Business sites in Salem need to be competitively priced with site in comparable settings. All incentives offered to business have a cost. A commitment by the City to package business sites is costly. Engineers, real estate advisors, City leaders and planners will typically need one to two years to prepare a site for market. Consulting fees and land improvement costs are out of reach to most communities without some form of grant assistance.

Disincentives play an equally important role in economic development. Sites which are not drained, or are on the Wetlands map, are not saleable, Sites which do not meet the "five-way test" are not competitive with other communities. Ongoing costs such as utility franchise taxes, if higher than neighboring competitors, are also strong disincentive.

Salem's relative property tax rates are neither an incentive nor a disincentive. **Salem's rate of .001228 is relatively low compared to other Utah County cities.** It is less than two-thirds of the rate in Pleasant Grove and at least 20% lower than American Fork, Lindon, Provo, Springville, Mapleton, Elkridge and Woodland Hills.

ACTION ITEMS

One of Salem's goals is economic development. This will be done by having City government act as development partners with owners of business sites. The City will: 1) Provide information on the City, 2) Make referrals of potential clients to local developers, and 3) Expedite business zoning and permit approvals. Another element of Salem's economic development program will be to assist owners and developers of business properties to package their sites for market. Packaged sites with meet the "five-way test."

Salem's economic development focus will be to encourage the appropriate development by the freeway interchange by working with quality developers to bring business sites to market, cooperating with utility services, and providing quality zoning ordinances to attract and keep targeted businesses in the City. Among the businesses targeted for attraction are: software, engineering, and light industry. **Area specific guidance on potential development around the interchange is provided in the Salem Interchange Commercial Master Plan portion of the General Plan.**

GOAL: 1.0 TO PROMOTE AND ENCOURAGE COMMERCIAL, INDUSTRIAL AND OTHER ECONOMIC ENDEAVORS TO STRENGTHEN AND IMPROVE THE CITY'S TAX BASE AND QUALITY OF LIFE.

POLICIES:

1.1 Coordinate closely and seek participation with private, county, state, and other economic development organizations.

1.2 Pursue the potential for local economic development activities.

1.3 Promote a positive environment for the growth and development of economic activities which will enhance the City's quality of life.

1.4 Encourage the development of "packaged" sites which meet the "five-way test" and promote the sites through economic development channels.

1.5 Provide adequate infrastructure to support the anticipated needs of commercial, industrial and residential development.

1.6 Utilize the existing Salem City Redevelopment Agency to create economic development areas and promote economic growth as contemplated in the Salem City Comprehensive General Plan.

GOAL: 1.0 TO PROMOTE BUSINESSES AND CLEAN INDUSTRIAL DEVELOPMENT WHICH WILL PROVIDE A DIVERSE ECONOMIC BASE AND WILL COMPLEMENT LOCAL RETAIL, COMMERCIAL, AND INDUSTRIAL ESTABLISHMENTS IN HARMONY WITH THE COMMUNITY’S OVERALL RURAL AND MODERN IMAGE AND IDENTITY AS REFLECTED IN THE COMMUNITY VISION STATEMENT.

GOAL: 2.0 TO PROMOTE AND ENCOURAGE COMMERCIAL, INDUSTRIAL AND OTHER ECONOMIC ENDEAVORS TO STRENGTHEN AND IMPROVE THE CITY'S TAX BASE AND QUALITY OF LIFE.

GOAL: 3.0 PREPARE INFORMATION INTRODUCING SALEM CITY AND OUTLINING THE ADVANTAGES OF LOCATING A BUSINESS IN SALEM.

GOAL 4.0 IMPLEMENT THE SUMMER SPRING COMMERCIAL MASTER PLAN.

Salem City
Summer Spring Commercial Master Plan

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SECTION I:
Article I. INTRODUCTION

1.1 Purpose and Intent

The City of Salem recognizes the need to proactively plan for the development of the properties surrounding the Salem/Benjamin I-15 Interchange. As such, this Summer Springs Commercial Master Plan is put forth to provide prospective developers, retailers and builders with a clear statement of the design philosophy, principles, and criteria for development within the Master Plan Area. The Master Plan provides a framework by which future development proposals will be reviewed and approved. Nonetheless, the standards outlined in this plan are intended to allow for a measure of flexibility so as to accommodate site specific needs and circumstances.

It is also intended that this Master Plan will provide sufficient guidance to allow the City and the development community to cooperatively work to install infrastructure within the Master Plan Area. At present, the 890 acres found within the Area are largely undeveloped. Substantial investments are required to construct roads and utilities in preparation for the Area's development. It is anticipated that Salem City may choose to exercise its ability to form an Economic Development Area or to otherwise establish a mechanism to invest in the area's infrastructure. Salem City also recognizes the role the development community will play in the development of the Area. As such, the City is eager to develop cooperative relationships with development professionals who will implement the various elements of this Plan.

Another significant purpose of this document is to provide the blueprint for the land-use zoning of the area. The Master Plan describes several land-use districts through narrative and identification on the Area Map. Several of the land-use districts identified in this document are similar to districts identified in Salem City's General Plan. However, the districts identified in this document do not identically match those found in the Salem's General Plan and are not intended to do so. This Plan is however intended to support and promote the Mission of the Salem City General Plan as articulated below:

> "The mission of the General Plan is to provide for a strong, positive civic image and quality of life for people who live and work in Salem City by providing guidelines and standards that ensure the orderly and balanced distribution of growth, sound fiscal and economic investment and the preservation of the open, rural living environment in a clean, attractive physical setting."

1.2 Community Profile

1.2.1 Demographics

At the time that this Master Plan was prepared, data from the 2000 Census was reaching obsolescence. Even so, the 2000 Census offers the only source for at least some of the demographic points reported and therefore is the reference for the information contained herein. While it's know that Salem's population has changed significantly between 2000 and 2009 it believed that little has changed relative to the characteristics of Salem's population.

Age Composition	Under 18	18 to 24	25 to 44	45 to 64	65 and older
	40.6%	10.2%	25%	16.4%	7.8%

Racial Composition	White	African American	Native American	Asian	Pacific Islander	Other Races	Hispanic
	97%	.1%	.1%	.15%	.27%	1.4%	2.7%

Income	Per Capita	Median Household	Median Family	Median Males	Median Females	Utah Median	US Median
	$16,507	$54,813	$57,557	$40,116	$22,798	$45,230	$42,128

For purposes of a commercial area master plan, one of the more important demographic factors to consider is household income. It is therefore noteworthy to emphasize Salem's median household income which is 17 percent higher that Utah's median household income and 23 percent higher than the median household income in the United States.

