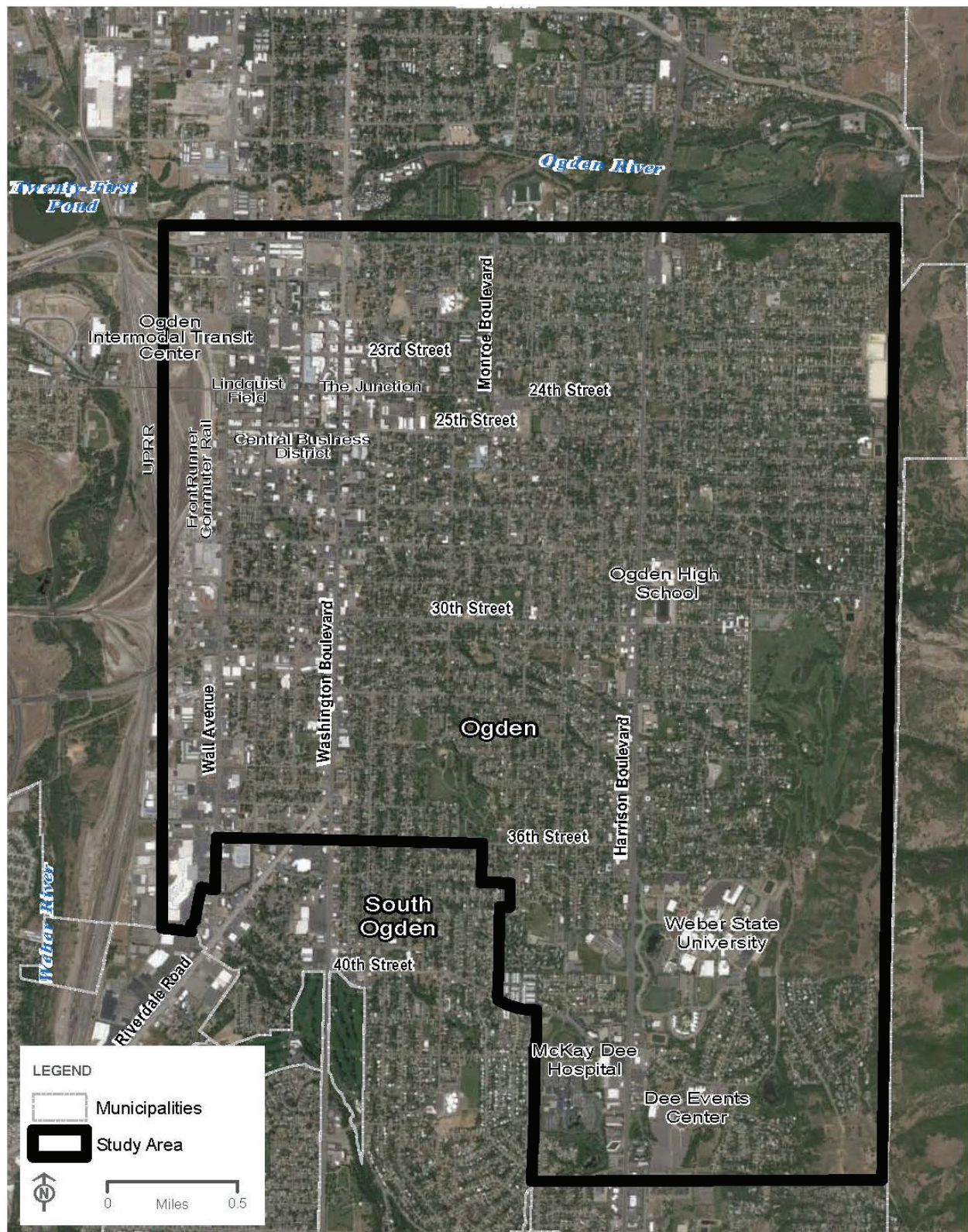
Floodplains are defined as normally dry areas that are occasionally inundated by snowmelt, stormwater runoff, or high lake water. Development in floodplains can reduce their flood-carrying capacity and extend the flooding hazard beyond the developed area.

