Chapter 3: Affected Environment and Environmental Consequences

Introduction

This chapter discusses environmental resources within the study area, potential impacts to those resources as a result of the project, and the planned mitigation for the impacted resources. Figures are included at the end of the chapter unless noted otherwise.

Study Area

The general study area roughly includes a half-mile buffer around the alignment that stemmed from the 2005 *Provo-Orem Rapid Transit Feasibility Study*. The general study area applies to all resources in this chapter unless otherwise noted. The general study area is shown on Figure 1-1 in Chapter 1.

Impact Line

A potential impact line was developed based on the conceptual design for the project. The impact line was used to determine impacts to environmental resources. In some cases additional analysis was conducted to determine impacts. The impact line is conceptual in nature and is shown on several figures in Chapter 3.

Impacts of Phasing

The impacts discussed in Chapter 3 are inclusive of impacts from both Phase I and Phase II, and the impact line includes the area needed to implement both phases. Phase I differs from Phase II from 400 West and University Parkway to the Orem Intermodal Center. In this segment, bus rapid transit (BRT) would operate in mixed-flow traffic on 1200 South and University Parkway (see Figure 2-1 in Chapter 2), and a station would be constructed to serve Utah Valley University (UVU) near Sandhill Road and University Parkway. After Phase II is implemented, BRT would not operate on this segment and the station would no longer be needed.

Summary of Impacts

A summary of environmental impacts associated with implementation of both phases of the Preferred Alternative is shown in Table 3.0: Summary of Environmental Impacts of the Preferred Alternative. Mitigation measures for each resource are also listed in the table. In general, the No-Action Alternative and Enhanced Bus Alternative have little to no environmental impacts.

Table 3.0: Summary of Environmental Impacts of the Preferred Alternative

Resource	Impact	Mitigation
Economic	The Preferred Alternative would attract transit-oriented development (TOD) investment.	None
Community Character and Cohesion	The Preferred Alternative would result in improved transportation accessibility and pedestrian connections, and increased traffic volumes on some local roads near the 800 South interchange.	1) A neighborhood entrance would be constructed at 800 West and 800 South. 2) A buffer area approximately 40 feet wide would be considered between the new road at 800 South and the back of the homes on 680 South. 3) The stakeholder committee established during the environmental phase (which included residents from 680 South and 800 South) would continue during final design to finalize mitigation concepts.
Environmental Justice	No impact because minority and low-income populations are distributed throughout the study area and are not concentrated in certain neighborhoods.	None
Land Use and Zoning	The Preferred Alternative would attract redevelopment and TOD investment near stations. The new interchange could change land use from residential to commercial near 800 South.	None
Land Acquisition, Displacements, and Relocations	The Preferred Alternative would result in 126 partial acquisitions and 16 full acquisitions (10 residential relocations, three industrial relocations, one UVU structure relocation, one agricultural relocation, and one vacant lot).	Property acquisitions would be completed according to federal guidelines and Utah Transit Authority (UTA) and Utah Department of Transportation (UDOT) policies. Regulations include fair compensation for property owners and qualified renters. UTA and UDOT would comply with Title VI of the Civil Rights Act of 1964 and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.
Historic Properties	The Preferred Alternative would result in *no adverse effects* to 22 historic properties, one historic district and four archaeological and linear historic resources.	None
Paleontological Resources	No impact	None

Table 3.0: Summary of Environmental Impacts of the Preferred Alternative (cont'd)

Resource	Impact	Mitigation
Visual Quality	Improvements are consistent with the urban landscape, so overall impacts would be minor. Viewshed for residences near the 800 South interchange would be affected, and mature trees and landscaping would be affected in some locations.	1) Street-side vegetation would be maintained and preserved wherever possible. 2) BRT stations would be designed and constructed to be compatible with the surrounding landscape 3) A buffer area would be considered south of 680 South to offset visual impacts (see Section 3.2).
Parks and Recreation Resources	The Preferred Alternative would result in minor impacts to two existing parks, one planned park, and two existing separated trails (College Connector Trail and Provo River Trail).	UTA would coordinate with Provo City and Orem City to ensure trails and bike lanes remain accessible and safe during construction through the use of striping, signage, raised crosswalks, flags, and signalization. A trail user outreach/communication plan would be developed to notify users of trail closures/detours resulting from construction. Construction activities that interrupt trail use would be scheduled during periods of low trail use, when possible.
Air Quality	The project would not create or contribute to any new or existing carbon monoxide (CO) or PM_{10} violations of the National Ambient Air Quality Standards (NAAQS) and conforms to the purpose of the regional State Implementation Plan.	None
Noise and Vibration	The Preferred Alternative would result in 121 moderate noise impacts and 10 severe noise impacts (FTA Category 2) and 6 moderate impacts (FTA Category 3) (assuming the construction of three noise barriers), based on FTA noise criteria. There would be no vibration impacts.	Noise barriers would be considered at 680 South (College Drive, north), 500 West (College Drive, south), and Ridgecrest Circle.
Biological Resources	The Preferred Alternative would impact 3.7 acres of wetlands. Of those, 0.23 acres would be impacted near the Provo River in Phase I. The remaining wetland impacts would occur as part of Phase II. Minimal impacts to wildlife and aquatic habitat are expected.	1) Pre-construction surveys would be conducted for migratory birds and Ute ladies'-tresses near the Provo River. 2) Best management practices would be implemented to reduce debris and sediment entering the Provo River to minimize potential impacts to June sucker and its habitat.

Table 3.0: Summary of Environmental Impacts of the Preferred Alternative (cont'd)

Resource	Impact	Mitigation
Water Resources	There are potential impacts to the Provo River, canals, and water quality.	1) Storm water runoff would be routed through detention basins where feasible. 2) Design plans would be submitted to the Department of Water Quality (DWQ) if end of pipe discharge is 5 cubic feet per second (cfs) or greater (for new storm drain construction). 3) Discarded asphalt and phosphate rock would not be used for fill material. 4) Temporary erosion would be controlled through best management practices and UPDES permit requirements. 5) No dry wells would be constructed in Drinking Water Source Protection Zones 1 or 2 for Orem Well 1. 6) Underground injection control inventory forms would be filed with DWQ prior to construction of dry wells. 7) Wells would be replaced or water rights would be purchased if a well must be relocated. 8) A floodplain development permit would be obtained before construction within a special flood hazard area.
Hazardous Materials	Four underground storage tank (UST) sites are located directly adjacent to the proposed corridor, and therefore could pose a contamination risk during construction.	If a contaminant from a UST or leaking underground storage tank (LUST) is encountered during construction. UTA would take appropriate measures to remove affected material. Disposal of hazardous waste would be carried out in accordance with the Utah Department of Environmental Quality (DEQ) and the Environmental Protection Agency (EPA).
Utilities	Approximately 65 utility lines would require relocation outside of the project corridor, and 19 utility lines would require protection during construction.	1) Utilities identified as high impact would be relocated outside of the project corridor. 2) Medium-impact utilities would be protected by methods including casing, adjusting the height of the utility line, or adjusting surrounding grading. 3) Low-impact utilities do not require mitigation.
Energy and Mineral Resources	No impact	None
Public Safety and Security	No impact	None

Table 3.0: Summary of Environmental Impacts of the Preferred Alternative (cont'd)

Resource	Impact	Mitigation
Travel Patterns, Accessibility, and Parking	Accessibility for autos, transit, pedestrians, and cyclists would be improved across I-15; one at-grade railroad crossing would be eliminated at 800 South in Orem; pedestrian accessibility at stations would be improved; some on-street parking would be eliminated on University Avenue; left turn movements would be prohibited along 900 East, 700 North, and University Avenue in Provo; and 1370 West in Orem would be a dead-end at 800 South.	See Chapter 4: Transportation Systems.
Construction Impacts	Construction of the Preferred Alternative may cause temporary minor impacts to air quality, noise levels, water, hazardous materials, business access, and traffic.	1) A public involvement plan would be developed to notify the public and residents of traffic delays, rerouting, and temporary lane closures. 2) A traffic management plan would be implemented during construction. 3) Best management practices would be implemented for water quality impacts. 4) Dust suppression would be used to mitigate for air quality impacts. 5) The contractor would adhere to local noise ordinances. 6) Hazardous materials would be removed if identified. 7) Provo City, Orem City, and UTA would work with business owners to provide business access during construction. They would work to publicize that businesses are open, and they would minimize construction delays as much as possible to maintain an expeditious construction schedule. Additional details about construction mitigation measures are described in Section 3.18.
Cumulative Impacts	No impact	None
Section 4(f)	Hillcrest Park, four archaeological sites, 22 historic buildings, and the Provo Downtown Historic District would be subject to a *de minimis* use by the Preferred Alternative. Temporary occupancy of Carterville Park and the Provo River Trail would occur during construction.	A written agreement would be prepared outlining UTA's and Provo City's joint understanding of how the Carterville Park and Provo River Trail would be impacted and the temporary use required, prior to construction.

3.1 ECONOMIC

Regulatory Setting, Studies, and Coordination

Consideration of possible adverse economic effects to the human environment relating to a proposed project is mandated in 23 United States Code (USC) 109(h). The U.S. Council on Environmental Quality regulation 40 Code of Federal Regulations (CFR) 1508.14 states that when an environmental document is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental document will discuss all of those effects on the human environment. Potential economic impacts were identified as relevant to the Provo-Orem Bus Rapid Transit Project during the scoping process.

Affected Environment

Utah County is rapidly transforming from a once primarily agrarian area into a major urbanized region and is second only to Salt Lake County in population. By 2010, approximately 560,511 people will live in Utah County, up from 450,000 in 2005 (Governor's Office of Planning and Budget, no date a).

The Provo/Orem metropolitan area lies at the heart of the county. Historically, Provo, which is the Utah County seat, has also been the center of the Utah County economy. While Provo remains the largest city in Utah County with a 2005 population of 112,000, the neighboring city of Orem has evolved into an urbanized area with a 2005 population of 91,000. Combined, the two cities will comprise nearly 30 percent (242,000) of the projected 805,000 residents expected in Utah County by 2030 (MAG 2007), as shown in Table 3.1-1: Projected Population and Employment in Provo and Orem.

Table 3.1- 1: Projected Population and Employment in Provo and Orem

Area	Population			Employment		
	2005	2030	% Change	2005	2030	% Change
Orem	91,000	104,000	14%	53,000	73,000	38%
Provo	112,000	138,000	23%	72,000	99,000	38%
Utah County	450,000	805,000	79%	200,000	390,000	95%

Source: MAG Regional Transportation Plan 2007–2030

This projected population growth is anticipated to provide economic development and employment opportunities. Total employment in both Provo and Orem is expected to increase from approximately 125,000 jobs in 2005 to 172,000 jobs by 2030, as shown in Table 3.1-1: Projected Population and Employment in Provo and Orem. As the region's population continues to grow, the demand for all levels of professional, technical, educational, and service-oriented positions will continue, keeping both Provo and Orem attractive to employers.

The Preferred Alternative connects UVU and Brigham Young University (BYU), two of the state's largest educational institutions. The universities are also two of Utah County's largest employers, with approximately 4,740 employees at UVU, and approximately 14,197 employees at BYU (UVU 2008; Reese 2009).

Environmental Consequences

This section addresses potential environmental consequences that the proposed alternatives would have on economic resources in the study area.

No-Action Alternative

The No-Action Alternative would have no impacts.

Enhanced Bus Alternative

Environmental consequences associated with the Enhanced Bus Alternative would likely be similar to those of the No-Action Alternative.

Preferred Alternative

Temporary construction impacts to economic resources are discussed in Section 3.18: Construction Impacts.

Private Development

Fixed-guideway improvements have been shown to increase private development adjacent to transit stations. Transit-oriented development (TOD) consists of a mix of land uses, including residential, commercial, and office space. This mix promotes walking to destinations and using transit. The location of the Preferred Alternative would further enhance economic development efforts underway by Provo City. Provo City has increased densities in its Central Business District; in addition, it has adopted a new interim TOD zone on the eastern border of the Central Business District in an effort to create new investment opportunities and a higher density urban core. The Preferred Alternative, which bisects Provo's Central Business District and runs one block east of the TOD zone, could increase attraction to the study area and the downtown area as a whole, creating a mix of housing and employment opportunities.

Access to Businesses

Chapter 4: Transportation Systems discusses impacts to business access due to restricted left turns and reduced on-street parking after project completion. Temporary impacts to business access during construction are discussed in Section 3.18: Construction Impacts.

Mitigation

No adverse economic impacts are anticipated; therefore, no mitigation for overall economic impact is necessary. Impacts and mitigation associated with business access impacts are discussed in Chapter 4: Transportation Systems and Section 3.18: Construction Impacts.

3.2 COMMUNITY CHARACTER AND COHESION

Regulatory Setting, Studies, and Coordination

Both Provo City's and Orem City's general plans outline objectives to preserve and enhance community character and cohesion. For example, one of the goals identified in Provo City's General Plan is to "Maintain integrity and preserve the identifiable personality of neighborhoods." Orem City's General Plan outlines one of its goals as "fostering attractive, stable, and safe residential neighborhoods."

Affected Environment

The Preferred Alternative runs either adjacent to or through 15 individual neighborhoods within the boundaries of Provo or Orem. These neighborhoods include the following:

- Sunset Heights, Orem
- Lakeview, Orem
- Westmore, Orem
- Cherry Hill, Orem
- Hillcrest, Orem
- Riverside, Provo
- Carterville, Provo
- University, Provo
- Pleasant View, Provo
- Wasatch, Provo
- Foothills, Provo
- Joaquin, Provo
- North Park, Provo
- Central Business District, Provo
- East Bay, Provo

Environmental Consequences

This section addresses potential environmental consequences that the proposed alternatives would have on the character and cohesion of communities in Provo and Orem.

No-Action Alternative

There would be no community impacts associated with the No-Action Alternative.

Enhanced Bus Alternative

Environmental consequences associated with the Enhanced Bus Alternative would likely be similar to those of the No-Action Alternative.

Preferred Alternative

The Preferred Alternative follows existing roads that are major arterials. With the exception of 800 South, impacts to community character and cohesion would be minimal; communities are already divided by University Parkway and University Avenue.

Traffic would likely increase on roads near the 800 South interchange. Traffic impacts are discussed in detail in Chapter 4. Also, the residents of the 680 South neighborhood have expressed concern with community character impacts from the new 800 South road. The new 800 South road would be rerouted closer to their homes.

Mitigation

To address residents' concerns about traffic impacts associated with construction of an interchange at 800 South, a traffic calming feature (community entrance) would be constructed at the intersection of 800 South/800 West in Orem (see Figure 3.2-1: Community Entrance Visualization, below).

Figure 3.2-1: Community Entrance Visualization (800 South/800 West, Orem)

To address additional community concerns associated with the 800 South interchange and to finalize specific mitigation solutions, stakeholder meetings with residents from 800 South and 680 South would continue through final design. A buffer area approximately 40 feet wide could be constructed between the new road at 800 South and the back of the homes on 680 South. The buffer area may include a landscaped berm or other measures, pending recommendations from the stakeholders during design. The buffer area may include a noise wall per UDOT's noise policy (additional analysis and balloting of the neighborhood will be necessary to comply with the policy). A cross-section of the 680 South Buffer Area is shown in Figure 3.2-2 below. Figure 3.2-3: Visualization of Mitigation Measures South of 680 South, below, is a visualization of these proposed mitigation measures. (Visual and Noise impacts are addressed in Section 3.8: Visual Quality, and Section 3.11: Noise and Vibration.)

Figure 3.2-2: Cross-Section of 680 South Buffer Area

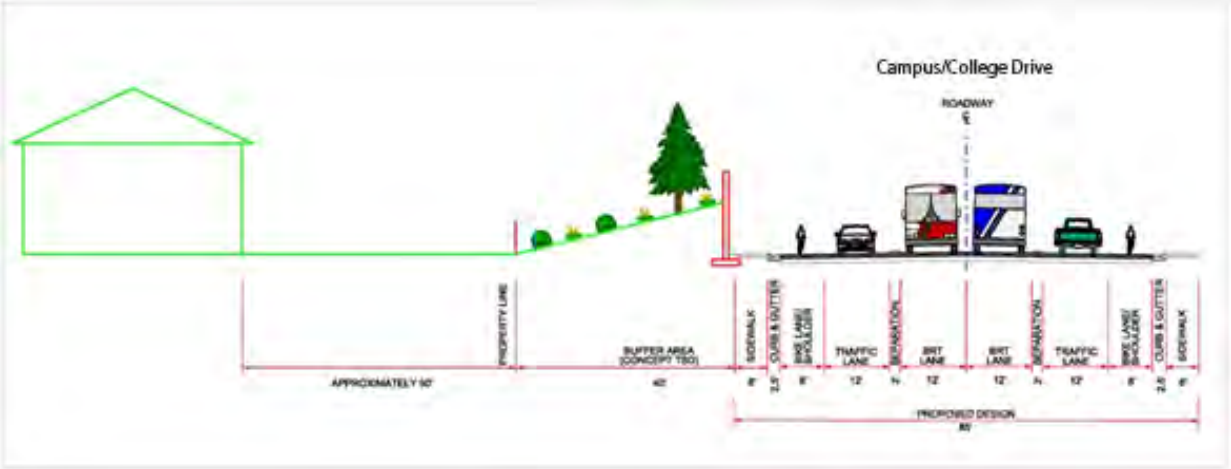


Figure 3.2-3: Visualization of Mitigation Measures South of 680 South

3.3 ENVIRONMENTAL JUSTICE

Regulatory Setting, Studies, and Coordination

Environmental justice impacts were assessed according to Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations) and the U.S. Department of Transportation (USDOT) Order on Environmental Justice. Federally funded projects are required to ensure that low-income households, minority households, and minority business enterprises do not suffer a disproportionate share of adverse environmental impacts.

Affected Environment

The study area for environmental justice includes census blocks and census block groups within 500 feet of the Preferred Alternative. The 500-foot distance was used to ensure the inclusion of census divisions directly adjacent to the proposed project. Demographics for the project study area were compared to those of the UTA service area (Box Elder, Davis, Salt Lake, Tooele, Utah, and Weber counties) to determine if environmental justice populations were present in higher proportions in the project study area. Data used to perform this analysis was collected from the 2000 U.S. Census.

Provo and Orem are diverse communities comprised of individuals with a wide range of ethnic and racial backgrounds. Universities in both cities contribute to this diversity by attracting students from outside Utah and the United States. The large student population also results in noticeably lower average income levels than neighboring cities.

This section discusses the concentration of minority and/or low-income populations within the project study area.

Low-income populations include family units with annual incomes below the poverty threshold determined by the U.S. Department of Health and Human Services. Table 3.3-1: 2000 Poverty Threshold shows specific values for the poverty threshold for household units of varying sizes in the year 2000 (the year for which the most recent census data is available). According to data from the 2000 Census, 8.53 percent of the total population in the UTA service area was living below the poverty threshold in 2000.

The study area comprises 41 census block groups, the finest-scale census unit at which household income data is reported. The 2000 Census total population count of these 41 block groups was 61,994 people, of which 20,874 (33.67 percent) fell below the poverty threshold. These results are expected, given the large numbers of university students living near the BYU and UVU campuses. The student population of BYU and UVU combined is currently more than 50,000.

Table 3.3- 1: 2000 Poverty Threshold

Size of Family Unit	Income ($)
1	$8,350
2	$11,250
3	$14,150
4	$17,050
5	$19,950
6	$22,850
7	$25,750
8	$28,650

Source: U.S. Department of Health and Human Services 2000

Minority populations represented in this analysis include the following census-defined races/ethnicities:

- Black/African American
- American Indian
- Asian
- Native Hawaiian/Pacific Islander
- Hispanic Latino

Table 3.3-2: UTA Service Area Population by Race or Ethnicity shows numbers and proportions of people belonging to racial minority groups, as well as numbers and proportions of Hispanic/Latino people in the UTA service area. People belonging to racial minority groups constitute 11.26 percent of the total population in the UTA service area. Hispanic/Latino people constitute 9.93 percent of the total population in the UTA service area. These percentages are used as benchmarks for further environmental justice comparison.

Table 3.3- 2: UTA Service Area Population by Race or Ethnicity

Race/Ethnicity	Total
Total Racial Minority	201,022
Total Population	1,785,930
Racial Minorities as a Percentage of Total Population	11.26%
Hispanic/Latino as a Percentage of Total Population*	9.93%

** Because Hispanic or Latino people self-identify as members of several different races, the Hispanic/Latino population was also evaluated separately from the other racial minorities.*

The race/ethnicity study area comprises 229 census blocks, the finest-scale census unit and the unit at which racial or ethnic group data is reported. Because census blocks are smaller than census block groups, this study area comprises a smaller footprint and smaller total population than that in the poverty analysis above. In aggregate, the 2000 Census total population of these 229 blocks was 28,380 people, of which 2,660 (9.37 percent) belonged to racial or ethnic minority populations. This is lower than the UTA service-area-wide proportion of 11.26 percent.

Because Hispanic or Latino people self-identify as members of several different races, the Hispanic/Latino population was also evaluated separately from the other racial minorities discussed above. As with the combined racial minority population, the Hispanic/Latino population in the UTA service area was divided by the total population to generate the benchmark proportion of 9.93 percent.

The Hispanic/Latino study area comprises the same 229 census blocks identified in the race/ethnicity study area. Of the 28,380 people residing in these census blocks, 1,909 (6.73 percent) were Hispanic/Latino. This is lower than the UTA service area–wide proportion of 9.93 percent.

No minority-owned or women-owned businesses are located in the project study area, according to the Utah Unified Certification Program's Disadvantaged Business Enterprise directory.

Environmental Consequences

This section addresses potential environmental consequences of proposed alternatives on environmental justice populations.

No-Action Alternative

The No-Action Alternative would not have any disproportionate adverse environmental impacts on low-income or minority populations. However, benefits associated with implementing an improved transit system for those who do not own or operate vehicles would not be realized under this alternative.

Enhanced Bus Alternative

Environmental consequences associated with the Enhanced Bus Alternative would be similar to those of the No-Action Alternative; however, minor transit improvements associated with the Enhanced Bus Alternative may result in somewhat enhanced mobility for low-income and minority populations.

Preferred Alternative

While overall the percentage of Hispanic/Latino and minority populations residing within the study area were found to be lower than that of the UTA service area, it was found that approximately one-third of the census blocks within 500 feet of the Preferred Alternative have concentrations of racial minorities and Hispanic/Latinos above the UTA service area average. However, it should be noted that environmental impacts would be dispersed throughout the project corridor and are not focused on any one census block or population group. Mitigation measures would apply to all population groups as needed. Low-income households, minority households, and minority business enterprises would not experience a disproportionate share of adverse environmental impacts as a result of implementation of the Preferred Alternative.

The poverty analysis in the Affected Environment section also highlights that the percentage of low-income individuals within the study area is higher than the poverty-level benchmark for the UTA service area. This is largely due to the large university population residing in Provo and Orem.

Implementing the Preferred Alternative would provide a low-cost transportation alternative and would be particularly beneficial for no-vehicle households. By linking major destinations within Provo and Orem—including commercial, retail, and industrial centers and universities—transit-dependent populations such as low-income individuals would experience increased access to essential services and employment opportunities. By providing a connection to both the Provo and Orem Intermodal Centers, these groups would also be able to access services and employment opportunities in both Utah and Salt Lake counties through the use of FrontRunner commuter rail.

Mitigation

The Preferred Alternative would not have disproportionate adverse environmental impacts on low-income or minority populations; therefore, no mitigation is necessary. The Preferred Alternative is likely to provide additional access and mobility benefits and employment opportunities for these groups.

3.4 LAND USE AND ZONING

Regulatory Settings, Studies, and Coordination

Land use is regulated through zoning by local communities. Sections 3 and 5 of the Urban Mass Transportation Act (1970) require that federally funded transit projects be consistent with official plans for the comprehensive development of an area in addition to a community's goals and objectives. The Federal Highway Administration's (FHWA's) Technical Advisory T6640.8a, which provides guidance for preparing and processing environmental documents, states that land use assessment should also verify that alternatives are consistent with comprehensive development plans.

The Orem City General Plan (amended 2008) and the Provo City General Plan (amended 2009) describe the long-range goals and related policies that will guide the future growth and development of the cities. These documents were utilized to understand impacts of the No-Action Alternative, the Enhanced Bus Alternative, and the Preferred Alternative on future land use goals and to ensure consistency with these plans.

Consistency with City Plans

While the Cities of Orem and Provo are strategically planning to preserve and enhance the individual character of their communities, the long-term land use goals outlined in both general plans are consistent with the Preferred Alternative.

Orem City

Orem City has taken a number of actions to encourage and facilitate land use changes that will benefit future transit investments; increase multi-modalism, walkability, and bikability; and create economic opportunities. Orem City is currently in the process of updating its zoning ordinance to include two new TOD zones.

The first TOD zone in Orem is the future Orem Intermodal Station site, which is the northern terminus for this proposed project and is currently owned by UTA. The purpose of this zone is to "allow development of an Intermodal Center integrated with other properties in the general vicinity to encourage good access for all modes of transportation including pedestrians" (Orem City 2010). The second TOD zone in Orem is proposed for the properties surrounding the future Orem Intermodal Station site and is currently owned by various private land owners. The text for this TOD ordinance is currently being drafted. Permitted uses are likely to include mixed-use development, high-density housing, professional offices, and retail uses (Goodrich 2010).

Orem City's master transportation plan includes an interchange at 800 South.

Provo City

In February 2009, Provo City adopted an interim TOD ordinance that includes an area between approximately 450 South and 920 South, centered on the future Provo Intermodal Center. The purpose of the TOD ordinance is to create an urban neighborhood around transit. It will do so by increasing densities and allowing additional uses and intensities in an area adjacent to, and surrounding, the Provo Intermodal Center.

Affected Environment

The study area for land use extends one-half mile from each proposed BRT station along the project corridor. Studies have shown that an individual's willingness to walk to and from a transit station is limited beyond half a mile. For this document, the land use study area has been divided into seven subsections based on proximity and use of transit stations. These subsections are shown on Figure 3.4-1: Land Use in the Study Area. This section describes current and future land use and zoning within each of the following land use study area subsections:

- Orem Intermodal Center
- UVU
- Orem Shopping District
- Plum Tree
- BYU
- Downtown Provo
- Novell Campus

Land Use Trends within the Study Area

Utah County land use reflects a regional transition from predominantly agrarian to suburbanized uses, with Provo and Orem serving as the urban center of the region. Educational institutions, dominant commercial and office use, and increased residential density along or near University Parkway and University Avenue have established these corridors as the core of the region.

Existing Land Use

Orem Intermodal Center Section

The Orem Intermodal Center section of the study area is the northern terminus of the proposed project. Notable land use surrounding the proposed center includes UVU, Wolverine/Parkway Crossing (a mixed-use student housing development), and the Orem Center Business Park, as summarized below in Table 3.4-1: Orem Intermodal Center Section Land Use.

Table 3.4- 1: Orem Intermodal Center Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.26%	0.98
Commercial	21%	77.75
Institutional	35.53%	131.53
High-Density Residential	6.33%	23.44
Medium-Density Residential	20.5%	75.88
Open	0.22%	0.83
Vacant	16.15%	59.78
Total		**370.19**

UVU Section

The Preferred Alternative extends to the east across Interstate 15 (I-15) on 800 South, through UVU. Three proposed stations are located along Campus/College Drive on the UVU campus. In addition, there is a proposed station at Sandhill Road (to serve UVU during Phase I of the project). UVU, commercial, and medium-density residential comprise the majority of this area (see Table 3.4-2: UVU Section Land Use).

Table 3.4- 2: UVU Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.84%	7.13
Commercial	14.09%	119.56
Institutional	33.40%	283.32
High-Density Residential	5.22%	44.24
Medium-Density Residential	34.28%	290.81
Low-Density Residential	0.50%	4.23
Vacant	11.67%	98.98
Total		**848.27**

Orem Shopping District Section

The Orem Shopping District section of the study area stretches from approximately 400 West to 1140 East. It includes three proposed stations on University Parkway. These three stations are located at the intersections of 400 West, Main Street, and at the University Mall.

This area, Orem's primary commercial corridor, is dominated by commercial and professional uses, including car dealerships, strip malls, large regional box stores, and local businesses. The University Mall, at the intersection of University Parkway and State Street, is the commercial anchor of this area and the identified center of the city.

Commercial, institutional, and residential uses comprise the majority, 90 percent, of this area (see Table 3.4-3: Orem Shopping District Section Land Use).

Table 3.4- 3: Orem Shopping District Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.002%	2.18
Commercial	32.30%	328.55
Institutional	11.98%	121.81
High-Density Residential	5.37%	54.63
Medium-Density Residential	40.67%	413.71
Open	0.00%	0.04
Vacant	9.47%	96.28
Total		**1,017.2**

Plum Tree Section

As University Parkway turns to the south, the Plum Tree section of the land use study area transitions from Orem to Provo. The area includes one proposed station at the Plum Tree Shopping Center, a regional entertainment and shopping attraction. The two dominant land uses in the area are commercial with nearly 40 percent of the total acreage and medium- and high-residential housing with approximately 42 percent of the total acreage (see Table 3.4-4: Plum Tree Section Land Use).

Table 3.4- 4: Plum Tree Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.00%	0.00
Commercial	39.43%	145.76
Institutional	2.02%	7.46
High-Density Residential	13.14%	48.57
Medium-Density Residential	29.14%	107.71
Open	6.58%	24.31
Vacant	9.70%	35.87
Total		**369.68**

BYU Section

The proposed BRT route crosses University Avenue and merges with 1650 North (East University Parkway) in Provo. The BYU section of the study area is clearly defined by the presence of BYU on approximately 430 acres, which constitutes approximately 44 percent of the total land use within this study area section (see Table 3.4-5: BYU Section Land Use). Three proposed station locations are included in this section: one on 1650 North, one on 900 East, and one on 700 North.

Table 3.4- 5: BYU Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.03%	0.26
Commercial	3.57%	35.09
Institutional	44.03%	432.20
High-Density Residential	16.69%	163.81
Medium-Density Residential	30.61%	300.52
Low-Density Residential	0.00%	0.00
Open	3.32%	32.59
Vacant	1.75%	17.17
Total		**981.64**

Downtown Provo Section

Provo's Central Business District is a clearly defined urban core and historically the center of the Utah County economy. The Downtown Provo section of the study area includes five proposed stations along University Avenue at the intersections of 600 North, 300 North, Center Street, and 400 South. The future Provo Intermodal Center is also located in this section of the study area.

Most of the Class "A" and "B" office inventory is located in Provo's Central Business District, along with the county courts and a new justice complex. Commercial is the dominant use in the area. The county's multi-family (medium- and high-density) housing units are also concentrated within the Central Business District area (see Table 3.4-6: Downtown Provo Section Land Use).

Table 3.4- 6: Downtown Provo Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.18%	1.59
Commercial	32.36%	279.69
Institutional	18.14%	156.81
High-Density Residential	16.21%	140.11
Medium-Density Residential	27.70%	239.39
Open	2.36%	20.38
Vacant	3.05%	26.37
Total		**864.34**

Novell Campus Section

The Novell campus is the southern terminus of the study area. The Novell campus section of the study area includes the proposed station at the Provo Towne Centre mall and the proposed station at the two main entrances to the Novell campus. The Novell campus, East Bay Golf Course, and the Provo Towne Centre mall comprise the bulk of the approximately 421 acres of commercial use within the study area (see Table 3.4-7: Novell Campus Section Land Use).

Table 3.4- 7: Novell Campus Section Land Use

Land Use	% of Total Acreage	Acreage
Agricultural	0.13%	0.92
Commercial	58.73%	421.70
Institutional	17.64%	126.68
High-Density Residential	2.85%	20.48
Medium-Density Residential	9.23%	66.30
Open	2.44%	17.53
Vacant	8.97%	64.44
Total		**718.05**

Future Land Use

Changes to land use in the future are expected to be minor and consistent with Orem City's and Provo City's general plans and current zoning. Expected land use changes include the following:

- **Orem Intermodal Center Section** – Future development is likely to comply with new TOD zones previously outlined.
- **Plum Tree Section** – The 2009 Provo City General Plan includes the Plum Tree section as part of a larger area within Provo with a high level of mixed-use redevelopment potential focusing around a Central Provo River Riverwalk/Frontage Plan.
- **BYU Section** – Originally, high-density housing was designated in the Joaquin neighborhood from the southern end of campus to 500 North, and from Freedom Boulevard to 900 East. However, the city is now considering amending the plan for transit-oriented type developments in the upcoming general plan.
- **Downtown Provo Section** – While the city has enacted an interim TOD zone in the area surrounding the intermodal center, the amended general plan directs development beyond the TOD along key transportation corridors including University Avenue and 100 West. According to the amended general plan, future structures will be concentrated into an identifiable city center, focused around key transportation corridors including University Avenue and the BRT system (Provo City 2009a).
- **Novell Campus Section** – While much of the land use in this area reflects the current zoning and general plan, the city is encouraging quality development and redevelopment near the Provo Towne Centre mall, especially along University Avenue. A goal of this area is to develop a regional destination that complements the current mall and surrounding uses.

Environmental Consequences

This section discusses potential impacts to existing land use and current planning along the project alignment and at the proposed BRT station locations under the No-Action Alternative, Enhanced Bus Alternative, and the Preferred Alternative. For the purpose of this impact analysis, a negative land use impact would be land use changes that are not consistent with municipalities' future land use plans (discussed in the Regulatory Setting section above).

No-Action Alternative

Throughout the study area, no adverse effects to land use would result from the No-Action Alternative. The No-Action Alternative would not yield the land use benefits attributed to the Preferred Alternative or serve future development and growth as described in the cities' plans.

Enhanced Bus Alternative

Effects to land use under the Enhanced Bus Alternative would be the same as those discussed in the No-Action Alternative section above.

Preferred Alternative

In general, under the Preferred Alternative, changes in land use near stations along the alignment would be positive and reflect the potential for increased value and investment. Most of these changes in both Provo and Orem would occur through development of underutilized commercial land or areas prime for redevelopment. Residential land used around 800 South could change to commercial after construction of the interchange.

The Preferred Alternative would affect land use in the following ways:

- **Orem Intermodal Center Section** – The Preferred Alternative would increase the likelihood of the development previously mentioned for this area and attract desired TOD investment.
- **UVU Section** – As commercial developments primarily on the south side of University Parkway age, the Preferred Alternative could stimulate and serve future redevelopment. The Preferred Alternative would increase transit ridership to campus, eliminating more than 500 auto trips to campus per day. This would reduce the need for parking on campus by 2 acres, providing more space on campus for future facilities.
- **Orem Shopping District Section** – As commercial developments along University Parkway and State Street age, the Preferred Alternative would attract future redevelopment. As approximately 45 percent of the land use in this section is residential, the Preferred Alternative would provide increased access to transit and increase the demand for any redevelopment to be pedestrian and transit friendly.
- **Plum Tree Section** – Provo City recognizes the redevelopment potential in this area. The Preferred Alternative would attract future development in this area.
- **BYU Section** – Provo City recognizes the redevelopment potential in this area. The Preferred Alternative would attract future redevelopment of decaying and unattractive higher-density residential units prevalent in the area, replacing these units with a mix of residential and commercial uses. Similar to UVU, the Preferred Alternative would increase transit ridership to campus, eliminating more than 1,000 auto trips to campus per day. This would reduce the need for parking on campus by 5 acres, providing opportunity for future campus facilities.
- **Downtown Provo Section** – The Preferred Alternative would support future development and redevelopment and would attract TOD investment.
- **Novell Campus Section** – The Preferred Alternative would support the city's goals of development and redevelopment and would attract TOD investment.

Mitigation

No adverse effects to land use would result from the alternatives; therefore, no mitigation is necessary.

3.5 LAND ACQUISITION, DISPLACEMENTS, AND RELOCATIONS OF EXISTING USES

Regulatory Setting, Studies, and Coordination

Relocations for the project will be assessed in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended July 2008). Given that the Preferred Alternative would be located partially on state roads, property acquisitions would also be undertaken in accordance with the State of Utah's relocation policy. This policy can be found in Utah Code, Section 57-12. The Utah Relocation Assistance Act and Title VI of the Civil Rights Act of 1964 would also be followed.

Affected Environment

For this analysis, it was assumed structures located within 15 feet of the project right-of-way line would be relocated. Properties that are within the right-of-way line but do not have a structure within 15 feet of that line were treated as a partial acquisition. A review of the zoning chapters in Provo City's and Orem City's codes identified setback requirements within the study area. These setback requirements are greater than 15 feet in some locations and will be reviewed for individual properties during final design.

There are approximately 912 parcels adjacent to the project corridor.

Environmental Consequences

This section describes potential displacements, relocations, and right-of-way acquisitions associated with the proposed alternatives. Because the project's need for right-of-way and the resulting acquisitions and relocations of existing uses were estimated using preliminary engineering drawings, the impacts listed below should be considered a preliminary estimate. Future refinement of the project during final design could result in different impacts for specific properties than described below; the impacts are expected to remain within a similar range.

No-Action Alternative

No relocations or displacements of property owners would result from this alternative.

Enhanced Bus Alternative

No relocations or displacements of property owners would result from this alternative.