1.2.2 Growth

Salem City's growth in recent years has been consistent. It is anticipated that Salem's growth will maintain its historic pace in the immediate years to come. It is also recognized that Salem's rate of growth will likely increase, perhaps substantially, as properties in the Plan Area begin to develop. In the past, Salem City's zoning regulations have generally limited opportunities to develop dwellings that are not located on at least .25 or .3 acres. This practice has had the effect of checking growth. While this effect is something that many in Salem City appreciate and support, it is believed that the introduction of opportunities in the Plan Area to execute residential developments that were not previously permitted will accelerate the community's growth.

The charts below contain population estimate data that is provided by Mountainland Association of Governments. This particular data was last updated in June of 2008. The values provided in the 2001 to 2007 columns indicate MAG's July 1 estimate for each respective year.

City	April 2001	2001	2002	2003	2004	2005	2006	2007	population difference	percent change	AARC
Salem	4,372	4,856	5,062	5,191	5,434	5,519	5,676	5,903	1,531	35.0%	4.4%

Given the situation of the Plan Area, located in something of a crossroads for several communities, it is recognized that growth in the surrounding communities will impact the viability of certain developments. All in all, communities in the southern end of the Provo/Orem Metropolitan Area have grown rapidly in recent years. Given the availability of land, the presence of infrastructure and land costs that are typically lower than elsewhere in the Metropolitan Area it is expected that growth in the region will continue well into the future. For purposes of this document, growth is being measured in the communities that adjoin Salem City. The following chart contains MAG's population estimates for the cities that share a boundary with Salem:

City	April 2001	2001	2002	2003	2004	2005	2006	2007	population difference	percent change	AARC
Spanish Fork	20,246	22,057	23,360	24,412	25,528	26,471	27,050	28,674	8,428	41.6%	5.1%
Payson	12,716	14,106	14,901	15,564	15,990	16,605	16,944	17,115	4,399	34.6%	4.3%
Elk Ridge	1,838	1,967	2,075	2,165	2,199	2,251	2,300	2,361	523	28.5%	3.6%
Woodland Hills	941	1,033	1,099	1,146	1,237	1,263	1,289	1,301	360	38.3%	4.7%

Perhaps the most relevant growth data for this document is the future projections for growth in Salem and the surrounding area. The following chart provides MAG's estimates of future growth in Salem and the four communities in the immediate vicinity:

City	2000	2006	2010	2020	2030	2040	2050	2060

Salem	4,372	5,632	9,004	17,022	28,651	38,000	45,000	51,100
Spanish Fork	20,246	27,717	34,173	46,042	56,651	66,300	69,400	72,700
Payson	12,716	16,748	19,221	30,234	43,790	55,300	63,100	71,900
Elk Ridge	1,838	2,296	3,133	5,578	6,963	7,100	7,200	7,300
Woodland Hills	941	1,269	1,461	1,558	2,245	2,900	3,000	3,000

Based on MAG's estimates, the population of the communities in the region is expected to reach 100,434 by 2020 and 138,300 by 2030. Should these estimates be accurate, the population of the five included cities will nearly double from 2006 to 2020 and nearly triple from 2006 to 2030.

1.2.3 Planning Inventory

1.2.4 City Services

Salem City provides the services that are customarily provided by municipalities. These services include police and fire protection, recreation, engineering, building inspection, garbage collection and administration. Additionally, Salem City also provides power service and operates its own wastewater treatment plant in addition to providing both culinary and pressurized

Other services provided in the community include natural gas (Questar), communications (Qwest), and cable television which is provided by a number of companies including Comcast and Direct TV.

1.3 Project Area Description

1.3.1 General Characteristics

The Master Plan Area includes 890 acres that are presently being used for one type of agricultural production or another. Very little of the infrastructure that is required to support the build out of the Master Plan is in place. The majority of the properties in the Plan Area are vacant and the dominant land-use is agriculture. A few dwellings exist along with the types of structures that are customarily associated with agrarian operations. The most substantial facility in the Plan Area is a wholesale greenhouse facility located at approximately 1880 North 460 West. By way of waterways, Beer Creek is the only significant watercourse found in the Plan Area.

1.3.2 Topography

The Plan Area has very little change in elevation with only a very gentle slope progressing downward towards the northwest. The average elevation of the Area is approximately 4,532 feet above sea level.

1.3.3 Climate

Rainfall and temperature data for the Plan Area are provided in the table below:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
average high	36°	44°	50°	58°	70°	81°	90°	87°	77°	64°	48°	38°
average low	15°	20°	27°	34°	44°	51°	58°	57°	46°	36°	26°	17°
mean	26°	32°	38°	47°	57°	67°	75°	72°	62°	51°	38°	28°
average precipitation	1.4"	1.4"	2.0"	2.1"	1.8"	1.0:	.9"	1.3"	1.4"	1.9"	1.8"	1.6"