In response to escalating taxpayer costs for flood disaster relief, Congress established the National Flood Insurance Program. This program is a voluntary mitigation program administered by the Federal Emergency Management Agency (FEMA). Under this program, the federal government makes flood insurance available in those communities that practice sound floodplain management. This incentive encourages state and local governments to develop and implement floodplain management programs.

Implementation of the No-Action Alternative would not result in adverse impacts to floodplains. The affected environment (existing conditions) would remain unchanged from current conditions.

Project Study Area. The project study area encompasses a 5.3-mile corridor between downtown Ogden, Weber State University, and McKay-Dee Hospital. The project study area is located in the city of Ogden in Weber County, Utah. The project study area encompasses a portion of downtown central Ogden bounded by the Union Pacific Railroad line to the west, 20th Street (State Route [S.R.] 104) to the north, the city limits at the base of the Wasatch Mountains to the east, and about 4600 South to the south, the southwestern part of which follows the Ogden/South Ogden municipal boundary (Figure 1).

Figure 1. Project Study Area



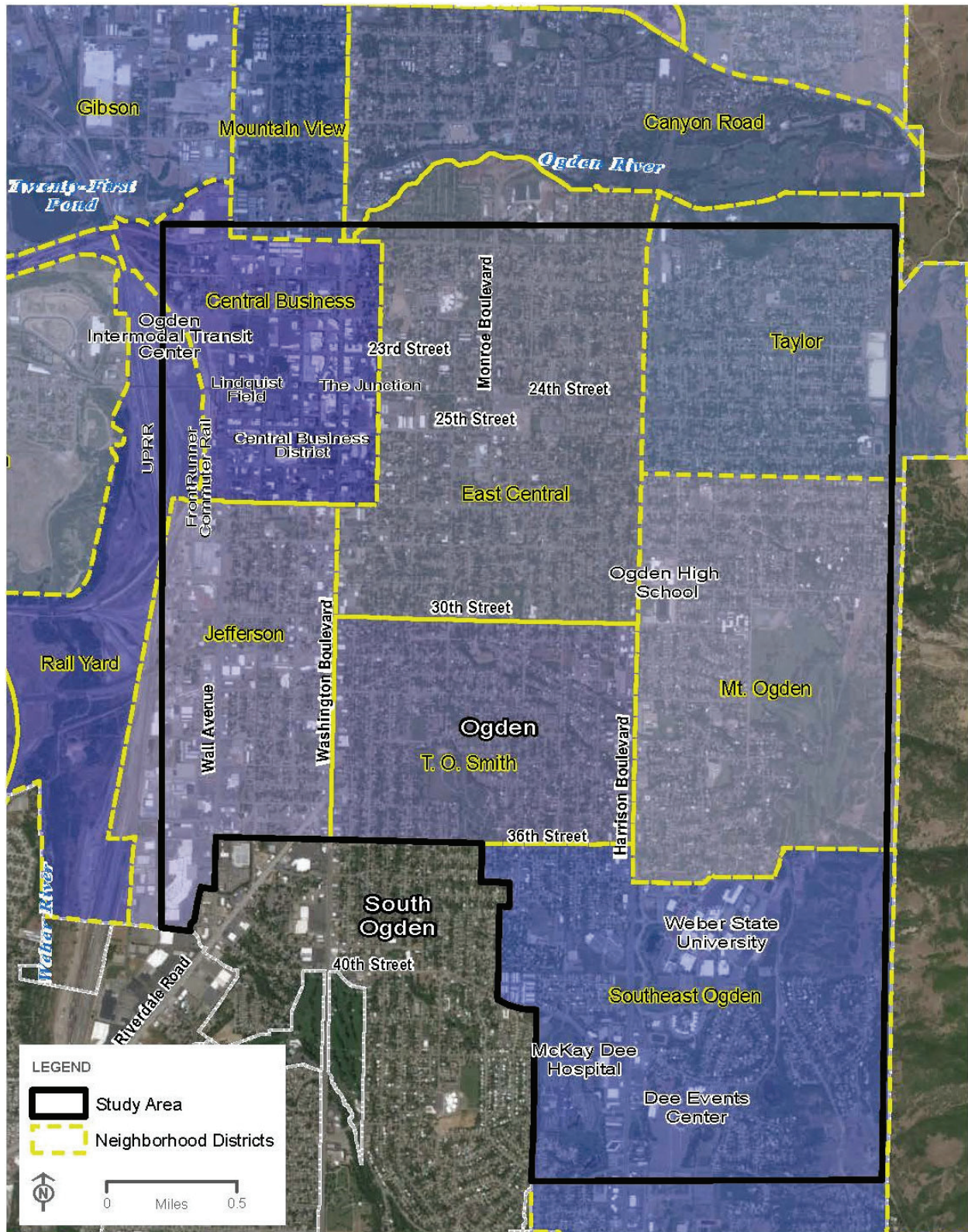
This project study area includes the following major destinations and Ogden neighborhood districts that could be served by the Action Alternative (Figure 2):