Preferred Alternative

Implementing the Preferred Alternative would require both partial and full acquisitions of properties along the project corridor. These properties are shown on Figures 3.5-1 through 3.5-7: Potential Relocations and Strip Takes. Based on the criteria outlined above, it is estimated that a total of 10 residences, three industrial properties, one agricultural property, and one UVU structure would be displaced. In addition, one vacant lot would be acquired by the project. Most of the displacements and full parcel acquisitions would occur near the 800 South interchange. Displacements are primarily due to the construction of the 800 South interchange and widening of Campus/College Drive on the UVU campus.

Properties that would require full acquisitions and relocations are also listed in Table 3.5-1: Full Acquisitions and Relocations. Some of the land from the acquisition of residential displacements may not be needed for the actual roadway right-of-way, but may be used for detention basins (parcels A, B, D, M, and N).

Table 3.5- 1: Full Acquisitions and Relocations

ID	Address	City	Current Use	Total Acres	Acres Taken	% Taken
A	1480 W. 800 S.	Orem	Residential, Single Family	.9569	.9569	100%
B	1435 W. 800 S.	Orem	Residential, Single Family	.9998	.9998	100%
C	1434 W. 800 S.	Orem	Residential, Single Family	.2215	.2215	100%
D	1421 W. 800 S.	Orem	Residential, Single Family	.9914	.9914	100%
E	1408 W. 800 S.	Orem	Residential, Single Family	.2044	.2044	100%
F	1405 W. 800 S.	Orem	Residential, Single Family	.9998	.9998	100%
G	1396 W. 800 S.	Orem	Residential, Single Family	.1948	.1948	100%
H	1391 W. 800 S.	Orem	Residential, Single Family	.9981	.9981	100%
I	1375 W. 800 S.	Orem	Residential, Single Family	1.000	1.000	100%
J	1261 W. 800 S.	Orem	Residential, Single Family	1.000	1.000	100%
K	1200 W. 800 S.	Orem	Industrial – Scrap metal yard	2.45	2.45	100%
L	Approx. 900 South, between railroad and I-15	Orem	Industrial – Scrap metal yard	.01	.01	100%
M	Between 950 and 1000 South, between railroad and I-15	Orem	Industrial – Scrap metal yard with structures	5.25	5.25	100%
N	Approx. 1050 South, between railroad and I-15	Orem	Agricultural	3.35	3.35	100%
O	1285 W. 400 S.	Orem	Vacant	.73	.73	100%
P	917 S. 750 W.	Orem	Institutional - UVU	.3486	.3486	100%
Total Full Acquisitions = 16 Properties			**10 Residential; 3 Industrial; 1 Institutional; 1 Agricultural 1 Vacant**	**Total Acres Taken = 19.71 Acres**		

It is also estimated that a total of 126 partial acquisitions would be required from existing residential and commercial properties (see Figures 3.5-1 through 3.5-7). Potential impacts associated with the partial right-of-way acquisitions of residential and commercial properties relate to the ongoing viability of the property and its ability to support its existing use. Generally these types of acquisitions will move the roadway closer to the existing structure, potentially causing additional impacts to noise level and safety. Parking impacts associated with construction of the Preferred Alternative are anticipated on 800 South (west side of I-15) in Orem due to the addition of bike lanes. Parking impacts are also anticipated along University Avenue in Provo due to limited right-of-way in this location. However, the availability of alternative parking (including private parking and on-street parking on adjacent streets) and improved access to transit would lessen these impacts. Parking impacts are discussed further in Chapter 4. Commercial properties along a portion of University Parkway in Orem may lose some parking in lots adjacent to the parkway; however, these impacts are likely to be minimal given the size of the commercial lots.

Mitigation

All property acquisitions, partial or total, would be completed according to federal guidelines and UTA and UDOT policies. These regulations include fair compensation measures for property owners and qualified renters. UTA and UDOT will comply with Title VI of the Civil Rights Act of 1964 and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

Property acquisition and relocation activities for the project would be conducted in accordance with all applicable state guidelines and regulations regarding relocation assistance and property acquisition. The underlying purpose of the state requirements is to offset or eliminate any financial hardship that private individuals or entities may experience as a result of acquiring property for public purposes. No individual or family would be required to relocate until adequate, decent, safe, and sanitary housing is available.

3.6 HISTORIC PROPERTIES

Regulatory Setting, Studies, and Coordination

The National Historic Preservation Act (NHPA) outlines the national policy and procedures regarding historic properties. Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on such properties by following regulation 36 CFR 800, which is issued by the Advisory Council on Historic Preservation. Other relevant federal legislation requiring the consideration of historic properties includes Section 4(f) of the USDOT Act of 1966 and 49 USC 303. See Chapter 7: Section 4(f) Evaluation for more details on Section 4(f).

Study Area and Resource Identification Methods

In accordance with the NHPA's regulation 36 CFR 800.4, the study area for historic properties is defined as the area of potential effects (APE) for direct and indirect impacts. FTA, in consultation with the Utah State Historic Preservation Office (SHPO) and other consulting parties, established the APE as a series of linear corridors that vary in width depending on the nature of the proposed project's development. The APE includes the area that would potentially be directly impacted by the Preferred Alternative design and the directly adjacent properties. The APE is illustrated on Figures 3.6-1 to 3.6-5: Historic Properties.

The APE for this project encompasses all areas potentially subject to ground disturbance or other physical alteration that could directly affect historic properties. It also includes areas that could contain historic properties; these resources may be indirectly affected through changes in their setting, feeling, association, or other integral elements of their character or importance as a result of physical disturbance adjacent to them. Given these considerations, the APE was defined as 10 feet beyond the outer-most edge of disturbance caused by potential construction activity or right-of-way acquisitions.

Efforts to identify the historic properties that could be affected by the proposed project's development included a visual inspection of the APE, consultation with various entities, a review of past studies in the area, and an evaluation of records from the Utah Division of State History's Antiquities and Preservation sections. The records review was carried out in August 2008 and updated periodically through April 2010 as alternatives were refined.

To ensure the entire APE was inspected, and because potentially affected resources were identified while project designs were still being prepared, the survey area for historic buildings was defined as a corridor extending 50 feet from the existing edge of pavement along both sides of each roadway where potential project activities would take place. If a portion of a property containing a historic building was located within the survey area (even if the building itself was not), the property was included in the assessment, and the potential impacts of the proposed alternatives were evaluated. The archaeological survey consisted of both a reconnaissance- and intensive-level inventory. The reconnaissance-level inspection was undertaken in areas that were developed with lawn grasses, pavement (asphalt or concrete), and modern landscaping. The intensive-level inspection was undertaken in undeveloped areas. The historic buildings inventory consisted of a selective reconnaissance-level survey along the entire project corridor. The detailed findings of these assessments are contained in separate technical reports, and a summary of the findings is provided in the Affected Environment section below (SWCA 2009a, 2009b, 2010a). Field studies were carried out in August 2008, August 2009, and May 2010.

The consultation component of the historic properties study included written and verbal correspondence. Interested parties were consulted regarding the area's historic resources. These interested parties included representatives from local communities, certified local governments, the Advisory Council on Historic Preservation, and six Native American tribes—the Northwestern Band of Shoshone Nation, the Shoshone-Bannock Tribes, the Confederated Tribe of Goshutes, the Paiute Indian Tribe of Utah, the Ute Indian Tribe, and the Skull Valley Band of the Goshutes. Copies of the letters sent to these tribes are included in the Appendix.

Affected Environment

Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register of Historic Places (NRHP). Typically, historic properties consist of prehistoric or historic resources that are at least 50 years old. For this Environmental Assessment (EA), however, an age threshold of 45 years was used. This lower threshold was used to account for the amount of time likely to lapse between the identification of historic properties as part of this EA and any construction related to the project, should an action alternative be selected.

Resources may be considered eligible for inclusion on the NRHP if they meet one or more of the following criteria set forth in regulation 36 CFR 60.4. Resources considered potentially eligible under one of these four criteria must also be evaluated for integrity of location, design, setting, materials, workmanship, feeling, and association.

A. [It is] associated with events that have made a significant contribution to the broad patterns of our history.
B. [It is] associated with the lives of persons significant in our past.
C. [It embodies] the distinctive characteristics of a type, period, or method of construction, or [it represents] a significant and distinguishable entity whose components may lack individual distinction.
D. [It has] yielded, or may be likely to yield, information important to prehistory or history.

History and Archaeology Overview

The Provo-Orem area was settled by Euro-Americans in 1847, shortly after the arrival of the first Mormon pioneers to the Salt Lake Valley. Prior to this, Utah Valley served as at least a semi-permanent seasonal home to small groups of Native Americans and their prehistoric ancestors.

For the first several decades of Euro-American settlement, agriculture was the dominant cultural and economic activity. By the late 1800s, the economy shifted from agriculture to a more industrial focus on railroading and mining. Interstate and interurban roadways were constructed through the area, connecting the Provo-Orem area to Salt Lake City and points beyond.

Given the more than 100 years of urban development within the APE, there are no undisturbed ground surfaces in the area. This means that surface evidence of archaeological properties, particularly those of the prehistoric period, is often limited or non-existent. Numerous discoveries of historic and prehistoric resources have been made during construction projects in the Provo-Orem area. Some of these discoveries were made during road construction or road improvement projects, but most have been made during excavations for building foundations and basements. One of the discoveries involved historic trolley tracks, discussed later in this section, found along University Avenue within the current APE. Many of the discoveries have consisted of prehistoric human burials. These types of discoveries have primarily occurred west of I-15, closer to the historic shoreline of Utah Lake and well away from all but the northwestern most portion of the current APE. While it is impossible to predict if and where buried historic or prehistoric resources might be encountered, the probability along most of the project corridor is relatively low given that most of the roads along which the transit system would be constructed have been in use as roads for at least a century.

Archaeological and Linear Historic Resources

One archaeological site and four linear historic resources were identified within the project's APE. These include two historic canals, two historic railroad corridors, and the archaeological remains of one historic trolley corridor.

The archaeological and linear historic resources found within the APE are listed in Table 3.6-1: Archaeological and Linear Historic Resources. The locations of these sites are shown on Figures 3.6-1, 3.6-2, and 3.6-4. The NRHP eligibility determinations identified in Table 3.6-1 represent the final determinations made by FTA in consultation with SHPO and other consulting parties.

Table 3.6- 1: Archaeological and Linear Historic Resources

Site Number	Site Name (if applicable)	Site Type	NRHP Eligibility
42UT00684	Provo Trolley*	Historic Trolley	Eligible
42UT001568	West Union Canal	Historic Canal	Eligible
42UT001029	Utah Southern/Union Pacific Railroad	Historic Railroad	Eligible
42UT001031/ 42UT001125	Denver & Rio Grande Western Railroad	Historic Railroad	Eligible
42UT001032	Lake Bottom Canal	Historic Canal	Eligible
** This site was discovered below the modern pavement during road construction. The tracks and ties were removed as part of the project. It is possible, however, that remains (i.e., tracks) of the trolley's other sections may be present within the Provo-Orem Bus Rapid Transit Project corridor along University Avenue.*			

Historic Buildings and Historic Districts

A total of 165 historic buildings were identified within the project's APE. Most of these buildings are located along 900 East, 700 North, and University Avenue, within the historic core area of Provo (SWCA 2009a, 2009b, 2010a). The locations of the buildings are shown on Figures 3.6-1 through 3.6-5. Generally speaking, the historic buildings along the project corridor are well preserved with regards to their historic integrity. Of the 165 documented properties, more than half (115) are considered historic properties (i.e., eligible for the NRHP).

Several of the historic properties within the APE along Center Street and University Avenue in Provo are within the Provo Downtown Historic District. Most of the buildings were constructed during the late 1800s and early 1900s, with a small number of structures built during the mid-20th century. The historic district contains many buildings that contribute to the overall eligibility of the district, but these buildings are not individually listed on the NRHP. A second historic district, the Provo East Central Historic District, is near, but outside, the APE.

In addition to the historic district, four of the historic properties within the APE are individually listed on the NRHP. The first property is the Church of Jesus Christ of Latter-day Saints (LDS) Provo Tabernacle located at 100 South University Avenue. This property is also a contributing property within the Provo Downtown Historic District. The second property, the William H. Ray House, is located at 415 South University Avenue. The third property is the Brigham Young Academy building at 520 North University Avenue, and the fourth is the Brigham Young Academy Gymnasium building at 519 North University Avenue. Table 3.6-2: NRHP-Listed Properties and Districts identifies the NRHP-listed resources within the APE.

Table 3.6- 2: NRHP-Listed Properties and Districts

Address	Approximate Date Built	Description	NRHP
Various	1875 to 1924	Provo Downtown Historic District (Contains 43 buildings)*	NRHP
100 S. University Ave.	1883/1890	Provo Tabernacle	NRHP
415 S. University Ave.	1898	William H. Ray House	NRHP
520 N. University Ave.	1891	Brigham Young Academy	NRHP
519 N. University Ave.	1912	Brigham Young Academy Gymnasium	NRHP
** The historic district contains many buildings that contribute to the overall eligibility of the district, but these buildings are not individually listed on the NRHP.*			

Environmental Consequences

Impacts to historic properties were assessed based on the standards of the NHPA and its implementing regulations found in 36 CFR 800. Under these regulations, three categories for classifying impacts to historic properties were established. The three classifications include *no historic properties affected*, *no adverse effect*, and *adverse effect*. The classification of impacts to any given historic resource is based upon two key factors: 1) whether the proposed undertaking would affect the resource at all; and 2) whether an impact would be neutral and minimally negative (i.e., not adverse) or substantially negative (i.e., adverse). The assessment includes consideration of both direct and indirect effects, including noise, vibration, and visual impacts. After evaluating the design of the Preferred Alternative in relation to the known historic properties in the area and after consulting with interested parties affiliated with those resources,

FTA made determinations of effect for each of these resources within the APE. FTA consulted with SHPO regarding the determinations, and SHPO concurred with FTA's findings. This correspondence can be found in the Appendix; it includes the determination of eligibility (DOE) and finding of effect (FOE) documenting the consultation with SHPO regarding the anticipated impacts of the project.

No-Action Alternative

It is anticipated that the No-Action Alternative would not impact any historic properties. Under the No-Action Alternative, historic properties along the project corridor would continue to experience existing levels of positive and negative effects. These effects would be caused by changes in the setting and feeling due to the development of the surrounding areas and by property owners' physical alterations. Property boundaries for historic properties would remain as-is unless modified by the property owners or acquired for other public projects (such as roadway improvements) undertaken by the city, county, or state.

Enhanced Bus Alternative

Under the Enhanced Bus Alternative, the existing transit system would be improved through operational efficiencies such as increasing the frequency of buses and reducing headways. New construction would be limited to additional signage, signals, and a few new bus stops. These improvements would not require the use or acquisition of property associated with any historic properties. As such, this alternative would have no effect on historic properties. The impacts from this alternative on historic properties would be identical to those of the No-Action Alternative.

Preferred Alternative

The Preferred Alternative includes a combination of exclusive and shared rights-of-way as well as multiple station locations. The Preferred Alternative would directly impact several historic properties. Direct impact means that the historic property or a portion of the property would be incorporated into the right-of-way for the Preferred Alternative.

No indirect effects on historic properties are anticipated based on the design and operational elements of the project. New structures introduced into the environment would be limited to low curbing and small station platforms in the center of roadways where dedicated transit lanes would be used and small bus stop shelters in areas of shared routes. Neither the curbing nor the station platforms in the middle of the road would alter the setting and feeling—the elements typically impacted by indirect effects—of individual historic properties. One station would be within the Provo Downtown Historic District. Given the existing width of University Avenue in this area, the minimal nature of the station platform design, and its location in the center of the roadway, the station stop is not expected to alter the setting or feeling of the historic district in any measurable way. The proposed 800 South interchange would be the most substantial new visual element of the overall project; however, no historic properties are located in the immediate viewshed of the interchange.

No indirect noise or vibration impacts on historic properties are anticipated. None of the historic properties within the APE are considered noise-sensitive historic resources. That is, quiet is not a significant factor in the NRHP eligibility of the properties. Additionally, none of the properties are considered vibration sensitive, and vibration levels from construction and operation of the Preferred Alternative are not expected to exceed damage-inducing levels in the vicinity of any historic properties.

Table 3.6-3: Historic Properties – Historic Buildings – Affected by the Preferred Alternative identifies the NRHP-eligible historic buildings that would be affected by the Preferred Alternative, and describes the nature of the impacts. Affects can be classified in one of three ways: *no effect*, *no adverse effect*, and *adverse effect*. *No adverse effect* means the property would be affected, but not adversely. Twenty-two (22) properties would experience *no adverse effect*. The remaining properties would not be affected at all. One of the properties affected by the Preferred Alternative, the Provo Tabernacle at 100 South University Avenue, is within the Provo Downtown Historic District. This property is also individually listed on the NRHP. Effects on this property would be minor, constituting acquisition of 13 square feet of the property to implement the Preferred Alternative. Such a limited impact would not adversely affect the property.

As noted above, a station would be within the historic district, along University Avenue near Center Street; however, given the minimal nature of the station facilities, the presence of the station would not appreciably alter the overall setting and feeling of the district. As such, the Preferred Alternative would have *no adverse effect* on the district.

Table 3.6-3: Historic Properties – Historic Buildings – Affected by the Preferred Alternative

ID #	Address*	Description of Impact	Type of Effect
Orem			
1	789 S. Geneva Road	Strip take of 10,800 sq ft out of 220,191 sq ft (4.9% taken)	No Adverse Effect
2	1485 W. 800 S.	Strip take of 1,170 sq ft out of 26,966 sq ft (4.3% taken)	No Adverse Effect
3	1467 W. 800 S.	Strip take of 998 sq ft out of 45,520 sq ft (2.2% taken)	No Adverse Effect
4	1451 W. 800 S.	Strip take of 1,650 sq ft out of 45,463 sq ft (3.6% taken)	No Adverse Effect
Provo			
5	1600 N. 900 E.	Strip take of 2,044 sq ft out of 251,124 sq ft (0.8% taken)	No Adverse Effect
6	945 E. 700 N.	Strip take of 170 sq ft out of 149,444 sq ft (0.11% taken)	No Adverse Effect
7	717 N. 900 E.	Strip take of 664 sq ft out of 5,580 sq ft (11.9% taken)	No Adverse Effect
8	889 E. 700 N.	Strip take of 398 sq ft out of 5,810 sq ft (6.9% taken)	No Adverse Effect
9	916 E. 700 N.	Strip take of 120 sq ft out of 6,565 sq ft (1.8% taken)	No Adverse Effect
10	885 E. 620 N.	Strip take of 183 sq ft out of 10,826 sq ft (1.7% taken)	No Adverse Effect
11	822 E. 700 N.	Strip take of 138 sq ft out of 7,411 sq ft (1.9% taken)	No Adverse Effect
12	686 N. 800 E.	Strip take of 306 sq ft out of 6,861 sq ft (4.5 % taken)	No Adverse Effect
13	695 N. 800 E.	Strip take of 238 sq ft out of 7,807 sq ft (3.0% taken)	No Adverse Effect
14	756 E. 700 N.	Strip take of 148 sq ft out of 5,711 sq ft (2.6% taken)	No Adverse Effect
15	680/690 N. 700 E.	Strip take of 49.5 sq ft out of 16,548 sq ft (0.3% taken)	No Adverse Effect

Table 3.6-3: Historic Properties – Historic Buildings – Affected by the Preferred Alternative (cont'd)

ID #	Address*	Description of Impact	Type of Effect
Provo			
16	665 E. 700 N.	Strip take of 97 sq ft out of 149,407 sq ft (0.07% taken)	No Adverse Effect
17	621-627 E. 700 N.	Strip take of 187 sq ft out of 4,399 sq ft (4.3% taken)	No Adverse Effect
18	39 E. 700 N.	Strip take of 87 sq ft out of 5,909 sq ft (1.5% taken)	No Adverse Effect
19	706 N. University Ave.	Strip take of 107 sq ft out of 4,969 sq ft (2.2% taken)	No Adverse Effect
20	689-691 N. University Ave.	Strip take of 35 sq ft out of 7,615 sq ft (0.5% taken)	No Adverse Effect
21	100 S. University Ave. (Provo Tabernacle)	Strip take of 13 sq ft out of 56,662 sq ft (0.02% taken)	No Adverse Effect
22	305 S. University Ave.	Strip take of 6 sq ft out of 12,261 sq ft (0.05% taken)	No Adverse Effect
** A "?" in front of an address denotes an estimated address where an exact address could not be confirmed.*			

Table 3.6-4: Historic Properties – Archaeological and Linear Historic Resources – Affected by the Preferred Alternative provides the same information for NRHP-eligible archaeological and linear historic resources affected by the Preferred Alternative. None of the NRHP-eligible linear historic resources would be adversely affected. The archaeological site, the former trolley track site, would only be affected if portions of the track system remain intact below existing roadway paving along University Avenue.

Table 3.6-4: Historic Properties – Archaeological and Linear Historic Resources – Affected by the Preferred Alternative

Site Number/ Name	Description of Impact	Finding of Effect
42UT00684, Provo Trolley	N/A	No Historic Properties Affected*
42UT001568, West Union Canal	Existing culverts under University Parkway and Campus/College Drive would be extended or replaced with longer culvert; approximately 870 feet of open channel near 800 South would be piped.	No Adverse Effect
42UT001029, Utah Southern/ Union Pacific Railroad	Crossed in two different locations; existing overpass over tracks west of I-15 would be widened; existing University Avenue overpass over tracks south of 600 South would be used as-is.	No Adverse Effect
42UT001031/ 42UT001125, Denver and Rio Grande Western Railroad	Crossed in two different locations; existing overpass over tracks west of I-15 would be widened; existing University Avenue overpass over tracks south of 600 South would be used as-is.	No Adverse Effect
42UT001032, Lake Bottom Canal	Approximately 2,300 feet of canal would be relocated near 800 South and I-15; one intact (unpiped) segment would be placed in a culvert under 800 South; existing culvert under University Parkway west of the Provo River would be extended or replaced with longer culvert.	No Adverse Effect
1. Assumes no remains (i.e., tracks) of the trolley system are discovered during construction.		

Mitigation

There would be no adverse effects to historic properties; therefore, mitigation measures are not warranted. Refer to Section 3.18: Construction Impacts for mitigation measures associated with historic properties potentially discovered during construction, including the potential to discover former Provo Trolley tracks along University Avenue.

Permits and Approvals

No permits for historic properties are needed. Necessary approvals involving historic properties include concurrence from Utah SHPO or the Advisory Council on Historic Preservation if concurrence with SHPO cannot be obtained. SHPO has concurred with FTA's and UTA's DOE and FOE. A copy of the concurrence letter is included in the Appendix. Additional approvals for historic properties are required under Section 4(f) of the Department of Transportation Act and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). See Chapter 7: Section 4(f) Evaluation for more information on Section 4(f).

3.7 PALEONTOLOGICAL RESOURCES

Affected Environment

Paleontological resources include the remains, traces, or imprints of ancient organisms that are preserved in or on the earth's crust and provide information about the history of life on earth. They are also referred to as fossils.

The Utah Geological Survey (UGS) was consulted regarding paleontological resources within the project area. For more information, see UGS correspondence found in the Appendix.

No paleontological resources were identified within the project area, and UGS indicated that the potential for encountering such resources within the area is low because of the Quaternary and Recent alluvial deposits present on the valley floor. However, UGS indicated that occasional exposures of Lake Bonneville lakeshore constructional features could be present along the project corridor and could be disturbed during the construction of the Preferred Alternative. Lake Bonneville lakeshore constructional features have yielded significant vertebrate fossils elsewhere along the Wasatch Front, including a significant giant ground sloth fossil that was located south of University Parkway near, but outside, the APE for the Preferred Alternative.

Environmental Consequences and Construction Impacts

No known paleontological resources would be affected by construction. However, fossil materials could be encountered given the potential (albeit low) of disturbing Lake Bonneville lakeshore features during construction. The probability of encountering such materials is extremely minimal, and discovery protocols would be implemented immediately to avoid or minimize impacts in the unlikely event that paleontological resources were encountered during construction.

Mitigation

Given the unlikely chance of impacts to Paleontological Resources, mitigation measures are not warranted. Refer to Section 3.18: Construction Impacts for mitigation measures associated with paleontological resources discovered during construction.

3.8 VISUAL QUALITY

Regulatory Setting, Studies, and Coordination

No specific federal regulations govern visual impacts to scenic or aesthetic resources along transportation corridors or rights-of-way. However, the FHWA guidance for National Environmental Policy Act (NEPA) implementation states that:

> The draft [EA] should state whether the project alternatives have a potential for visual quality impacts. [It also] should identify the impacts to the existing visual resource, the relationship of the impacts to potential viewers of and from the project, as well as measures to avoid, minimize, or reduce the adverse impacts (FHWA 1987).

Additionally, FTA guidance Circular 9400.1A: Design and Art in Transit Projects provides guidance for aesthetic treatments for transit projects and encourages the use of design and art in transit projects (FTA 1995).

Methodology

Visual contrast analysis is a method used by federal agencies to assess the scenic quality and potential project-related impacts to visual resources. Visual contrast analysis can be summarized as, "The degree to which a project or activity affects scenic quality or visual resources. This degree depends on the visual contrasts created or imposed by a project on the existing landscape" (Bureau of Land Management 1986). The criteria for measuring visual contrast changes to landscape features are the forms, colors, textures, and lines that comprise the existing and potentially modified landscape.

In general, project-related landscape and roadway changes are considered well integrated with the existing landscape or roadway features when they are harmonious with their surroundings. These changes produce low levels of contrast and have a low impact on existing scenic quality. Conversely, landscape or roadway modifications that contrast with the existing landscape or roadway features are considered to have a negative impact to that landscape or roadway.

Affected Environment

Viewpoint 1: University Parkway at LaVell Edwards Stadium

The stadium viewpoint was selected because this section of the parkway is tree lined and shady with scenic views of the Wasatch Range, as shown in Figure 3.8-1: Viewpoint 1, below. The existing landscape characteristics include a wide parkway-like roadway that features sidewalks and bike lanes. The roadway is lined with mature trees on both sides and in the median strip.

Viewpoint 2: University Parkway at Provo River

This viewpoint is close to the Provo River bridge and river crossing along University Parkway, as shown in Figure 3.8-2: Viewpoint 2, below. The existing landscape characteristics of this viewpoint include the wide parkway corridor, mature trees, and landscaping along the sides of the roadway and in the median strip. The Provo River bridge and trail system runs parallel to the parkway. Commercial and residential properties lie adjacent to the roadway.

Figure 3.8-1: Viewpoint 1
University Parkway at LaVell Edwards Stadium

Figure 3.8-2: Viewpoint 2
University Parkway at Provo River

Viewpoint 3: 680 South/800 South

This viewpoint is between the existing UVU parking lot and campus buildings and neighboring residential homes. Currently there is no roadway in this location; it is generally open land with typical backyard, residential landscape. The viewshed from the back of the residential homes looks onto UVU parking lots and campus structures, as shown in Figure 3.8-3: Viewpoint 3, below.

Viewpoint 4: 800 South, West of I-15

This viewpoint is along 800 South, west of the proposed 800 South and I-15 interchange, as shown in Figure 3.8-4: Viewpoint 4, below. This existing viewpoint is characterized by an urban roadway lined with old and new residential homes. This section of roadway is in a mixed-use area with residential, commercial, and industrial properties.

Figure 3.8-3: Viewpoint 3
680 South/800 South

Figure 3.8-4: Viewpoint 4
800 South, West of I-15

Viewpoint 5: University Avenue and Center Street

This viewpoint is looking south along University Avenue near the intersection of Center Street in downtown Provo (see Figure 3.8-5: Viewpoint 5, below). This existing viewpoint is characterized by an urban roadway lined with residential and commercial properties, on-street parking, and landscaping. The roadway includes a continuous sidewalk on both sides that is buffered from the existing pavement by mature and young trees and an occasional landscaped planter.

Figure 3.8-5: Viewpoint 5
University Avenue and Center Street

Environmental Consequences

Visual impacts were evaluated according to potential contrasts imposed on the existing landscape from each proposed alternative. These contrasts can result from, but are not limited to, a loss of existing landscaping and visual intrusions (e.g., vehicles, equipment, or structures).

No-Action Alternative

There would be no impacts to visual quality with the No-Action Alternative.

Enhanced Bus Alternative

There would be no impacts to visual quality with the Enhanced Bus Alternative.

Preferred Alternative

Viewpoint 1: University Parkway at LaVell Edwards Stadium

Under the Preferred Alternative, the University Parkway BRT route would utilize the existing lanes as shared BRT lanes without new lane construction or modification. At this viewpoint, a BRT center-running station would be constructed within the existing median strip. Although several mature trees within the median strip would be removed, the design of this station would consider the preservation and integration of the existing trees where possible. Overall, the improvements associated with the Preferred Alternative would be consistent with the existing urban landscape. Therefore, the visual impact at this viewpoint is minor.

Viewpoint 2: University Parkway at Provo River

The Preferred Alternative would designate the segment of University Parkway near the Provo River bridge as an exclusive two-lane BRT route and would construct two additional non-BRT traffic lanes.

The proposed widening along the stretch of parkway is consistent with the existing urban setting. Although the landscaped median would be removed and utilized for roadway widening, the landscaping along the road near the Provo River bridge and trail would be maintained.

Viewpoint 3: 680 South/800 South

The existing open space between the residential backyard and the campus parking lot would be converted into a new roadway with two general purpose lanes, two BRT lanes, and a BRT station as part of the new interchange overpass at 800 South and I-15 under the Preferred Alternative. Due to the existing urban environment in this location, there would be minimal visual impact for those using the parking lot and campus facilities at this viewpoint. For residents whose existing backyards abut what is now open space, the addition of a new roadway would result in a moderate visual impact. This visual impact would be limited to the area just in the foreground of this viewpoint, which consists of open space. The existing urban campus setting, which is the ultimate backdrop to this viewpoint, would remain unchanged.

Various alignments were discussed during stakeholder committee meetings involving residents, city representatives, and the project team. During these discussions, residents with homes along 680 South expressed concern for the impacts associated with a new roadway in this location. At a neighborhood meeting held August 6, 2009, residents along 680 South voiced concerns about the lights from vehicles traveling along the new roadway, loss of privacy, and a change in feel to their neighborhood. Orem City representatives discussed several design treatments to offset these potential impacts, including a landscaped berm or retaining wall. (See Section 3.2: Community Character and Cohesion for more details.)

Viewpoint 4: 800 South, West of I-15

The Preferred Alternative would include a new interchange at 800 South. A structure would be constructed over I-15 and the existing railroad tracks. It would gradually become at-grade, generally heading west following the existing 800 South alignment toward Geneva Road. The existing viewpoint consists of a residential roadway lined with residential homes and mixed commercial and industrial uses nearby. The homes located northeast along 800 South look onto the roadway and residential homes. Under the Preferred Alternative, these homes would look onto the roadway and the walls supporting the 800 South roadway structure. Although construction of the 800 South structure and roadway would change the existing viewshed for those homes located northeast along 800 South, this change is consistent with the existing urban setting. Thus, the 800 South improvements west of I-15 would result in moderate visual impact.

Viewpoint 5: University Avenue and Center Street

Under the Preferred Alternative, University Avenue would be widened to accommodate a dedicated two-lane BRT route and four BRT stations. Minor changes to the existing landscape would result from implementation of the Preferred Alternative. The removal of existing mature and young trees would be required. An estimation of trees that could be saved and trees that would need to be removed was performed along University Avenue between 800 North and 500 South (Lochner 2010c). Based on the conceptual design, approximately 108 of the 190 trees in this segment could be potentially impacted (Lochner 2010a). Most could be replaced with new trees as part of this project either in the parkstrip or in the median. Of the 108 potentially impacted trees, approximately 12 are mature trees. Coordination with Provo City Forestry Division will continue as the project moves into final design and construction. Tree preservation, removal,

and/or replacement associated with the project will occur in accordance to Provo City Ordinance Chapter 9.20, Provo Arboricultural Standards and Specifications.

Mitigation

Best management practices that would reduce visual impacts within the study area could include the following:

- Maintaining and preserving street-side vegetation wherever possible to mitigate the impacts of additional concrete, steel, and lane markings on the urban landscape.
- Ensuring that the BRT station design and construction in each site-specific locality is compatible with the surrounding landscape and development.
- To offset the visual and aesthetic impacts associated with Viewpoint 4 and the proposed roadway along 680 South, design treatments such as a landscaped berm or retaining wall could be incorporated into the final design (see Section 3.2: Community Character and Cohesion for more details).
- Tree preservation, removal, and/or replacement within Provo would be conducted in accordance to Provo City Ordinance Chapter 9.20, Provo Arboricultural Standards and Specifications.
- To mitigate noise impacts associated with the proposed roadway along 680 South in Orem a noise barrier is proposed south of 680 South in Orem. Additional analysis and balloting of the neighborhood would be necessary prior to construction of a noise barrier in this location (per UDOT's noise policy) (see Section 3.11: Noise and Vibration).

3.9 PARKS AND RECREATION RESOURCES

Regulatory Setting, Studies, and Coordination

Section 4(f) of USDOT Act of 1966 (49 USC 303) regulates the use of publicly owned parks and recreation resources. Section 4(f) resources refer to public lands as defined in Section 4(f). The intent of the legislation is to protect public lands, parks, recreation areas, wildlife refuges, and historic sites. The FHWA Section 4(f) Policy Paper (1989) provides guidance for complying with Section 4(f). The Section 4(f) evaluation for the project is provided in Chapter 7 of this document. All parks and recreation resources in the study area are discussed below.

Affected Environment

The study area for parks and recreation resources is one-quarter mile from either side of the BRT alignment. For the purpose of this analysis, recreation resources include parklands, recreation facilities, open space, and trails. Bike lanes/routes and pedestrian facilities for the purpose of transportation are discussed in Chapter 4: Transportation Systems.

Existing Recreation Resources

The existing recreation resources identified in the study area are listed in Table 3.9-1: Existing Parks and Recreation Resources, and are shown on Figure 3.9-1: Parks and Recreation Resources. Twenty (20) existing recreation resources were identified. Twelve parks, seven trails, and a golf course are located in the study area and described below. Potential impacts to these protected resources are described below in the Environmental Consequences section and in Chapter 7: Section 4(f) Evaluation.

Table 3.9- 1: Existing Parks and Recreation Resources

Facility	Description
Intramural Fields (UVU) Orem	This field is located on the west side of 400 West in Orem directly north of Willy Way. This field is owned by the university and is used for UVU student intramural games.
Maeser Park 600 S. 500 E. Provo	Maeser Park is situated on approximately 2.5 acres. Amenities include a pavilion, picnic tables, basketball courts, restrooms, and a playground. Maeser Park is owned and maintained by Provo City.
Brent Brown Ballpark 970 W. University Parkway Orem	Brent Brown Ballpark is a baseball field located on the campus of UVU in Orem with a capacity of 5,000. It is owned by UVU and is primarily used for baseball. It is the home field of UVU's baseball team and the minor-league Orem Owlz. The ballpark can be scheduled for public use.
Carterville Park 2400 N. Carterville Road Provo	Carterville Park is situated on 5 acres, and its amenities include two pavilions with picnic tables, playground equipment, restrooms, sand volleyball, and a walking path. The park is owned and maintained by Provo City.
Hillcrest Park 1400 S. 650 E. Orem	Hillcrest Park is situated on 2 acres and is owned and maintained by Orem City. Amenities include restrooms, a playground area with equipment, a tennis court, and a softball field.
North Park 500 N. 500 W. Provo	North Park is approximately 15 acres. It features a softball field, restrooms, barbecue grills, playground equipment, and the Veterans Memorial Swimming Pool. Pioneer Village and Museum is also on the North Park property. North Park is owned and maintained by Provo City.
Timp Ballpark 500 N. 400 W. Provo	Timp Ballpark features a baseball field with restrooms. The field can only be scheduled for organized league play. Timp Ballpark is owned and maintained by Provo City.
Westmore Park 1050 S. Main Street Orem	Westmore Park's amenities include restrooms, two playground areas, and a jogging/walking path. It is owned and maintained by Orem City.
Branbury Greenway Provo	This greenway is located southeast of Branbury Apartments, which are located at 449 West 1720 North in Provo. The greenway property is owned by Provo City and is maintained by Branbury Apartments.
2230 North Trailhead Provo	This trailhead is located at 2230 North and approximately 270 West in Provo. This trailhead is maintained by Provo City and open to the public.
Kiwanis Park 820 N. 1100 E. Provo	Kiwanis Park includes picnic facilities, a playground, tennis courts, and volleyball facilities. This park is owned and maintained by Provo City.
Powerline Park 500 W. 1400 S. Provo	Powerline Park is directly west of I-15 and includes picnic facilities. This park is owned by Rocky Mountain Power.
East Bay Golf Course 1860 S. East Bay Blvd. Provo	This facility offers an 18-hole golf course and an executive nine-hole course. The course is owned by Provo City but must be scheduled for public use.
Provo River Trail Provo	The Provo River Trail is an 8- to 10-foot-wide paved, multi-use facility that serves cyclists, pedestrians, and other users. The 15-mile trail runs north-south through Provo from Utah Lake State Park to Vivian Park in Provo Canyon. This trail is owned by Provo City.