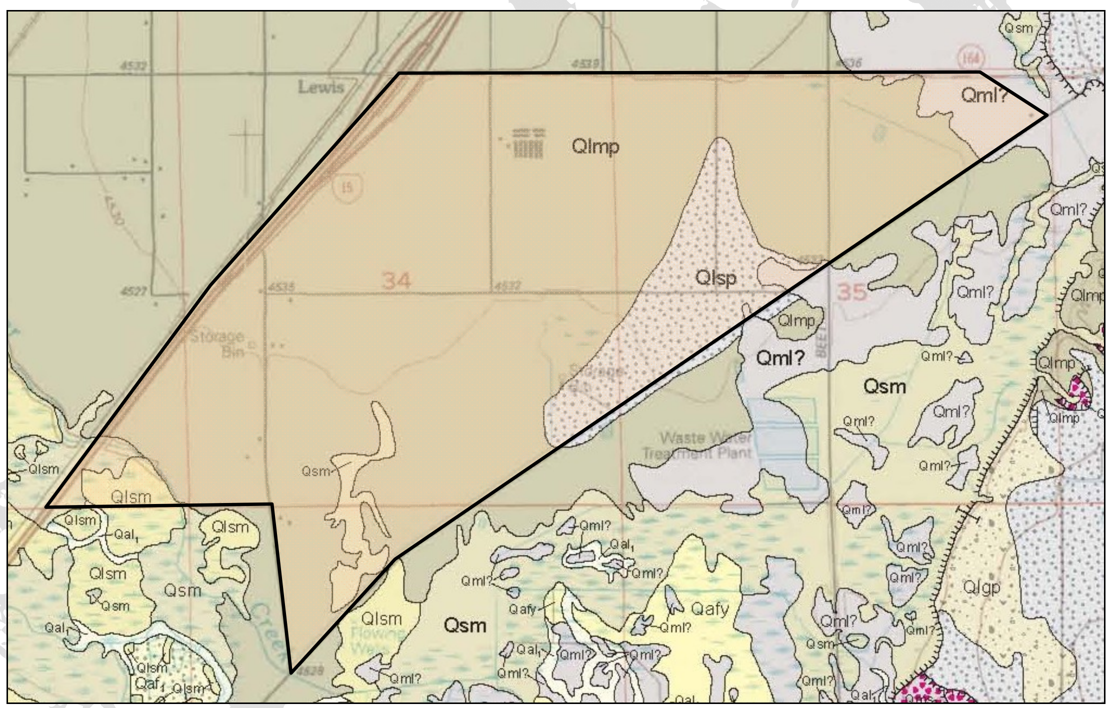
Source: Country Studies

1.3.4 Building Requirements

The snow load for the Plan Area is 30 pounds per square foot roof load, 43 pounds per square foot snow load. The wind factor for the study area is 90 miles per hour.

No specific Geotechnical Studies or Soils Reports were prepared in connection with the development of this Master Plan. Nonetheless, it is understood that the only significant geologic hazard present in the Plan Area is the threat of liquefaction. Relative to the development potential of particular properties, the presence of small pockets of wetlands that most likely exist on the eastern edge of the Plan Area are believed to be the only natural limitation. In certain situations wetlands will need to be accounted for as part of the development design process. Relative to structural design, the prospect of liquefaction will need to be accounted for. Aside from those factors, it is believed that development can proceed without encountering any unique circumstances.

Soils in the Plan Area vary somewhat but are mostly Lacustrine silt and clay (Qlmp). Other soils found in the Plan Area include Lacustrine sand and silt (Qlsp), Lacustrine and marsh deposits, undivided (Qlsmeters), and Marsh deposits (Qsmeters). The following are excerpts taken from the GEOLOGIC MAP OF THE SPANISH FORK QUADRANGLE, UTAH COUNTY, UTAH produced by Barry J. Solomon, Donald L. Clark, and Michael N. Machette of the Utah Geological Survey in 2007:



Lacustrine silt and clay (upper Pleistocene) – Calcareous silt (marl) and clay with minor fine sand; typically laminated or thin bedded but appears unstratified at a distance; ostracodes locally common. Deposited in quiet water below the Provo shoreline in moderately deep basins and sheltered bays; overlies lacustrine silt and clay of the transgressive phase (Qlmb). Likely includes or may be entirely lagoon-fill deposits (Qllp) in the flat area south of Payson between beach ridges (Qlgp) along U.S. Highway 6 on the west and the Provo shoreline on the east. Machette (1992) reported that silt and clay of the regressive phase can be differentiated from silt and clay of the transgressive phase by the presence of conchoidal fractures in blocks of transgressive deposits and their absence in regressive deposits, but Qlmp may include some undifferentiated transgressive deposits. Exposed thickness less than 15 feet (5 meters).

Lacustrine sand and silt (upper Pleistocene) – Moderately to well-sorted, subrounded to rounded, fine to coarse sand and silt with minor pebbly gravel. Thick to very thick bedded; commonly has ripple marks and scour features; gastropods locally common. Deposited at and below the Provo shoreline in relatively shallow water near shore; overlies and grades downslope into lacustrine silt and clay of the regressive phase (Qlmp) and laterally to sandy deltaic deposits (Qldp). Exposed thickness less than 30 feet (10 meters).

Lacustrine and marsh deposits, undivided (Holocene to upper Pleistocene) – Sand, silt, and clay in areas of mixed marsh and lacustrine deposits that are undifferentiated because the units are similar. Thickness less than 10 feet (3 meters).

Marsh deposits (Holocene) – Fine, organic-rich sediment associated with springs, ponds, seeps, and wetlands; commonly wet, but seasonally dry where drained by canals northwest of Payson; may locally contain peat deposits as thick as 3 feet (1 meter); overlies and grades into fine-grained regressive (Provo phase) deposits of Lake Bonneville (Qlmp); present where water table is high such as near Salem (Beer Creek feature), Spanish Fork city (Springville/Spanish Fork feature), Spring Lake, and north of Payson. Thickness commonly less than 10 feet (3 meters). Most marsh deposits in the Spanish Fork quadrangle occupy the center of a shallow, sinuous trough extending from north of Salem, westward along Beer Creek to the Benjamin fault, and farther west into the adjacent West Mountain
quadrangle. Although the origin of the trough is unknown, possibilities include: (1) it is the result of its position in a shallow depression between the northsloping piedmont and buried transgressive Lake Bonneville deltaic deposits that underlie the large, fan-shaped regressive delta at the mouth of Spanish Fork Canyon; or (2) it is a relict channel of Spanish Fork, formed before or during the transgression of Lake Bonneville, and covered and partially filled by later lacustrine deposits. Water in the trough accumulates from discharge in springs and seeps where unconfined granular deposits upslope meet less permeable fine-grained lake beds and from upward flow of ground water under artesian pressure through leaky confining lake beds from underlying aquifers (Brooks and Stolp, 1995).

1.4 Planning Process

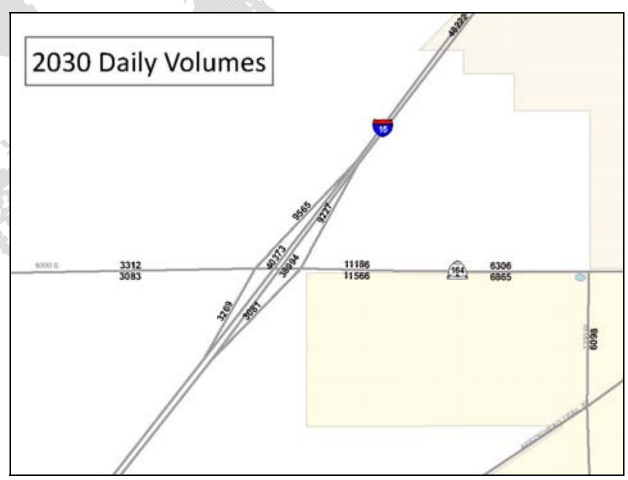
SECTION II:
COMMUNITY VISION

2.1 The Opportunity

The driving forces behind this Master Plan are the Mater Plan Area's proximity to the Salem I-15 Interchange and strong growth in surrounding communities.