- The Ogden Intermodal Transit Center (FrontRunner operates frequent service from Ogden to Provo, an 88-mile route)
- Lindquist Field, a minor-league baseball stadium with an 8,262-person capacity
- The Junction, a 20-acre entertainment, residential, retail, and office mixed-use redevelopment
- The Ogden downtown central business district, which includes city, county, and federal offices
- Seven neighborhood districts: Central Business (downtown), East Central, Taylor, Jefferson, T.O. Smith, Mt. Ogden, and Southeast Ogden
- Ogden High School, with an annual enrollment of about 1,000 students in grades 10–12
- Weber State University, with about 2,500 faculty and staff and about 25,000 students (up from 17,000 in 2007), 840 of whom lived on campus as of September 2016 (Sears 2016)
- The Dee Events Center, a 12,000-seat sports and entertainment venue with a 3,000-space parking lot
- The McKay-Dee Hospital Center (at 2,300 employees, the fourth-largest hospital in Utah)

Ogden is one of the oldest communities in Utah and has a number of historic districts and neighborhoods. Much of central Ogden is served by a traditional grid street system, and a number of the major arterials are state highways managed by the Utah Department of Transportation (UDOT) which serve regional travel through Ogden. These major arterials are Washington Boulevard (S.R. 89), Harrison Boulevard (S.R. 203), and 30th Street (S.R. 79). Harrison Boulevard is part of the National Highway System and is a major north-south arterial that serves an important statewide transportation function through Utah by connecting Washington Boulevard (S.R. 89), Weber State University, and 12th Street (S.R. 39). The Union Pacific Railroad (UPRR) line and the Ogden Intermodal Transit Center are on the western edge of the city, and Interstate 15 is just west of the city.

Floodplain Evaluation Area. The floodplain evaluation area is from Weber State University on the east to the Weber River on the west and from 46th Street on the south to 23rd Street on the north.

Figure 2. Neighborhood Districts



OGDEN/WEBER STATE UNIVERSITY TRANSIT PROJECT
NEIGHBORHOOD DISTRICTS

2.0 Project Description

The Federal Transit Administration (FTA) and the Utah Transit Authority (UTA), in cooperation with project partners Ogden City, Weber County, the Wasatch Front Regional Council, UDOT, Weber State University, and McKay-Dee Hospital, have prepared an Environmental Assessment under the National Environmental Policy Act (42 United States Code §§ 4321–4347) for the Ogden/Weber State University Transit Project.

Proposed Transit Corridor. The proposed transit corridor is the alignment of the Action Alternative (Figure 3). The bus rapid transit (BRT) route for the Action Alternative would be about 5.3 miles long (10.6 miles round trip), with a western terminus at the Ogden Intermodal Transit Center. From there, the BRT route would head east in mixed-flow traffic on 23rd Street to Washington Boulevard, south on Washington Boulevard to 25th Street, east on 25th Street to Harrison Boulevard, and south on Harrison Boulevard. At about 31st Street and Harrison Boulevard, the BRT route would transition to center-running, bus-only lanes. It would continue on a dedicated busway through the Weber State University campus and then travel west to McKay-Dee Hospital, where it would again travel in mixed-flow traffic. The BRT route would loop back on the same route.