Table 3.9-1: Existing Parks and Recreation Resources (cont'd)

Facility	Description
College Connector Trail Orem-Provo	The College Connector Trail is a paved urban trail serving the University Parkway corridor. The trail serves non-motorized transportation between UVU and BYU. The College Connector Trail is a bike lane along 1200 South in Orem. Maintenance of the trail is performed by Orem City and Provo City.
Geneva Road Trail Orem	This trail runs from 1200 South along Geneva Road, crosses at University Parkway, and continues heading east.
BYU Campus Trail (South) Provo	This trail runs south from the center of the BYU campus to 800 North in Provo.
BYU Campus Trail (North) Provo	This trail runs from the northeast corner of the BYU campus to the center of the campus in Provo.
BYU Campus Trail (East) Provo	This trail runs east from the center of the BYU campus onto Heritage Drive.
West Union Canal Trail Orem	This separated trail follows the West Union Canal from 1430 South to 1600 South in Orem.

Planned Recreation Resources

Based on Mountainland Association of Governments' (MAG's) bicycle plan and coordination with the Cities of Provo and Orem, one multi-use path and three proposed trails that are separated from roads were identified in the study area. They are listed in Table 3.9-2: Planned Recreation Resources, and shown on Figure 3.9-1: Parks and Recreation Resources.

Table 3.9- 2: Planned Recreation Resources

Facility	Description
Carterville Multi-Use Path Orem	This path will be a 10- to 12-foot-wide paved trail, following Carterville Road north from University Parkway. The portion of this path that is south of University Parkway and continues to approximately 2100 West is classified as a proposed bike lane.
Geneva Road Trail Provo/Orem	This is a planned 10-foot-wide asphalt trail along Geneva Road between Center Street in Provo and State Street in Pleasant Grove.
Provo River Trail Extension	This is a planned extension of the Provo River Trail from 3700 North to 2230 North in Provo along the Provo River. The facility will be a 10-foot-wide asphalt trail.
800 East Trail Orem	This will be an approximately 3.6-mile, 10-foot-wide concrete trail that will connect University Parkway to 1600 North in Orem along 800 East.

Environmental Consequences

No-Action Alternative

The No-Action Alternative would not use any parklands, recreation facilities, or trails within the study area.

Enhanced Bus Alternative

The Enhanced Bus Alternative would not use any parklands, recreation facilities, or trails within the study area.

Preferred Alternative

Table 3.9-3: Impacts to Existing and Proposed Recreation Resources lists the potential impacts to existing and proposed recreation resources resulting from the Preferred Alternative.

Overall, two existing parks (Carterville and Hillcrest), one planned park (UVU Intramural Fields), and two existing trails that are separated from the road (Provo River Trail and College Connector Trail) would be impacted as a result of the Preferred Alternative. The current design of the Preferred Alternative would accommodate these facilities; therefore, no permanent impact is anticipated.

Table 3.9- 3: Impacts to Existing and Proposed Recreation Resources

Facility	Type	Potential Impact
Carterville Park	Existing Park	Carterville Park is likely to experience temporary construction impacts associated with modifications to existing abutments of the Carterville Road bridge.
Hillcrest Park	Existing Park	Widening of University Parkway north of Hillcrest Park would require a strip take of approximately .015 acres. Sidewalk would be constructed on the north side of the park and the existing wall (adjacent to University Parkway) would be relocated approximately 11 feet to the south.
Provo River Trail	Existing Separated Trail	Construction of abutments for the Provo River bridge would require temporary occupancy of the Provo River Trail. This could include the need for a detour.
College Connector Trail	Existing Separated Trail	Widening of University Parkway would require relocation of sections of this trail (between 3 feet and 25 feet). Between State Street and the first University Mall access, the trail would be narrowed from 12 feet (existing) to 10 feet. In this location the trail would be directly adjacent to the curb and would not include a shoulder. Between the first University Mall access and 800 East, the trail would be maintained at 12 feet (existing); however, the trail would be directly adjacent to the curb and would not include a shoulder.
UVU Intramural Fields	Planned Park	A strip take along the south side of the Intramural Fields would be required due to widening of Willy Way.

Mitigation

UTA would coordinate with the parks and recreation departments of Orem, Provo, and UVU regarding impacts to existing and proposed recreation resources if the Preferred Alternative is implemented. Mitigation measures could include striping, signage, raised crosswalks, flags, and signalization.

The following mitigation measures would ensure that any affected separated trail, bike lane, or route would remain accessible and safe to users during construction and after operation of the BRT line begins.

- If construction activities would require the temporary closure of any portion of the affected trail or route, UTA would coordinate with the cities to maintain service and safety during construction.
- A trail user outreach and communication plan would be developed to notify users of trail closures and detours resulting from project construction. Signage informing users of detour schedules and routes would be posted along the trail. Efforts would be made to coordinate with the universities to increase outreach opportunities.
- Construction activities that would interrupt trail use would be scheduled during periods with low trail usage when possible.

3.10 AIR QUALITY

Regulatory Setting, Studies, and Coordination

The air quality analysis was prepared in accordance with the Clean Air Act, amended in 1990, which requires the EPA to set National Ambient Air Quality Standards (NAAQS) (40 CFR 50) for pollutants considered harmful to public health and the environment. Additionally, this section is consistent with UDOT's *Air Quality Hot Spot Manual* (UDOT 2003) and the EPA's *Guidelines for Modeling Carbon Monoxide from Roadway Intersections* (EPA 1992). Similarly, the PM_{10} air quality analysis is intended to comply with the definitive guidelines established by the EPA and FHWA included in *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Non-attainment and Maintenance Areas*.

Affected Environment

Because air quality is a resource that is not confined to the limits of the project corridor, the study area for assessing the air quality for the project is Utah County, which is a non-attainment area.

Climatology and Meteorology

At an elevation of 4,551 feet, the Provo-Orem climate is moderate with average daytime temperatures ranging from 33.0°F in the winter to 74.1°F in the summer, with just under 20 inches of rainfall per year on average (19.84 inches). The average humidity during the five winter months is less than 50 percent, while 70 percent humidity prevails during the remaining seven months of the year (Utah County, no date; Western Regional Climate Center, no date).

Pollutants of Concern

This study focuses on the six criteria pollutants and mobile source air toxics that are commonly monitored and regulated for their effects on human health. The six criteria pollutants include carbon monoxide (CO), nitrogen dioxide, ozone (O_3), sulfur dioxide (SO_2), lead, and particulate

matter—including PM_{10}, particulate matter with a diameter of 10 microns or less, and $PM_{2.5}$, particulate matter with a diameter of 2.5 microns or less.

Current Attainment Status

The EPA designates geographic areas of the country that have measured pollutant concentrations exceeding the levels prescribed by the air quality standards as "non-attainment." Areas that have attained the standards after a period of non-attainment and that have plans in place to reduce emissions are classified as maintenance areas. The BRT study area, which is located entirely in Utah County, is in non-attainment for PM_{10}, and $PM_{2.5}$. Based on the 2006 re-designation by the EPA, Utah County is a maintenance area for CO due to violations in the recent past. No attainment designation has been determined for the new one-hour nitrogen dioxide standard.

Environmental Consequences

Carbon Monoxide

Because CO emissions are associated with motor vehicles and transportation projects, and because the project is located in a CO maintenance area, CO is a pollutant of concern for the project. Maximum one- and eight-hour CO concentrations were predicted at the four most congested intersections and the results are summarized in Tables 3.10-1 and 3.10-2. CO impacts are assumed if the concentrations are above the federal and state one-hour CO standard of 35 parts per million (ppm) and the eight –hour CO standard of 9 ppm.

Table 3.10- 1: Predicted Maximum 1-Hour CO Concentrations at Selected Intersections (ppm)

Traffic Intersection		Municipality	2008	2030	2030
No.	Description		Existing	No-Action	Preferred Alternative
1	University Parkway and Main Street	Orem	15.4	7.5	7.5
2	University Parkway and State Street	Orem	17.0	7.8	7.8
3	University Parkway and 2230 North	Provo	12.9	7.5	7.5
4	University Parkway and University Ave.	Provo	11.7	8.3	9.7

Table 3.10- 2: Predicted Maximum 8-Hour CO Concentrations at Selected Intersections (ppm)

Traffic Intersection		Municipality	2008	2030	2030
No.	Description		Existing	No-Action	Preferred Alternative
1	University Parkway and Main Street	Orem	10.3	4.7	4.7
2	University Parkway and State Street	Orem	11.4	4.9	4.9
3	University Parkway and 2230 North	Provo	8.5	4.7	4.7
4	University Parkway and University Ave.	Provo	7.7	5.3	6.3

Similarly, since the project is located in a PM_{10} and $PM_{2.5}$ non-attainment area (Utah County), a quantitative impact assessment must be conducted according to federal regulation 40 CFR 93.123. Since the EPA has not finalized the methodologies for conducting a quantitative PM_{10} modeling analysis, a qualitative analysis was prepared according to the guidelines established in *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Non-attainment and Maintenance Areas*.

No-Action Alternative

Under the 2030 No-Action Alternative, the one-hour and eight-hour CO concentrations would be below the state and federal CO standards, as shown in Tables 3.10-1 and 3.10-2.

Enhanced Bus Alternative

The traffic volumes and level of service (LOS) at congested intersections under the Enhanced Bus Alternative are expected to be the same as under the No-Action Alternative. As a result, the predicted CO concentrations under the Enhanced Bus Alternative are predicted to be the same as reported for the No-Action Alternative.

Preferred Alternative

Under the Preferred Alternative, traffic volumes, and therefore CO concentrations, increased slightly at Site 4 over the No-Action Alternative. Although the highest reported CO concentration for the Preferred Alternative was recorded at Site 4, the CO one-hour and eight-hour concentrations were well below the state and federal standards.

Particulate Matter (PM_{10})

It is believed that traffic volumes and corresponding LOS have less impact on PM_{10} concentrations than the larger regional trends in the emission rates and industrial controls. Therefore, it can be expected that PM_{10} in Utah County will remain a regional issue related to prolonged temperature inversions and a gradual build-up of PM_{10}-related pollutants and will not be created by local PM_{10} concentrations at any intersection within the project area.

The results of the vehicle delay analysis for the four most congested intersections are summarized in Table 3.10-3: Total Peak-Hour Vehicle Delay at Selected Intersections. Using average vehicle delay and the change in total volumes as a surrogate for the potential impacts, PM_{10} emissions are predicted to remain the same at Sites 1 and 2, decrease 2.5 percent at Site 3, and increase slightly at Site 4 between the No-Action Alternative and the Preferred Alternative. Collectively, PM_{10} emissions at the four selected intersections are expected to decrease one-half of a percent due to delay and volume reductions as a result of the proposed project. Since the traffic conditions under the Enhanced Bus Alternative are expected to be the same as under the No-Action Alternative, the predicted vehicle delays are also predicted to be the same (i.e., No-Action delay is the same as Enhanced Bus delay).

Table 3.10- 3: Total Peak-Hour Vehicle Delay at Selected Intersections (veh-sec)

Traffic Intersection		2030		
No.	Description	Preferred Alternative	No-Action	Percentage Change
1	University Parkway and Main Street	5,704.2	5,704.2	0.0%
2	University Parkway and State Street	7,198.6	7,198.6	0.0%
3	University Parkway and 2230 North	4,634.7	4,518.6	-2.5%
4	University Parkway and University Ave.	4,019.0	4,021.3	+0.1%
Totals		**21,556.6**	**21,442.8**	**-0.5%**

Source: AECOM, January 2009

Further reductions of PM_{10} emissions along the project corridor are expected due to the required conversion to ultra-low sulfur diesel fuel. As required by the federal government, all diesel fuel sold in the U.S. by December 1, 2010, will only contain 15 ppm of sulfur. This reduction is expected to reduce PM_{10} emissions in the following ways:

- Primary PM_{10} and SO_x emissions will be reduced due to newer engine emissions technologies that take advantage of the new ultra-low sulfur diesel fuel
- Atmospheric conversion of SO_2 to a particulate gas (ammonium sulfate) is expected to reduce overall PM_{10} concentrations.

Other factors, such as the mix or percentage of heavy diesel-powered trucks, were also evaluated to estimate the potential impact from PM_{10} emissions. However, since the percentage and total volume of heavy trucks is expected to be the same between the future No-Action Alternative and the Preferred Alternative, the proposed project is unlikely to contribute to any potential PM_{10} impacts.

Particulate Matter ($PM_{2.5}$)

The Preferred Alternative could be considered an air quality concern for $PM_{2.5}$ under 40 CFR 93 due to the increased bus headways over the No-Action Alternative; however, the proposed emission control measures are expected to offset the increase in volumes. The Preferred Alternative buses are expected to include "green technologies" that reduce diesel emissions through diesel particulate filters (DPF), diesel oxidation catalysts (DOC), selective catalytic reduction (SCR), and other emission technologies approved by the EPA. These technologies reduce $PM_{2.5}$ emissions from buses by more than 90 percent. Additionally, traffic volumes at intersections are not expected to increase with the Preferred Alternative. As a result, future $PM_{2.5}$ emissions from the Preferred Alternative are not expected to be greater than the future No-Action condition.

Other Pollutants

O_3 is a regional pollutant and cannot be analyzed at the project level. While no further analysis of project-level O_3 is necessary, it is important to mention that the Wasatch Front region does have O_3-related issues, especially Salt Lake and Davis counties, which are non-attainment areas for O_3. O_3 is formed at a regional level, and is therefore a complex and regional problem unlikely to be negatively affected by the proposed project. In areas where BRT reduces traffic congestion and delay, it may actually improve the region's O_3 problems, though project-level improvements are likely to impact O_3 minimally.

Similarly, no federal laws or regulations have been enacted at this time, and the EPA has not established criteria or thresholds for greenhouse gas emissions. Because the sources and effects of greenhouse gases are global in nature, to attempt project-level analysis of negligible increases or decreases of carbon dioxide (the primary greenhouse gas transportation-related emission) is technically unfeasible. Because of high levels of uncertainty, the results of such an analysis would not be likely to inform decision-making at the project level. The scope of such an analysis, with any results being purely speculative, goes far beyond the disclosure impacts needed to make sound transportation decisions.

Conformity

The Transportation Equity Act and the Clean Air Act require that all regionally significant highway and transit projects in air quality non-attainment and maintenance areas be derived from a "conforming" Long Range Transportation Plan and Transportation Improvement Program. A conforming Long Range Transportation Plan is one that has been analyzed for emissions of controlled air pollutants and found to satisfy the emission limits established in the State Implementation Plan, which was approved by the EPA on December 23, 2002. The proposed project is included in the Regional Transportation Plan 2007 – 2030 (MAG 2007) and was adopted by the MAG Metropolitan Planning Organization on June 7, 2007. Additionally, a BRT project is also included in the Transportation Improvement Program, which was approved on August 4, 2005, (updated on May 3, 2007) by the regional Metropolitan Planning Organization, MAG. Since the conformity analysis completed by MAG was approved by FHWA and FTA, pursuant to 23 CFR 770, this project conforms to the Statewide Implementation Plan and therefore complies with the Clean Air Act requirements.

Additionally, based on the results of the microscale analysis, none of the modeled CO concentrations are predicted to exceed the NAAQS one- or eight-hour standards during any of the analysis years. Similarly, PM_{10} concentrations are also not predicted to exceed the NAAQS 24-hour standard of 150 $\mu g/m^3$ during any of the analysis years as a result of the project. Therefore, the project would not create or contribute to any new or existing CO or PM_{10} violations of the NAAQS and would conform to the purpose of the regional Statewide Implementation Plan.

Mitigation

The project would not create or contribute to any new or existing CO or PM_{10} violations of the NAAQS and would conform to the purpose of the regional Statewide Implementation Plan. Therefore, no mitigation measures are required for this project.

3.11 NOISE AND VIBRATION

Regulatory Setting, Studies, and Coordination

The noise and vibration assessment was prepared in accordance with NEPA, the guidelines set forth by FTA's Transit Noise and Vibration Impact Assessment (FTA 2006), UTA's Noise Assessment and Mitigation Procedures (2010), and UDOT's Noise Abatement Policy (UDOT 2008a). UDOT's Noise Abatement Policy is based on FHWA's Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR 772).

Affected Environment

The noise and vibration study area included a 500-foot screening distance (as measured from the proposed BRT centerline) that was used when locating sensitive receptors.

Human Perception of Noise and Vibration

Noise

Noise is "unwanted sound" and, by this definition, the perception of noise is a subjective process. Several factors affect the actual level and quality of sound (or noise) as perceived by the human ear and can generally be described in terms of loudness, pitch (or frequency), and time variation.

The A-weighted decibel (dBA) is commonly used to describe the overall noise level because it attempts to take into account the human ear's response to audible frequencies. Because the decibel is based on a logarithmic scale, a 10-decibel increase in noise level is generally perceived as a doubling of loudness, while a 3-decibel increase in noise is barely perceptible to the human ear.

Vibration

Ground-borne vibration associated with vehicle movements is usually the result of uneven interactions between the wheel and the road or rail surfaces. Vibration induced by transit vehicle pass-bys can generally be discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by monitoring instruments and other objects are more accurately described with velocity. Therefore, the vibration velocity level is used to assess vibration impacts from transit projects.

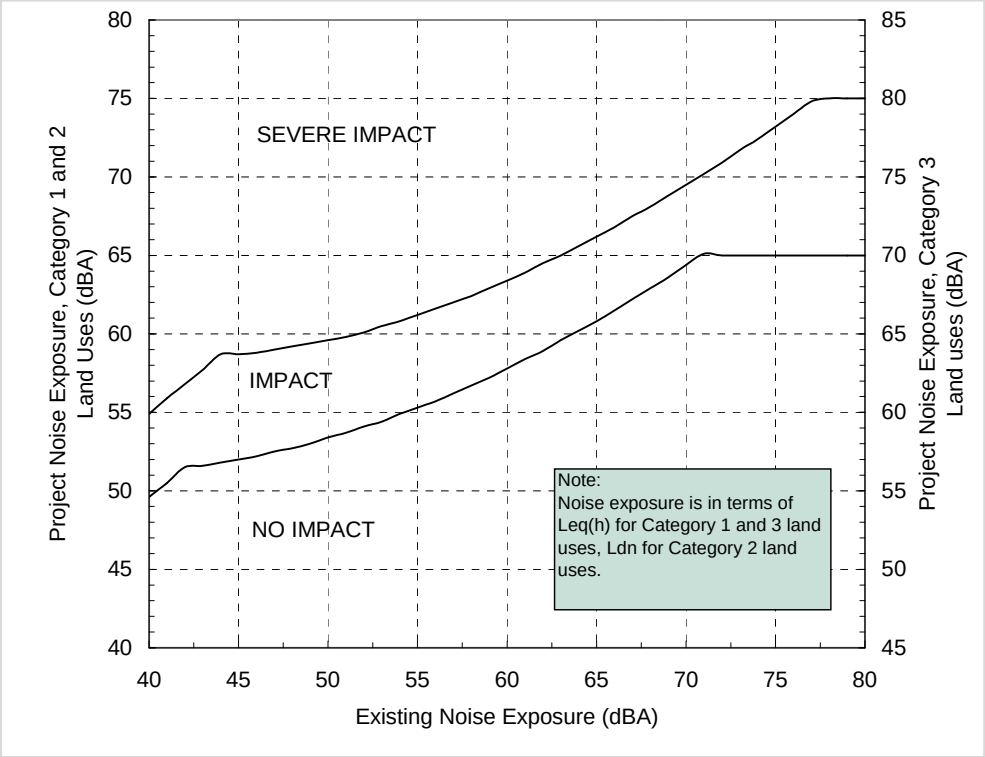
Transit Noise and Vibration Evaluation Criteria

Transit noise and vibration impacts are assessed based on land use categories and sensitivity to noise and vibration from transit sources under the FTA guidelines. Although roadway traffic noise due to future motor vehicles was determined according to the UDOT Noise Abatement Policy and FHWA policy, cumulative project impacts were evaluated using the FTA criteria.

Transit Noise Criteria

As shown in Figure 3.11-1: FTA Transit Noise Impact Criteria, below, the FTA noise impact criteria are defined by two curves that allow increasing project noise levels as existing noise increases up to a point, beyond which, impact is determined based on project noise alone.

Figure 3.11- 1: FTA Transit Noise Impact Criteria



Source: FTA, May 2006

The FTA noise criteria are delineated into two categories: moderate impact and severe impact. The moderate impact threshold defines areas where the change in noise is noticeable but may not be sufficient to cause a strong, adverse community reaction. The severe impact threshold defines the noise limits above which a significant percentage of the population would be highly annoyed by new noise. The level of impact at any specific site can be established by comparing the predicted project noise level at the site to the existing noise level at the site. The FTA noise impact criteria for all three land use categories are shown graphically in Figure 3.11-1. The FTA land use categories and their respective noise metrics are described below in Table 3.11-1: FTA Land Use Categories and Noise Metrics.

Table 3.11- 1: FTA Land Use Categories and Noise Metrics

Land Use Category	Noise Metric*	Description
1	Leq(h)	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and historic landmarks
2	Ldn	Buildings used for sleeping, such as residences, hospitals, hotels, and other areas where nighttime sensitivity to noise is of utmost importance
3	Leq(h)	Institutional land uses with primarily daytime and evening uses, including schools, libraries, churches, museums, cemeteries, historic sites, parks, and certain recreational facilities used for study or mediation
**Traffic noise levels vary overtime; therefore, they are expressed as equivalent levels. Leq(h) represents a level of constant noise with the same acoustical energy as the fluctuating noise levels during a one-hour period. Ldn represents the 24-hour day-night noise level.*		
Source: FTA's Transit Noise and Vibration Impact Assessment, May 2006		

Highway Noise Criteria

Potential negative impact from traffic noise is assessed on the basis of predicted noise levels approaching or exceeding the FHWA Noise Abatement Criteria. As shown in Table 3.11-2: UDOT Noise Abatement Criteria, the criteria for residences and similar sensitive exterior receivers is a one-hour equivalent sound level (Leq(h)) of 66 dBA during the peak traffic hour. These noise levels are used by UDOT to evaluate the need for noise mitigation measures due to highway improvements.

Table 3.11- 2: UDOT Noise Abatement Criteria

Activity Category	Leq(h)*	Description of Activity Category
A	56 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	66 (exterior)	Picnic areas, recreational areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals
C	71 (exterior)	Developed lands, properties, or activities not included in Categories A or B above
D	–	Undeveloped lands
E	51 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums
** The hourly A-weighted sound level (or Leq(h) in decibels, reflecting a 1 dBA "Approach" value below 23CFR772 values.*		
Source: Noise Abatement Policy, UDOT 08A2-1, January 15, 2008. This policy is based on the FHWA's "23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise".		

Existing Conditions

Baseline Noise Monitoring Methodology

The project team used the FTA screening assessment guidelines (FTA 2006) to identify noise-sensitive receptors and land uses in the noise evaluation area. The project team identified 16 representative monitoring locations where existing noise levels were measured. During the peak travel periods, concurrent traffic volumes and speeds were also documented during the noise monitoring period. All noise levels were reported in dBAs, which best approximate the sensitivity of human hearing.

Existing Noise Conditions

As shown in Table 3.11-3: Results of the Baseline Noise Monitoring Program, measured day-night (Ldn) noise levels range from 51 dBA at Receptor R13 (residences along 925 South) to 66 dBA at Receptors R1 (Fairfield Inn along University Avenue) and R6 (residences along Fir Avenue). The lower levels are representative of ambient conditions influenced by natural sounds only with an occasional car pass by in the neighborhood. The higher levels reflect vehicular traffic along I-15 or regional arterials such as University Avenue. Most of the residential communities identified along the proposed BRT corridor represent active urban or suburban land uses, particularly along University Parkway and BYU.

Table 3.11- 3: Results of the Baseline Noise Monitoring Program (in dBA)[1]

ID	Receptor Description/Address	Land Use	Ldn	Leq
R1	Fairfield Inn, 1515 S. University Ave.	Hotel	66	69
R2	Crestline Mobile Estates, 888 S. Freedom Blvd.	Res.	64	63
R3	371 N. University Ave.	Res.	65	64
R4	315 N. University Ave.	Res.	62	66
R5	USDA FS Shrub Sciences Lab, 735 N. 500 E.	Edu.	65	62
R6	921 Fir Ave.	Res.	66	69
R7	475 E. University Parkway	Res.	61	61
R8	Raintree Apartment Complex, 1849 N. Freedom Blvd.	Res.	60	59
R9	2468 N. 850 W.	Res.	57	60
R10	1572 S. Carterville Road	Park	58	57
R11	465 W. 1250 S.	Church	61	57
R12	UVU Campus, W. 800 South	Edu.	56	57
R13	617 W. 925 S.	Res.	51	44
R14	895 S. Geneva Road	Res.	54	57
R15	1105 W. 680 S.	Res.	53	51
R16	792 S. 1370 W.	Res.	55	52

1. Existing baseline noise levels, which were measured at representative sites, were used to estimate ambient levels at all other noise-sensitive locations along the project corridor.

Source: AECOM, Midvale, UT, August 2010

Existing Vibration Conditions

Since the proposed mode of transit along the BRT corridor is bus, no existing vibration measurements were conducted. In general, rubber-tired vehicles, particularly buses, do not contribute to impacts due to the vibration isolation provided by the vehicle suspensions. Since the FTA vibration screening distance is only 50 feet for a bus way, no impacts are expected along the project corridor due to BRT operations.

Environmental Consequences

This section describes the noise impacts associated with the proposed project. The noise impact assessment was conducted according to FTA's *Transit Noise and Vibration Impact Assessment* guidelines. Specifically, a detailed assessment was conducted to model the noise levels from the proposed BRT operations under the Preferred Alternative in the design year 2030. Additionally, since the project noise includes a combination of highway and transit sources, traffic noise was also modeled using FHWA's Traffic Noise Model. The impact assessment is described in detail in the Provo-Orem Bus Rapid Transit Noise and Vibration Technical Report (August 2010).

No-Action Alternative

Future noise levels along the project corridor under the No-Action Alternative are expected to be similar to those measured under the existing conditions. Proposed growth in traffic is not enough to contribute to a noticeable change in noise.

Enhanced Bus Alternative

Future noise levels along the project corridor under the Enhanced Bus Alternative are also expected to be similar to those measured under the existing conditions. Since this alternative involves primarily roadway improvements and only minor transit-related changes, the Enhanced Bus Alternative is also not expected to cause any noise impacts. Similar to the No-Action Alternative, ambient noise levels due to roadway traffic are also expected to remain the same since the proposed growth in traffic is not enough to contribute to a noticeable change in noise.

Preferred Alternative

To assess the impact from a new transit source along the project corridor, the FTA evaluation criteria were used to assess 24-hour Ldn impacts (especially during the most sensitive nighttime period when people are sleeping) at residential receptors and the peak-hour Leq impacts at institutional receptors such as schools, churches, and libraries.

FTA Noise Assessment

Since most of the noise-sensitive sites for this project are residential, the Ldn descriptor was used to reflect the particularly heightened sensitivity to nighttime noise. Predicted noise levels are shown in Table 3.11-4: Predicted Noise Levels at Representative Monitoring Locations. The table compares noise levels that were measured using the same monitoring locations for existing conditions and the Preferred Alternative. Note that existing noise levels are based on actual noise measurements while the future noise levels are predicted for BRT only.

Table 3.11- 4: Predicted Noise Levels at Representative Monitoring Locations

ID	Receptor[1]	Land Use	FTA Noise Metric	FTA Noise Levels		FTA Impact Criteria[2]		FHWA Noise Levels			FHWA[3]
				Existing[4]	Preferred Alternative	Moderate	Severe	Existing[4]	No-Action	Preferred Alternative	NAC
R1	Fairfield Inn, 1515 S. University Ave.	Hotel	Ldn	66	56	61	66	69	65	65	66
R2	Crestline Mobile Estates, 888 S. Freedom Blvd.	Res.	Ldn	64	62	60	65	63	69	69	66
R3	371 North University Ave.	Res.	Ldn	65	60	61	66	55	70	70	66
R4	315 North University Ave.	Res.	Ldn	62	60	59	64	56	68	68	66
R5	USDA FS Shrub Sciences Lab, 735 N. 500 E.	Edu.	Leq	62	61	64	69	62	69	69	66
R6	921 Fir Ave.	Res.	Ldn	66	59	61	66	69	66	66	66
R7	475 E. University Pkwy.	Res.	Ldn	61	59	58	63	61	65	65	66
R8	Raintree Apartment Complex, 1849 N. Freedom Blvd.	Res.	Ldn	60	53	58	63	59	67	67	66
R9	2468 N. 850 W.	Res.	Ldn	57	54	56	62	60	69	69	66
R10	1572 S. Carterville Rd.	Park	Leq	57	52	61	67	57	68	68	66
R11	465 W. 1250 S.	Church	Leq	57	54	61	67	57	63	63	66
R12	UVU Campus, W. 800 South	Edu.	Leq	57	49	61	67	57	57	58	66
R13	617 W. 925 S.	Res.	Ldn	51	54	54	60	52	58	58	66
R14	895 S. Geneva Rd.	Res.	Ldn	54	52	54	60	57	57	59	66
R15	1105 W. 680 S.	Res.	Ldn	53	58	54	60	51	51	52	66
R16	792 S. 1370 W.	Res.	Ldn	55	60	55	61	51	51	53	66

1. Receptor locations are shown on Figures 3.11-2 to 3.11-6.
2. The FTA impact criteria, which are reported as 24-hour Ldn levels for residences, vary by location based on the existing noise levels.
3. The FHWA noise abatement criteria (NAC), which are reported as peak-hour Leq levels, are based on land-use type in accordance with the UDOT Noise Abatement Policy.
4. Existing noise levels represent actual field measurements, while the future No-Action and Preferred Alternative are based on modeling predictions.
Note: Underlined noise levels are predicted to exceed the FTA/FHWA noise criteria.

Noise impacts at the 16 noise-monitoring locations described above were used to characterize noise impacts from the Preferred Alternative at all other locations within the project area. Consequently, project-related noise impacts were determined at a total of 585 receptors along the proposed BRT alignment.

As a result of this overall evaluation, project noise levels under the Preferred Alternative are predicted to exceed the FTA moderate impact criteria at 121 residences (FTA Category 2 receptors) and the FTA severe impact criteria at an additional 19 residences. Thirteen (13) of the residences that would be severely impacted are located near the 800 South interchange; however nine of these residences would be relocated because the property would be incorporated into the roadway right-of-way; therefore these residences were not considered impacted. The Preferred Alternative would exceed the FTA severe impact criteria at 10 remaining residences along the project corridor.

Except for residences closest to a proposed station, all of the predicted impacts would be due to BRT pass-by operations. Residences within approximately 100 feet of proposed stations would also be affected by idling buses while passengers board and alight. The predicted noise impacts are shown on Figures 3.11-2 through 3.11-6.

The FTA Category 3 receptors (such as schools, libraries, and other institutional land uses), which are evaluated using the peak-hour Leq(h), are dominated primarily by traffic noise during the daytime. As shown in Table 3.11-5, peak-hour Leq(h) noise levels under the Preferred Alternative are predicted to range from 49 dBA at Site R12 (Education Building on the UVU campus) to 52 dBA at Site R10 (Carterville Park) to 61 dBA at Site R5 (USDA FS Shrub Sciences Lab on the BYU campus). As shown in Table 3.11-4, corridor-wide peak-hour Leq(h) noise levels under the Preferred Alternative are predicted to exceed the FTA moderate impact criteria at three sites and the FTA severe impact criteria at one site (LDS Institute). All of the affected FTA Category 3 receptors are located on the UVU campus.

As shown in Table 3.11-5: Overall Project-Related Noise Impacts under the Preferred Alternative,, project noise levels are predicted to exceed the FTA moderate and severe impact criteria under the Preferred Alternative at 129 residences.

Table 3.11- 5: Overall Project-Related Noise Impacts under the Preferred Alternative

ID	Corridor Segment	FTA Assessment[1]				FHWA Assessment[2]	
		Category 2		Category 3		NAC Category	
		Moderate	Severe	Moderate	Severe	B	C
1	Orem	35	4	3	1	8	23
2	Provo	86	6	0	0	12	8
Totals		**121**	**10**	**3**	**1**	**20**	**31**

1. *The FTA assessment evaluated transit impacts at both Category 2 (residential) and Category 3 (institutional) receptors.*
2. *The FHWA assessment evaluated transit impacts at both Category B (residential/institutional) and Category C (commercial/industrial) receptors.*

Source: AECOM, April 2011

FHWA Noise Assessment

In addition to the FTA impact assessment, cumulative traffic noise levels were evaluated for the peak-hour daytime period using FHWA methodologies. Maximum peak hourly traffic volumes were used to develop maximum traffic noise conditions. These results are conservative and will be generally higher compared to traffic data with an LOS C or better (which represents free flow conditions to maximize tire-pavement noise). Existing and future proposed bus volumes, for both local and BRT service, were also developed for the same evaluation period as the existing traffic. The cumulative noise levels predicted for the future Preferred Alternative were evaluated against the UDOT noise abatement criteria to determine the onset of impact.

As shown in Table 3.11-4, peak-hour Leq noise levels from the cumulative traffic conditions are predicted to range from 52 dBA at representative Site R15 (residences along West 680 South behind the UVU campus) to 70 dBA at Site R3 (residences along North University Avenue) under the Preferred Alternative. Except for low-traffic areas (such as at 850 South in Orem), the future peak-hour noise levels under the Preferred Alternative are dominated by the existing roadway traffic and are, therefore, predicted to remain the same as No-Build condition. At several of these sites (such as Sites R2 to R6 and R8 to R10), existing and future predicted peak-hour Leq(h) noise levels are expected to equal or exceed the UDOT noise abatement criterion of 66 dBA. None of the peak-hourly daytime noise levels at sites not currently exposed to high levels of traffic (such as Site R12 along the UVU campus) are predicted to exceed the UDOT noise abatement criterion of 66 dBA.

As shown in Table 3.11-5 corridor-wide future peak-hour Leq(h) noise levels are predicted to exceed the UDOT noise abatement criterion of 66 dBA at 20 residential or FHWA Category 'B' land uses (eight in Orem and 12 in Provo) under the Preferred Alternative. Similarly, future peak-hour noise Leq(h) levels are predicted to exceed the UDOT noise abatement criterion of 71 dBA at 31 commercial or FHWA Category 'C' land uses (23 in Orem and eight in Provo) under the Preferred Alternative. As shown in Table 3.11-4, the proposed BRT service is not expected to contribute to an increase in noise during the daytime peak travel periods at any of the sites where UDOT impacts are predicted

Mitigation

Since noise impacts are predicted under the Preferred Alternative, mitigation measures were investigated to determine their effectiveness in reducing severe noise impacts from BRT operations. Mitigation measures were evaluated for their potential to eliminate noise impacts along the project corridor. The itemization of funding between FTA and FHWA for the implementation of the Preferred Alternative, including mitigation, would be determined during final design.

Noise barriers were investigated along the project corridor since they are typically most effective in mitigating transit noise impacts. To be effective, noise barriers need to be high enough to block the line of sight between the receiver and the noise source and must not have any gaps or openings. Based on FTA guidance (FTA 2006) and UTA Noise Assessment and Mitigation Procedures (2010), UDOT's procedures for noise abatement are acceptable for gauging if the cost of mitigation is reasonable. Therefore, for this report, noise barriers were evaluated using the UDOT Noise Abatement Policy (January 2008).

As shown in Table 3.11-6: Noise Barriers Evaluated to Mitigate Impacts under the Preferred Alternative, three noise barriers were evaluated to determine their potential for reducing the severity of FTA moderate and severe noise impacts predicted along the project alignment. Based on this evaluation, each of the three barriers were determined to be both feasible (able to reduce noise levels 5 dBA at over 75 percent of all first-row receptors) and reasonable (able to achieve compliance at a cost below the UDOT criterion of $30,000 per benefited receiver at a unit material cost of $25 per square foot) (UDOT 2008a). As shown in the table, all of the barriers were evaluated for their potential to reduce project noise levels (see Figures 3.11-2 to 3.11-6).

Table 3.11- 6: Noise Barriers Evaluated to Mitigate Impacts under the Preferred Alternative

No.[1]	Barrier Description	Begin[2]	End[2]	Align Side	Length (feet)	Height (feet)	Noise Reduction (dBA)[3]	Benefited Receivers	Cost-Effective-ness	Feasible and Reasonable Y/N[4]
1	680 South (College Dr., north)	1.11	0.89	NB	1,306	12	7-14 (8)	16	$24,488	Yes
2	500 West (College Dr., south)	1.96	1.88	NB	524	10	0-7 (6)	5	$26,200	Yes
3	Ridgecrest Cir. (Freedom Blvd.)	9.59	9.65	SB	240	12	8-15 (11)	16	$4,500	Yes

1. The noise barrier associated with each number is shown in Figures 3.11-2 to 3.11-6.
2. The mileposts begin at the Orem Intermodal Center and end at the Novell campus in Provo.
3. This column shows the range of noise reduction and the average noise reduction (in parentheses).
4. The UDOT "feasible and reasonable" criteria include only barriers that 1) achieve a minimum 5-dBA reduction at over 75% of first-row receptors; and 2) whose cost-effectiveness index is less than $30,000 per benefitted receptor based on a material unit cost of $25 per square foot.