The Area includes the southeast quadrant of the properties that immediately flank the Salem/Benjamin Interchange at Interstate 15. This interchange is the last undeveloped interchange along the Wasatch Front, meaning the adjacent properties are vacant. Interstate 15 serves as the backbone of the Utah's transportation system while also acting as one of the dominant north-south routes for the western United States. State Road 164 is the primary path to the interchange from the East. This State Road not only provides a direct connection with the population of Salem City but also ties the communities of Woodland Hills, Spanish Fork, Elk Ridge and Payson to the interchange.

In recent decades, the communities in South Utah County have experienced considerable growth. This growth is expected to continue well into the future. Mountainland Association of Governments (MAG) suggests that the 2030 population of South Utah County will be 234,512, an increase of 137,446 persons from the 2007 population estimate. Corresponding growth in I-15 traffic has occurred and is expected to continue. MAG suggests the traffic count on I-15 at the Salem/Benjamin Interchange will jump from the 2005 count of 48,279 trips to day to 104,509 trips per day in 2030.



Source: Mountainland Association of Governments, 2009

It is difficult to predict exactly what new opportunities growth will create within the Master Plan Area. Even so, there is ample reason to believe pressure will exist to have this interchange develop in a fashion that mimics what's occurred elsewhere along the Wasatch Front and Western United States. More particularly, it's anticipated that the development of this area will be anchored by a Regional Shopping Center. It's anticipated that the Regional Shopping Center will be located in a portion of the Master Plan Area that has both excellent visibility and access from Interstate 15 and State Road 164.

2.2 Tiers

As a preparatory step towards the completion of a Land-Use Map for the Master Plan Area, the Area has been divided into three portions defined as Tiers.

A concentric model is employed to create a pattern for the distribution of the various tiers as they radiate from transportation facilities. This form was chosen, rather that a linear model, in order to focus intense land-uses around areas where access to transportation facilities is most abundant.

The concentric model calls for the placement of the most intense land-uses around significant transportation facilities, with land-uses changing based on proximity to major activity centers. The effect of this pattern is then to create a "step down" pattern with the most intense land-uses surrounding large intersections and less and less intense land-uses surrounding them in a concentric form. Conceivably, this model would limit the creation of incompatible situations between neighboring land-uses.

Examples of high intensity land-uses would include Regional Commercial and Industrial. Low intensity Land Uses would be residential and agricultural. Factors considered when evaluating the intensity of a land-use would include traffic generation, noise, lighting, height, bulk, utility requirements, and site coverage.

The First Tier outlines the area where the greatest viability for retail uses is anticipated. Given the goals of Salem City, the First Tier is most significant portion of the Master Plan Area. The nature of the First Tier must be protected from any forms of development that may have a detrimental impact on the Tier's ability to attract or support retail uses. As currently planned, the First Tier encompasses approximately 170 acres.

The Second Tier contains some 360 acres and provides opportunities to locate non-retail uses in close proximity to employment and transportation routes. It is anticipated that the Second Tier will provide an opportunity to create, among other things, an inventory of housing types that are not readily found elsewhere in Salem City.

Lastly, the Third Tier has the potential to develop in a variety of ways. Given the potential for the this portion of the area to support a wide range of land uses, this Master Plan contemplates various scenarios that may occur as Salem City and the surrounding area evolve. Of note however is Salem City's interest in having some part of this Tier develop with light industrial or business park uses. Given the amount of land, approximately 330 acres, found in the Third Tier, a combination of distinct land uses can certainly be supported. The particular challenge in planning for the development of this Tier is the provision of design elements to create harmonious relationships between land uses that aren't historically found in close proximity to one another.

2.3 Tier One

A typical Regional Shopping Center would require a population of 150,000 persons to achieve market viability. This type of center would likely have one or two full-line department stores and would have something between 300,000 and 900,000 square feet of leasable area. Regional Shopping Centers generally require 60 to 120 acres of land. With that in mind, the First Tier has been designed so as to reserve at least 120 acres for the development of a Regional Shopping Center.

It's believed that 120 acres would accommodate the largest development that the market area could potentially support. As neighboring communities are also planning for retail development in the vicinity, it is understood that the full retail development of 120 acres in the Area may prove to be unfeasible. Nonetheless, as Salem City's paramount concern is the preservation of land for potential retail development, this Master Plan contemplates the most optimistic scenario relative to the market's ability to support retail uses.

The nature of Regional Shopping Centers has evolved substantially in recent decades. This evolution is most evident in the physical form the centers take and in the tenant base found within the center. As such, it is conceivable that variations on the Regional Shopping Center model may prove feasible and advantageous in the Master Plan Area. Lifestyle Centers and Urban Centers are two such models that may function very well at First Tier locations in the Area.

Lifestyle centers are commonly recognized by the conglomeration of national retailers with exceptional design, outdoor plazas and other ancillary attractions. The inclusion of numerous national retailers may supplant the presence of a department store as the center's anchor.

Urban Centers are typically characterized by a distinct urban form that contains elements reminiscent of traditional downtowns. Key aspects of Urban Centers include the creation of a social environment as well as a center for commerce. The inventory of retailers may be similar in Town and Lifestyle Centers. Another similarity is the open-air nature of both centers.

Given the fact that the First Tier may develop in a fashion that follows any one of several different models, this Master Plan recognizes the underlying need for the City to maintain pliability in terms preparing ordinances that regulate the form a particular center may take.

2.4 Tier Two

The Master Plan Area is not intrinsically connected to the presently developed portions of Salem City. Given the Area's distinct relationship with the remainder of the City, Salem City has considered elements of land-use planning for the Master Plan Area that currently aren't employed elsewhere in the City.

Salem City understands the essential need to maximize the area's potential to provide basic services, to provide employment and, perhaps above all, to generate retail sales. These fundamental needs have led the City to investigate planning opportunities that will help the Master Plan Area develop so as to support a diverse range of activities.