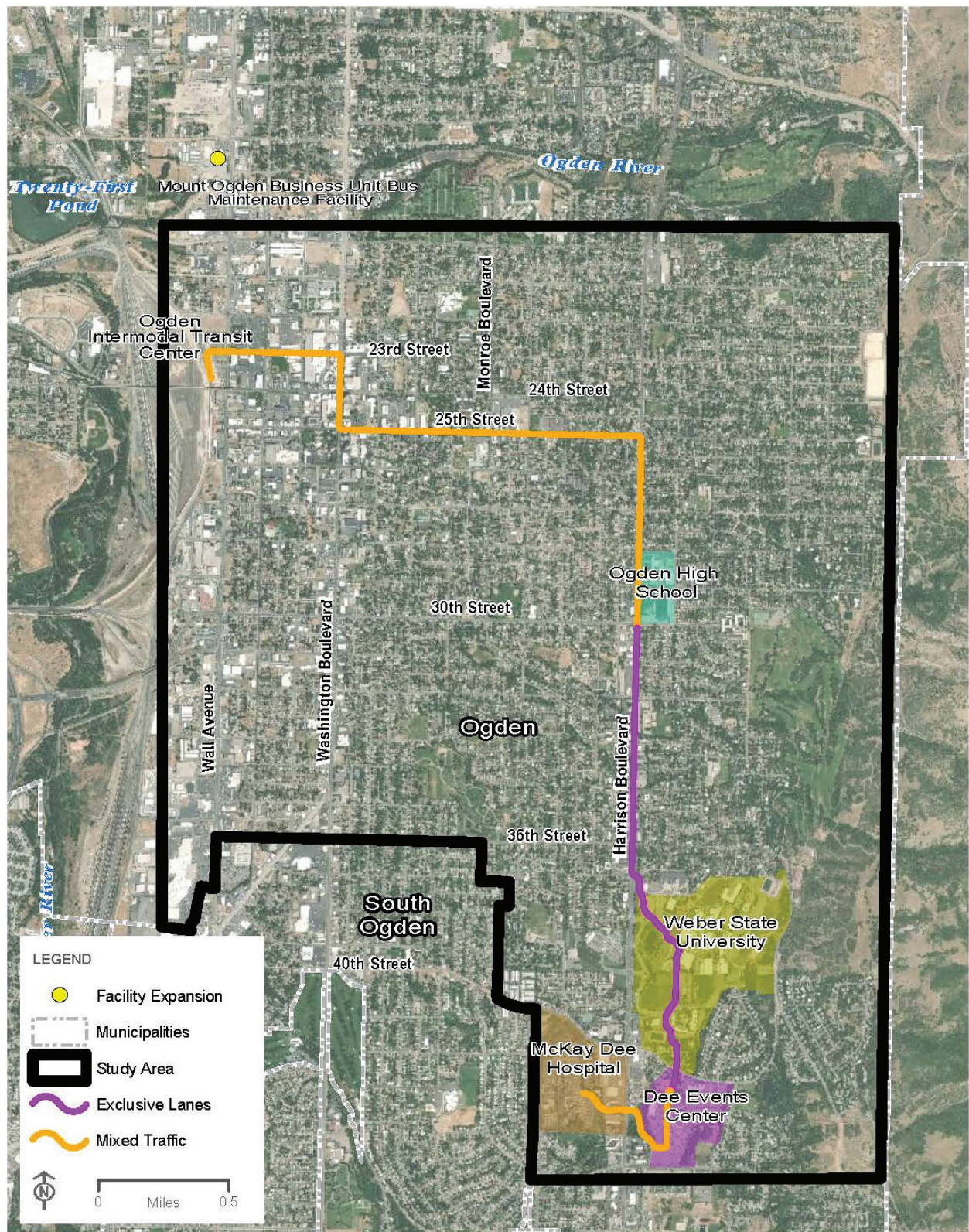
Station Locations. The Action Alternative includes 16 brand-identified stations. The station locations were chosen during the project’s Alternatives Analysis update process. Station spacing ranges from about 0.25 mile apart to about 0.50 mile apart; several stations on Harrison Boulevard would be farther apart because of the spacing of major destinations.