Source: AECOM, October 2009

However, as shown in Figures 3.11-2 through 3.11-6, barriers are not proposed in some of the areas where future noise impacts are predicted because openings are necessary for access (such as driveways). Since openings for driveways degrade the acoustical benefits of a barrier, they would not achieve a 5-decibel reduction as required under the UDOT guidelines in order to be "feasible." Furthermore, many of the noise impacts predicted under the Preferred Alternative are scattered throughout the corridor, resulting in barrier-costs-per-receiver that are higher than the allowable UDOT cost-effectiveness criterion of $30,000. Therefore, due to the need for openings for driveway access (such as 800 South in Orem) and the high cost-effectiveness for widespread receivers, only the three noise barriers evaluated would be feasible and reasonable according to the UDOT Noise Abatement Policy. Prior to construction of the proposed noise barriers, additional analysis and balloting of the neighborhood would be necessary (per UDOT's noise policy).

The results of the mitigation measures (noise barriers) indicate that each of the three barriers would lower the project noise levels well below the FTA noise criteria for 27 residences. However, 96 moderate impacts (residential and institutional) and six severe impacts (residential) are predicted to remain under the Preferred Alternative even with noise wall mitigation:

- 1 residence – Apartment building at the corner of University Parkway and University Avenue (Provo)
- 1 residence – 700 North (Provo)
- 4 residences – Freedom Boulevard (Provo)

Mitigation for the severely impacted residences could include sound caulking and sealing gaps in the façade of the structure and installing sound-proof doors and windows. These measures would be taken if they were determined to be cost-effective according to UTA's Noise Assessment and Mitigation Procedures dated September 2010. To be considered cost-effective, the mitigation measures must provide a minimum of 5 decibels noise reduction in the interior of the building, in addition to other criteria. All mitigation measures would be re-evaluated during the final design phase of the project when the details of the project components and the construction scenarios are finalized.

3.12 BIOLOGICAL RESOURCES

Regulatory Setting, Studies, and Coordination

Vegetation

Utah Noxious Weed Act (amended July 2008)
This act states that it is the duty of every property owner to control and prevent the spread of noxious weeds on any land in his or her possession or under his or her control. Each year, public notices will be posted by the County Weed Board in at least three public places in each county in the state. If the property owner fails to comply with this notice, enforced weed control measures may be imposed at the direction of county authorities.

Executive Order 13112 Invasive Species (1999)
This order was established to help prevent the introduction of invasive species into the United States and to provide means for their control. It is meant to minimize the economic, ecological, and human health impacts of invasive species. The Invasive Species Council oversees the implementation of this order.

Plant Protection Act of 2000
This act was established to protect the agriculture, environment, and economy of the United States through controlling the spread of plant pests or noxious weeds. This act is overseen by the Secretary of Agriculture.

Wetlands

Section 404 of the Clean Water Act of 1972
This act prohibits the discharge of dredged and fill material into jurisdictional waters of the United States (including wetlands) without a permit. The United States Army Corps of Engineers (USACE) presently has jurisdiction over any waters that are adjacent to navigable waterways.

Executive Order 11990 Protection of Wetlands (1977)
This order was enacted to ensure protection and proper management of wetlands by United States federal agencies.

Executive Order 11988 Protection of Floodplains (1977)
This order was enacted to ensure protection and proper management of floodplains by United States federal agencies.

Wildlife and Fisheries

Fish and Wildlife Coordination Act (originally enacted in 1934)
This act requires consultation with the state wildlife agencies and with the U.S. Fish and Wildlife Service (USFWS) concerning the conservation of wildlife where streams or other waters are proposed to be controlled or modified by a federal agency.

Bald and Golden Eagle Protection Act (originally enacted in 1940)
This act prohibits the possession, taking, or selling of bald and golden eagles, their parts, eggs, or nests in the United States.

Migratory Bird Treaty Act of 1918
The Migratory Bird Treaty Act makes it unlawful at any time, by any means, or in any manner, to pursue, hunt, take, capture, kill, or sell migratory birds, their parts, nests, or eggs in the U.S.

Executive Order 13186
This order directs federal agencies whose activities are likely to have a measurable negative effect on migratory birds to undertake actions in support of the Migratory Bird Treaty Act.

Threatened, Endangered, and Sensitive Species

Endangered Species Act of 1973
This act provides a program for the conservation of threatened and endangered plants, animals, and habitats. It prohibits federal agencies from authorizing, funding, or carrying out actions that may jeopardize the continued existence of listed endangered or threatened species or cause adverse modification to designated critical habitat without a permit. Section 7 of the Endangered Species Act, as amended, applies to federal agency actions and sets forth requirements for consultation between the lead federal agency and USFWS or the National Marine Fisheries Service concerning potential project-related and cumulative impacts to federally listed species.

Affected Environment

This section describes the various biological resources occurring in the study area. The study area consists of a 500-foot-wide corridor, including both the roadway impact areas and the station impact areas delineated on Figure 3.12-1 and Figure 3.12-2: Wetlands and Water Resources.

Vegetation

Five cover types occur in the study area. The non-vegetated cover types (e.g., developed) are included to account for the entire study area. Plant species listed as part of a community or cover type were identified during field observations made during site visits in August 2008 and August 2009. These five cover types include landscaped, disturbed, riparian, emergent marsh, shrub-scrub wetland, and developed (Biological Resources Technical Report, SWCA 2010b).

Wetlands and Water Resources

Wetland types found within the study area as indicated in the National Wetland Inventory dataset include riverine wetlands associated with the Provo River, palustrine scrub shrub (PSS), palustrine emergent marsh (PEM), and palustrine aquatic bed (PAB). Plant species that occur in the PSS wetland type include thinleaf alder (*Alnus incana*), coyote willow (*Salix exigua*), reed canary grass (*Phalaris arundinacea*), meadow horsetail (*Equisetum arvense*), and European bittersweet (S*olanum dulcamara*). The PEM wetland type is dominated by broadleaf cattail (*Typha latifolia*) and hardstem bulrush (*Schoenoplectus acutus*). PAB wetlands support submerged aquatic vegetation such as pondweed (*Potamogeton* spp.).

This variation in wetland type is typically associated with landscape position and hydrology. While this dataset is useful for understanding the location and extent of potential wetland resources, the modification of hydrology and recent development limit its accuracy. For this reason SWCA conducted a wetland delineation to identify actual wetlands and inform the discussion of environmental consequences associated with this project (SWCA 2010c). Due to the size of the study area the wetland delineation was restricted to the impact area.

Waters of the United States identified and delineated within the study area include four wetlands, the Provo River, and four canal segments following procedures outlined in the *1987 Corps of Engineers Wetland Delineation Manual* and the Arid West Region Supplement (USACE 1987; USACE 2008). Wetlands were assigned National Wetland Inventory mapping codes based on the Cowardin classification system (Cowardin et al. 1979). USACE issued a preliminary jurisdictional determination (JD) in November 2010, concurring with the SWCA wetland delineation. The preliminary jurisdictional determination is included in the Appendix.

Wildlife and Fisheries

The study area is primarily located in an urban setting, which provides wildlife habitat in the form of parks, landscaped areas, and buildings. Generalist species capable of thriving in an urban environment—such as the house finch (*Carpodacus mexicanus*), house sparrow (*Passer domesticus*), house mouse (*Mus musculus*), big brown bat (*Eptesicus fuscus*), Northern raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*)—are likely to use the study area.

Some sections of canals in the study area have natural habitat characteristics, including the Lake Bottom Canal and the West Union Canal. The Provo River and some wetlands have natural habitat characteristics. These areas could provide habitat for wildlife species including small migratory birds (songbirds and shorebirds) and bird species like the red-winged blackbird (*Agelaius phoeniceus*) and marsh wren (*Cistothorus palustris*) as well as for the urban-adapted species described above.

The project crosses the lower reach of the Provo River. Within the study area, this section of river is swift-moving with cobble and sandy bottoms. Although the river is surrounded by paved trails, roads, and buildings, the riparian corridor is relatively intact. Rip-rap has been placed on both sides of the river underneath the University Parkway bridge. The west side of the river has a narrow floodplain with native vegetation. Because this portion of the river is surrounded by development, there is potential for urban runoff and other pollution to reach the water and affect the quality of fish and wildlife habitat.

Fish that could occur in this reach of the Provo River include the brown trout (*Salmo trutta*) and the rainbow trout (*Oncorhynchus mykiss*).

Threatened and Endangered Species

Federally Listed and Candidate Species

Seven federally listed and candidate species are listed for Utah County. The status of each species, a description of suitable habitat, and a rating of the potential for the species to occur in the study area are provided in the Biological Resources Technical Report (SWCA 2010b) for the project. The three species with potential to occur in the study area are discussed below.

June Sucker: Historically, the June sucker used all rivers within the Utah Lake drainage for spawning and larval fish development but is currently known only to use the lower 4.9 miles of the Provo River, which has been designated as critical habitat for the species by 51 CFR 10851. The study area intersects the Provo River less than 1 mile upstream from the designated critical habitat. However, most spawning fish are prevented from continuing upstream into the study area because of the Tanner Race Diversion Dam, which is the boundary of the designated critical habitat.

Yellow-Billed Cuckoo: The study area does not contain a patch of riparian habitat large enough to sustain populations of this species. Although the area may have some value as a migratory stop-over location, such habitat use would likely be brief and inconsistent.

Ute Ladies'-Tresses: There are recent records of occurrence for this species near the study area, as discussed in the August 2008 letter from the Utah Division of Wildlife Resources to SWCA (see Appendix).

The only potentially suitable habitat found for this species in the study area is along the Provo River (see Figure 3.12-2). This area was surveyed for Ute ladies'-tresses individuals; none were found in the study area.

State-Listed Sensitive Species

Information on state-listed wildlife species with recent occurrences near the study area is provided in the Biological Resources Technical Report (SWCA 2010b). No potentially suitable habitat for any state-listed wildlife species is present in the study area.

Environmental Consequences

An analysis of project-related impacts on vegetation, wetlands, wildlife, and threatened and endangered species and their associated habitats in the study area was conducted for the project, as described in detail in the Biological Resources Technical Report (SWCA 2010b). This section identifies the potential biological impacts for each alternative under consideration.

Vegetation

No-Action Alternative

Because the existing road alignment would be maintained under the No-Action Alternative, there would be no impacts to riparian plant communities in the study area.

Enhanced Bus Alternative

There would be no project-related impacts to vegetation in the study area under the Enhanced Bus Alternative.

Preferred Alternative

All impacts to vegetation communities would occur during the construction process; no ongoing operational impacts would occur once construction is complete. There are three scrub shrub wetlands and one emergent marsh within the impact area. Effects to these resources are discussed in the Wetlands and Waters of the U.S. section below. The Preferred Alternative would result in approximately 0.23 acres of direct impacts to riparian vegetation associated with road widening and bridge construction over the Provo River. Overall, these impacts are considered minimal because there are no unique plant species or communities within the impacted riparian area.

Wetlands and Waters of the U.S.

No-Action Alternative

There would be no project-related impacts to wetlands in the study area under the No-Action Alternative.

Enhanced Bus Alternative

There would be no project-related impacts to wetlands in the study area under the Enhanced Bus Alternative.

Preferred Alternative

Wetlands and other waters of the U.S. are delineated within the impact area, and are depicted in Figures 3.12-1 and 3.12-2. All impacts to wetlands would occur during the construction process; no ongoing operational impacts would occur once construction is complete. There are approximately 8.19 acres of jurisdictional waters within the impact area. However, the Preferred Alternative would only result in approximately 3.7 acres of direct impacts for reasons described below. Approximately 3,300 feet of canals potentially designated as waters of the U.S. could be directly impacted by the Preferred Alternative, as discussed in Section 3.13: Water Resources.

Impact areas used for this project and for the I-15 Corridor Expansion (I-15 CORE) project overlap. The I-15 CORE project will fill portions of Wetland 3 before this project is constructed. After subtracting impacts anticipated from the I-15 CORE project, the Preferred Alternative is expected to impact approximately 3.5 acres of wetlands in the vicinity of the proposed interchange at 800 South and I-15.

At the Provo River, there are 0.23 acres of perennial stream and 0.23 acres of Wetland 4 within the impact area. No permanent impacts to the perennial stream are anticipated because the new structure would span the channel. Wetland 4 could be impacted by footings and increased shade resulting from bridge widening. This study assumes all of Wetland 4 could be impacted; 0.23 acres is included in the total project wetland impact. During final design, and through coordination with USACE, this impact may be reduced.

Finally, implementation of the Preferred Alternative is planned to be phased. The first phase of the Preferred Alternative will include the construction of proposed improvements with the exception of the 800 South and I-15 interchange. Phase I will utilize University Parkway to cross I-15 and reach the project terminus located at the Orem Intermodal Center. Phase II of the project includes the design and construction of the 800 South interchange. It is likely that Phase II would not be implemented for many years after Phase I has been completed.

Wildlife and Fisheries

No-Action Alternative

The No-Action Alternative would have no impact on wildlife and fish species in the study area.

Enhanced Bus Alternative

There would be no project-related impacts on wildlife and fish species in the study area under the Enhanced Bus Alternative.

Preferred Alternative

The Preferred Alternative would impact the PSS and PEM habitat associated with Wetlands 1 through 4 (Figures 3.12-1 and 3.12-2). This action could result in indirect impacts to wildlife including displacement from wetland habitat.

The project crosses the Provo River corridor on the lower reach of the river, as shown on Figure 3.12-2. The floodplain habitat on the west side of the river (Wetland 4) would be indirectly impacted by construction of the new BRT bridges between the existing bridges. There is potential for bridge construction–related debris to enter the Provo River, resulting in incidental negative impacts on the quality of aquatic habitat. Birds protected under the Migratory Bird Treaty Act could nest in the floodplain habitat indirectly impacted by implementation of the Preferred Alternative. Construction occurring during the nesting season could temporarily displace roosting bird species and nesting birds. Implementation of best management practices and the mitigation measures outlined in the Mitigation section below would avoid impacts to fish and wildlife species, including those protected under the Migratory Bird Treaty Act.

Threatened, Endangered, and Sensitive Species

No-Action Alternative

There would be no project-related impacts to threatened, endangered, and sensitive species in the study area.

Enhanced Bus Alternative

There would be no project-related impacts to threatened, endangered, and sensitive species in the study area.

Preferred Alternative

June Sucker: The study area intersects the Provo River less than 1 mile upstream from the designated critical habitat for this endangered fish species. There is potential for bridge construction–related debris to enter the Provo River, resulting in indirect, adverse effects on June suckers and their habitat. Decreased water clarity associated with increased river sedimentation has been shown to decrease the feeding efficiencies of planktivorous fish like the June sucker (USFWS 1999). The conservation measures outlined in the Mitigation section below will prevent adverse impacts to June suckers and their habitat.

Yellow-Billed Cuckoo: Because the study area does not contain a large enough patch of riparian habitat to sustain populations of this species, it is unlikely the bridge widening or increased traffic would have any effect on this species.

There is the potential that individuals of this species could use the study area or adjacent riparian habitat as a migratory stop-over location. If that were to occur, the noise associated with bridge

construction activities could cause the individual cuckoos to relocate to more suitable habitat upstream or downstream from the study area (Chace and Walsh 2006). These impacts would be temporary and limited to the construction period. Implementation of best management practices and the conservation and mitigation measures outlined in the Mitigation section below would help prevent adverse impacts to the Provo River riparian habitat.

Ute Ladies'-Tresses: Potentially suitable Ute ladies'-tresses habitat could be indirectly impacted along the Provo River as a result of bridge widening; however, no Ute ladies'-tresses were found in this area during the August 18, 2008, or August 5, 2009, botanical surveys. Thus, it is unlikely that this species would be affected by project implementation. Implementation of best management practices and the conservation and mitigation measures outlined in the Mitigation section below would help prevent adverse impacts to the Provo River riparian habitat.

Mitigation

Wetland Mitigation

Based on the phasing of the 800 South interchange, permits required for the impacts to wetlands would also occur in phases. Wetland impacts associated with Phase I of the Preferred Alternative would total 0.23 acres of floodplain wetlands located near the Provo River. A Nationwide permit would be required for the Phase I wetland impacts. The remaining wetland impacts, totaling 3.5 acres, would occur during implementation of Phase II of the Preferred Alternative. In compliance with Section 404 of the Clean Water Act, a Nationwide permit would be required for Phase I while an Individual permit would be required for the Phase II wetland impacts. The project will comply with mitigation requirements and other conditions outlined in the Section 404 permits.

Conceptually, mitigation for impacts to wetlands during Phase I is expected to consist of compensatory mitigation on-site. Compensatory mitigation is the replacement of wetland functions through the creation, restoration, enhancement, or in some cases revegetation for temporary impacts. A mitigation site has not been selected for impacts expected during Phase II. As part of the Section 404 permitting process, the mitigation site and ratio would be negotiated. Indirect impacts during construction would be mitigated with the use of best management practices, including the proper storage of topsoil material and erosion control measures.

Wildlife Mitigation – Pre-construction Surveys

If construction begins in the Provo River corridor or other suitable habitat for migratory birds during the nesting season, March to August depending on the avian species of concern and weather in a given year, nest surveys are required under the Migratory Bird Treaty Act. Surveys should be conducted within seven days of the start of construction. Construction activities occurring completely outside the nesting season do not necessitate surveys although authorization from USFWS is required any time a tree with a raptor nest is removed. If construction in potential nesting habitat is started prior to the nesting season, nest surveys are not required. Construction activities would continue through the nesting season so migratory birds would be discouraged from using the construction area.

Pre-construction plant surveys would be conducted for Ute ladies'-tresses in the study area along the Provo River less than one year prior to construction. These surveys would need to take place during the August flowering period.

Wildlife Mitigation – Best Management Practices

The best management practices outlined below would reduce debris and sediment entering the Provo River and therefore minimize potential impact to the June sucker and its habitat.

- If the water turbidity in an adjacent surface water is increased by 10 nephelometric turbidity units or when turbidity is visibly increased, UTA would notify the Division of Water Quality (DWQ).
- No fill material would be used that may leach organic chemicals (e.g., discarded asphalt) or nutrients (e.g., phosphate rock) into the receiving water.
- Any potentially affected fish spawning areas would be protected.
- Asphalt surfacing would be scraped and taken off site prior to demolition.
- Silt fencing would be installed above the current water level adjacent to the existing abutments to minimize the amount of sediment entering the channel due to demolition activities.
- When possible, the bridge would be taken apart piece by piece and removed from the site.
- Every effort would be made to prevent demolition debris from entering the channel using the bin/catch technique and others as necessary. Should debris enter the channel, it would be removed immediately to prevent flow obstruction.
- Following completion of all construction activities, portions of the study area that remain unpaved would be stabilized and revegetated using native seed and seedlings.

3.13 WATER RESOURCES

Regulatory Setting, Studies, and Coordination

Water resources are regulated under the Clean Water Act. Impacts to waters of the U.S. require a 404 permit from USACE; impacts to natural stream channels require a stream alteration permit from the Division of Water Rights. Construction activities disturbing more than 1 acre require a Utah Pollutant Discharge Elimination System (UPDES) permit.

Water quality is regulated under the Clean Water Act and the Safe Drinking Water Act. Under the Clean Water Act, Section 303(d), Water Quality Standards, DWQ must establish standards for designated beneficial uses. DWQ must also monitor and assess surface waters and compile a 303(d) list of "impaired" waters that do not meet standards for beneficial use. Once listed, DWQ must prepare a plan to restore water quality to meet standards for the beneficial use. The plan must include a total maximum daily load analysis, which determines the amount of a specific pollutant a water body can receive without exceeding water quality standards. Under the Safe Drinking Water Act, each public drinking water supplier must have a Drinking Water Source Protection plan. The plan includes four source protection zones delineated for management purposes. Potential contamination sources are identified. Various activities could be restricted if they jeopardize the water quality of the source.

Floodplains are regulated by the Federal Emergency Management Agency (FEMA) through the National Flood Insurance Program. Provo and Orem participate in the National Flood Insurance Program, and FEMA has published a Flood Insurance Rate Map for both communities that delineates the special flood hazard area. A special flood hazard area is subject to a 1 percent or greater chance of flooding in any given year and is commonly referred to as a 100-year

floodplain. In both cities, a development permit must be obtained before construction or development begins within any special flood hazard area. Any encroachment that would result in an increase in flood levels during the occurrence of the base flood is prohibited.

Existing drainage patterns were established through coordination with UDOT, Provo City, and Orem City and verified through field review.

Affected Environment

Water resources, water quality, and floodplains identified within the study area are described below. Wetlands are described separately in Section 3.12: Biological Resources. Additional information regarding water resources and water quality can be found in the Water Resources/Water Quality Technical Report (August 2010).

Surface Water Resources

Watersheds

The proposed project is located within the Jordan River and Utah Lake Watershed Management Unit. This watershed management unit consists of four major hydrologic units. Three of these hydrologic units (Utah Lake, Provo River, and Spanish Fork River) comprise the Utah Lake watershed. The Jordan River flows out of Utah Lake north to the Great Salt Lake.

Surface Waters

Utah Lake

Utah Lake is one of the largest freshwater lakes in the western United States and supplies drinking water to the Salt Lake Valley. Utah Lake is regulated by USACE as a water of the U.S.

Provo River

The Provo River flows from its headwaters in the Uinta Mountains to Utah Lake and supplies drinking water to more than 50 percent of Utah's population. The lower Provo River through Provo is highly regulated and urbanized to allow for residential and commercial development through the historic floodplain. Because of channel modifications, floodplain width is minimal and stream banks are overly steep. The Provo River is regulated by USACE as a water of the U.S. (SWCA 2010c) and is also discussed in Section 3.12.

Mill Race

Mill Race diverts flow from the Provo River near 2300 North and eventually flows south into Provo Bay. Mill Race was originally constructed as a man-made irrigation channel and currently is primarily used for storm water conveyance (Clayton 2008a). Some sections of Mill Race are regulated by USACE as a water of the U.S.

West Union Canal

The West Union Canal diverts water from the Provo River and flows into Utah Lake. It is operated by the West Union Canal Company. It is regulated by USACE as a water of the U.S. (SWCA 2010c) as discussed in Section 3.12.

Lake Bottom Canal

The Lake Bottom Canal diverts water from the Provo River 3 miles below the head gate for the West Union Canal. It is operated by the Lake Bottom Canal Company. It is regulated by USACE as a water of the U.S. (SWCA 2010c) as discussed in Section 3.12.

Upper Union Canal

The Upper Union Canal, also known as the Upper East Union Canal, diverts water from the Provo River near the West Union Canal diversion. The section through BYU is enclosed. It is regulated by USACE as a water of the U.S. (SWCA 2010c) as discussed in Section 3.12.

Existing Drainage

A significant portion of Orem City's storm water system consists of dry wells. Dry wells—also referred to as sumps—allow storm water to infiltrate into the groundwater system. Dry wells are used for roadway runoff along University Parkway between 620 West and 200 East. There are also existing storm drain systems on University Parkway that discharge to Utah Lake. In Provo, existing storm drain systems generally discharge to the Provo River, Mill Race, or directly into Utah Lake. Existing and proposed storm drainage is shown on Figure 3.13-1: Existing and Proposed Storm Drainage.

Surface Water Quality

Beneficial Use Assessment

Table 3.13-1: Beneficial Use Assessment lists the beneficial uses of the surface waters and impairment designations in the study area.

Table 3.13- 1: Beneficial Use Assessment

Water Body	Beneficial Use Class	Assessment	Pollutant	Comment
Utah Lake	2B, 3B, 3D, 4	Partially Supporting for Class 3B	Total phosphorus; Total dissolved solids	Total Maximum Daily Load analysis in progress, Target date is April 1, 2010
Provo River	2B, 3A, 4	Fully Supporting Class 3A, 4; Not Assessed for Class 2B	N/A	N/A
Mill Race	2B, 3B, 4	Not Assessed	N/A	N/A
West Union Canal	2B, 3E, 4	Not Assessed	N/A	N/A
Lake Bottom Canal	2B, 3A, 4	Not Assessed	N/A	N/A
Upper Union Canal	2B, 3E, 4	Not Assessed	N/A	N/A

1C: Protected for domestic purposes with prior treatment as required by the Division of Drinking Water.
2B: Protected for secondary contact recreation such as boating, wading, or similar uses.
3A: Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
3B: Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
3D: Protected for waterfowl, shore birds, and other water-oriented wildlife not included in Classes 3A, 3B, or 3C; this beneficial use classification also includes the necessary aquatic organisms in these animals' food chain.
3E: Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.
4: Protected for agricultural uses, including irrigation of crops and stock watering.

Source: Utah Administrative Code R317-2-13, DWQ 2006 Integrated Report Volume II, 303 (d) list of impaired waters

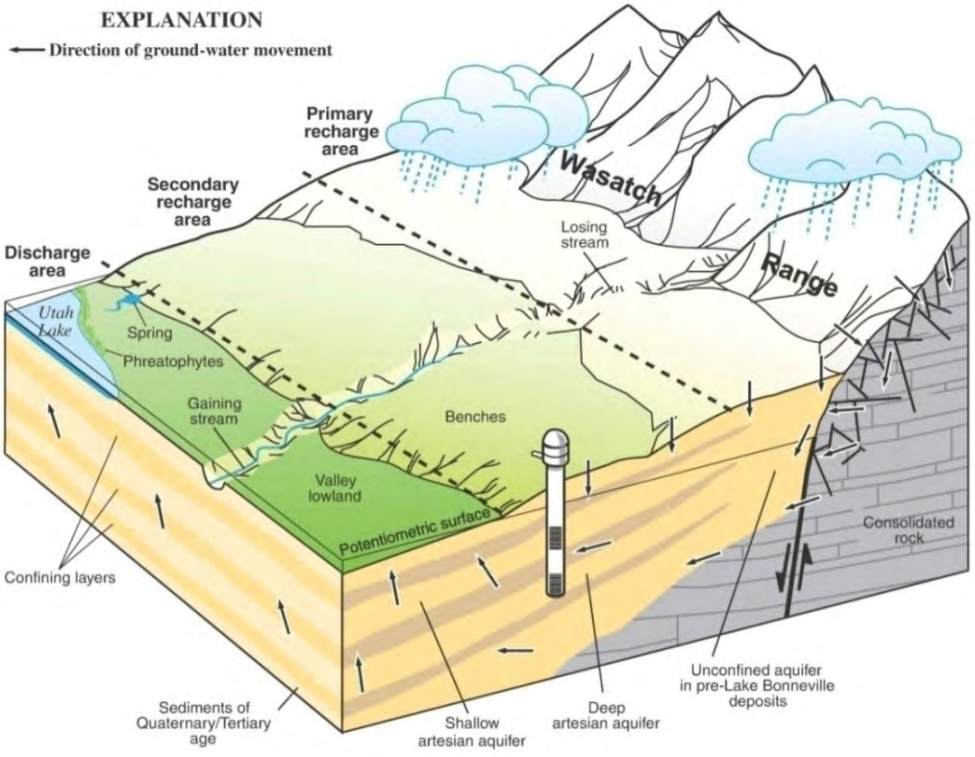
DWQ has completed a water quality assessment for Utah Lake and the Provo River; the other surface waters in the study area have not been assessed. Utah Lake is listed on the 2006 303(d) list for only partially supporting its beneficial use classification. The pollutants exceeding standards in Utah Lake are total dissolved solids and total phosphorus amounts. The Provo River is not listed on the 2006 303(d) list of impaired waters. DWQ found that the Provo River from Utah Lake to the Murdock Diversion fully supports beneficial use classes 3A and 4. There was insufficient data to assess the support of class 2B.

Groundwater Resources

There are four distinct aquifers in northern Utah Valley: a shallow unconfined aquifer and three confined artesian aquifers. The three confined aquifers are part of the principal aquifer for Utah Valley (Anderson et al. 1994). Figure 3.13-2, below, depicts the groundwater system in northern Utah Valley.

Most of the project corridor lies within a secondary recharge area. However, the ends of the corridor—west of I-15 in Orem and roughly west of Center Street in Provo—are within a discharge area. One section—the eastern end of University Parkway in Orem—is located in a primary recharge area (Anderson et al. 1994).

Figure 3.13-2: Groundwater System in Northern Utah Valley



Drinking Water Sources

Drinking Water Source Protection zones are shown on Figure 3.13-3: Groundwater. As seen in the figure, the project corridor intersects Drinking Water Source Protection zones for the Orem and Provo wells listed in Table 3.13-2.

Table 3.13- 2: Public Drinking Water Wells within One-half Mile of Corridor

ID #	System Owner	System Name	Type	Status
25020-03	Orem City	Well 1	Community	Active
25006-01	Provo City	North Well	Community	Active
25006-25	Provo City	BYU Well	Community	Active
25006-08	Provo City	Utilities Well	Community	Active
Source: Division of Drinking Water 2008				

The project corridor lies within Zone 2 for Orem Well 1, the BYU Well, and the Utilities Well, meaning contaminants from the road could reach the well within 250 days. Well 1 is drilled within a protected aquifer.

The Drinking Water Source Protection plan for Well 1 lists Orem City's storm drain dry wells as a potential contamination source for chemicals accidentally or delinquently spilled. Orem City has identified management strategies for the storm drains as a potential contamination source, including sending educational mailers and information packets to all residents informing them not to dispose of chemicals in storm drains.

The BYU Well has an extensive protective layer approximately 50 feet thick with a radius of approximately 1 mile. The Utilities Well has a protective clay layer approximately 120 feet thick with a radius of 2 miles. However, the confining layers are not water tight and groundwater moves vertically from deeper confined aquifers toward the surface due to vertical hydraulic gradient. The Drinking Water Source Protection plan does not list roads or storm drains as a potential contamination source in any zone for either well. Provo City's management strategies for Zone 2 include the sanitary sewer and storm drain system that service the area as well as protective ordinances (Willsey 2002).

Groundwater Rights

In addition to public drinking water source wells, there are numerous private wells within the groundwater study area. Figure 3.13-3 shows all wells in the Utah Division of Water Rights database within one-half mile of the corridor. These wells are classified according to use, and are listed below in Table 3.13-3.

Table 3.13- 3: Wells within Groundwater Study Area

Use	Number of Wells
Domestic[1]	271
Irrigation	137
Municipal[2]	14
Stock Watering	8
Other	49

1. Domestic use indicates the well supplies drinking water to private homes or businesses.
2. Municipal use indicates the well is owned by a city or county for a variety of uses, including drinking water or agricultural.

Groundwater Quality

The groundwater quality in eastern Utah Valley generally has TDS concentrations less than 500 mg/L and would qualify for Class IA (pristine groundwater) based on available U.S. Geological Survey data (Anderson et al. 1994).

Floodplains

FEMA-designated floodplains are shown on Figure 3.13-4: Surface Waters, Canals, and Floodplains. The 100-year floodplains are considered special flood hazard areas. The project corridor crosses or is adjacent to floodplains at three locations: the interchange at University Parkway and I-15, the University Parkway-Provo River crossing, and the interchange at I-15 and University Avenue. Two of these floodplains are 100-year floodplains, and the third is a 500-year floodplain.

Environmental Consequences

This section identifies potential impacts to water resources, water quality, and floodplains for each alternative under consideration.

No-Action Alternative

Under this alternative, the existing roadway and drainage system would be maintained and no construction would occur. There would be no direct or indirect impacts to water resources, water quality, or floodplains. There would be no temporary impacts to water quality from erosion.

Enhanced Bus Alternative

Environmental consequences associated with the Enhanced Bus Alternative are likely to be similar to those of the No-Action Alternative.

Preferred Alternative

Surface Waters

Provo River

Under the Preferred Alternative, the existing eastbound and westbound structures over the Provo River would be replaced with new, wider structures and an additional structure would be constructed in the median for BRT lanes. The two existing bridges are each 43 feet wide (86 feet total width). The new eastbound and westbound bridges would be 53 feet wide, and the BRT bridge would be 32 feet wide (138 feet total width). The profile elevation and span length of the new bridges would be approximately the same as the existing bridges. The hydraulic capacity would be improved because existing columns in the channel would be removed, and the new bridge would span the channel. Impacts to the Provo River related to vegetation, wetlands, and wildlife are discussed in Section 3.12: Biological Resources.

Mill Race

The Preferred Alternative would cross Mill Race at four locations. Impacts at each crossing would be as follows:

- University Parkway: The existing culvert would be extended or replaced with a new culvert approximately 12 feet longer.
- University Avenue at 900 South: No impact (improvements to the future Provo Intermodal Center are being cleared as part of a separate project).
- East Bay Boulevard: No impact to existing culvert (no roadway widening at this crossing).
- 1860 South: No impact to existing culvert (no roadway widening at this crossing).

West Union Canal

The Preferred Alternative would cross the West Union Canal at two locations and parallel it in one location. Impacts at each location would be as follows:

- Campus/College Drive: The existing culvert would be extended or replaced with a new culvert approximately 30 feet longer.
- University Parkway: The existing culvert would be extended or replaced with a new culvert approximately 20 feet longer.
- 800 South and parallel section on UVU campus: There is an existing culvert approximately 110 feet long under 800 South and an open channel approximately 760 feet long north of 800 South, parallel to the Preferred Alternative. The existing culvert and open channel would be piped for approximately 870 feet.

Lake Bottom Canal

The Preferred Alternative would cross the Lake Bottom Canal at two locations. Improvements to I-15 to accommodate the new interchange would run parallel to the Lake Bottom Canal. Impacts at each location would be as follows:

- 800 South: The new crossing would require placing the Lake Bottom Canal in a culvert for approximately 150 feet.
- University Parkway: The existing culvert would be extended or replaced with a new culvert approximately 15 feet longer.
- West of I-15 between 800 South and University Parkway: Improvements to I-15 would require realignment of approximately 2,300 feet of the Lake Bottom Canal to the west.

Upper Union Canal

The Preferred Alternative would not result in impacts to the Upper Union Canal. There is no roadway widening proposed at the existing culvert on University Parkway, and the canal is already enclosed at 900 East.

Drainage Systems

Existing and proposed drainage is shown on Figure 3.13-1. Under the Preferred Alternative, one existing and two planned detention basins would be affected. The existing detention basin is owned and maintained by Orem City and is located east of I-15 and north of 800 South. The roadway fill would encroach on the available storage capacity. This pond would be eliminated and the flows would be accommodated by the I-15 CORE ponds or the Geneva Pond discussed below.

The two planned detention basins are currently being constructed as part of the I-15 CORE project. One is north of 800 South and west of I-15 and is referred to as Pond C-11. The other is west of I-15 and north of University Parkway and is referred to as Pond C-10. This project would affect Pond C-11 by increasing the flow in and decreasing the volume. Pond C-12 would be affected by an increase in flow. Both ponds would need to be re-graded and expanded to accommodate additional flows. Additional property adjacent to the planned ponds would be required to provide additional volume. Pond C-11 would be expanded to the south and Pond C-10 would be expanded to the north. Parcels that may be used for expansion of the I-15 CORE ponds are discussed in Section 3.5 and are labeled as J–N in Table 3.5-1 and Figure 3.5-1. The parcels are full acquisitions—required for construction of the interchange. Both ponds discharge

to the Lake Bottom Canal. The discharge rate would not be increased beyond what was negotiated for the I-15 CORE project.

A new detention basin (referred to as the Geneva Road Pond) is proposed south of 800 South and between Geneva Road and I-15. Two locations are under consideration for this detention basin. Both locations are on property that would be purchased for the project. Parcels that may be used for the Geneva Road Pond are discussed in Section 3.5 and are labeled as A, B,D,F,H, and I in Table 3.5-1 and Figure 3.5-1. The parcels would be full acquisitions—required for construction of the interchange. Determination of which parcels would be necessary for detention would occur during final design. The total detention volume would need to be approximately 1 acre-foot. Table 3.13-4 describes proposed detention.

Table 3.13- 4: Proposed Detention Ponds

Detention Pond*	Existing Storage Volume (acre-ft)	Proposed Storage Volume (acre-ft)
Pond C-11 (planned by I-15 CORE Project)	6.6	17.9 (re-grade and expand to the south)
Pond C-10 (planned by I-15 CORE Project)	5.6	6.1 (re-grade and expand to the north)
Existing Orem City Pond	7.2	0.0(eliminate pond and route flow to proposed Pond C-11)
Geneva Road Pond	No existing pond	1.0**

**Pond design is based on a 25-year, 24-hour storm event per Orem City guidance*
***Proposed storage volumes maybe shifted from Pond C-11 to the Geneva Road Pond during final design if necessary.*

Under the Preferred Alternative, there would be an increase in impervious area and a corresponding increase in storm water runoff peak flow. The impervious area along the Preferred Alternative corridor would increase by approximately 32.8 acres. This would result in a total increase of 75.2 cubic feet per second (cfs) for the 10-year storm event. A 10-year storm is a theoretical storm event that is used for storm drain design. It corresponds to a recurrence interval of 10 years, and there is a 10 percent chance of occurrence in any given year.