This diversity becomes evident in what's planned for the Second Tier. Properties that immediately flank Tier One are designated so as to allow Second Tier uses such as professional office, residential, specialty retail or perhaps a mixture of all three. It is expected several opportunities will be maximized by planning for these uses in the Second Tier.

First, these uses will be positioned to maximize the value of excellent access to transportation facilities while forgoing the land cost that will be afforded in the First Tier locations. As substantial transportation routes are planned though the Second Tier, uses in this area will enjoy the visibility and access that's necessary to support professional office and specialty retail uses.

Second, these uses will be able to capitalize on their proximity to both retail uses and those uses found in the Third Tier areas. The main component of this opportunity is the inclusion of residential uses. The proximity of dwellings to should help create true synergy as Area residents patronize Area business and as Area businesses provide support for one another.

Third, the presence of professional office, residential and specialty retail uses in the Second Tier will help create a functional transition between the other tiers. While there is some question as to what type of development will occur in the Third Tier, it is understood that the area's primary traffic generators and activity centers will be located in the First Tier. Under any likely scenario, the intensity of activity in the Third Tier will be substantially less than what will be found in the other two areas. Tier Two will be the transition areas and may act as something of a buffer for the less-intense uses in the Third Tier.

2.5 Tier Three

The Third Tier offers a dynamic element to the Master Plan and Master Plan Area. This tier enjoys a few key characteristics that may lead to diverse development opportunities. Initially viewed as an appropriate location for predominately residential uses, Salem City is currently entertaining the prospect of allowing light industrial uses in a portion of this tier. With nearly 330 acres in the Tier Three, it's anticipated that it could support a combination of residential, business park and light industrial uses.

The principle challenge in designing a development or land-use plan for this specific area is the very distinct nature of the uses that may be present. The need to allow for some flexibility in arranging land-uses is recognized within this Master Plan.

Property owners will experience unique opportunities and pressures to allow the use of their land to change. Relative to business park or light industrial uses, there is a very low level of predictability as to the likelihood that a particular parcel will develop in a particular fashion. At the same time, it is generally understood that the marketability of the parcels in this tier for residential uses will become increasingly strong. It is certainly conceivable that the market for residential uses will outpace the market for any other use in the Third Tier.

Planning for the unknown timing and sequence of development is particularly complex as excellent opportunities for various non-residential uses may arise at any time. Understanding the nature of this situation, it is also recognized that substantial long-lasting problems may arise if insufficient land-use controls are in place. Of particular concern is the prospect of having residential and light industrial uses arranged such that the inherent incompatibilities of those uses are unaccounted for.

In an effort to balance the potential problems of allowing incompatible uses in the same area and the need to prepare for unforeseen development opportunities, this document outlines strategies that are to be employed to create functional uses between the distinct uses in the area.

2.6 Project Fundamentals

Ultimately the Project Vision can be synthesized into the follow points or Project Fundamentals:

1. Provide the framework for a functional transportation network.
2. Preserve key locations for retail uses.
3. Provide areas for employment generators.
4. Provide areas for housing.
5. Allow for mixed uses and sufficient density to peak the Area's activity levels.
6. Arrange land-uses so as to maximize efficiency while creating viable, functional relationships.
7. Create a distinct, welcoming sense of place that will attract both residents and visitors to the area.

SECTION III:
TRANSPORTATION

3. Framework

This document is not intended to serve as a Transportation Element for Salem City or the Plan Area. Even so, the anticipated transportation network within the Plan Area will certainly define the potential of the properties within the Area to support various land-uses. As this Master Plan is a plan for the ultimate build-out of the area it is understood that its implementation will occur incrementally. It's believed that the incremental upgrades to streets and transit options in the Area will play a significant role in creating new viability for shopping and other land-uses that rely on specific traffic counts to justify a presence. Moreover, these upgrades are an essential component of creating said opportunities.

The transportation system will have a critical impact on the viability of any land-use plan for the Area. As such, necessary reliance has been given to key assumptions. It is understood that while UDOT and MAG have plans in place for transportation facilities in the Plan Area there is no specific, reliable timetable in place for the construction of planned upgrades. It is also understood that additional upgrades will be made as Salem City works in concert with the development community to facilitate the construction of City facilities.

Given the unpredictable timing of key improvements and the tendency for transportation planning to evolve, this Master Plan is designed to focus on relationships between land-uses and transportation facilities. These relationships create land-use patterns that can be replicated with relative ease. Uses that tend to generate the most traffic, noise or other impacts are typically located adjacent significant transportation facilities. Uses that generate progressively less and less impact are therefore located at greater and greater distances from substantial roadways.

These assumptions include the following:

1.) The Utah Department of Transportation will make necessary upgrades to the Interstate 15 and the Salem Interchange in order to accommodate increased traffic.
2.) The Utah Department of Transportation will upgrade 8000 South to 5 lanes.

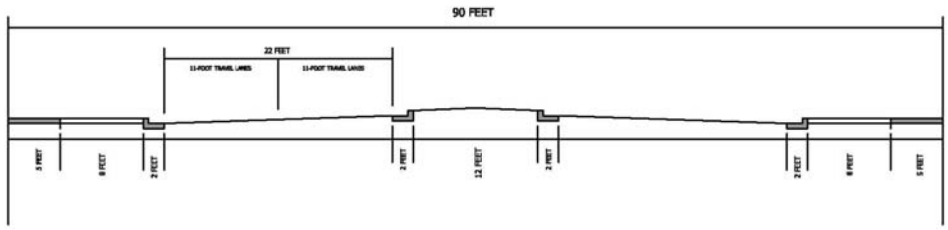
The network of collector and arterial class streets utilized in this Plan was prepared by Long Pine under the advisement of Salem City's Engineering Department. No traffic model was prepared in the development of the proposed street network, aside from what has been performed by MAG on the regional facilities. The driving factors for the street network include the following:

1.) The provision of adequate access to adjacent properties.
2.) The provision of access between surrounding communities and regional transportation facilities.
3.) The ultimate creation of contiguous properties that are configured to maximize development potential.
4.) The placement of streets in corridors where utilities are currently located.
5.) The placement of streets in locations where their development is shared between adjoining property owners.

Cross sections have been prepared for the arterial and collector streets to clearly define what type of facilities are to be constructed as the Plan Area develops. The cross sections have been designed so as to accommodate vehicular, bicycle and pedestrian traffic while creating a zone that is safe and attractive for pedestrians. Also, the bifurcated nature of the cross sections will potentially accommodate their construction in phases, a characteristic that is hoped to help accelerate the initial developments in the area.