Of the proposed 16 stations, 11 are existing bus route 603 stations (including the termini at the Ogden Intermodal Transit Center and McKay-Dee Hospital) that would be enhanced as part of the Action Alternative. The project team agreed that not all 16 stations would be constructed for the BRT service’s opening day (2020). Three of the 16 stations are designated as future stop locations. The existing route 603 bus currently stops at two of these three locations, and those locations would be discontinued and new enhanced stations would be constructed in their place in the future based on ridership and station demand.

Station Amenities. The Action Alternative stations would include a platform, canopy, landscaped planter, and station amenities. The station would sit on a concrete bus pad elevated above the sidewalk curb height between 6 and 9 inches above the street grade. Stations would be about 125 feet long, with a platform length of 100 feet to accommodate two 40-foot-long BRT vehicles. Station shelters would be roughly comparable in size to existing UTA bus passenger shelters in the area, though somewhat longer.

At present, UTA anticipates that the shelters would be designed to include a combination of glass panels and solid support members that would have a minimal visual “footprint.” Station canopies would be opaque features that provide shelter from sun and rain and would be about 10 to 15 feet high, depending on the incorporation of decorative architectural features that would be determined during final design.

Figure 3. Action Alternative



The platform provides the area for passenger waiting, boarding, and station amenities. The station platform would range from 8 to 25 feet wide, depending on the station location and the need for a platform to accommodate either single-direction travel or both southbound and northbound travel. Station amenities could include ticket vending machines, seating, lighting, a canopy and wind screens, garbage receptacles, and wayfinding information (maps and signs).

Mount Ogden Business Unit Bus Maintenance Facility Expansion. In conjunction with the Action Alternative, UTA would expand the existing Mount Ogden Business Unit Bus Maintenance Facility located at 175 W. 17th Street in Ogden. The Mount Ogden facility is currently operating at maximum capacity and cannot accommodate the additional eight BRT vehicles needed for the Action Alternative. As a result, the existing Mount Ogden facility would be renovated and expanded.

Operations at the Mount Ogden facility would continue to include maintenance, repairs, inspections, and cleaning for the existing bus fleet and the additional BRT vehicles. The BRT vehicles would be maintained and stored overnight at this facility. The north maintenance building would be expanded to the east by about 8,000 square feet, remaining within property currently owned by UTA and remaining within the existing parking lot pavement area; no additional right-of-way would be required. The expansion would consist of four new bus maintenance bays, which are covered areas for maintaining the new BRT vehicles as well as buses already in the fleet. The expansion would bring the existing facility from about 32,000 square feet to just under 40,000 square feet.

23rd Street and 25th Street Roadway Improvements. To further support the Action Alternative, Ogden City would upgrade portions of 23rd Street and 25th Street to better accommodate the Action Alternative. 25th Street would be rebuilt from the bottom up, and, in certain instances, water mains would be replaced, storm sewers would be installed, and sanitary sewers would be repaired. Depending on the extent of the utility work, curbs might be fully replaced. Ogden City would also upgrade the roadway infrastructure on portions of 23rd Street between Wall Avenue and Kiesel Avenue to better support the Action Alternative and active transportation (walking and bicycling). Improvements would include adding a traffic signal at Lincoln Avenue, restriping, adding bicycle lanes, adding crosswalks, reconstructing curbs, and reconfiguring parking.

3.0 Regulatory Setting

Two terms that are used in floodplain regulatory guidance are *100-year floodplain* and *100-year flood*. A 100-year floodplain is the area that would be flooded by a water body during a 100-year flood. A 100-year flood (also referred to as a base flood) is a level of flood water that has a 1% chance of occurring in a given location in any given year. Note that the term *100-year flood* does not mean that such a flood will occur only once in 100 years. If such a flood were to occur one year, there would still be a 1% chance of a similar flood occurring the following year.

Since floodplains can be mapped, the boundary of the 100-year flood is commonly used in floodplain management and mitigation programs to identify areas where the risk of flooding is significant. Any other statistical frequency of a flood, such as a 5-year, 20-year, 50-year, or 500-year flood, can be chosen depending on the degree of risk that an agency wants to evaluate.