Existing and proposed storm drainage is shown on Figure 3.13-1, and described in Table 3.13-5: Proposed Drainage (all flow values reported are for the 10-year storm). Coordination with Orem City, Provo City, and UDOT is ongoing and will continue through final design. An agreement between UTA, UDOT, and Orem City will be necessary to discharge to the detention ponds listed in Table 3.13-4.

Table 3.13- 5: Proposed Drainage

Preferred Alternative Corridor Segment	Existing Drainage	Proposed Drainage*
800 South, west of I-15	Runoff currently flows into a storm drain system on Geneva Road, is routed through a detention basin at the golf course, and discharges to Utah Lake.	Additional flow of 10.0 cfs would discharge to the proposed Geneva Road Pond. Outflow would be restricted to 0.134 cfs/acre (60 GPM/acre) per Orem City requirements. An outflow of approximately 0.6 cfs would discharge to a new storm drain system being constructed by UDOT as part of the Geneva Road project.
High-Occupancy/Toll (HOT) Lanes on I-15	No existing drainage.	Flow would be routed to the I-15 CORE detention ponds (6.0 cfs to Pond C-11, and 6.0 cfs to Pond C-10). The ponds would be enlarged and would discharge to the Lake Bottom Canal at the rate negotiated for the I-15 CORE project.
Through UVU campus, between I-15 and 800 South	The existing storm drain is routed through a detention pond at the intersection of 800 South and 1200 West and discharges to the Lake Bottom Canal at 800 South.	Orem's pond would either be re-graded to provide equal or greater capacity, or it would be eliminated and existing flows would be accommodated in I-15 CORE Pond C-11. Additional flow of 30.9 cfs would be routed through I-15 CORE Pond C-11. The pond would be enlarged and would discharge to the Lake Bottom Canal at the rate negotiated for the I-15 CORE project.
Through UVU campus, east of 800 South to 600 West	The existing storm drain discharges to the Lake Bottom Canal north of 1200 South.	Additional flow of 3.9 cfs would be routed through I-15 CORE Pond C-11. The pond would be enlarged, and would discharge to the Lake Bottom Canal at the rate negotiated for the I-15 CORE project.
Through UVU campus, 600 West to University Parkway	The existing storm drain system discharges to the Lake Bottom Canal.	Additional flow of 3.4 cfs would be discharged to I-15 CORE Pond C-11. The pond would be enlarged and discharge to the Lake Bottom Canal would not increase above the rate negotiated for the I-15 CORE project. As an alternative, sumps may be used in this area with coordination from the city and Utah DEQ regarding water quality.

Table 3.13-5: Proposed Drainage (cont'd)

Preferred Alternative Corridor Segment	Existing Drainage	Proposed Drainage*
University Parkway, 400 West to 800 East	Runoff either flows to an existing dry well system and discharges to groundwater, or discharges to an existing storm drain system between 200 East and 800 East that is routed through a detention basin at Main Street and 1450 South, eventually discharging to Utah Lake.	Additional flow of 9.9 cfs would be added to the existing system. Available capacity in the existing storm drain system would be used as a first preference. The remainder would be discharged to existing or new dry wells.
University Parkway, 800 East to West Union Canal	Runoff is currently conveyed in concrete ditches and storm drain pipes to discharge into the West Union Canal.	Additional flow of 2.1 cfs would be added to the existing system, with approval of the canal company, or it would bypass the canal and discharge to the Provo River.
University Parkway, West Union Canal to the Provo River	Runoff is currently conveyed by gutter or culverts to discharge into the Provo River.	Additional flow of 8.4 cfs would discharge into the Provo River through a conveyance system of storm drain pipes and/or vegetated swales. No detention is planned in this segment.
University Parkway, Provo River to University Avenue	The existing storm drain discharges to Mill Race.	Additional flow of 1.3 cfs would be added to the existing system.
University Parkway, University Avenue to 900 East; 900 East to 100 North	The existing storm drain ties into storm drain line flowing west on 800 North, eventually discharging to the Provo River.	Minor increase in flow from station would be added to the existing drainage system.
700 North	Runoff is currently conveyed by gutter flow to eventually reach a storm drain system and discharge to Mill Race.	Under the Preferred Alternative, an additional flow of 2.5 cfs would be added to the existing system.
University Avenue	The existing storm drain system discharges to Mill Race.	Additional flow of 1.7 cfs would be added to the existing system.
Freedom Boulevard, Town Center Boulevard, and Novell Campus	Storm drain discharges to Mill Race and Utah Lake at Provo Bay.	No additional flow or changes to the existing drainage system.

**Based on conceptual-level engineering design using a 10-year storm event with a 10-minute storm duration*

Surface Water Quality

The main pollutants of concern for surface waters are total dissolved solids, total phosphorus, and other sediments. Total dissolved solids and total phosphorous already exceed water quality standards in Utah Lake. Although roadway runoff is not the main source of these pollutants in Utah Lake, these pollutants are present in roadway runoff. Total dissolved solids may be present in roadway runoff from de-icing materials, vehicle deposits, and pavement wear. Total phosphorous may be present in roadway runoff from sediments. Under the Preferred Alternative, an increase in impervious area would also result in an increase in these potential sources of total dissolved solids and total phosphorous.

Construction activities—such as grading, heavy equipment traffic, stockpiling, and material staging—disturb vegetation and cause erosion. Runoff from disturbed areas could increase suspended sediment loading into receiving waters. Construction activities near the Provo River and various canals could result in temporary impacts to the quality of these surface waters. Construction equipment and materials could leak if not properly handled, which would potentially impact surface waters and groundwater.

The Preferred Alternative could result in a temporary increase in sediment loading during construction, thereby temporarily increasing total phosphorous. However, most of the storm water runoff would be routed through either detention basins or dry wells (see storm water runoff discussion in the Mitigation section below). Detention basins and dry wells improve water quality through sedimentation, infiltration, and adsorption. Total dissolved solids are removed through infiltration and adsorption.

Groundwater

Under the Preferred Alternative, there would be an increase in impervious area and a corresponding increase in storm water runoff and roadway-related pollutants infiltrating the shallow, unconfined aquifer. However, impacts to the principal aquifer are expected to be limited. The topmost of the three confined aquifers comprising the principal aquifer is typically overlain by clay about 50 to 100 feet below ground. Pollutants, including TDS, would be removed through infiltration and adsorption as groundwater flows through the soil.

Although the corridor lies within Zone 2 for three public drinking water sources, the Preferred Alternative would not violate the Drinking Water Source Protection plan and would therefore not result in negative impacts. The Drinking Water Source Protection plan for Orem Well 1 lists Orem City's storm drain dry wells as a potential contamination source for chemicals accidentally or delinquently spilled. Under the Preferred Alternative, no dry wells would be constructed within Zone 2 of Well 1. The Drinking Water Source Protection plan for the BYU Well and the Utilities Well does not list roads or storm drains as potential contamination sources for either well. On the contrary, Provo City's management strategies for protecting groundwater in Zone 2 include the storm drain system that services the area as well as protective ordinances. Additionally, groundwater moves vertically from deeper confined aquifers toward the surface due to vertical hydraulic gradient at these two wells.

Private wells could possibly be impacted under the Preferred Alternative because they are located on land that would be acquired for the project. If a well needs to be relocated, UTA would either purchase the water right or negotiate an agreement with the owner to replace the well.

Floodplains

The Preferred Alternative crosses or is adjacent to floodplains at two locations (see Figure 3.13-4):

- At the University Parkway-Provo River crossing, the proposed bridges (approximately 140 feet long) would span the 100-year floodway. The existing columns in the floodway would be removed and hydraulic capacity would be improved.
- At the interchange at I-15 and University Avenue (Novell Provo campus), one proposed station and a park-and-ride lot would be constructed within the 100-year floodplain. Because this is considered a special flood hazard area, UTA must obtain a development permit from Provo City prior to construction.

Mitigation

This section identifies the potential mitigation measures for the Preferred Alternative.

Mitigation Measures for Increases in Storm Water Runoff

To reduce the peak flow, the proposed drainage design for the Preferred Alternative would include routing storm water runoff through detention basins where feasible. The 75.2 cfs total increase in storm water runoff would be discharged to detention basins, dry wells, or surface waters as follows:

- 45.7 cfs to detention basins (reduced to 4.6 cfs)
- 13.2 cfs to dry wells
- 16.3 cfs directly to surface waters

Detention basins store runoff and release it at a slower rate. Through detention, the 45.7 cfs would be reduced to roughly 4.6 cfs. The 13.2 cfs increase discharged to dry wells would infiltrate into the groundwater. Therefore, the total increase in storm water runoff that would be discharged to surface waters would be 20.9 cfs (16.3 cfs discharged directly plus 4.6 cfs routed through detention basins).

Mitigation Measures for Surface Water Quality

The following best management practices would be implemented as part of the Preferred Alternative to mitigate impacts to surface waters:

- Detention basins would improve water quality in addition to reducing peak flows.
- Plan elements for permanent storm water runoff control and treatment would be submitted to DWQ if end of pipe discharges exceed 5 cfs for any new construction of a storm drain. Plan elements would be determined during final design and may include features such as oil/water separators, vegetated swales, infiltration basins, etc.
- The contractor would not use any fill material that may leach organic chemicals (e.g., discarded asphalt) or nutrients (e.g., phosphate rock) into the receiving water.

Mitigation Measures for Temporary Impacts to Water Quality

Mitigation for temporary construction impacts would be addressed through UPDES permit requirements and through the use of best management practices.

Mitigation Measures for Impacts to Groundwater Quality

The following best management practices would be implemented as part of the Preferred Alternative to mitigate impacts to groundwater:

- No dry wells would be constructed in Drinking Water Source Protection Zones 1 or 2 for Orem Well 1, as shown on Figure 3.13-3.
- Underground injection control inventory forms for storm water dry wells would be filed with the underground injection control coordinator at DWQ prior to construction.
- If a well is impacted, UTA would purchase the water right or the lands associated with the water right or would replace the well. If a well needs to be abandoned, it would be abandoned by a licensed individual in accordance with Utah Administrative Code 655-4-12.

Mitigation Measures for Impacts to Floodplains

Mitigation for impacts to floodplains would be addressed through coordination with Orem City and Provo City, and would include the following:

- The project would conform to the Flood Damage Prevention Ordinance adopted by the Cities of Orem and Provo.
- A development permit would be obtained before construction or development begins within any special flood hazard area (100-year floodplain).

The project would not result in an increase in flood levels during the occurrence of the base flood to any special flood hazard area.

Permits and Approvals

Table 3.13-6: Permits and Approvals describes the likely water quality permits and approvals necessary for implementation of the Preferred Alternative:

Table 3.13- 6: Permits and Approvals

Agency	Permit/Approval Required	Description
USACE	Section 404 Permit	A Section 404 permit would be required for wetland impacts near the Provo River as discussed in Section 3.12. A Section 404 permit may be required for impacts to man-made canals if USACE determines that a permit is required. Coordination during the design phase with USACE and the Division of Water Rights would be required to determine the appropriate permit(s).
Division of Water Rights	Stream Alteration Permit	A state stream alteration permit would be required for impacts to the Provo River.
DWQ	Section 402 UPDES Storm Water General Permit	Development of a storm water pollution prevention plan and temporary erosion control plan would be required during design phase. Filing of notice of intent would be required prior to construction.

Table 3.13-6: Permits and Approvals (cont'd)

Agency	Permit/Approval Required	Description
DWQ	Section 402 UPDES General Permit for Construction Dewatering	May be required if there are any dewatering activities during construction.
DWQ	Underground Injection Control Inventory	Underground injection control inventory forms for storm water dry wells must be filed with an underground injection control coordinator prior to use (found at www.waterquality.utah.gov/UIC/UICInvInf/UtahUICInvInfFrms.htm).
Provo City	Floodplain Development Permit	A floodplain development permit would be obtained before construction or development begins within any special flood hazard area (100-year floodplain).

3.14 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

Regulatory Setting, Studies, and Coordination

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—now commonly referred to as Superfund—created regulatory statutes for cleanup requirements and provided liability to persons involved in hazardous waste releases. CERCLA authorizes the EPA to act if there is an imminent threat from hazardous waste (EPA 2008a). Sites listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database are under investigation by the EPA and could potentially become National Priorities List (NPL) sites. Only 1 percent of sites listed in the CERCLIS database actually become NPL sites (Christiansen 2008). Underground storage tanks (USTs) are regulated by the Utah Division of Environmental Response and Remediation (DERR), a division of the Utah DEQ.

Affected Environment

The study area for hazardous waste sites is within one-quarter mile of the project corridor.

The hazardous materials analysis utilized information from existing federal and state online databases: EnviroMapper; the EPA's Envirofacts Warehouse database; DERR's UST/leaking underground storage tank (LUST) list and interactive map; the NPL database; the CERCLIS database; and the Utah Automated Geographic Reference Center database. These databases were used to determine the location of potential hazardous sites. Specifically, the federal databases were used to locate NPL sites and CERCLIS sites within one-quarter mile of the project corridor, and the state databases were used to locate UST and LUST sites within one-quarter mile of the project corridor. Both the NPL sites and CERCLIS sites are regulated by the EPA, while UST and LUST sites are state regulated.

A visual reconnaissance of the study area was conducted on September 5, 2008, to verify the location of identified UST, LUST, and CERCLIS sites within the study area. Based on the online database research and visual reconnaissance, 27 hazardous waste sites were identified within the study area. Four open UST sites are located directly adjacent to the proposed corridor. They are described in Table 3.14-1: Hazardous Materials Sites with Potential for Impacts, and shown on Figure 3.14-1: Hazardous Materials.

Table 3.14-1: Hazardous Materials Sites with Potential for Impacts

No.	Name	Address	City	Facility ID	Type	Notes
1	Sunmart #861	1320 S. State St.	Orem	1000084	Open UST	Gas Station
2	Sinclair #43036	795 W. 1200 S.	Orem	1000455	Open UST	Gas Station
3	Stadium Chevron Extra Mart #50	1645 N. Canyon Rd.	Provo	1000087	Open UST	Gas Station
4	7-Eleven 1852-26749	496 N. University Ave.	Provo	1000296	Open UST	Gas Station

There are no No Further Remedial Action Planned sites near the project right-of-way. Additional details about the sites that do not pose potential for concern can be found in the Hazardous Materials and Hazardous Waste Technical Report (August 2010).

Environmental Consequences

This section addresses the potential environmental consequences resulting from hazardous waste sites for the No-Action Alternative, Enhanced Bus Alternative, and the Preferred Alternative.

No-Action Alternative

Because no construction would occur under the No-Action Alternative, there would be no threat of encountering contamination from any of the listed hazardous waste sites.

Enhanced Bus Alternative

Because no construction would occur under the Enhanced Bus Alternative, there would be no threat of encountering contamination from any of the listed hazardous waste sites.

Preferred Alternative

Four UST sites are located directly adjacent to the proposed corridor, and therefore could pose a contamination risk during construction.

Mitigation

If a contaminant from a UST or LUST is encountered during construction, UTA would take appropriate measures to remove the affected material. Disposal of hazardous waste must be carried out in accordance with the Utah DEQ and EPA. The project construction team will be aware of the locations of and seek to avoid the four identified USTs.

3.15 UTILITIES

Regulatory Setting, Studies, and Coordination

Utilities are protected under federal law and FHWA regulations in Title 23 of the U.S. Code and in the CFR. These laws and regulations govern how utilities may be used in public highway right-of-way.

Affected Environment

The study area for identifying utilities extended to the project impact line, a 10-foot buffer from the farthest edge of the preliminary design. Table 3.15-1: Utilities within the Study Area lists each utility line identified to date that either crosses or runs parallel to the transit corridor. The table is divided into utility types and municipal, agency, and private companies. The identification of impacts to utilities will be updated throughout the environmental and design process as more detailed utility information is gathered from survey locating, potholing, and other methods.

Table 3.15- 1: Utilities within the Study Area (Identified to Date)

Owner	Utility Type	Total No. of Utilities
Municipality		
American Fork City	Fiber	17
Orem City	Water	34
	Sewer	20
	Power	14
	Fiber	20
Provo City	Water	63
	Sewer	39
	Power	71
	Fiber	0
Total	**N/A**	**278**
Agency		
UDOT	Fiber	11
Utah County	Fiber	4
UVU	Fiber	10
Total	**N/A**	**25**
Private Companies		
Centracom Interactive	Fiber	16
Comcast Cable	Fiber	30
XO Communications	Fiber	2
UTOPIA	Fiber	N/A
Integra	Fiber	13
MCI	Telecommunications	11
AT&T	Telecommunications	N/A
Qwest	Telecommunications	73
Questar Gas	Gas	79
Rocky Mountain Power	Electric	35
Total	**N/A**	**258**

Environmental Consequences

The potential impact to utilities was assessed for the No-Action Alternative, the Enhanced Bus Alternative, and the Preferred Alternative. If a potential impact was identified, a level of impact was determined. The level of impact was used to measure what type of mitigation would be required. The levels of impact are defined as follows:

- High: The utility is directly in conflict with the proposed construction and would need to be removed and relocated outside of the conflict area.
- Medium: The utility is impacted by construction limits and requires treatment such as casing extension, new casing installation, lowering, or other adjustments. The utility would remain in the same location.
- Low: The utility is minimally impacted or not impacted by construction. In many cases, the utility would need to be protected during construction, but no additional measures would be needed.

No-Action Alternative

The No-Action Alternative would not impact any utilities.

Enhanced Bus Alternative

The Enhanced Bus Alternative would not impact any utilities.

Preferred Alternative

The Preferred Alternative would affect several utilities. Table 3.15-2: Level of Utility Impact, on the following page, lists the utilities that are potentially affected and the level of impact for each utility. Additional utility conflicts may be identified as project design progresses.

Mitigation

This section discusses the type of mitigation necessary for high, medium, and low levels of impact. Several utility impacts listed above might be avoided during the final design of the project. UTA would consult with all utility providers that would be affected by construction activities, and the construction contractor would coordinate with all utility providers to minimize interruptions to utility service.

High Impact

Utilities identified as high impact would require relocation outside of the proposed design of the transit corridor.

Medium Impact

For utilities identified as medium impact, various methods would be used to protect the utility line during construction. These methods include casing the utility line to protect it, adjusting the height of the utility line, or adjusting the grading around the utility line.

Low Impact

Utilities identified as low impact would require no mitigation or would require protection of the utility only during construction.

Table 3.15- 2: Level of Utility Impact

Owner	Utility Type	High (No. of Utilities)	Medium (No. of Utilities)	Low (No. of Utilities)
Municipality				
American Fork City	Fiber	13	2	2
Orem City	Water	6	5	23
	Sewer	4	2	14
	Power	14	0	0
	Fiber	12	3	5
Provo City	Water	3	19	41
	Sewer	4	8	27
	Power	34	4	33
	Fiber	0	0	0
Total	**N/A**	**90**	**43**	**145**
Agency				
UDOT	Fiber	9	0	2
Utah County	Fiber	0	1	3
UVU	Fiber	0	5	5
Total	**N/A**	**9**	**6**	**10**
Private Companies				
Centracom Interactive	Fiber	12	2	2
Comcast Cable	Fiber	7	2	21
XO Communications	Fiber	2	0	0
UTOPIA	Fiber	N/A	N/A	N/A
Integra	Fiber	7	0	6
MCI	Telecommunications	1	3	7
AT&T	Telecommunications	N/A	N/A	N/A
Qwest	Telecommunications	7	4	62
Questar Gas	Gas	13	6	60
Rocky Mountain Power	Electric	16	2	17
Total	**N/A**	**65**	**19**	**175**

3.16 ENERGY AND MINERAL RESOURCES

Regulatory Setting, Studies, and Coordination

NEPA regulations require an EA to address energy and natural or depletable resources, the conservation potential of various alternatives, and applicable mitigation measures (40 CFR 1502.16(e)(f)).

Affected Environment

Mineral Resources

For the purpose of this analysis, mineral resources include the presence of existing mines and the potential for the presence of mineral commodities including, but not limited to, metals (such as iron and copper) and construction materials (sand and gravel).

According to the Utah Department of Natural Resources' (UDNR) Utah Abandoned Mine Reclamation Program, there are no abandoned mines in the study area. The Utah Abandoned Mine Reclamation Program has not performed an inventory of the area, but given the area's location, history, and urbanization, UDNR does not expect mines in or near the study area (Utah Division of Oil, Gas & Mining 2008). UDNR stated it has reviewed its Utah Mineral Occurrence System database and publications on the area by the Utah Geologic Survey, and found minimal commercial mineral deposits in the project area. In areas surrounding Utah County, scattered clay and sand pits have been developed, but given the level of urban development along the project corridor, UDNR does not foresee development of these resources in the future (UGS 2008b).

The Utah Valley area has been identified as an area of low to moderate temperature geothermal resource potential. The location of the most favorable geothermal areas has not been delineated, but future development of these resources may occur for local space heating of individual properties (UGS 2008b).

Minimal mineral resources are located within the study area and the Utah Division of Oil, Gas and Mining reports no oil or gas issues or concerns within the project study area (UGS 2008a).

Environmental Consequences

No-Action Alternative

There would be no impacts to energy or mineral resources under the No-Action Alternative.

Enhanced Bus Alternative

The Enhanced Bus Alternative would have the same effects as the No-Action Alternative.

Preferred Alternative

No impacts to energy or mineral resources are expected under the Preferred Alternative.

3.17 PUBLIC SAFETY AND SECURITY

Regulatory Setting, Studies, and Coordination

This section is consistent with FTA's guidance for addressing public safety and security in environmental analysis and review.

Affected Environment

Police and Fire Protection Facilities

Two cities and two universities are directly adjacent to the BRT corridor and provide police services and/or fire protection for their respective jurisdictions.

In addition to the protection services described below, UTA has adopted a safety ordinance that establishes fare-enforcement, parking facility safety, and orderly conduct along its corridor through the use of public safety officers. These UTA security officers work closely with the local municipalities to respond to criminal activities and to prevent security risks.

Orem City

Orem City provides the primary response to 911 calls within the city limits from its main police station at 95 East Center Street. Typical shifts are divided into three areas: north, south, and central Orem. Orem also provides fire protection for the project corridor from Fire Station 1 at 300 East and 1000 South (Edwards 2008).

Provo City

Provo City's police department provides protection from one central police station at 48 South and 300 West. Provo's fire department responds from five fire stations: Station 1 at 80 South and 300 West, Station 2 at 2737 North Canyon Road, Station 3 at 601 West Columbia Lane, Station 4 at 95 South 2050 West, and Station 5 at 275 South and 700 East (Riley 2008).

BYU

BYU provides police protection on campus grounds. BYU Police operates from one station on the university campus (BYU 2008).

UVU

UVU also provides police service on its campus. UVU Police operates from one station on the university campus (UVU 2008).

Schools

Schools generate a large amount of pedestrian traffic, especially near school crossing zones and designated crosswalks over roadways. These areas are a potential safety concern and have been identified within the study area. There are 10 elementary schools, eight high schools, and two K–12 schools within the study area. Two universities, BYU and UVU, are also located in the study area. A complete list of the schools and their addresses is provided below in Table 3.17-1: Schools within the Study Area.

Table 3.17- 1: Schools within the Study Area

School	Address	City
Vineyard Elementary	950 W. 800 S.	Orem
Hillcrest Elementary School	651 E. 1400 S.	Orem
Westmore Elementary School	1150 S. Main Street	Orem
Lakeridge Junior High	951 S. 400 W.	Orem
East Shore High	1551 W. 1000 S.	Orem
Utah County Academy of Science (High)	940 W. 800 S.	Orem
Cherry Hill School (Elementary)	250 E. 1650 S.	Orem
Alpine Life and Learning Center (High)	1551 W. 1000 S.	Orem
UVU	800 W. University Parkway	Orem
Provo High School	1125 N. University Ave.	Provo
Discovery Academy (High)	105 N. 500 W.	Provo
The Journey (High)	1991 N. State Street	Provo
Central Utah Enterprises (High)	1170 S. 350 E.	Provo
Franklin Elementary	350 S. 600 W.	Provo
Timpanogos School (Elementary)	449 N. 500 W.	Provo
Wasatch School (Elementary)	1080 N. 900 E.	Provo
Oakridge School (Elementary)	1165 Birch Lane	Provo
Meridian School (K-12)	931 E. 300 N.	Provo
Kimber Academy (K-12)	85 Eastbay Blvd.	Provo
Joaquin Elementary	550 N. 600 E.	Provo
BYU	1600 S. University Ave.	Provo

Environmental Consequences

No-Action Alternative

No public safety and security impacts are anticipated as a result of the No-Action Alternative.

Enhanced Bus Alternative

No public safety and security impacts are anticipated as a result of the Enhanced Bus Alternative.

Preferred Alternative

Under the Preferred Alternative, emergency response times are not likely to be affected, and emergency vehicles may utilize the BRT corridor. Additionally, the new stations proposed as part of the Preferred Alternative would be well-lit to deter criminal activities, and UTA will utilize its security patrol as it does on other corridors.

The impact of the Preferred Alternative on existing crosswalks is discussed in Chapter 4: Transportation Systems. The Preferred Alternative would not interfere with existing school zone crosswalks. BRT service would abide by active warning signals and devices as well as crossing guards in the corridor. Also, the proposed station locations near UVU and BYU would provide additional pedestrian crosswalks near these campuses.

No public safety and security impacts are anticipated at railroad crossings as a result of the Preferred Alternative.

Mitigation

Overall, there would be no negative impacts to public safety and security as a result of the alternatives; therefore, no mitigation is proposed.

3.18 CONSTRUCTION IMPACTS

No-Action Alternative

There would be no construction impacts associated with the No-Action Alternative.

Enhanced Bus Alternative

No construction impacts are anticipated under the Enhanced Bus Alternative.

Preferred Alternative

Construction impacts are defined as impacts that are likely to occur during construction of the Preferred Alternative and are generally temporary in nature, lasting for short durations. Construction impacts and mitigation are discussed below for the following resources:

- Economic
- Historic Properties
- Paleontological Resources
- Air Quality
- Noise and Vibration
- Water Quality
- Hazardous Materials
- Traffic

Impacts and mitigation for impacts to biological resources related to construction activities are discussed in Section 3.12: Biological Resources.

Economic

Disruption in business activity during construction could result in temporary economic impacts. These impacts could consist of reduced sales and/or loss of business as a result of the inconvenience to traveling motorists, the restricted access to adjoining properties, utility disruption, the safety, and/or the unsightly appearance of construction activities in the area. Mitigation is discussed under the traffic subheading of this section.

Historic Properties

No historic properties would experience adverse effects from construction of the Preferred Alternative. All 22 NRHP-eligible historic buildings, the historic district, four linear historic resources, and one archaeological site affected by the Preferred Alternative would experience either minor strip takes of land or would have their existing crossings (for railroads and canals) modified slightly. None of these impacts would be considered adverse. That is, they would not affect the NRHP eligibility of the affected properties. During construction, additional historic properties might be discovered other than those already identified.

Mitigation

In accordance with 36 CFR 800.13(b), the project team would provide for the protection, evaluation, and treatment of any historic property discovered prior to or during construction.

Paleontological Resources

Although no paleontological resources have been identified in the study area, paleontological resources could be discovered during earth-disturbing construction activities.

Mitigation

If paleontological resources are discovered during construction, the contractor would immediately suspend construction operations in the vicinity of the discovery and must notify the on-site engineer.

Air Quality

Construction activities could result in short-term impacts to ambient air quality. These potential impacts include direct emissions from construction equipment and trucks, increased emissions from motor vehicles on the streets due to disruption of traffic flow, and fugitive dust emissions. These impacts would be temporary, and would affect only the immediate vicinity of the construction sites and their access routes. Emissions from project-related construction equipment and trucks would be much less than the total emissions from other industrial and transportation sources in the region, and therefore, are expected to be insignificant with respect to compliance with the NAAQS.

The Preferred Alternative would involve construction activities and equipment to support construction of primarily new roadbed and bridges along the project corridor as well as the upgraded intersections.

Roadway traffic disruption due to lane closures, detours, and construction vehicles accessing the sites could cause congestion, which could increase motor vehicle exhaust emissions. Fugitive dust emissions could occur during demolition, ground excavation, material handling and storage, movement of equipment at the site, and transport of material to and from the site. Fugitive dust would most likely be a problem during periods of intense activity and would be accentuated by windy and/or dry weather conditions.

Mitigation

All contractors are required to prepare and follow a Fugitive Dust Control Plan in compliance with Rule R307-205, Emission Standards: Fugitive Emissions and Fugitive Dust. The Dust Control Plan would employ such control measures as:

- Minimizing land disturbance by setting up designated staging areas
- Using watering trucks to minimize dust
- Creating site-specific traffic management plans
- Revegetating any disturbed land not used

These measures would be in accordance with the project's goal to achieve sustainability provisions whenever possible, minimizing project impacts to the community.

Noise and Vibration

Noise levels from construction activities along the project corridor, though temporary, could be a nuisance at nearby sensitive receptors like residences and schools. Noise levels during construction are difficult to predict and vary depending on the types of construction activity and the types of equipment used for each stage of work. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns and is not usually at one location very long. Project construction activities could include relocating utilities and constructing stations.

Construction normally occurs during daylight hours when some residents are not at home, when residents who are at home are less sensitive to construction activities, and when other community noise sources contribute to higher ambient noise levels. Since none of the receptors along the project corridor are expected to be exposed to construction noise for a long time, extended disruption of normal activities is not expected.

Construction noise differs from transit noise in the following two ways:

- Construction noise lasts for the duration of the construction contract and it is usually limited to daylight hours when most human activity occurs. Construction activities are generally of a short duration and, depending on the nature of construction operations, could last from seconds (such as for a truck passing by) to months (such as when constructing a tunnel under railroad tracks).
- Construction noise is also intermittent and depends on the type of operation, location, and function of the equipment as well as the equipment usage cycle. Transit noise, on the other hand, is present in a more continuous fashion after construction activities are completed.

Mitigation

To reduce temporary construction noise and vibration impacts expected along the project corridor, several "good housekeeping" practices are recommended. For example, the following noise- and vibration-control measures would be considered during construction:

- Comply with local noise ordinances.
- Use alternative construction methods that avoid impact pile driving near noise- and vibration-sensitive receptors like residences, schools, and hospitals. Whenever possible, UTA would consider using drilled piles or sonic/vibratory pile drivers to reduce excessive vibration.
- Erect temporary noise barriers between noisy activities and noise-sensitive receptors.
- Establish equipment and material staging areas away from sensitive receptors.
- Reroute construction traffic along roads to reduce impacts at nearby sensitive receptors.
- Require contractors to use best available control technologies to limit excessive noise and vibration at nearby residences.
- Whenever possible, conduct all construction activities between 7 a.m. and 10 p.m. in accordance with Provo City's and Orem City's noise-control ordinances.
- Adequately notify the public of construction operations and schedules. Methods such as construction-alert publications could be used to handle complaints quickly.

Water Quality

There is the potential for impacts to water quality during construction of the Preferred Alternative. Specifically, construction activities near the Provo River, West Union Canal, and the Lake Bottom Canal could result in water quality impacts.

Mitigation

Mitigation for temporary construction impacts would be addressed through UPDES permit requirements and through the use of best management practices as outlined below:

- Best management practices for erosion control would be used where appropriate to keep sediment-laden runoff from leaving the construction site.
- Runoff would be diverted away from exposed soil.
- The contractor would obtain coverage under the UPDES Storm Water General Permit for Construction Activities.
- An erosion control plan and storm water pollution prevention plan including a spill prevention and response plan would be developed and incorporated into construction documents.
- If necessary, the contractor would obtain coverage under the UPDES General Permit for Construction Dewatering.
- Existing vegetation, including wetland and riparian areas, would be protected by preventing disturbance beyond specified construction limits.
- Disturbed areas would be stabilized and revegetated.
- Where possible, materials and equipment would be staged away from stream banks and located in areas that minimize impacts to existing vegetation.
- The contractor would notify DWQ if turbidity in adjacent surface water is visibly increased as a direct result of the project.
- The contractor would protect any potentially affected fish spawning areas from construction impacts.
- The contractor would adhere to stream alteration and Section 404 permit requirements.

Hazardous Materials

Hazardous waste sites could be encountered during construction of the Preferred Alternative.

Mitigation

Disposal of hazardous waste must be carried out in accordance with Utah DEQ and EPA regulations. If soil or groundwater containing regulated contaminants is encountered during construction, coordination with DERR and the Utah Division of Solid and Hazardous Waste would be pursued. If contaminant concentrations in soil or water exceed state or federal action levels, the sites involved would be evaluated for appropriate response actions. All actions would be coordinated with the appropriate state and federal agencies.

Traffic

Area residents and commuters may experience temporary impacts while traveling along the proposed Preferred Alternative route during construction. Likely traffic impacts would include business and residential access, traffic delays, rerouting, and temporary lane closures. While all access along the route would be maintained during construction, some accesses to businesses and residences could be altered during construction. Access to special events such as the Freedom parade on the 4th of July, BYU football games, etc., could be impacted during construction.

Mitigation

UTA contractors would develop and implement a traffic management plan during construction to ensure access to residences, businesses, community facilities and services, and local roads. Construction signs indicating access points and signs indicating that businesses are still open would be used to reduce construction impacts to businesses along the corridor. Construction sequencing and activities would be coordinated with emergency service providers to minimize delays and response times during construction. A public involvement plan would be developed prior to construction to notify area residents and commuters regarding traffic delays, rerouting, and temporary lane closures. Public involvement activities during construction may include door-to-door visits to business owners along the project corridor, distribution of fliers throughout the project area, development of a project Website providing up-to-date construction information, and maintenance of a project hotline.

3.19 CUMULATIVE IMPACTS

Introduction

All resources were analyzed to determine cumulative impacts associated with the Preferred Alternative. In accordance with the Council on Environmental Quality guidance referenced below, this cumulative impact analysis assesses the past, ongoing/present, and reasonably foreseeable cumulative impacts to these resources from other actions. Agency scoping and public comments received during the scoping process were also considered.

Regulatory Setting, Studies, and Coordination

Council on Environmental Quality regulations (40 CFR 1500 to 1508) require an assessment of cumulative impacts. These regulations ensure that the proposed Provo-Orem Bus Rapid Transit Project and other federal, state, and private actions will be evaluated with regard to cumulative effects. The Council on Environmental Quality regulations found in 40 CFR 1508.7 define cumulative effects as follows:

> The impact on the environment [that] results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cumulative Impacts Analysis

Important Cumulative Impacts Issues

Based on scoping and the impacts analysis completed for each resource, air quality and wetland resources were identified for the cumulative impacts analysis. While the air quality analysis for this project shows no impact, Utah County is an EPA-designated non-attainment area.

County boundaries are the regulatory boundaries most often used to discuss air quality. For the purposes of this section the geographic scope is Utah County due to the location of the study area. The timeframe for this analysis is approximately 1976 to 2007, based on available data from the Utah Division of Air Quality's 2007 Annual Report. The timeframe for future analysis extends from present day to the reasonably foreseeable year of 2030.

The Utah County boundary was also utilized to discuss noise. Since the rapid development of Utah County from 1850 until present day, the once relatively undisturbed sounds of nature have been increasingly impacted by development. The timeframe extends to the reasonable foreseeable future of 2030.

The geographic boundary for wetlands includes the Salt Lake, Utah, and Tooele valleys. These three valleys were selected because they are frequented by migratory birds that use the wetlands as feeding and resting areas during migration and because a decrease in wildlife habitat and wetlands in one county could affect bird and other local wildlife populations in other counties. Similar to noise, the time frame extends from approximately 1850 to 2030.

Past Actions

Since the settlement of Provo in 1849, Utah County has experienced major urbanization, resulting in residential, commercial, and industrial developments. It has also experienced the conversion of farmland to other uses. Rapid population expansion began in 1850 with the establishment of several new settlements in Utah Valley: Alpine, American Fork, Lehi, Payson, Pleasant Grove, and Springville (Holzapfel 1999). According to the 1850 Census, Utah County had a population of approximately 2,000. With continued urban expansion, the population has grown dramatically to approximately 520,000 in 2007 (Governor's Office of Planning and Budget, no date b).

This growth has caused a loss of farmlands, wetlands, and wildlife habitat, as well as degradation of air and water quality. The aggregate environmental effects of past actions in the study area are reflected in the current affected environment, as described in each section of this chapter.

Present and Reasonably Foreseeable Actions

Present and reasonably foreseeable future actions include ongoing development activities and transportation projects. Table 3.19-1: Present and Reasonably Foreseeable Actions describes current transportation projects and notable residential and commercial developments in Provo and Orem. While approved developments appear limited, a number of proposed developments are currently in early phases of the planning process. Development is expected to continue to occur in and around the study area through the year 2030.