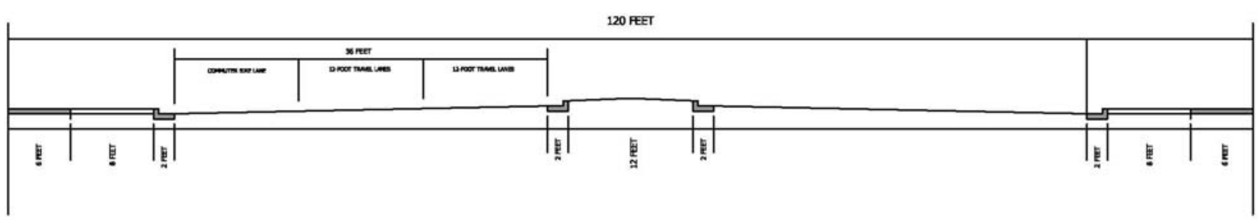
The Collector Street Cross Section contains 90 feet of right-of-way and could accommodate a variety of potential facilities. Perhaps the most likely configuration of facilities would simply be a travel lane in each direction with a turn lane and shoulder. However, the asphalt width could also support two travel lanes in each direction with the turn lane or one travel lane in each direction with bike lanes in each direction and the turn lane. It is believed that having numerous options at the City's disposal as the Plan Area develops will be essential to providing the evolving level of service that will be at play. Relative to pedestrian facilities, the cross section identifies an eight-foot park strip and 5 foot walk. A park strip of this size will allow for the planting of deciduous trees that will provide a canopy over the sidewalk while the five-foot walk will allow for ADA compliance at the most problematic locations.

COLLECTOR STREET CROSS SECTION



The Arterial Street Cross Section has been designed on same philosophy as the design of the Collector Street Cross section. A need exists to define and construct a facility that can be adapted to needs as the characteristics of the Plan Area change. In the case of the Arterial Cross Section, it can accommodate the same facilities as the Collector Cross Section while additionally accommodating one travel lane in each direction.

ARTERIAL STREET CROSS SECTION



SECTION IV:
INFRASTRUCTURE

Very little of the infrastructure that is required to support development in the Plan Area is currently in place. An existing 8" sewer line is located in Arrowhead Trail which then extends in Beet Road to an existing lift station. A 12" culinary water line is also present in Beet Road; it is understood that this line's primary customer is the greenhouse facility located at 1880 North 460 West. A power substation is currently located just south of the Plan Area at approximately 1400 North 600 West. While power service is provided to various structures in the Plan Area, it's understood that development of any significance will require the installation of new power facilities. Questar has natural gas available in the study area.

It is anticipated that the necessary utilities will be extended into the Plan Area as development occurs. Salem City maintains Construction and Development Standards will be followed in the design and construction of the infrastructure. Water lines (culinary and secondary) will be installed in the north and east sides of streets while sewer will be placed on the south and west sides. The accompanying Infrastructure Map identifies the anticipated locations for the main utilities in the Plan Area.

It is also necessary to note the anticipated need to construct a sewer lift station near the southwest corner of the Plan Area. It is not precisely known what area this station would serve and is therefore premature to suggest what size it should be.

SECTION V:
LAND-USE DISTRICTS

5. Districts

The following descriptions are associated with corresponding delineations on the Land-use Map. It is expected that these descriptions will serve as a blueprint not only for specific zoning proposals but also for zoning standards and development requirements.

5.1 Low Density Residential

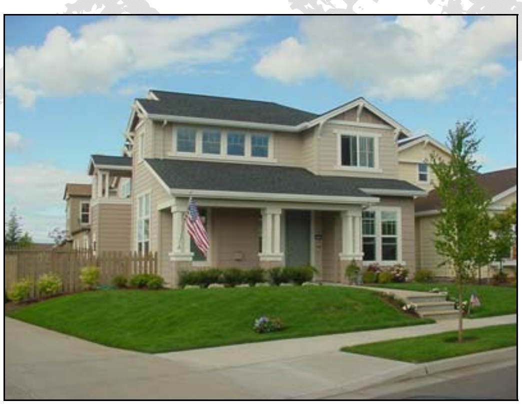
The Low Density Residential designation is designed to provide areas for residential subdivisions with an overall density of 2 to 4 units per acre. This district will be characterized by its suburban nature that resembles neighborhoods elsewhere in Salem.

While this district will closely match the most prevalent development type in Salem City, it will comprise a small portion of the Master Plan Area.

5.2 Medium Density Residential

The Medium Density Residential designation is provided as a means of allowing for residential developments at higher densities in neighborhoods that still maintain a suburban character. This area is to be characterized by density ranging from 4 to 10 units per acre. Development in this area may include a mixture of attached and detached dwellings.

The main application of this designation should be in areas where Salem City desires to create a functional transition from one land-use to another. While some multi-family structures may be permitted in a stacked form, the majority of any attached dwellings should be designed in a side-by-side configuration. Developments in these areas should include recreational features.



5.3 High Density Residential

The High Density Residential designation is intended to identify specific areas in the Master Plan Area where high levels of activity are anticipated and access to major transportation facilities is available.

Densities in the High Density Residential areas will range from 10 to 16 units per acre.

Attention to design will be essential as site and structural plans are prepared for High Density projects.

Properties developed in the High Density residential areas shall provide substantial amenities. The use of high quality materials in all aspects of High Density Residential developments construction will be mandatory.

Developments are to be characterized by a combination of stacked and side-by-side multi-family structures and a variety of amenities. Projects shall be designed so as to complement and connect to the surrounding land-uses.

5.4 Mixed Use

The Mixed Use designation is designed to provide for developments that have a combination of well integrated residential and commercial uses. It is expected that developments in the Mixed Use areas will be among the most difficult in the City to design. As such, it is also expected that teams of highly sophisticated design and construction professionals will be involved in the preparation of development plans in the Mixed Use areas.

In addition to the residential and retail based commercial uses, the Mixed Use district is intended to accommodate the majority of the professional office space in the Area. Office components should be included as an integral part of developments in this district so as to capitalize on the benefits that can be enjoyed with a mixture of distinct yet complimentary land-uses.