3.1 Federal Emergency Management

In the 1970s and 1980s, FEMA performed location hydrologic and hydraulic studies to identify and map special flood hazard areas within communities. A result of the FEMA studies was the development of flood insurance rate maps that show the floodplain for each river, lake, or other surface water resource that was studied.

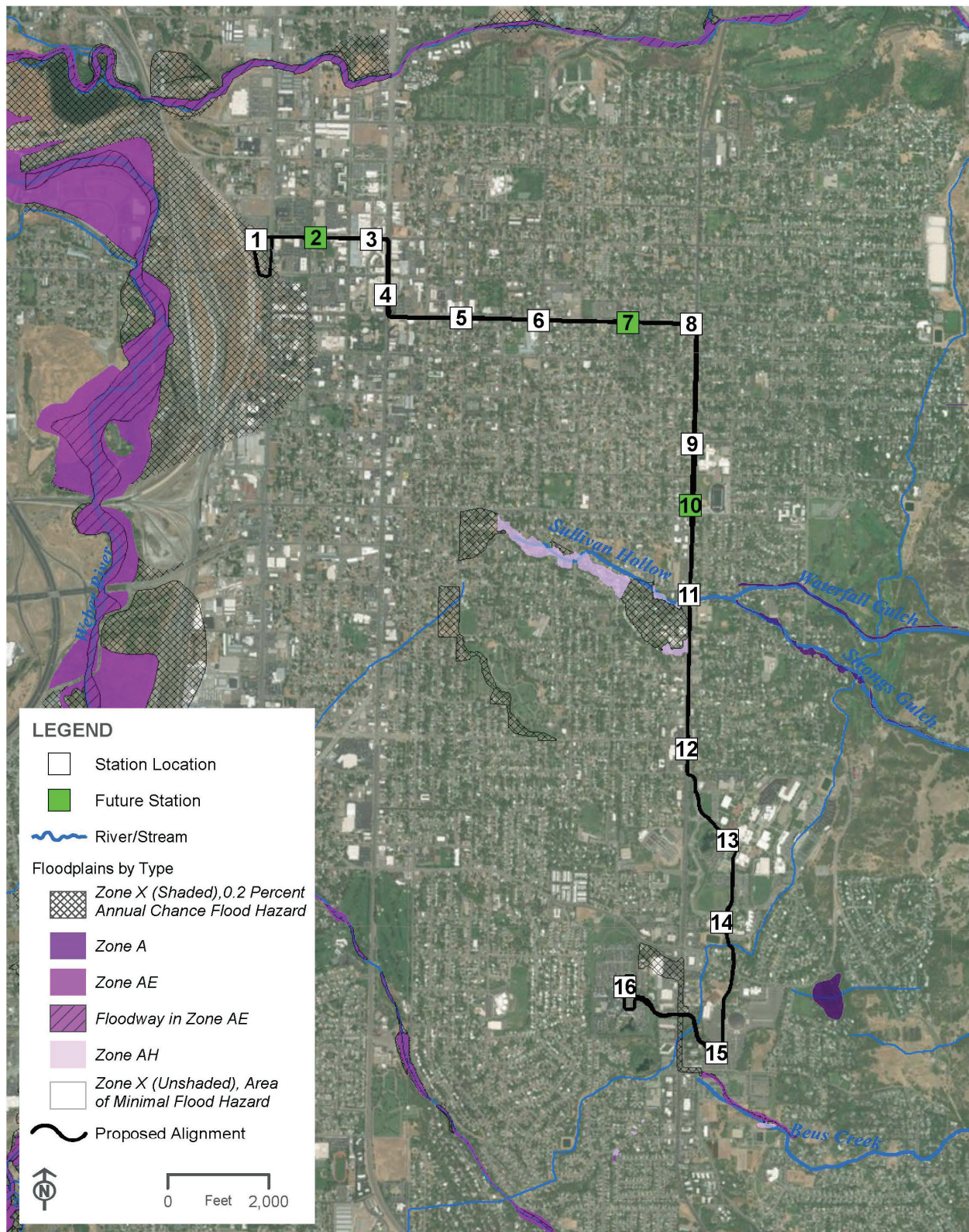
What is a 100-year flood?