Table 3.19- 1: Present and Reasonably Foreseeable Actions

Project or Activity	Description	Project Status	Impacts*
Transit			
FrontRunner Commuter Rail Alignment	Commuter rail from Salt Lake City to Provo	Construction	Project conforms to SIP
Provo and Orem Intermodal Centers	Independent facilities	Final Design	Project conforms to SIP
Roadway			
Mountain View Corridor	Create new highway and transit corridors in Salt Lake and Utah counties	Construction	1. Air Quality – Project conforms to SIP 2. Wetlands – Approx.151 acres
Pioneer Crossing	Build new road north of Utah Lake from Redwood Road to I-15	Recently completed	1. Air Quality – Project conforms to SIP 2. Wetlands – 3.6 acres
I-15 Corridor (Utah County)	Capacity and safety improvements to I-15 in Utah County	Construction	1. Air Quality – Project conforms to SIP 2. Wetlands – 39.64 acres
SR-92 Construction	Widen to four 12-foot lanes and add a 14-foot median and 8-foot shoulders for approximately 1.25 miles. The median is continuous. Another 12-foot lane will be added to the southbound off-ramp. The lane will be added toward the interstate. A third lane will be added near the bottom or at the end of the ramp at SR-92.	Construction	1. Air Quality – Project conforms to SIP 2. Wetlands – 0 to 1 acre
Geneva Road	Widen existing Geneva Road from 800 North in Orem to Center Street	Construction	1. Air Quality – Project conforms to SIP 2. Wetlands – Approx.1.22 acres
Vineyard Connector	The study area includes the area east of Utah Lake and west of I-15; from about Center Street in Orem on the south to the I-15 interchange at American Fork Main Street on the north. The study area includes the cities of American Fork, Lindon, Vineyard, and Orem.	Corridor Preservation/ Future Construction	1. Air Quality – Project conforms to SIP 2. Wetlands – 1.43 acres
State Street	Improve intersections and widen State Street from 200 North in Orem to 100 East in American Fork	In design	1. Air Quality – Project conforms to SIP

**SIP = State Implementation Plan*

Table 3.19-1: Present and Reasonably Foreseeable Actions (cont'd)

Project or Activity	Description	Project Status	Impacts*
Roadway			
Airport Road	Build new road from I-15 to Provo Airport or Center Street	Planning	1. Air Quality – Project conforms to SIP
SR-89, State Street Railroad Bridge Pleasant Grove	Widen State Street and replace railroad bridge	Construction Complete	1. Air Quality – Project conforms to SIP 2. Noise – impacts to two residences
Springville Interchange	Improve interchange on SR-77	Construction Complete	1. Air Quality – Project conforms to SIP
Trails			
Provo Reservoir Canal Trail	Open space/pedestrian trail corridor, 10-foot asphalt trail; assumed crossing on reconfigured SR-92 overpass crossing	Planning	1. Air Quality – Project conforms to SIP
SIP = State Implementation Plan			

Cumulative Impacts

Air Quality

Past Trends

Despite rapid growth and development, air quality in Utah has improved in the past 25 years due to more rigorous guidelines for vehicle emissions and industry. During the 1980s, the health standards for four of the six "criteria pollutants" identified by the EPA were violated in one or more Utah counties. Those pollutants included:

- CO
- O_3
- Particulate Matter ($PM_{2.5}$ and PM_{10})
- SO_2

Figures 3.19-1 through 3.19-5, on the following pages, show the historic trends for five of the six criteria pollutants along the Wasatch Front. Lead is omitted from the charts below. Leaded gasoline was phased-out by the end of 1995, and lead from this source is no longer a significant problem (Utah Department of Air Quality 2008).

Utah County has had trouble meeting the NAAQS in the past. In 1990, the EPA designated Utah County as a non-attainment area for CO and PM_{10}. In 2006, the EPA re-designated Utah County as an attainment area for CO; however, a re-designation is currently pending for PM_{10}. On March 29, 2007, the EPA issued a rule defining requirements for state plans. These regulations require states to clean the air in areas with levels of fine particle pollution, specifically $PM_{2.5}$, that do not meet national air quality standards. In October 2009, portions of Salt Lake and Utah counties were designated as non-attainment areas under the revised $PM_{2.5}$ (35 micrograms per cubic meter) standard. Conformity to the new standard will be required in 2011.

Figure 3.19- 1: Nitrogen Annual Averages

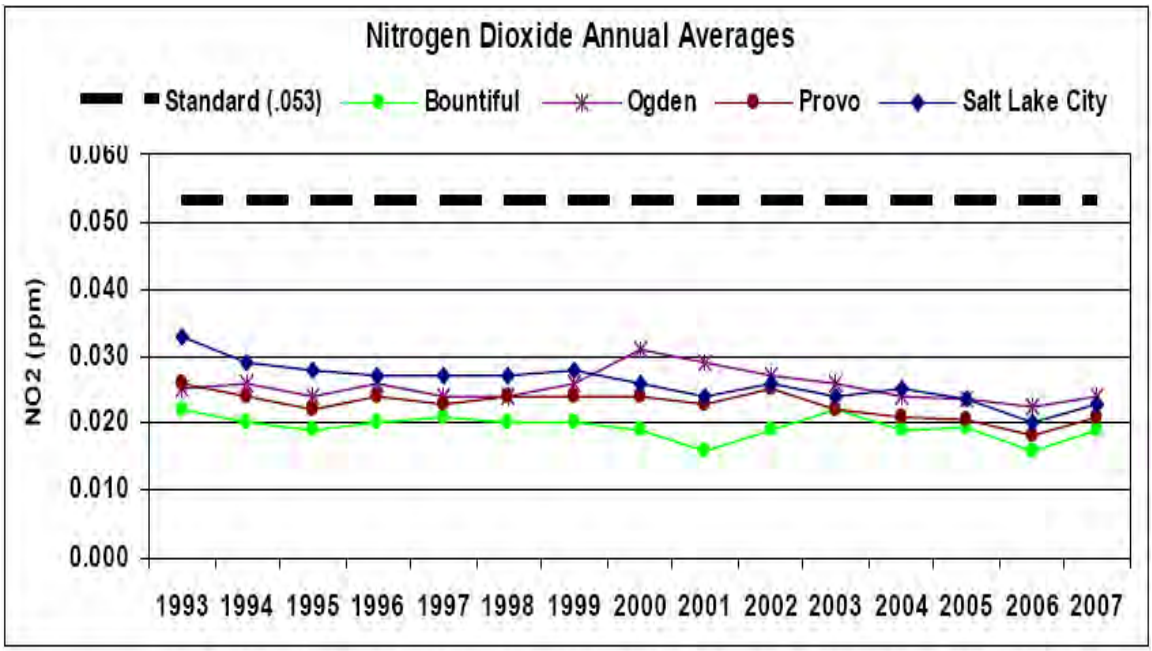


Figure 3.19- 2: Three-Year Average, 8-Hour O_3 Concentration

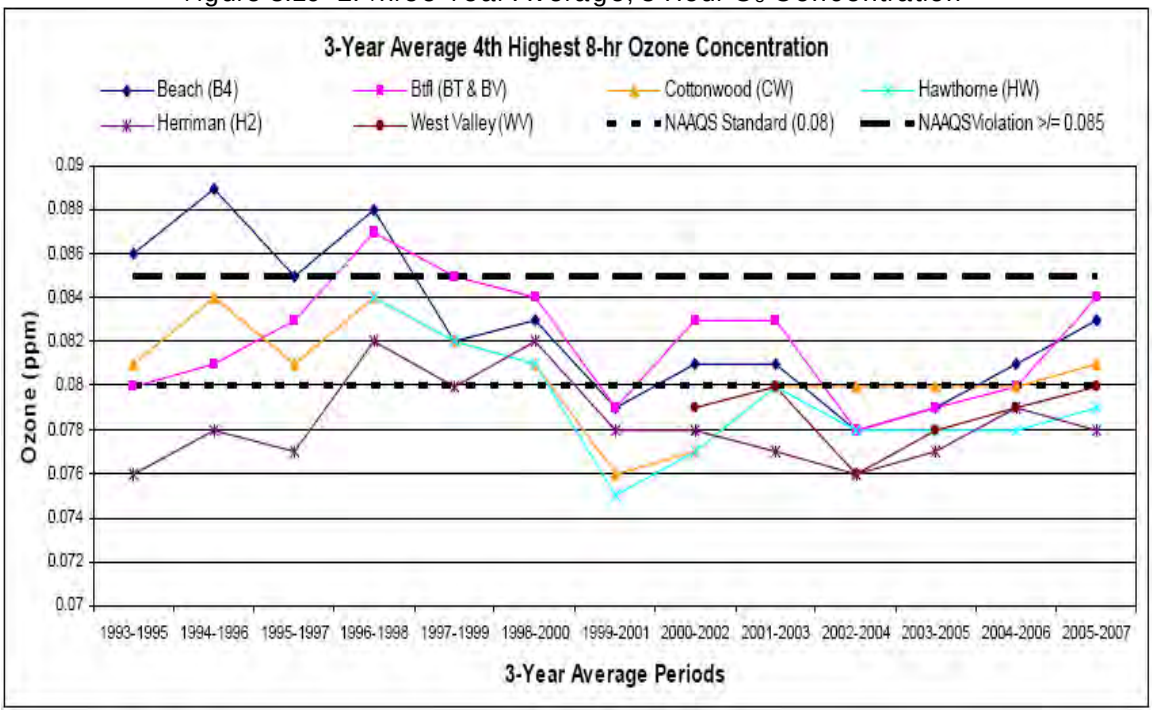


Figure 3.19- 3: PM_{10} Highest 24-Hour Concentration

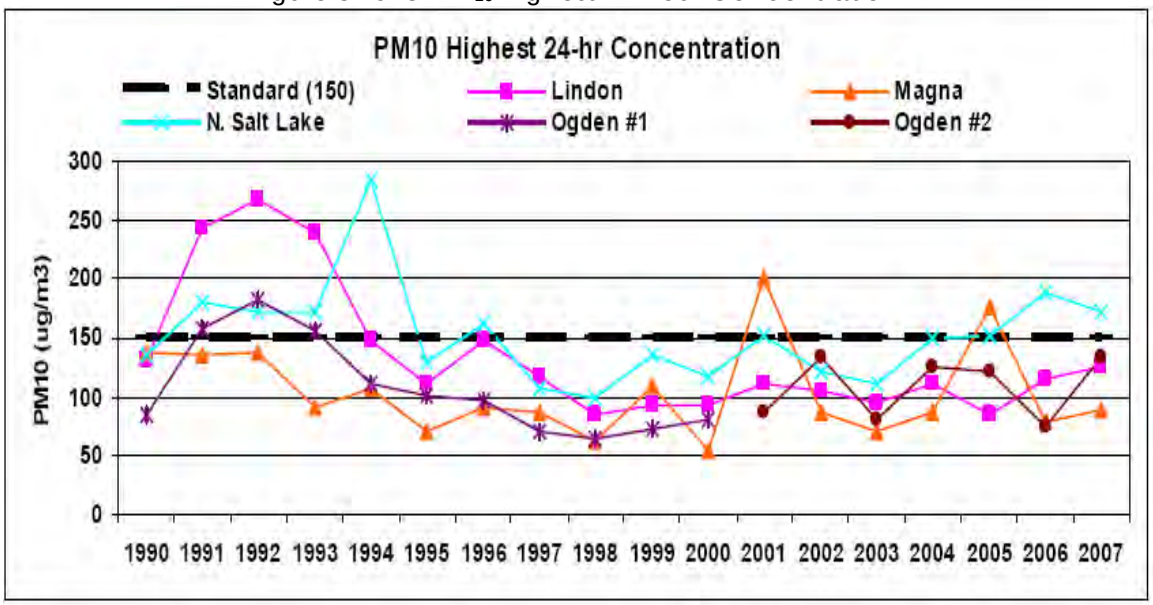


Figure 3.19- 4: $PM_{2.5}$ Three-Year Average of 98th Percentile of 24-Hour Concentration

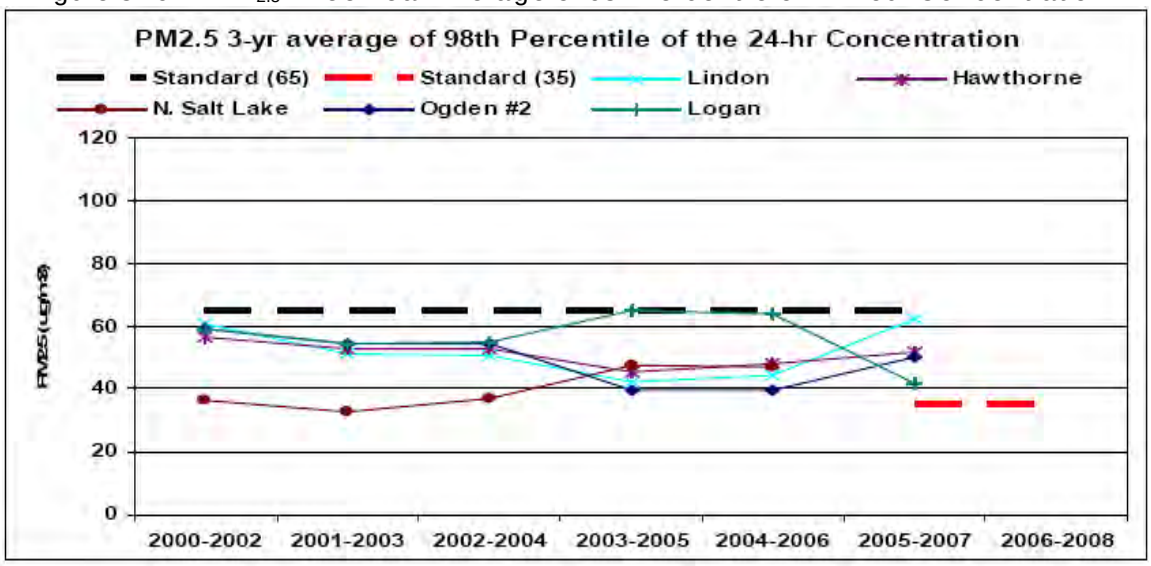
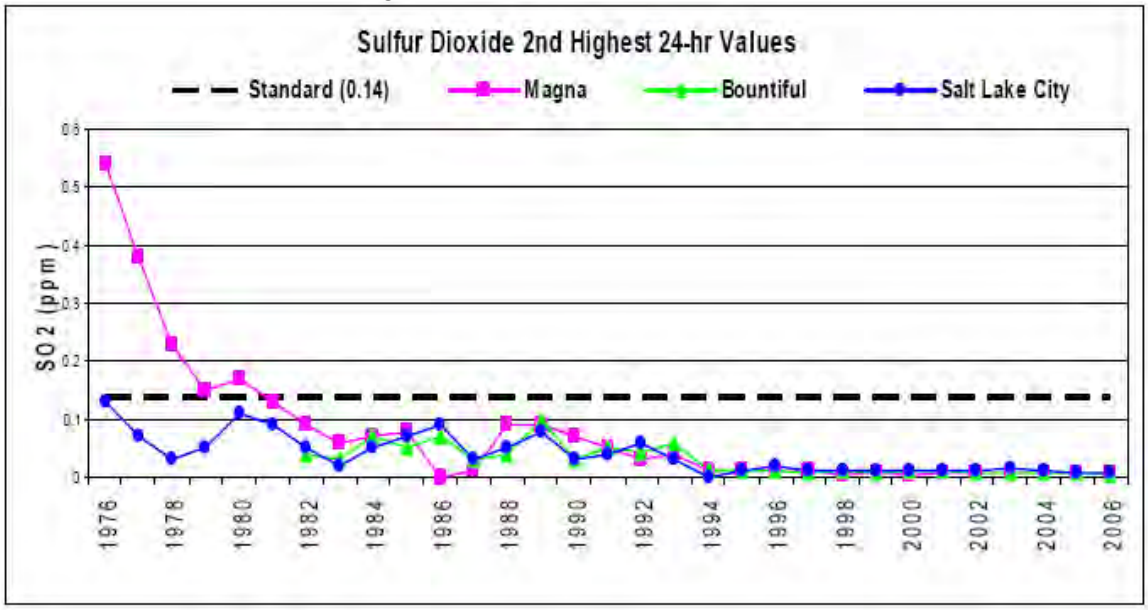


Figure 3.19- 5: SO_2 24-Hour Value



Future Trends

Rapid growth in Utah County by the 2030 planning period would most likely continue without the Provo-Orem Bus Rapid Transit Project. Although a growing population will continue to put pressure on the air quality of Utah County, continued improvements in technology and vehicle emissions, as well as more stringent air quality laws and requirements, will continue to reduce auto-related emissions.

Provo-Orem Bus Rapid Transit Project Impacts

Modeling of all projects in the MAG Regional Transportation Plan 2007 – 2030 demonstrates that all projects, including the Provo-Orem Bus Rapid Transit Project, would be in conformity with NAAQS standards and conform to the purpose of the regional Statewide Implementation Plan. While additional capacity is expected to slightly increase traffic volumes within the study area, the Provo-Orem Bus Rapid Transit Project would not create or contribute to any new or existing CO or PM_{10} violations.

Additionally, global climate change and greenhouse gas emissions are a national and regional concern and are being addressed by the federal government in several ways. FHWA is working with other transportation administrations to develop strategies to reduce transportation's contribution to greenhouse gases, specifically carbon dioxide emissions. In Utah, the Governor's Blue Ribbon Advisory Council on Climate Change identified measures to minimize greenhouse gas emissions including encouraging the use of mass transit, carpooling, telecommuting, the use of alternative fuels, and idle reduction programs for school buses and heavy trucks.

Noise

Past Trends

Since 1850, noise (unwanted sounds) levels have steadily increased along with industrialization and urbanization of Utah County. With the advent and popularity of mechanized or motorized machinery of all types, noise levels have experienced further acceleration. While noise from various

sources is evident from a variety of location types throughout the county, noise levels are typically at their highest along commercial corridors, where high volumes of vehicles are concentrated.

Future Trends

Data on future noise trends in Utah County is not available, and it is expected that future transportation projects will continue to have the largest impacts on noise. However, as engine and fuel technologies continue to accelerate, making combustion engines on all types of vehicles quieter, current noise levels may be reduced. Trends in land use may also reduce the need for single occupancy vehicles, thereby reducing noise levels as well.

Provo-Orem Bus Rapid Transit Project Impacts

The Provo-Orem Bus Rapid Transit Project would contribute to the cumulative noise impacts in Utah County. Mitigation measures including noise walls, berms, and landscaping would be implemented where necessitated and practical to reduce the impacts to neighboring residences, businesses, and services. Noise walls would be implemented per UDOT's and UTA's noise policies.

Wetlands

Past Trends

Wetlands and wildlife habitat adjacent to Utah Lake have been extensively altered or lost as a result of urban and agricultural development, and many of the streams that flowed into Utah Lake have been altered for water supply, control of storm water, agricultural uses, and urban development. Much of the upland wildlife habitat has also been developed, and only a few areas remain on the west side of Utah Lake. Based on National Wetland Inventory data, Utah County has about 11,018 acres remaining out of the historic estimate of 66,200 acres, a loss of 83 percent.

Future Trends

No data is available on the exact amount of wetlands to be converted to urban uses because each project is treated independently by USACE. It is expected that all direct impacts will have to be mitigated (through creation, restoration, or enhancement of wetlands) within the general vicinity of the project to satisfy the federal policy of no net loss of wetland acres and/or function. Although other planned transportation projects could also result in impacts to wetlands, urban growth, regardless of the construction of roads and rails, will likely cause the greatest impact to wetlands between 2002 and 2030. However, all projects subject to a Section 404 individual permit are required to identify the least environmentally damaging practicable alternative, which is the goal of the wetland assessment component of this EA process. In addition, all projects are required to complete a wetland delineation, from which mitigation is determined through avoidance, minimization, and/or some form of creation, restoration, or enhancement of wetlands.

Provo-Orem Bus Rapid Transit Project Impacts

The Preferred Alternative would directly impact 3.7 acres of wetlands, and would not have a significant impact on the remaining 11,000 acres of wetlands in Utah County. See Section 3.12: Biological Resources for more information. As required by USACE, jurisdictional wetlands would be mitigated by replacing the major wetland functions, vegetation communities, and areas lost as a result of this project.

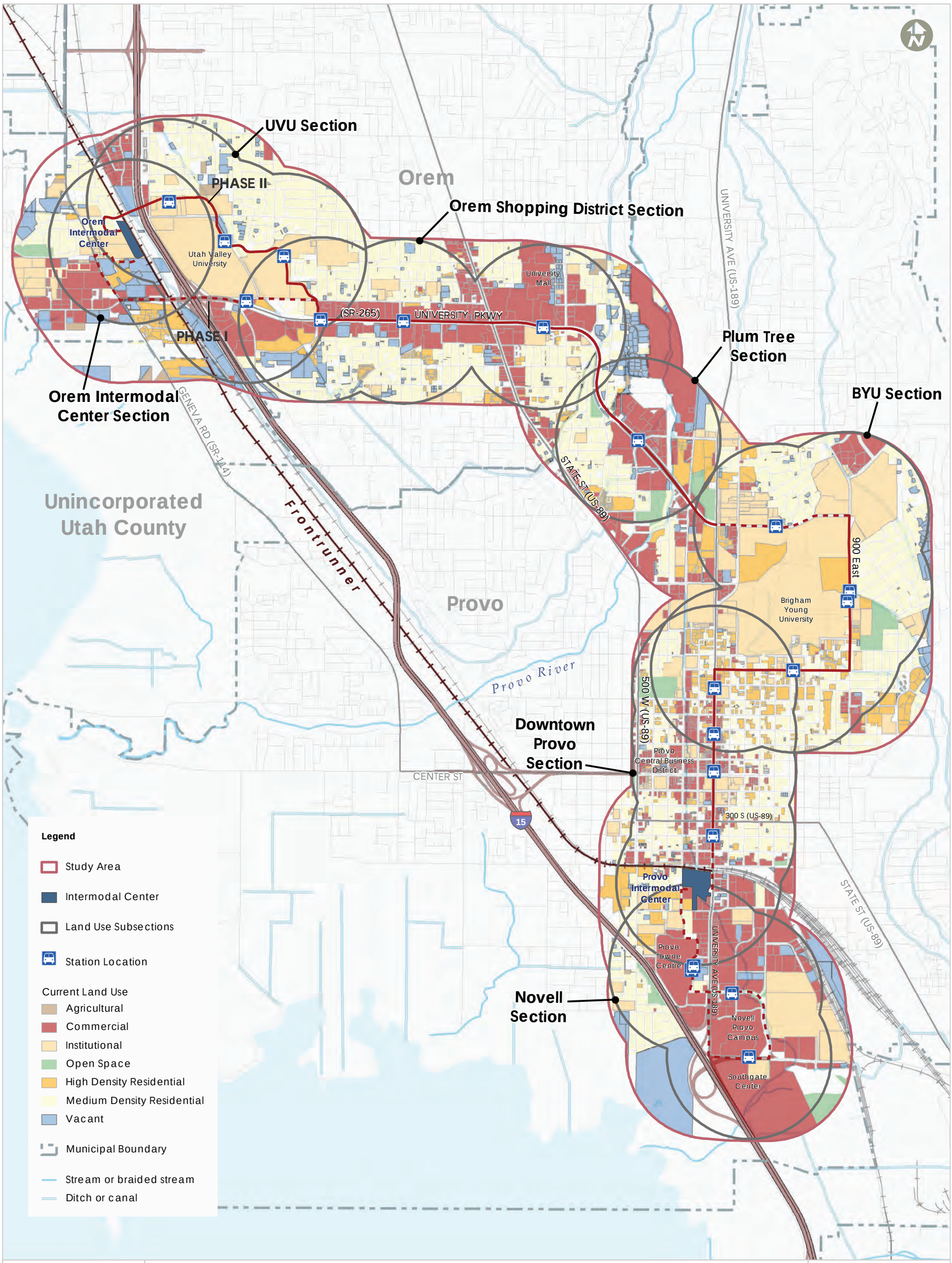
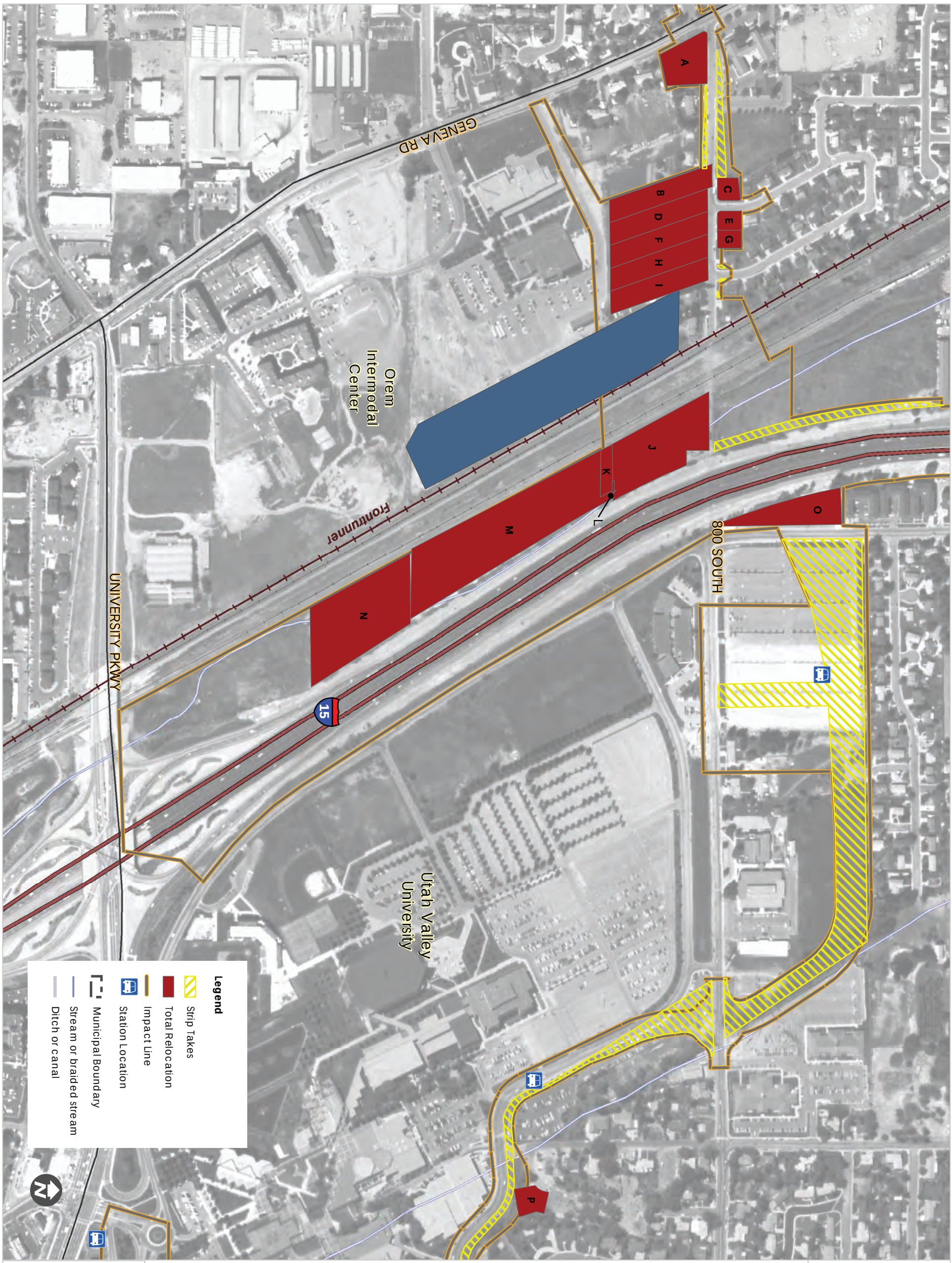
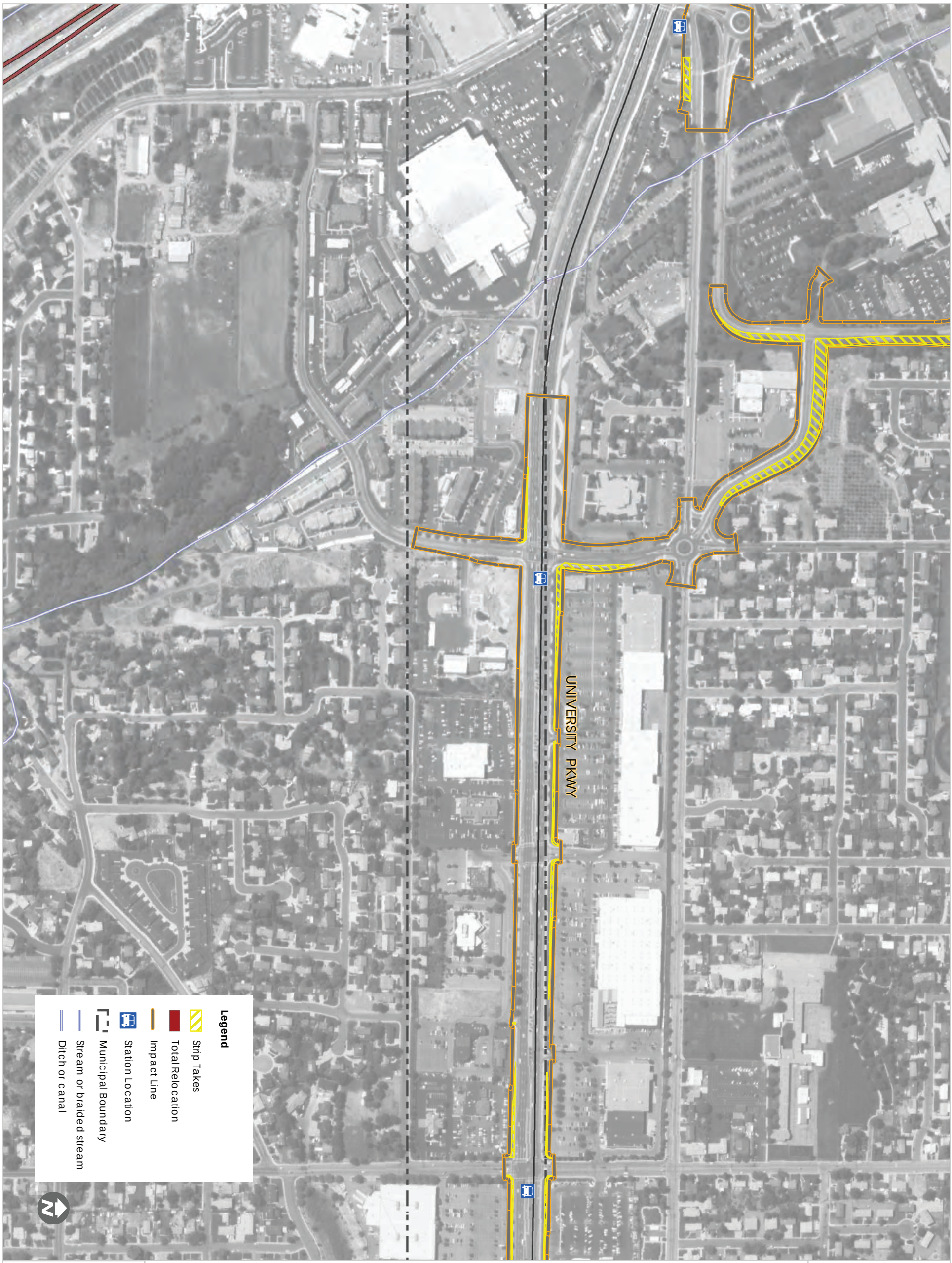


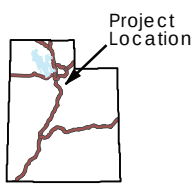
Figure 3.4-1 Land Use in the Study Area



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

Figure 3.5-1 Potential Relocations and Strip Takes

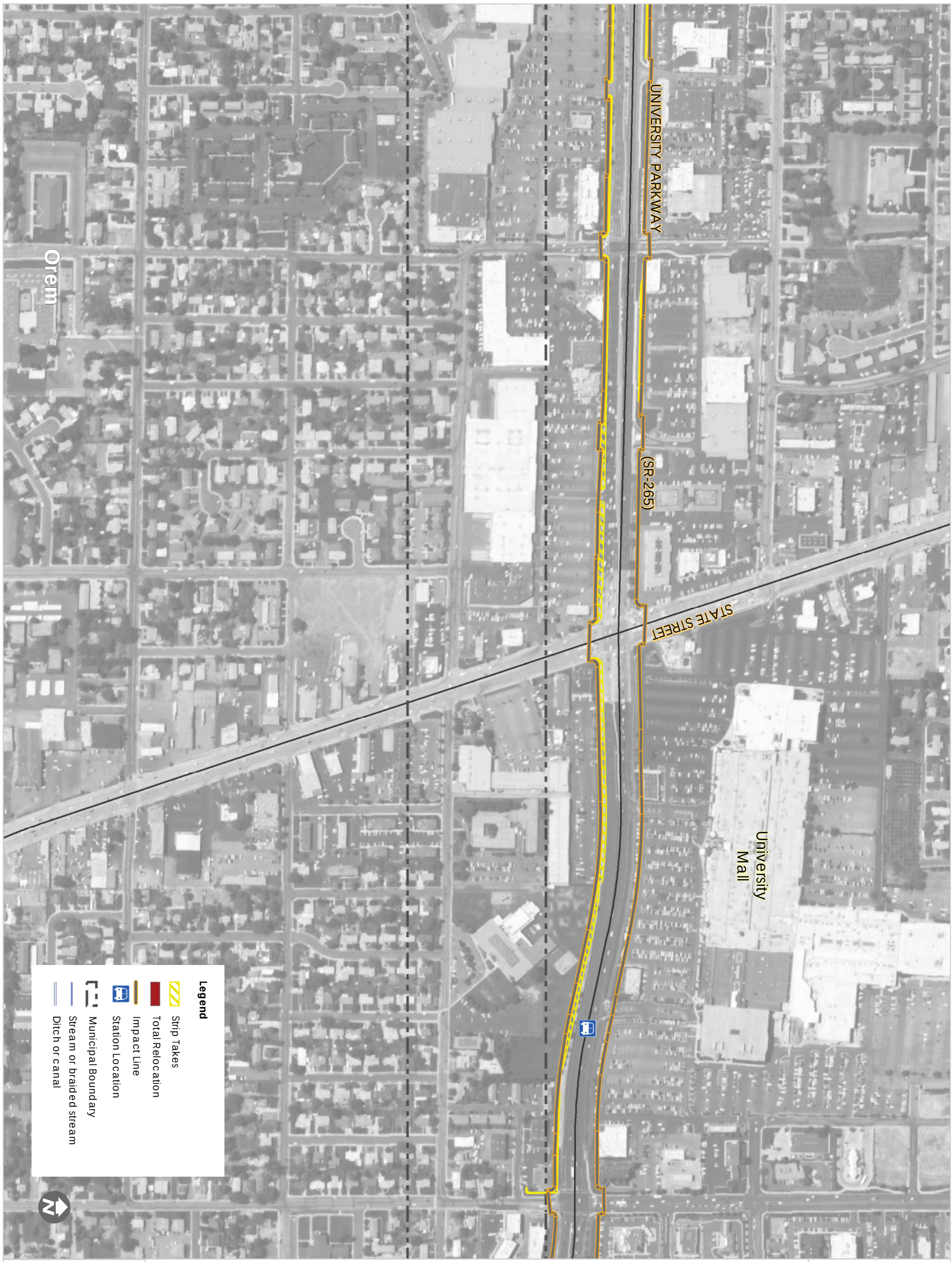




Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 275 550 Feet
0 100 200 Meters