The residential component shall be designed and integrated so as to complement the surrounding commercial activity. While not required, it is anticipated that dwelling units will be located in shared residential/commercial structures so as to preserve first-floor and other prime commercial spaces for retail activities. Plazas and recreational features shall be designed for the use and enjoyment of both the commercial patrons and the development’s residents

5.5 Neighborhood Commercial

The Neighborhood Commercial designation is intended to identify locations where small-scale, neighborhood-oriented commercial developments are to be located. These commercial developments are to provide goods and services that are used on a daily basis by the surrounding residents.

Tennant spaces in these areas shall be limited to 2,000 square feet. Neighborhood Commercial developments should be large enough to accommodate functioning traffic patterns but should not exceed 2 acres in size.

Parcels considered for this designation should be located in close proximity to residential areas where pedestrian activity between residents and the development is likely to occur. Improvements such as trails, seating and lighting that would help create gathering spaces and promote pedestrian activity are expected and shall be considered and essential part of developments in the Neighborhood Commercial areas.

5.6 Regional Commercial

Regional Commercial areas shall be characterized by a variety of retail users including big box retail configured in developments that provide excellent vehicular access to and from major transportation facilities. Developments located in Regional Commercial areas shall be designed so as to create efficient, functional conglomerations of commercial activities.

Regional Commercial areas are to be located in close proximity to 8000 South and I-15. As such, careful consideration shall be given to the arrangement of structures and other improvements along the 8000 South corridor and adjacent to I-15.

Among the many tenants anticipated in these areas are large, destination-oriented businesses. With that in mind, individual sites shall be designed so as to make automobile access a priority. Even so, specific areas for pedestrian activity shall be designated and appropriately improved. Plazas and other features shall be provided as gathering places which should be incorporated so as to make each site an inviting place to visit.

5.7 Urban Center

The Urban Center designation is intended to provide specific a location where the development of a focal point of the Area can be planned. It is anticipated the Urban Center will include a broad range of land-uses with the expectation that the land-use combinations will be complimentary in nature.

While the developments in the Mixed Use will accommodate developments that maintain a sub-urban character, the Urban Center area will maintain urban characteristics.

The use of materials and design patterns that will contribute towards the creation of an interesting and inviting atmosphere will be mandatory. The inclusion of parks, plazas and broad pedestrian walks will be expected with individual development's designs. The mass and height of structures in the Urban Center district will exceed that of the other districts in the Area. Gradation standards for structures bulk shall be employed so as to create logical functioning transitions between this district and others.

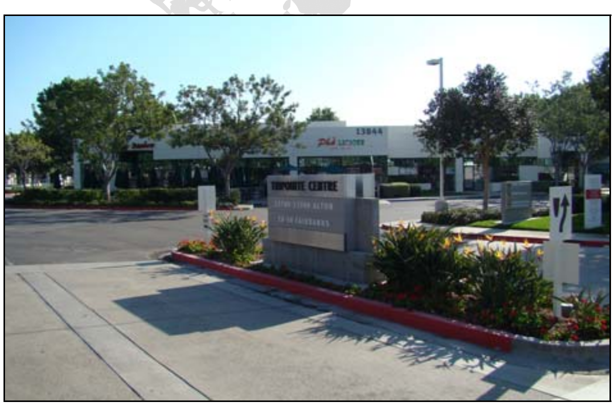
The Urban Center district will be defined by compact developments with most parking provided in structures and at street level.

5.8 Business Park

The Business Park designation will provide locations in the Area that will accommodate land-uses that require larger tracts of land and specific infrastructure facilities. Developments in the Business Park areas will create and maintain a campus type of setting. The central land-use in the district should be office space but other land-uses will be considered.

As it is anticipated that potential operators is this district will have unique infrastructure needs, consideration will be given as those needs are identified so as to ensure the establishment of a functioning atmosphere for the individual businesses.

Developments in these areas shall contain landscaping and recreational features as per the City's Parks and Trails Element of the General Plan.



5.9 Office Warehouse

The Office Warehouse district is provided to identify locations for a number of different land-uses. The nature of the area will be defined by different activities that will range from automotive repair centers to office and assembly facilities for small business. It is expected that the individual tenants will maintain some office or showroom space as a part of their business activity. Developments in the area will provide an attractive, functional and secure setting for the combination of tenants and land-uses that are anticipated.

As it is anticipated that land-uses within this district will create certain sounds, odors and other elements that might be incompatible with other land-uses, careful consideration will be given when developments in these areas are designed so as to provide suitable transitions between the distinct land-uses.

5.10 Light Industrial

The Light Industrial designation is included to provide a way to identify specific locations that may be suitable for light manufacturing and assembly facilities. The inclusion of Light Industrial developments is not the highest priority for Salem City. Nonetheless, Salem City recognizes the potential benefit of having sizable employment generators in the Area.

Sites being developed for activities in this area shall provide an attractive, functional atmosphere. Sizeable, intricately designed buffers may be required between Light Industrial and other uses in the Area. Light Industrial areas that adjoin public right-of-ways will be landscaped and otherwise beautified so as to make the individual sites as attractive as possible.

Developments in these areas shall contain landscaping and recreational features as per the City's Parks and Trails Element of the General Plan.

5.11 Agricultural

At present, the Master Plan Area is almost exclusively being used for agricultural activities. These activities will continue until such time that the uses are converted to a use that is consistent with the designation on the Land Use Map.

The Agricultural designation is provided to make a formal allowance for those activities to continue indefinitely. At the same time, Salem City is promoting the conversion of those uses. With that in mind, the construction of additional dwellings or agricultural facilities that may hinder or delay those properties conversion is discouraged.

SECTION VI:
DESIGN GUIDELINES

6. Purpose

Salem City recognizes the significant role design will have in guiding development towards the City's recognized goals. At the same time, the City understands the value of providing a level of flexibility for the designers of individual projects. In an effort to balance those factors, no architectural style, or theme is prescribed in this document.

Even so, the absolute necessity to design sites, structures and any other physical elements in a manner that accurately reflects an authentic architectural style is understood. Regardless of the particular style that might be chosen, the project design must include elements that celebrate and support the selected theme or style. Specifically, the building mass, roofline, materials, entrance placement and window placement should all promote the design of a structure that exhibits an easily recognizable style. Furthermore, architectural details such as mullions, cornice molding and window treatments will be utilized to promote a consistent look and feel throughout the Area.