A 100-year flood (also referred to as a base flood) is a level of flood water that has a 1% chance of occurring in a given location in any given year.

A special flood hazard area is the area that has a 1% annual chance of flooding (this flood is commonly referred to as the 100-year flood or base flood). Special flood hazard areas are given a zone designation based on the level of detail of the FEMA study and the anticipated type of flooding. There are several types of zones, but only the following zones are present in the floodplain evaluation area (FEMA 2016a):

- **Zone X (Shaded)** – Areas with a moderate risk of flooding (usually between the limits of the 100-year and 500-year floods) from the principal source of flooding in the area.
- **Zone AE** – Areas that would be flooded by a 100-year flood and where the base flood elevations have been determined. A Zone AE floodplain might include a defined floodway (see the description following this list).
- **Zone A** – Areas that would be flooded by a 100-year flood determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, the base flood elevations have not been determined.
- **Zone AH** – Areas with a 1% annual chance of shallow flooding—usually areas of ponding—with an average depth ranging from 1 to 3 feet. Base flood elevations derived from detailed analyses are shown within these zones.
- **Zone X (Unshaded)** – Areas of minimal flood hazard. This zone is present in the floodplain evaluation area but is not pertinent to impact analysis and is therefore not shown in Figure 4.

Figure 4. Floodplains



OGDEN/WEBER STATE UNIVERSITY TRANSIT PROJECT
FLOODPLAINS



The 100-year floodplain for rivers and streams is the area in and around the river or stream that would be inundated by a 100-year flood. Zone AE might include a designated floodway, which is defined as the stream channel and the adjacent areas that must be kept free of encroachment to pass the 100-year flood without increasing the water surface elevation by more than a designated height (FEMA 2016b).

3.2 Executive Order 11988

Executive Order 11988, *Floodplain Management* (May 24, 1977), established federal policy “to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.” Executive Order 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input* (January 30, 2015), was issued to improve resilience to current and future flood risk. However, Executive Order 13690 was subsequently revoked by Executive Order 13807, *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (82 Federal Register 40463).

Accordingly, this evaluation relies on the FTA floodplains compliance process based on Executive Order 11988. This process requires that projects avoid a “significant encroachment” on a floodplain unless FTA finds that the proposed action is the “only practicable alternative” (FTA 2016). In addition, if the proposed action involves significant encroachment, FTA requires consideration of alternatives that avoid or minimize adverse impacts.

Under FTA’s regulations, a “significant encroachment” would involve one or more of the following impacts:

- A considerable probability of loss of human life
- Likely future damage associated with the encroachment that could be substantial in cost or extent, including interruption of service for a vital transportation facility
- A significant adverse impact on natural and beneficial floodplain values (FTA 2016)

However, the “expansion of a facility already located within a floodplain usually would not be considered a significant encroachment” (FTA 2016).

Natural and beneficial floodplain values include, but are not limited to, natural flood conveyance, storage, and control; water quality maintenance; groundwater recharge; water quality function; open space; outdoor recreation; and wildlife habitat and diversity (DOT 1979).

4.0 Affected Environment

4.1 Methodology

The floodplain evaluation area focuses on the Action Alternative (labeled in Figure 4 above as the Proposed Alignment). This evaluation area includes portions of floodplain features that could be affected by project construction and BRT operation. The primary sources of data used to develop the floodplain inventory were FEMA Flood Insurance Rate Maps (FIRMs), ArcGIS World Imagery, and the U.S. Geological Survey's (USGS) Ogden, Utah 7.5-minute Topographical Quadrangle (USGS 1998).

4.2 Streams

Streams in the floodplain evaluation area convey stormwater runoff, but not all of these streams have a regulatory floodplain boundary. The water conveyed by these streams originates in the Wasatch Mountains east of the project study area.