Figure 3.5-2 Potential Relocations and Strip Takes



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 250 Yards
0 250 Meters

Figure 3.5-3 Potential Relocations and Strip Takes

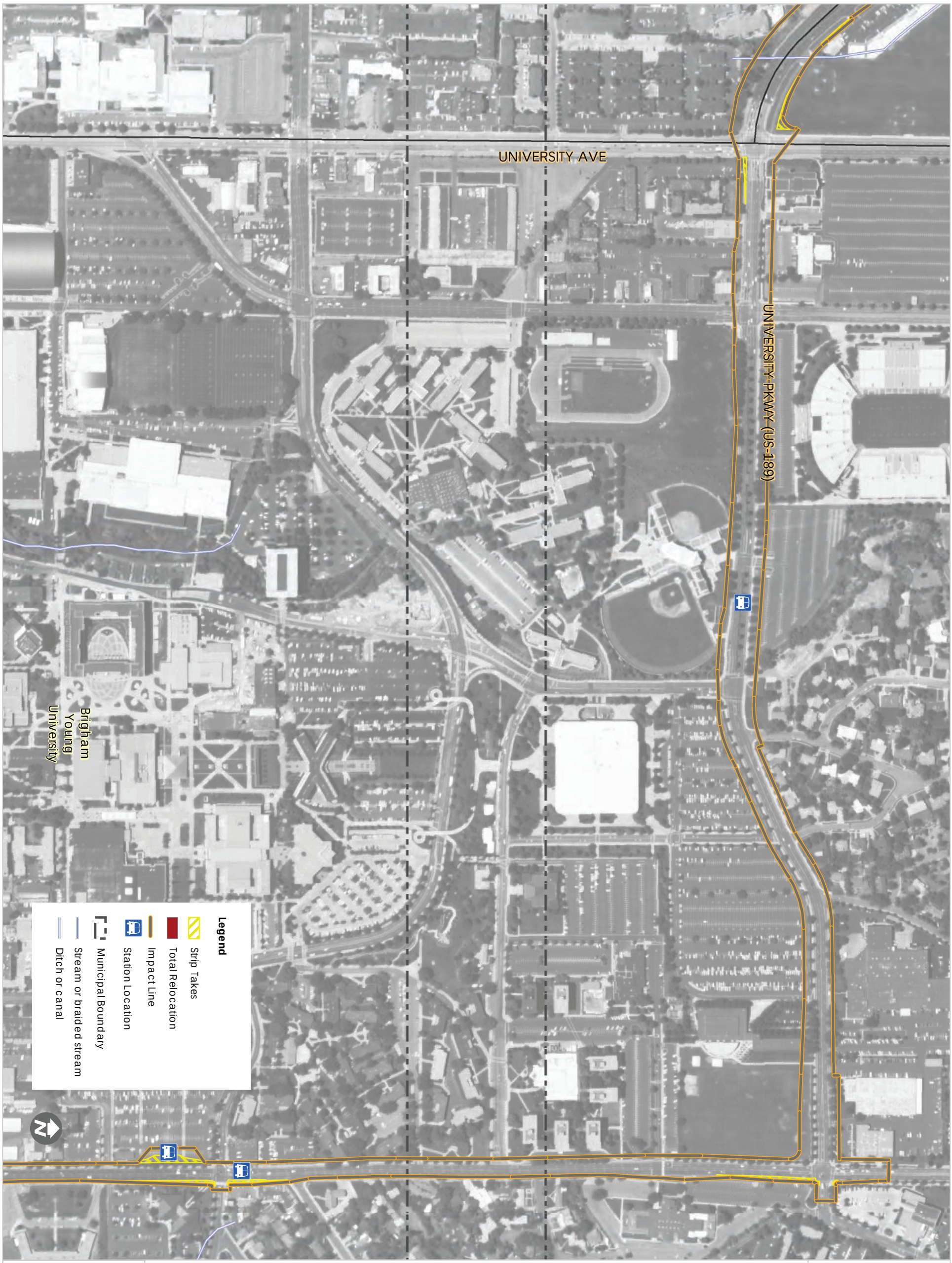
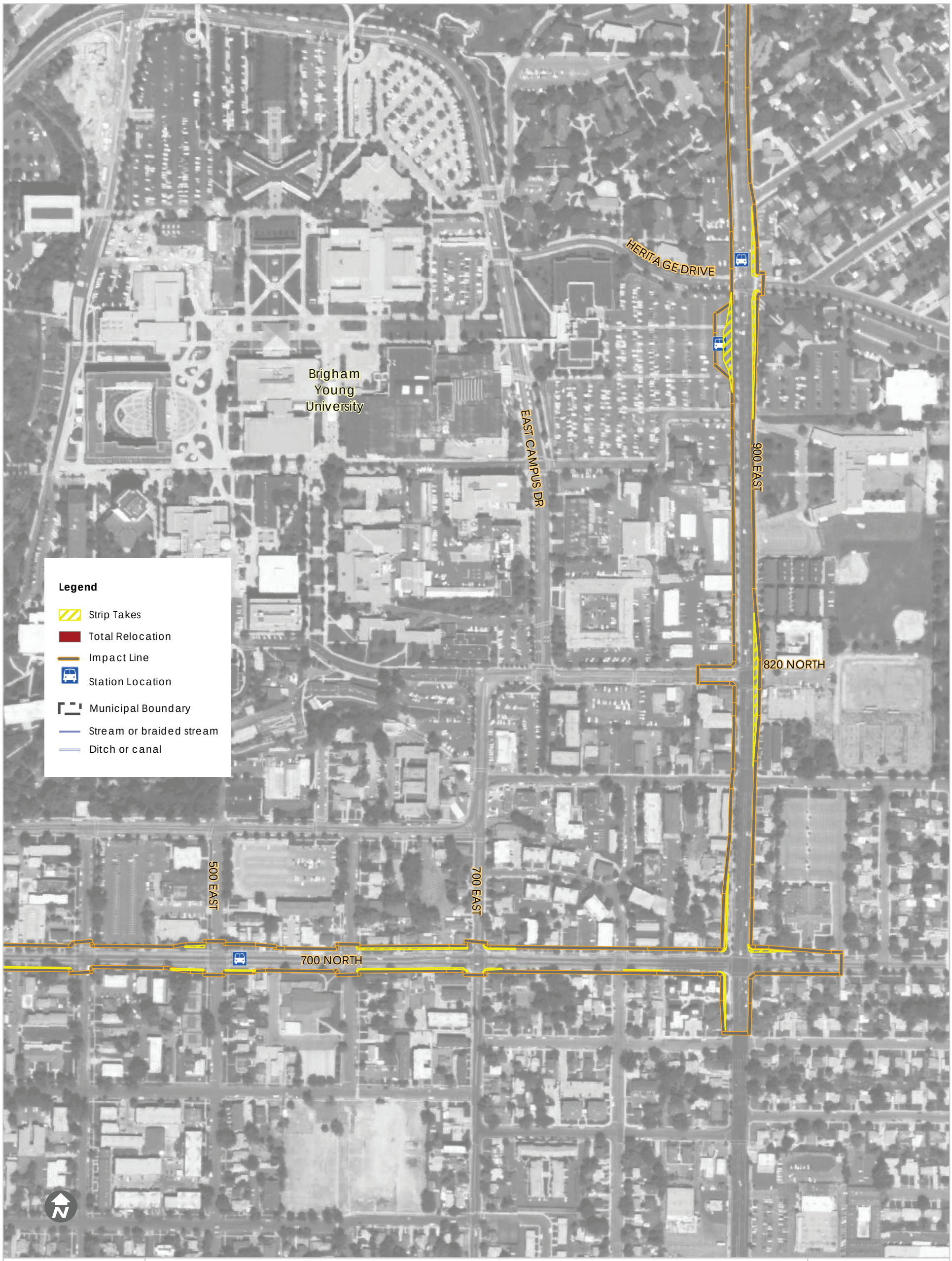
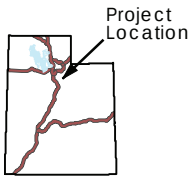


Figure 3.5-4 Potential Relocations and Strip Takes

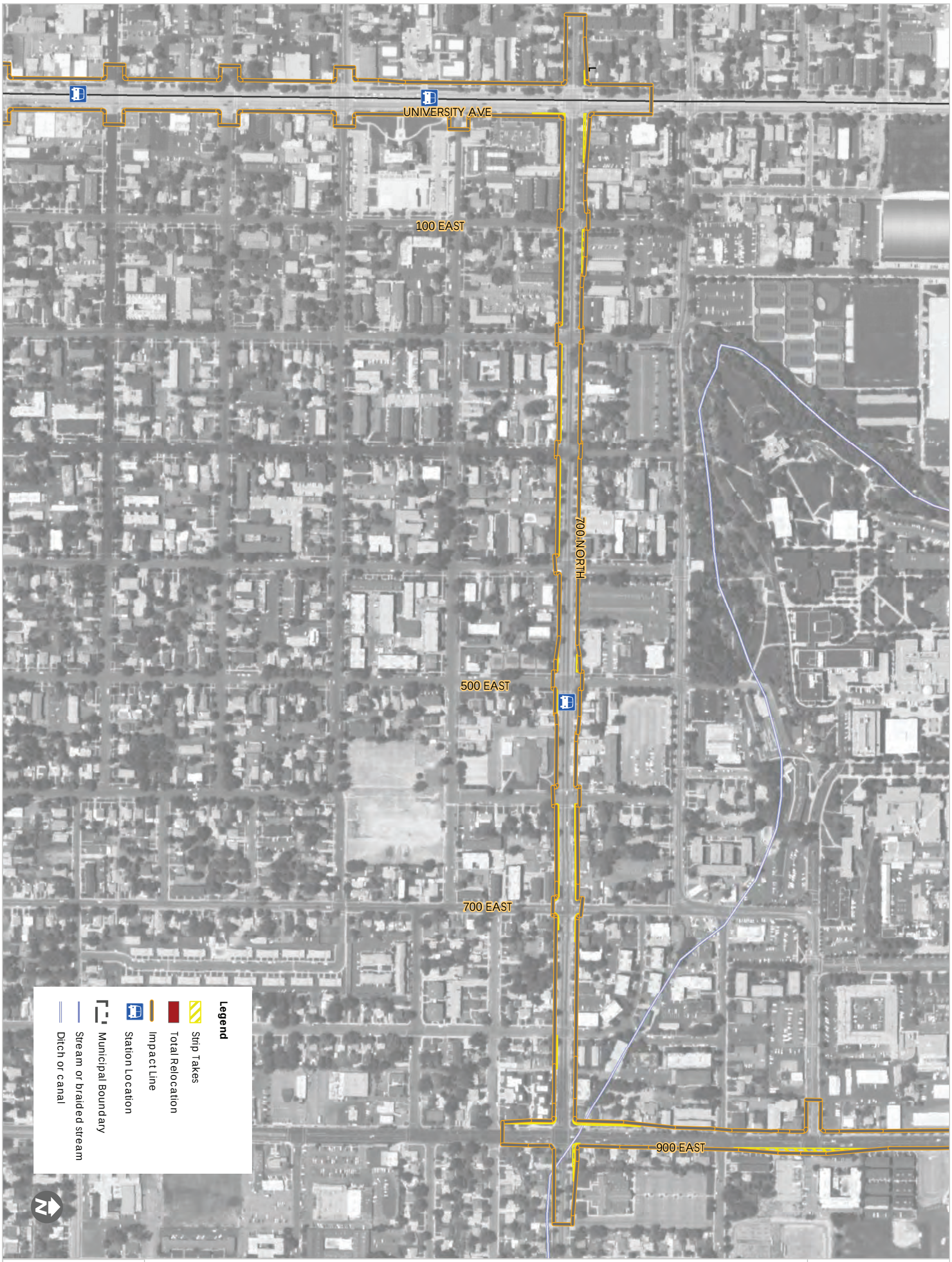


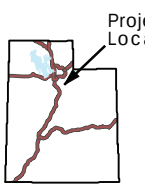


Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 250 500 Feet
0 100 200 Meters

Figure 3.5-5 Potential Relocations and Strip Takes

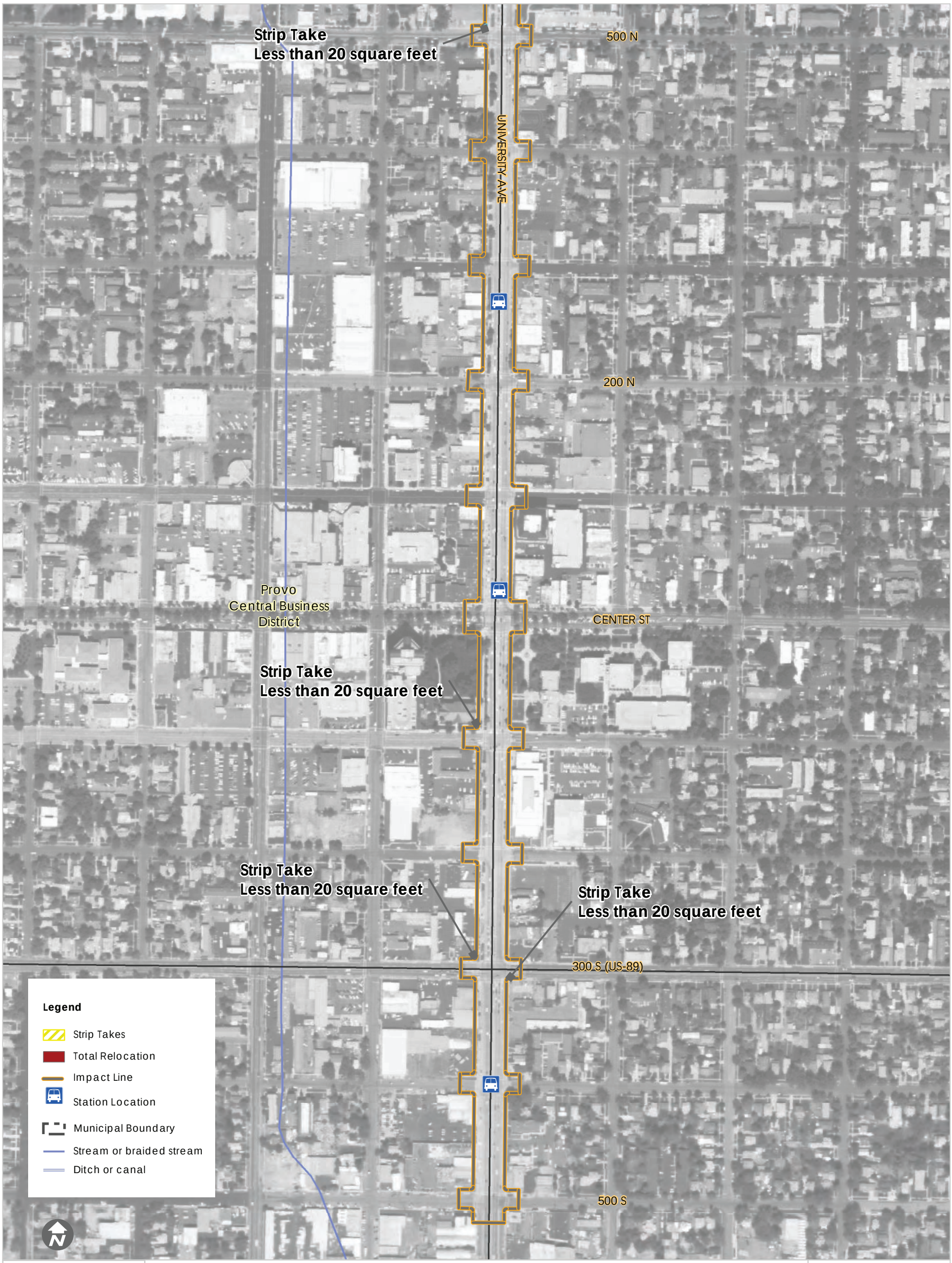


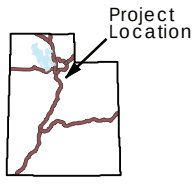


Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 250 500 Feet
0 100 200 Meters

Figure 3.5-6 Potential Relocations and Strip Takes

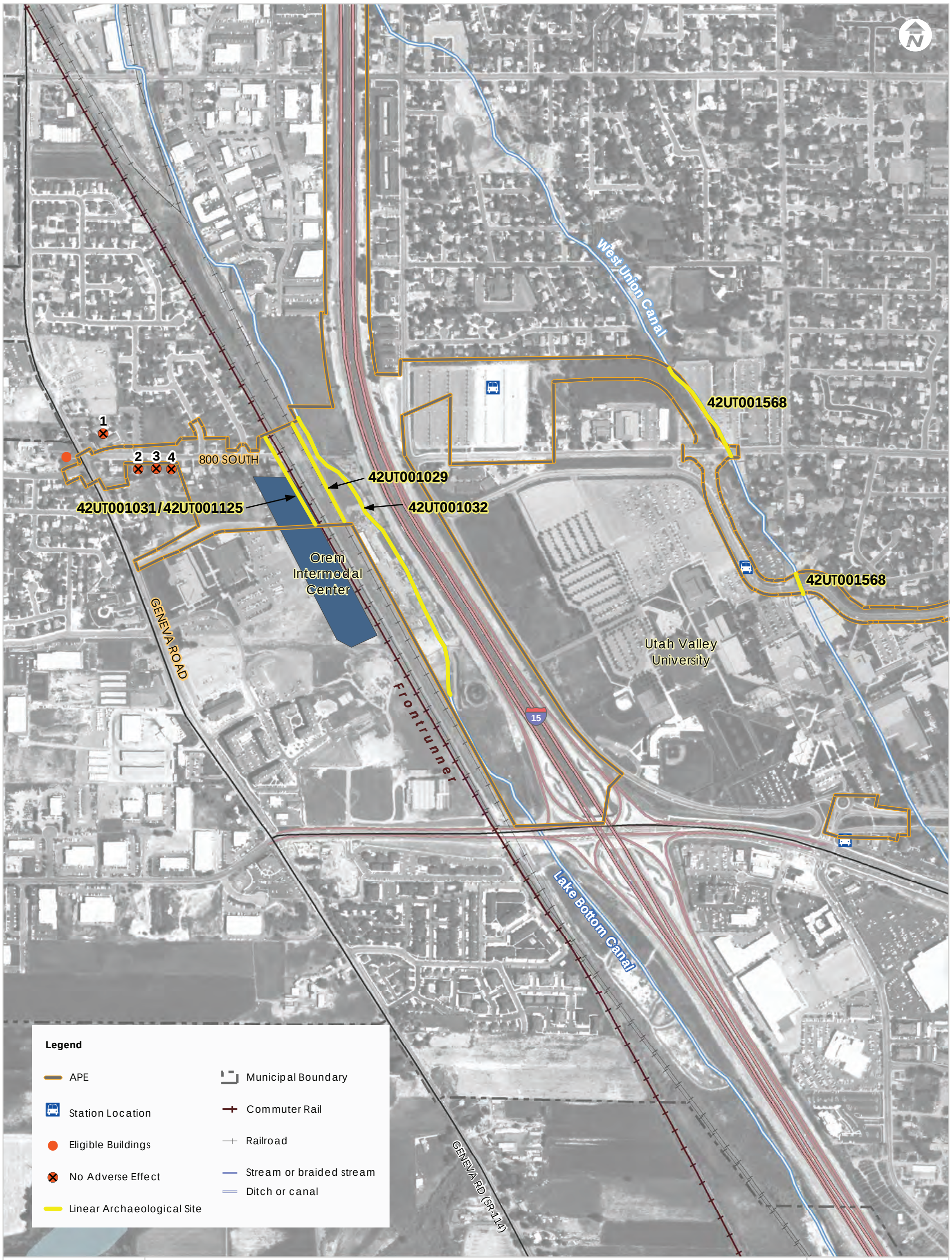




Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 250 500 Feet
0 100 200 Meters

Figure 3.5-7 Potential Relocations and Strip Takes



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans. Thematic data from SWCA.

0 500 1,000 Feet
0 200 400 Meters

Figure 3.6-1
Historic Properties - 1

University Mall
University Mall
UNIVERSITY PKWY
West Union Canal
Provo River
42UT001568
Lake Bottom canal
W 2230 N
42UT001032
UNIVERSITY PKWY
RIVERSIDE AVE
STATE ST (US-89)

Legend

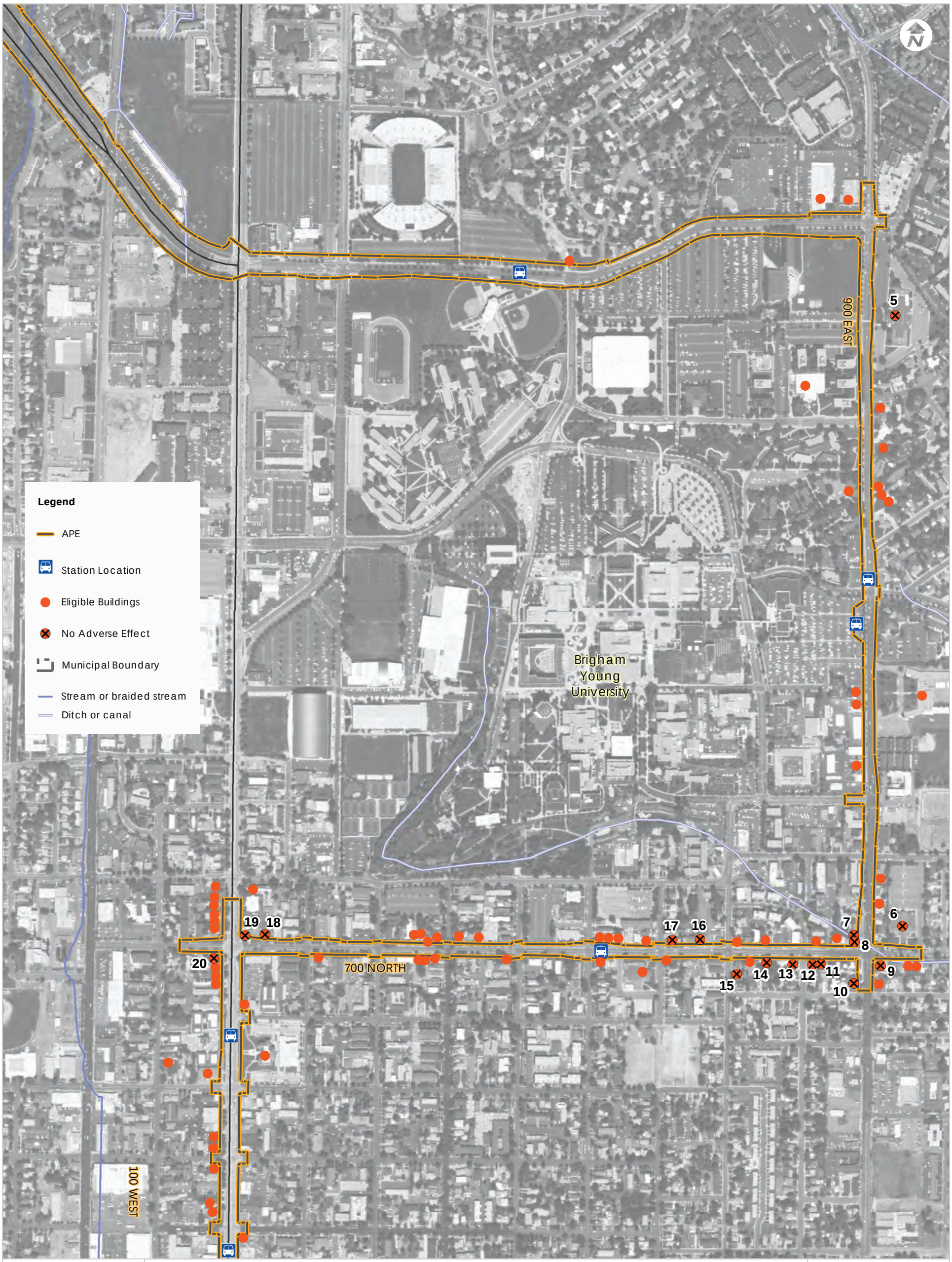
- Station Location
- Linear Archaeological Sites
- Municipal Boundary
- Stream or braided stream
- Ditch or canal

Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans. Thematic data from SWCA.

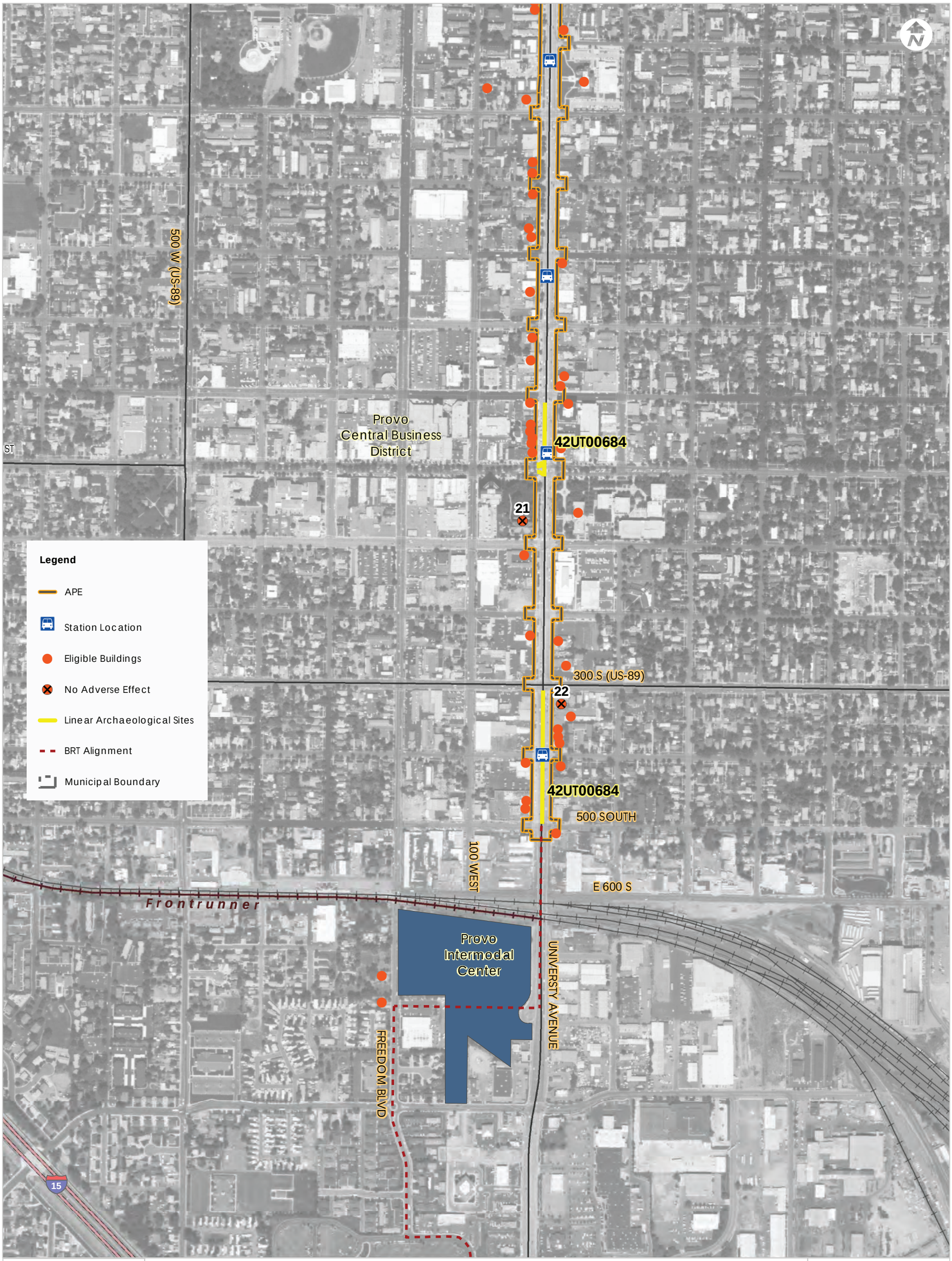
0 500 1,000 Feet
0 200 400 Meters

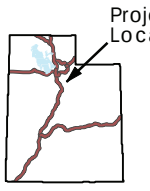
Figure 3.6-2
Historic Properties - 2



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans. Thematic data from SWCA.

Figure 3.6-3 Historic Properties - 3

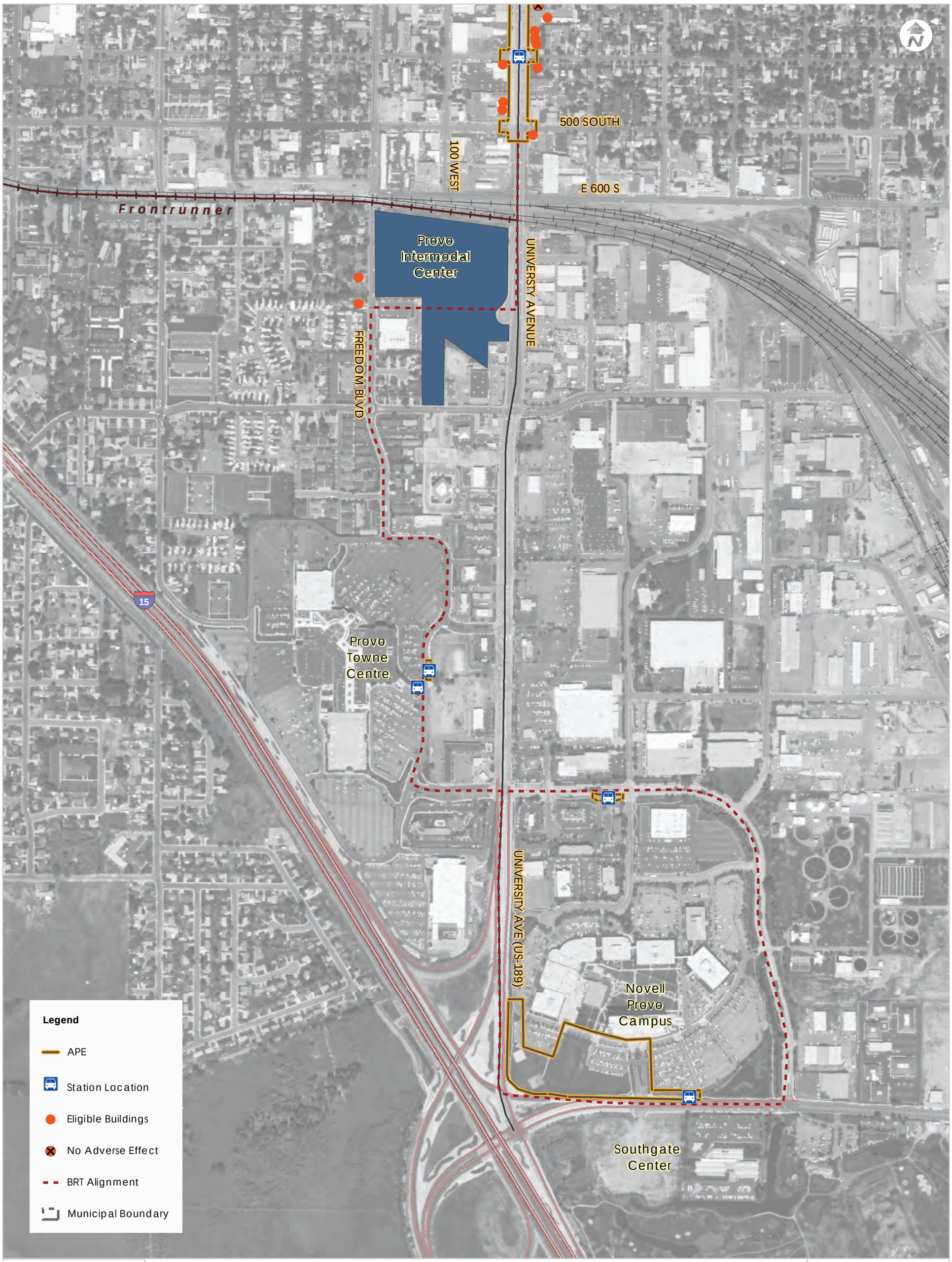


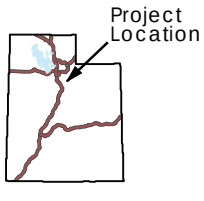


Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans. Thematic data from SWCA.

0 500 1,000 Feet
0 200 400 Meters

Figure 3.6-4
Historic Properties - 4

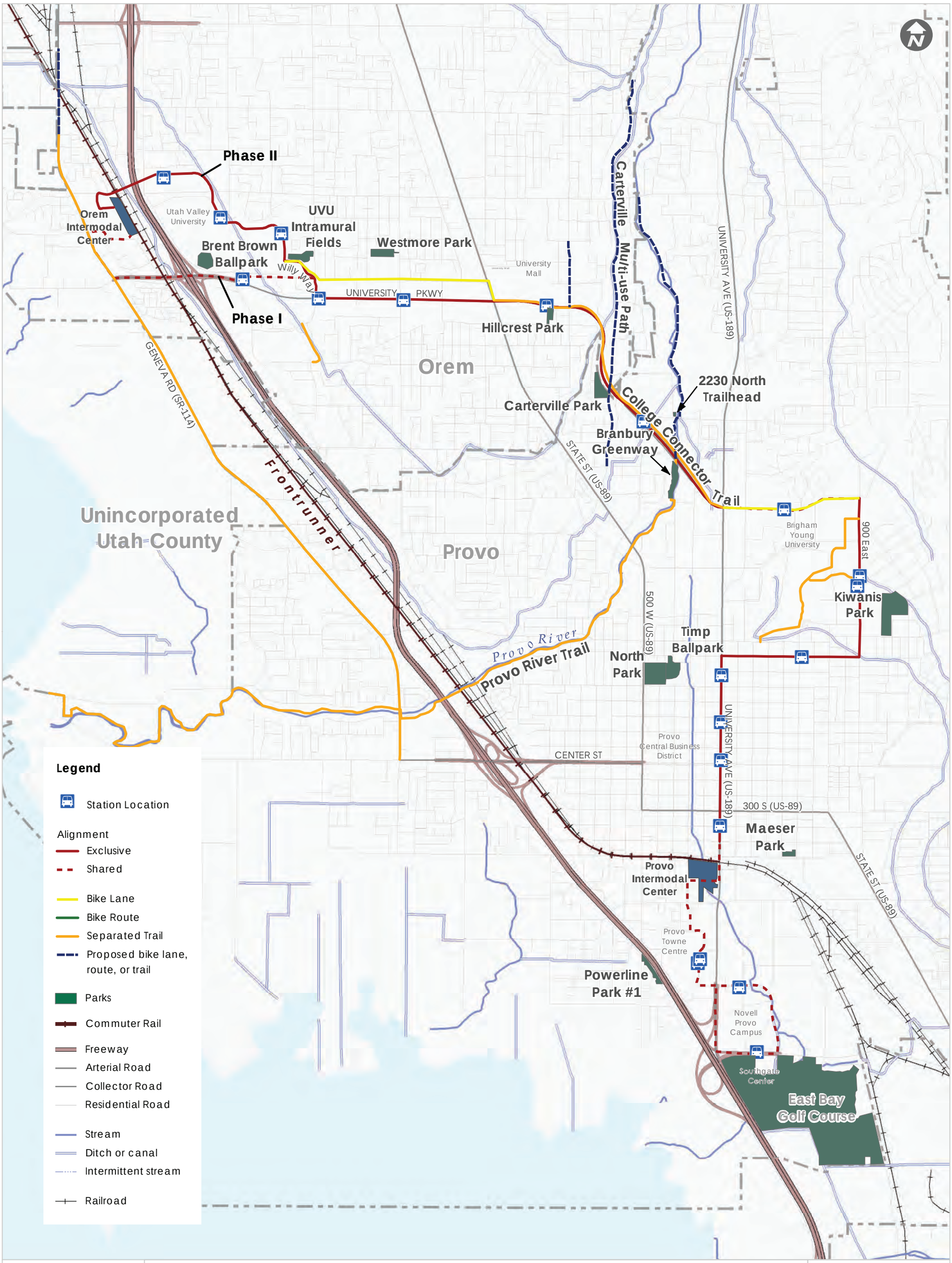




Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans. Thematic data from SWCA.