The Weber River watershed includes all land that drains into the Weber River from Weber Canyon (located at about Interstate 84 and U.S. Highway 89) northward to where the river empties into the Great Salt Lake. The Weber River roughly parallels the western boundary of the floodplain evaluation area.

Beus Creek runs east to west from Beus Canyon into the southern portion of the evaluation area near Harrison Boulevard and 46th Street. Beus Creek itself does not cross the Action Alternative alignment, but the floodplain associated with Beus Creek does cross the alignment.

Waterfall Gulch and Strongs Gulch, which are above-ground streams east of the evaluation area, merge to a confluence in the evaluation area at Tyler Avenue and 32nd Street and are directed into a 42-inch pipe at Goddard Road, which is east of Harrison Boulevard. This pipe crosses under Harrison Boulevard just south of 32nd Street, and the combined flow appears to be directed into Sullivan Hollow. Sullivan Hollow runs east to west from downstream of Harrison Boulevard and 32nd Street in a 54-inch pipe that intersects with several smaller pipes. The 54-inch pipe eventually discharges into the Sullivan Hollow detention basin at about Madison Avenue and Patterson Street, which is more than a half mile west of Harrison Boulevard.

4.3 Floodplains

Table 1 lists the FEMA-defined floodplains in the floodplain evaluation area. Figure 4 above shows the locations of these floodplains and their associated water bodies.

According to the FIRMs produced by FEMA, most of the floodplain evaluation area is designated as Zone X (Unshaded), which is an area of minimal flood hazard. Because this zone is not pertinent to the floodplain impact analysis, it is not included in Table 1.

Table 1. Flooding Sources and Flood Hazard Zones

Flooding Sources	Flood Hazard Zones
Beus Creek	Zone X (Shaded)
Sullivan Hollow (localized flooding south of drainage)	Zone AH, Zone X (Shaded)
Sullivan Hollow (localized flooding along main drainage)	Zone A, Zone AH, Zone X (Shaded)
Weber River	Zone X (Shaded)

5.0 Environmental Consequences

5.1 No-Action Alternative

With the No-Action Alternative, the Action Alternative would not be built. Implementation of the No-Action Alternative would not result in adverse impacts to floodplains. The affected environment (existing conditions) would remain unchanged from current conditions.

5.2 Action Alternative

North of 31st Street. North of 31st Street, the Action Alternative would not require any substantial construction that would affect floodplains.

South of 31st Street. South of 31st Street, the Action Alternative would cross Sullivan Hollow (at about 33rd Street and Harrison Boulevard), which has a floodplain with designated Zones AH, X (Shaded), and A. In this location, the Action Alternative includes road widening to accommodate the bus-only travel lanes, and this would encroach on all three zone types of the regulatory floodplain.

Additionally, the Action Alternative would cross a designated Zone X (Shaded) floodplain associated with Beus Creek. No new construction is planned for this area, so the floodplain would not be affected.

5.3 Mitigation Measures for Floodplain Impacts

UTA or its construction contractor will obtain floodplain development permits for the segment of the Action Alternative that would encroach on the Sullivan Hollow regulatory floodplain. The design of the roadway widening to accommodate the bus-only lanes will follow the more stringent of FEMA requirements or local floodplain ordinances. UTA or its construction contractor will also obtain a stream alteration permit from the Utah Division of Water Rights.

Based on the nature of the expected impacts to the Sullivan Hollow regulatory floodplain, pre- and/or post-project revisions to FEMA maps might be required. Detailed floodplain impact analyses could require significant time and effort and should be performed early in project development to avoid potential coordination and permitting delays.

6.0 References

[DOT] U.S. Department of Transportation

- 1979 Order 5650.2: Floodplain Management and Protection.
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- 2016a Definitions of FEMA Flood Zone Designations. <http://www.fema.gov/flood-zones>. Accessed May 18, 2016.
- 2016b Flood Insurance Study, Flood County, USA and Incorporated Areas (Sample Flood Insurance Study). <http://www.fema.gov/library/viewRecord.do?id=2361>. Accessed May 19, 2016.

[FTA] U.S. Department of Transportation, Federal Transit Agency

- 2016 Floodplains. <https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/floodplains>. Accessed June 21, 2016.

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