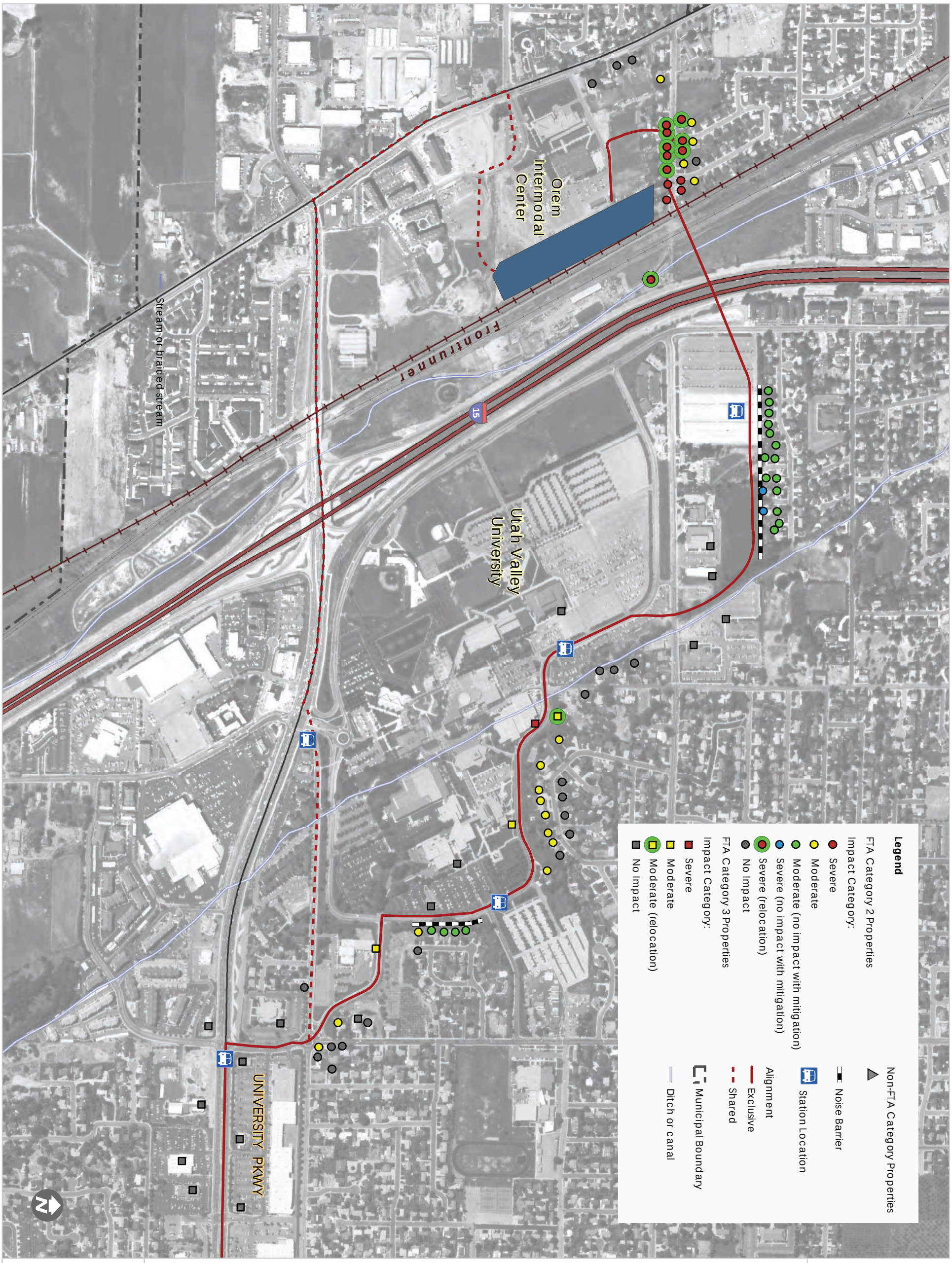
0 500 1,000 Feet
0 200 400 Meters

Figure 3.6-5 Historic Properties - 5



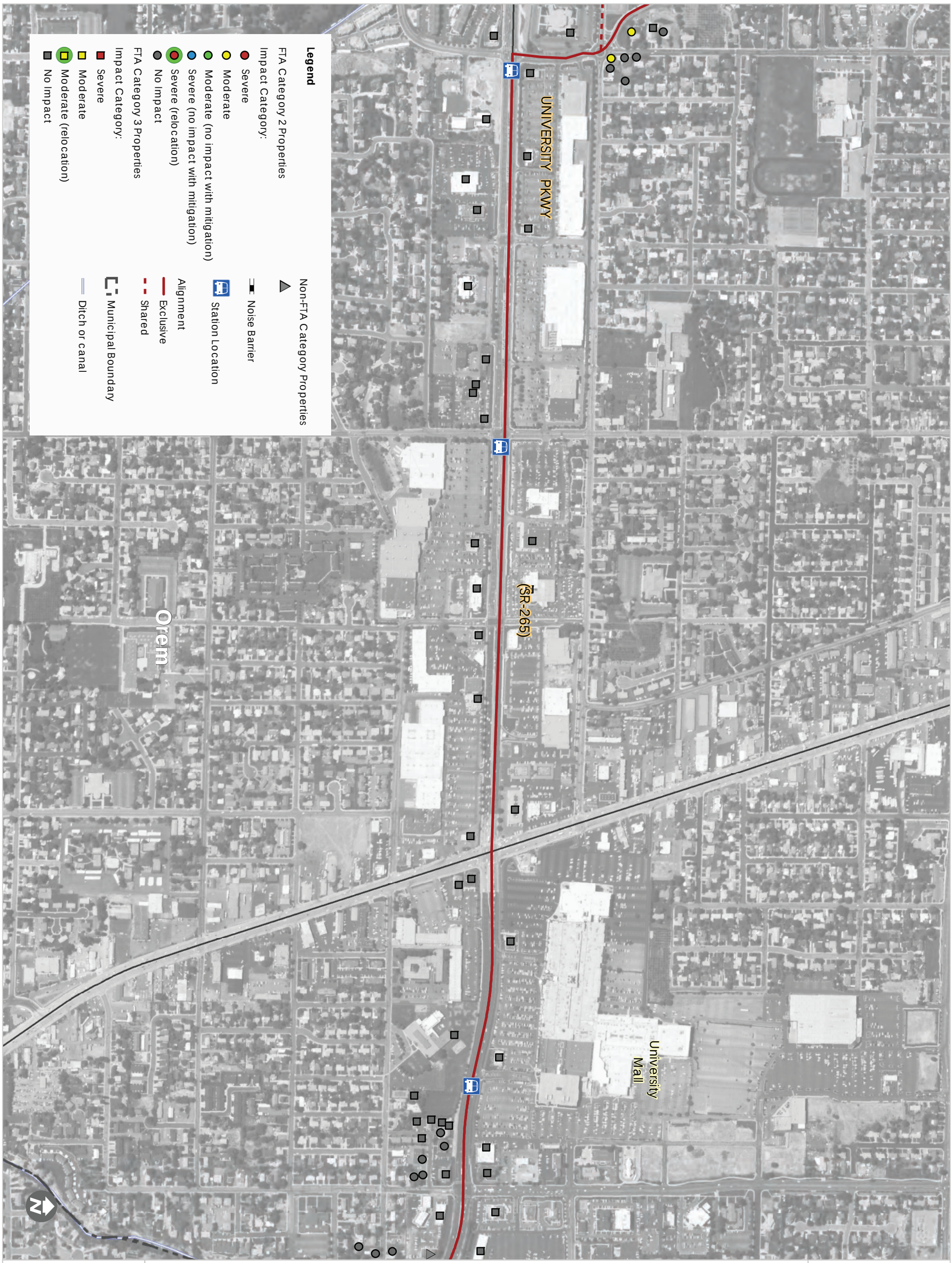
Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

Figure 3.9-1 Parks and Recreation Resources



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and thematic data layers from AECOM.

Figure 3.11-2 Predicted Noise Impacts under the Preferred Alternative (Orem Intermodal/UVU)

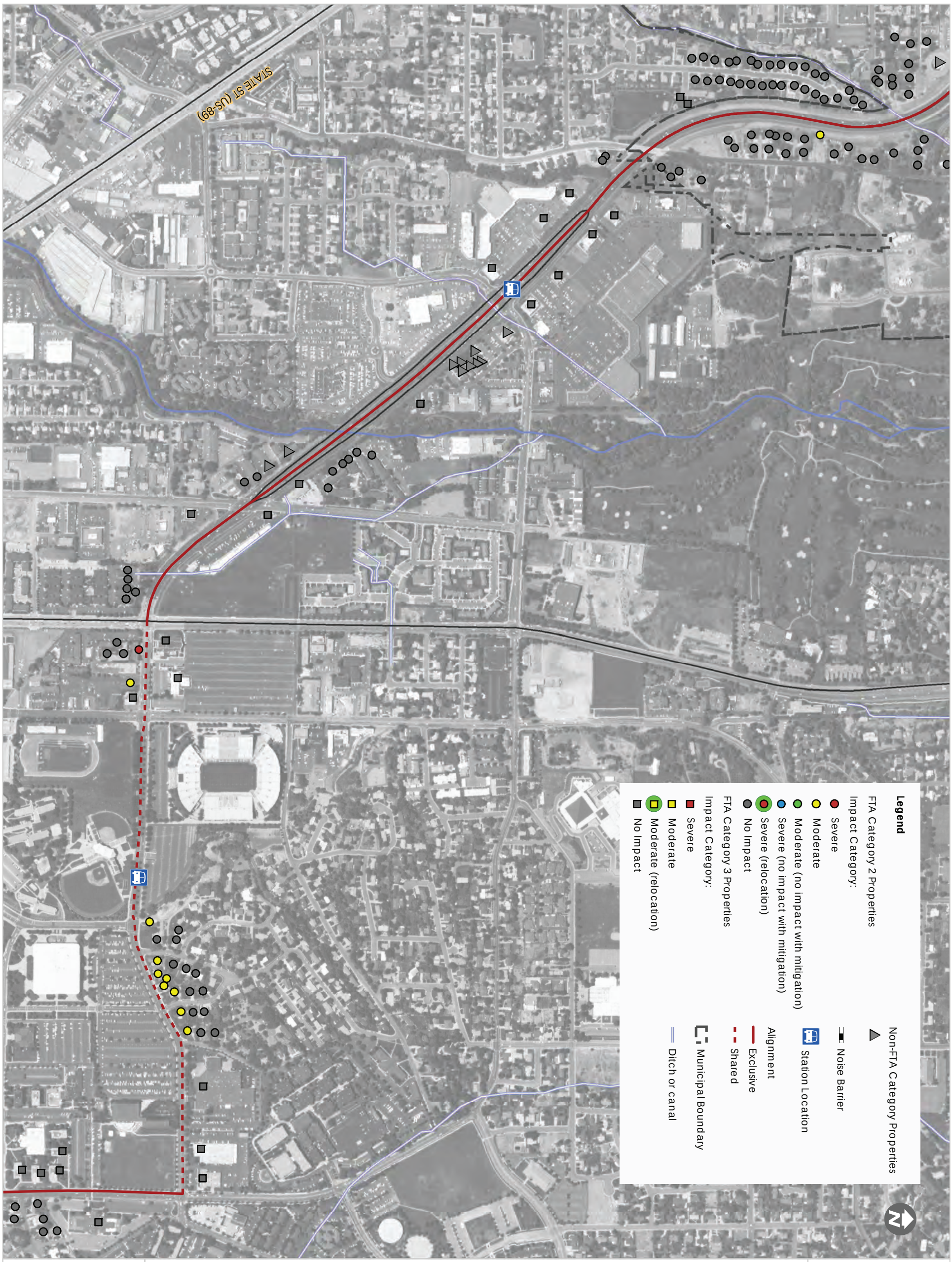


Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and thematic data layers from AECOM.

0 500 1,000 Feet
0 200 400 Meters

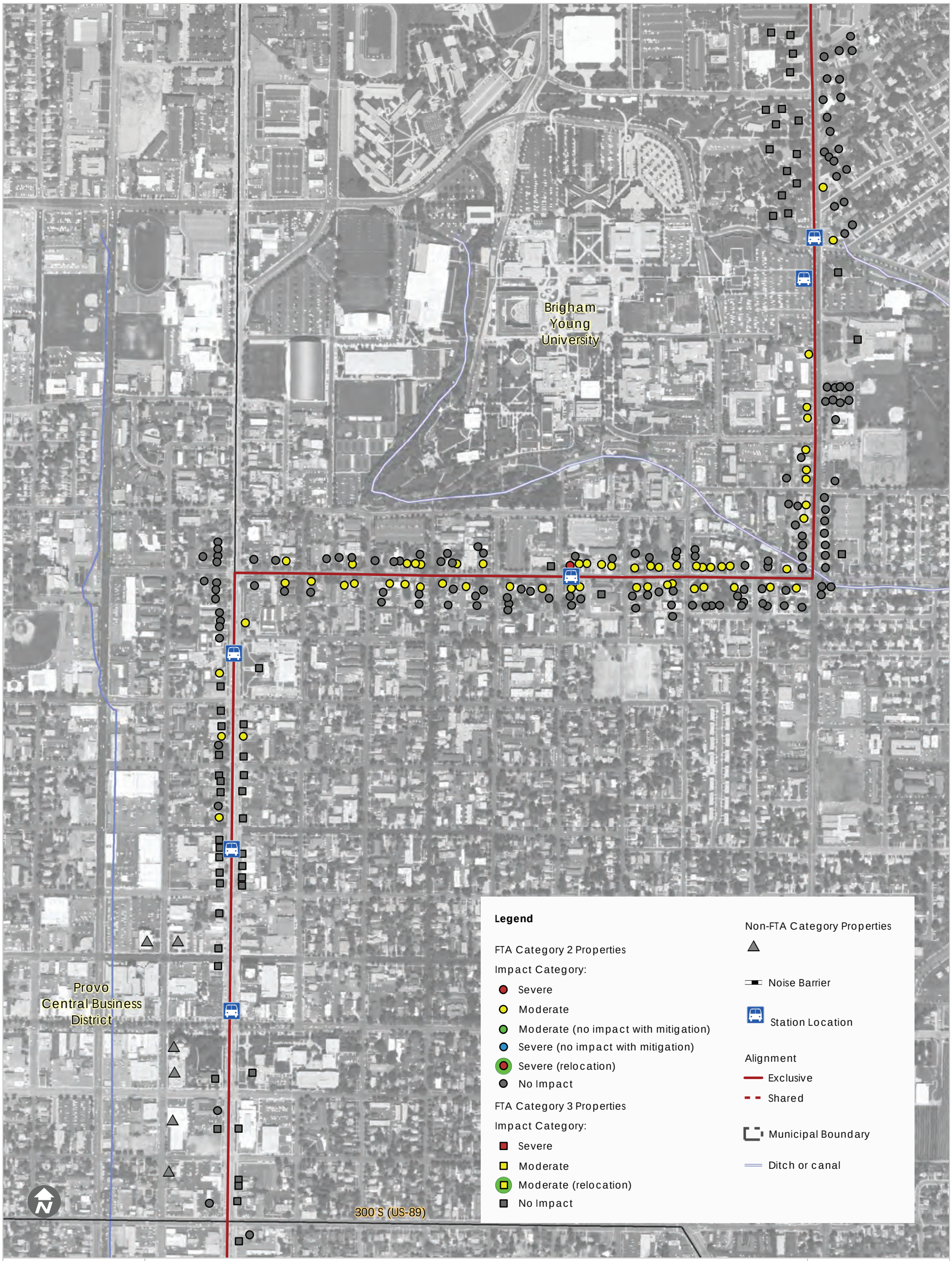
Figure 3.11-3 Predicted Noise Impacts under the Preferred Alternative (Shopping District)



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and thematic data layers from AECOM.

0 500 1,000 Feet
0 200 400 Meters

Figure 3.11-4 Predicted Noise Impacts under the Preferred Alternative (University Parkway)

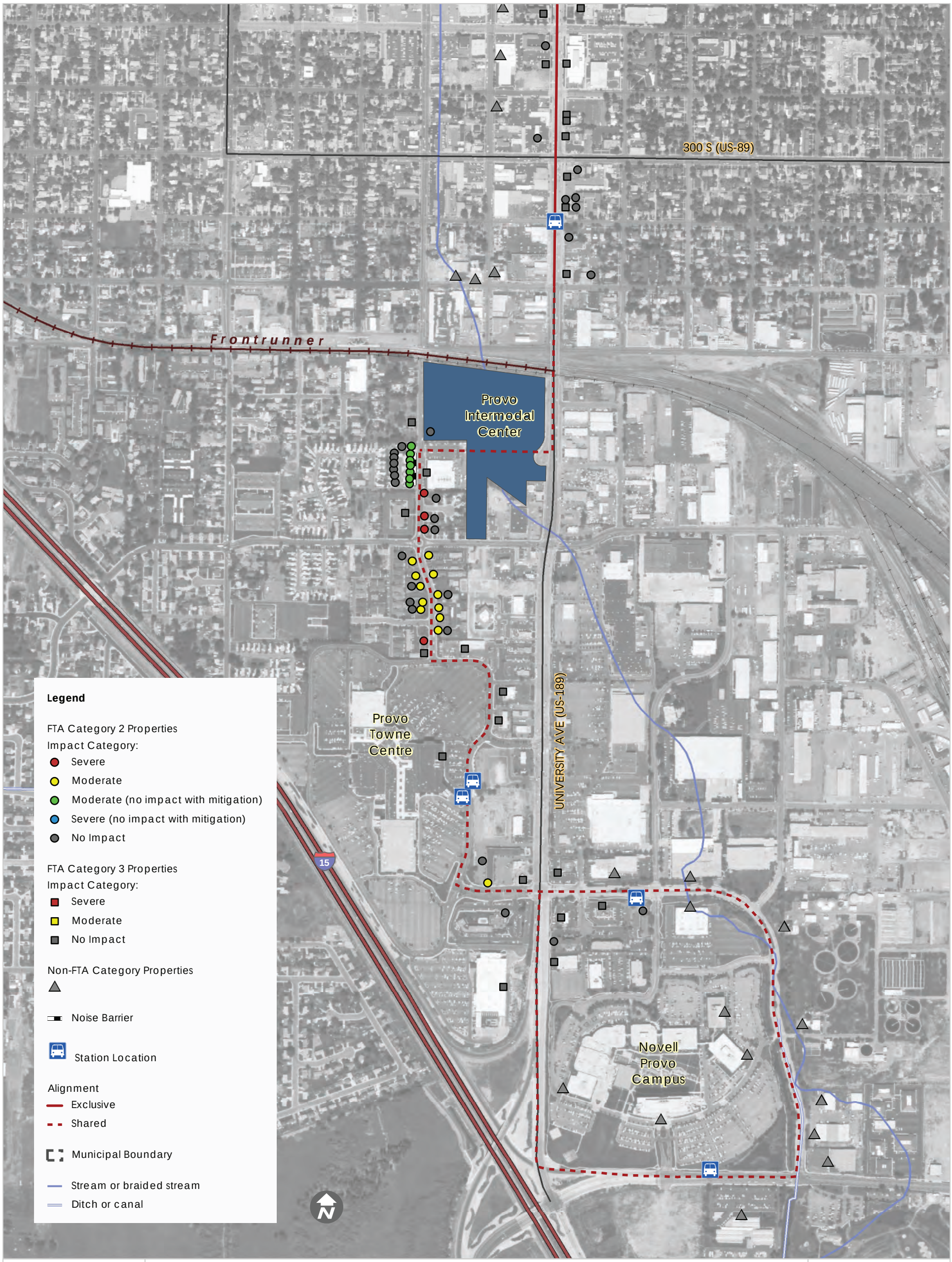


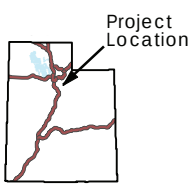
Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and thematic data layers from AECOM.

0 500 1,000 Feet
0 200 400 Meters

Figure 3.11-5 Predicted Noise Impacts under the Preferred Alternative (BYU/Downtown Provo)

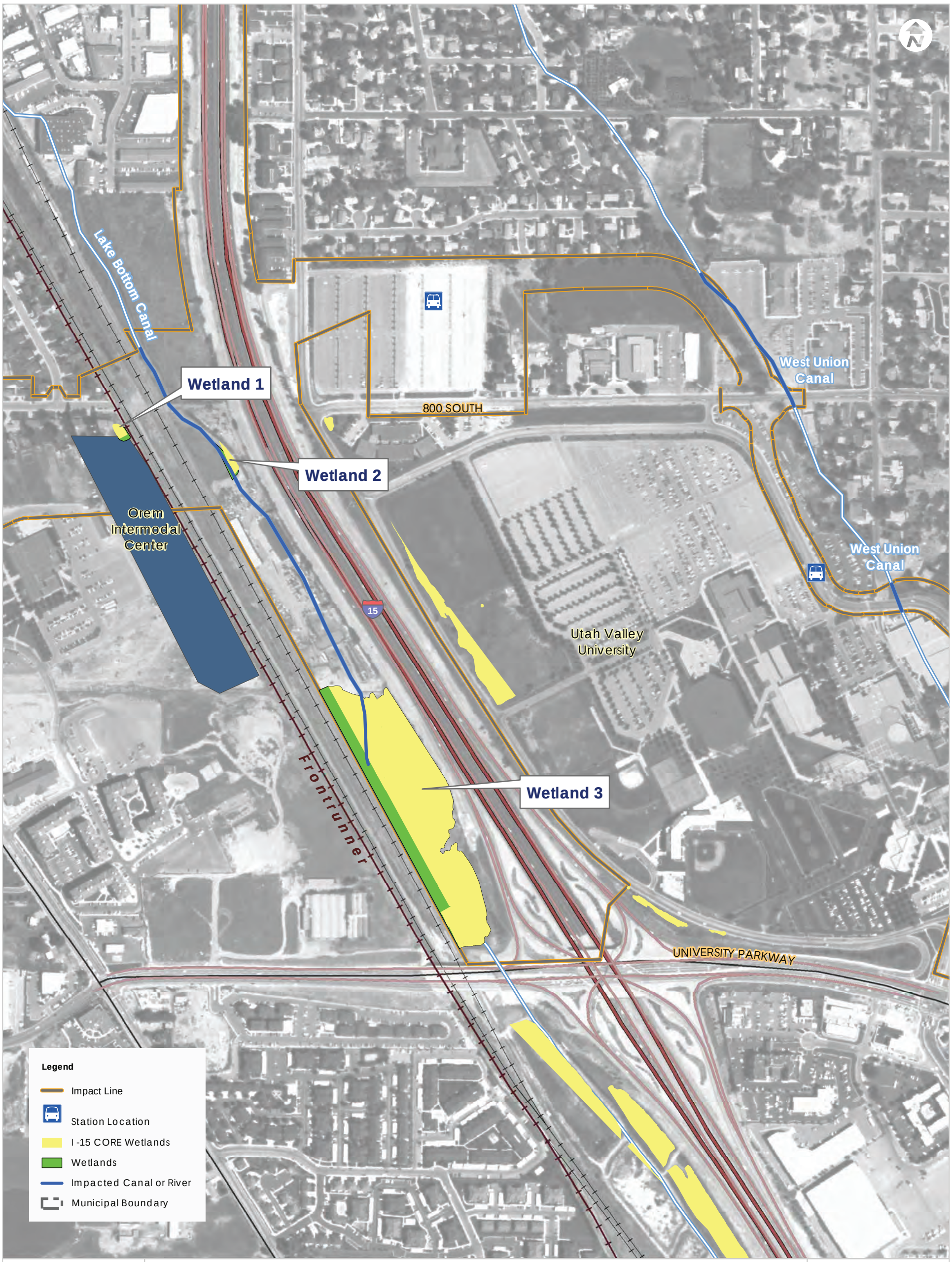




Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and thematic data layers from AECOM.

0 500 1,000 Feet
0 200 400 Meters

Figure 3.11-6 Predicted Noise Impacts under the Preferred Alternative (Provo/Novell Center)



Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 250 500 Feet

0 100 200 Meters

Figure 3.12-1
Wetlands and Water Resources

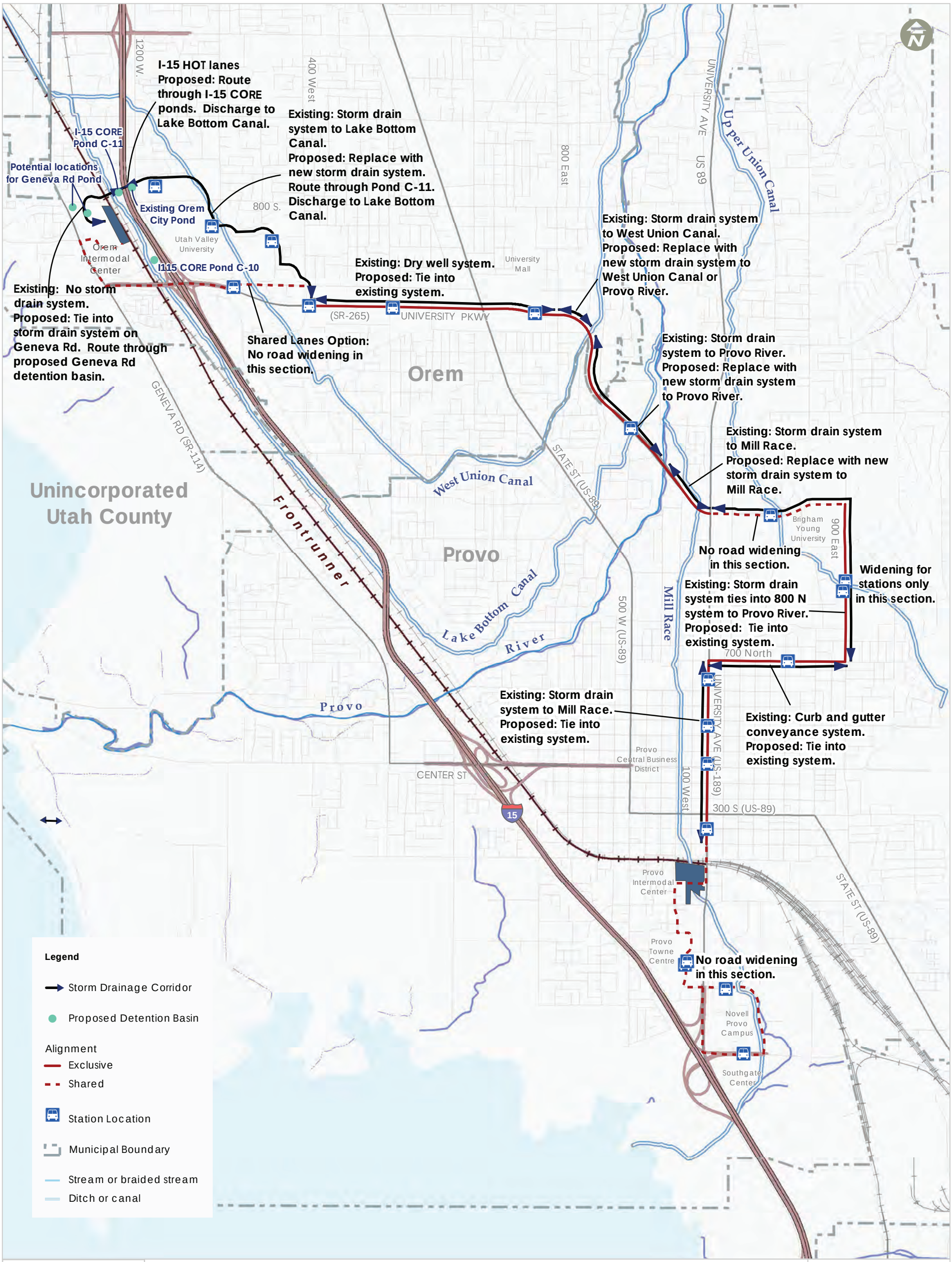
Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 250 500 Feet

0 100 200 Meters

Figure 3.12-2
Wetlands and Water Resources

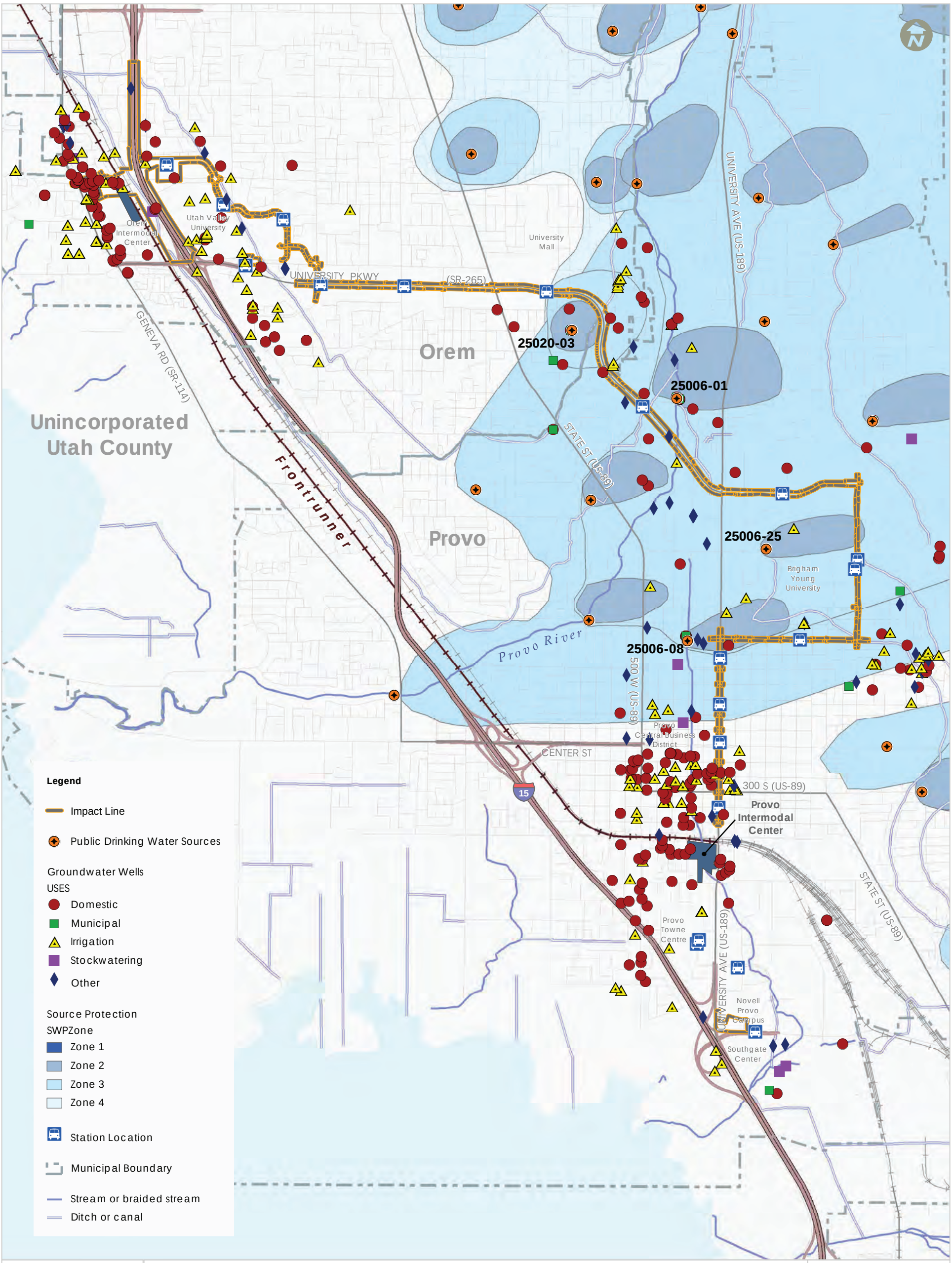


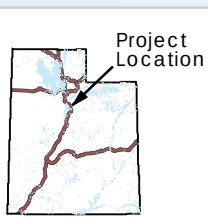
Project Location

Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 0.5 1 Mile
0 0.5 1 Kilometers

Figure 3.13-1 Existing and Proposed Storm Drainage



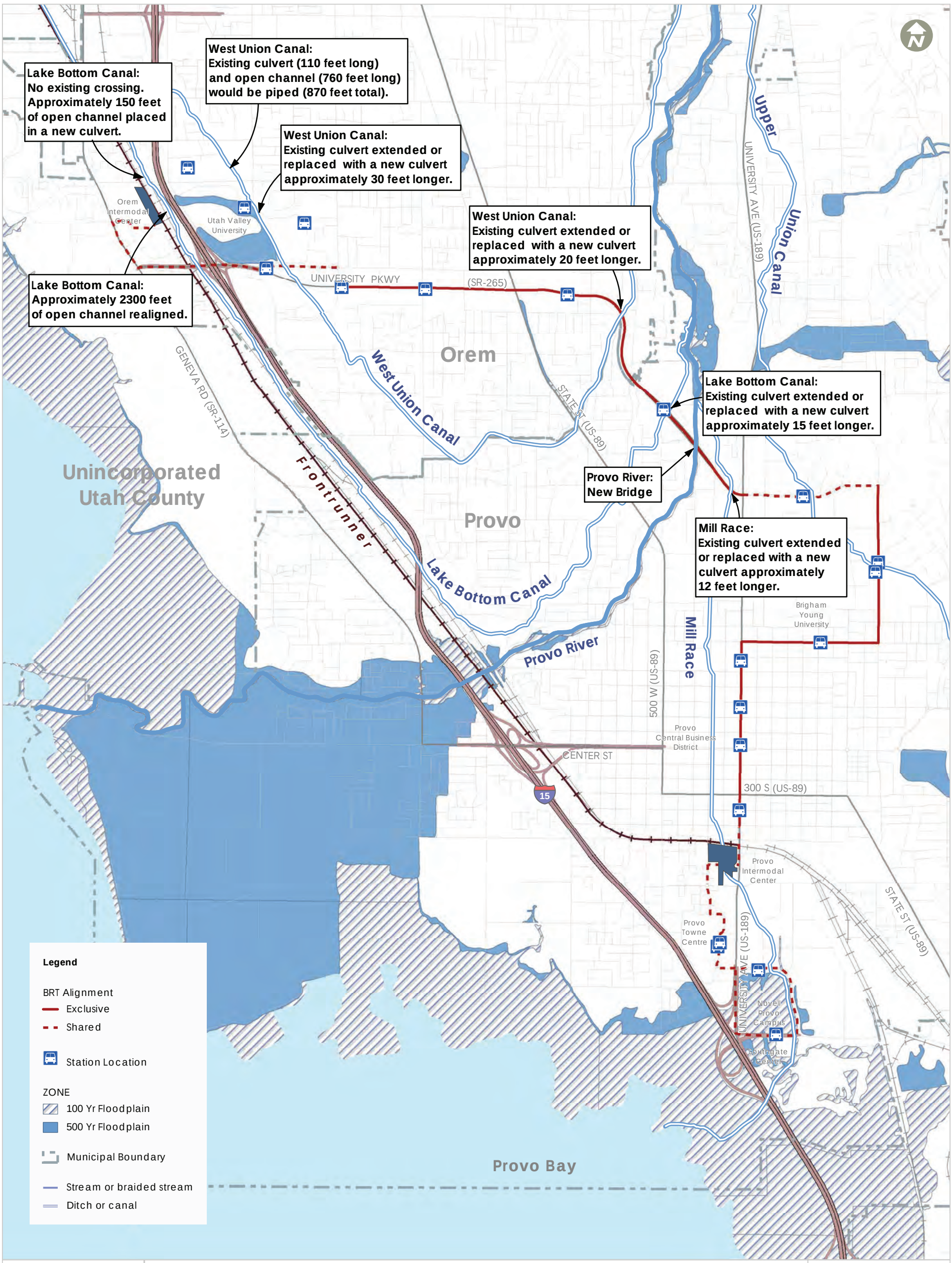


Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

0 0.5 1 Mile

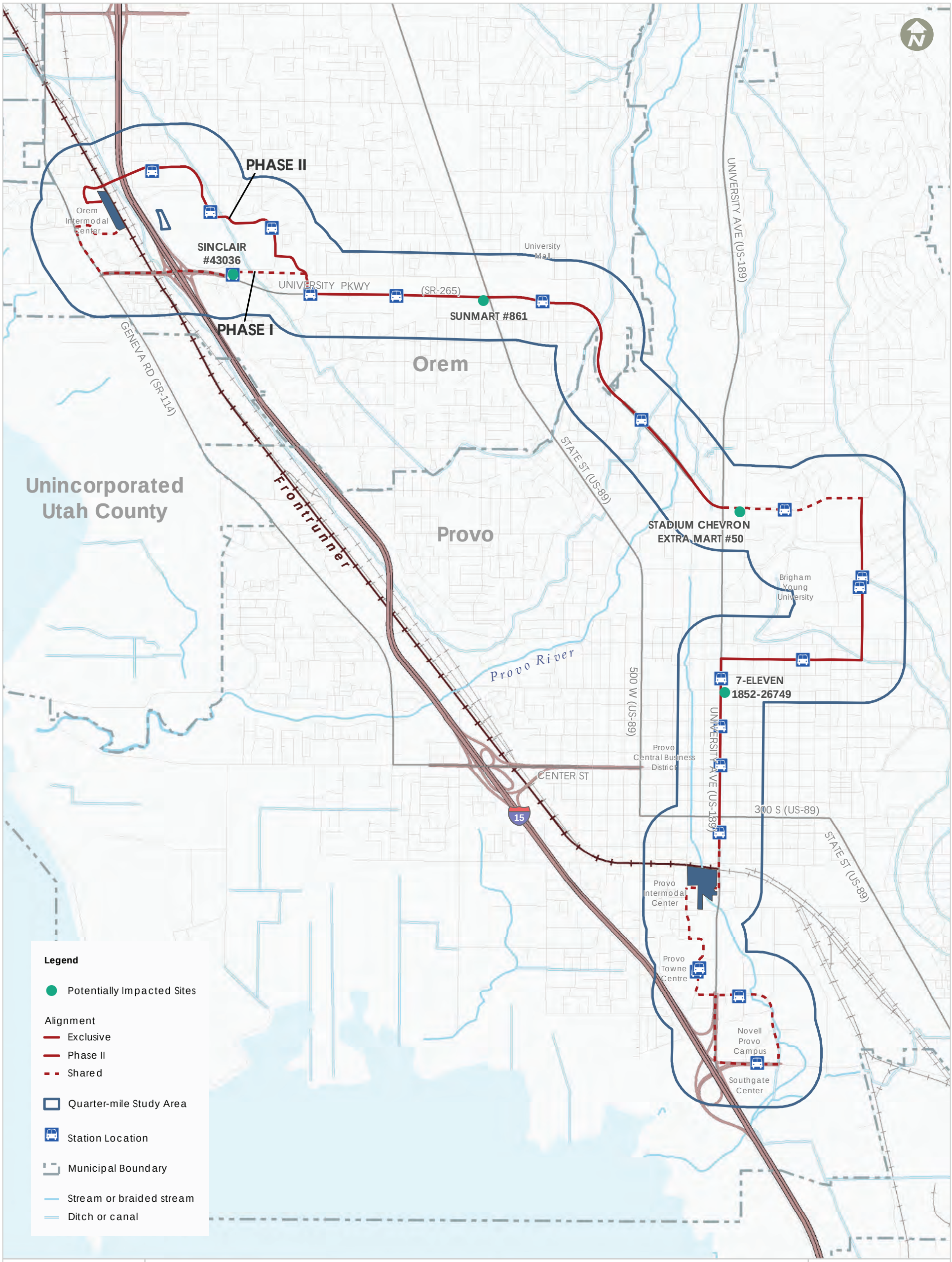
0 0.5 1 Kilometers

Figure 3.13-3
Groundwater



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

Figure 3.13-4 Surface Waters, Canals, and Floodplains



Map projection is UTM12N NAD83. Base data layers from the State of Utah Automated Geographic Reference Center (AGRC) and from municipal zoning plans.

Figure 3.14-1 Hazardous Materials