6.1 Building Design and Orientation

Objectives

6.1.1 To orient front facades and main entries toward streets or other public open spaces.
6.1.2 To orient windows and doors toward the street.
6.1.3 To orient and design buildings in ways that define the pathways from one area to another.
6.1.4 To appropriately design facades that face public areas so as to create an inviting environment.
6.1.5 To design building's rear or side facades with adequate attention to design and quality of materials so as to create visual authenticity and to maintain the value of adjoining properties.
6.1.6 To locate the front facade of the building in close proximity to drive aisles and public rights-of-way.
6.1.7 To design corner buildings so as to share architectural elements and details with adjoining corners.
6.1.8 To design buildings so that the majority of the building facade should be oriented parallel to the street on which it fronts.
6.1.9 To orient building entries to public streets.
6.1.10 To create buildings that provide human scale, interest and variation.
6.1.11 To create a commercial storefront character along major roadways by situating wall planes parallel to the street and by establishing consistent setbacks.
6.1.12 To create visual harmony by grouping structures of similar bulk and mass.
6.1.13 To moderate substantial changes in scale between adjacent buildings.
6.1.14 To emphasize the entry or entries to buildings.
6.1.15 To avoid large unbroken planes and blank facades.
6.1.16 To promote the use of details, architectural elements, and materials that will provide visual interest and create a recognizable, distinct sense of place.
6.1.17 To use windows to emphasize a particular architectural style.
6.1.18 To preclude the construction of long, blank, smooth, unbroken walls.
6.1.19 To utilize landscaping or architectural details to visually interrupt uninteresting planes.
6.1.20 To frame key nodes, paths and areas with buildings that are sized to visually emphasize those locations.

6.2 Building Materials

Objectives

6.2.1 To incorporate building materials that are authentic to particular architectural styles.
6.2.2 To incorporate building materials that will create a timeless sense of place.
6.2.3 To utilize materials that have the proven ability to withstand the rigors of Utah's climate while otherwise maintaining a consistent, presentable look over time.
6.2.4 To use appropriate materials to embellish structures at key locations.
6.2.5 The use of materials to create appropriate textural contrast in building design.
6.2.6 The use of appropriately colored materials to create visual interest.

6.3 Parking

Objectives

6.3.1 To provide adequate parking.
6.3.2 To minimize the visual presence of parked cars from key paths and areas.
6.3.3 To require appropriate landscaping in parking areas so as to minimize the visual impact and propensity to create heat islands.
6.3.4 To provide safe, comfortable and identifiable pedestrian routes through and adjacent to parking areas.
6.3.5 To place parking areas at the rear of buildings or provide screening to limit the areas dominance on the streetscape.
6.3.6 To consolidate crossings of drive aisles and public rights-of-way so as to minimize conflicts between automobiles and pedestrians.
6.3.7 To limit curb cuts and driveways that interfere with pedestrian paths.
6.3.8 To develop cross access arrangements between adjacent developments in order to facilitate functional traffic patterns.

6.4 Building Lighting

Objectives

6.4.1 To accentuate important architectural components of the building.
6.4.2 To create a safe, well lit environment.
6.4.3 To use lighting to emphasize building entries.
6.4.5 To avoid light pollution.
6.4.6 To avoid light spillover.
6.4.7 To provide adequate, uniform light in service areas.

6.5 Mechanical Equipment Screening

Objectives

6.5.1 To maintain the integrity of architecturally designed roofs.
6.5.2 To reduce the visual clutter of mechanical equipment as seen from public areas.
6.5.3 To mitigate the impact of impact noise.
6.5.4 To screen rooftop equipment with materials that are consistent with the architectural character of the building.
6.5.5 To screen ground level equipment with durable materials that are consistent with the building character.
6.5.6 To use landscaping or authentic architectural elements to soften the visual impact of equipment screening.

6.6 Landscaping

Objectives

6.6.1 To insure that all impervious areas of a development are landscaped.
6.6.2 To identify boundaries.
6.6.3 To create an appropriate balance of hard and softscape treatments according to the use of specific areas.
6.6.4 To use landscaping as a buffer between distinct land uses and activity areas.
6.6.5 To use landscaping to soften building planes and walls.
6.6.6 To use landscaping to create an attractive area with a finished look and feel.
6.6.7 To use a combination of landscape materials that will accomplish immediate and long-term goals.
6.6.8 To select appropriate plantings and materials for site specific conditions.
6.6.9 To avoid the use of landscaping that will be destroyed by pedestrian traffic or other activity.
6.6.10 To reduce the development of heat islands by incorporating appropriate landscaping.
6.6.11 Where appropriate, use native plant materials.
6.6.12 To landscape detention basins and other storm drain facilities so as to prevent erosion and maintain an attractive environment that blends with surrounding areas.

6.7 Walls and Fencing

Objectives

6.7.1 To screen from view outside trash receptacles, loading docks, open storage areas and utility equipment from public areas.
6.7.2 To provide security.
6.7.3 To design walls and fences so as to blend with area architecture.
6.7.4 To use materials in wall and fence construction that will withstand the impact of weather and adjacent use.
6.7.5 To limit graffiti's potential impact by using appropriate materials and by screening walls and fences with landscaping.
6.7.6 To avoid the creation of unsafe areas by using open fencing where appropriate.
6.7.7 Limit the need to construct walls by combining refuse storage and pick-up areas with other service and loading areas.

6.8 Site Lighting

Objectives

6.8.1 To provide adequate uniform lighting throughout a site.
6.8.2 To use fixtures that are consistent with the surrounding architectural style.
6.8.3 To use fixtures that limit light pollution.
6.8.4 To provide multiple light sources in areas that may present security concerns.
6.8.5 To place and screen fixtures so as to limit light pollution.
6.8.6 To use appropriate lighting for pedestrian paths and outdoor gathering areas.
6.8.7 High-pressure sodium.

SECTION VII:
SIGNAGE

7. Signage

Appropriate signage is an essential element of any healthy, functional commercial area. In the case of this Master Plan Area, signage will be particularly important for those businesses that rely on their site's visibility from the I-15 and 8000 South corridors. Elsewhere in the Area, signage and other wayfinding tools will provide opportunities for business advertising, traffic movement and to promote a consistent look.

Signage plays an integral role in establishing aesthetic quality and an overall sense of place. In the case of this Master Plan, signage will play a uniquely significant role in creating a distinctly recognizable character for the Area. The need for cohesive signage design is this area is exacerbated by the likelihood that the area will include a variety of architectural styles. In this case, signage should provide a common thread that weaves throughout the Area and serves to provide a common, discernable theme.

No proscriptive style for signage in the Master Plan Area is identified in this document. It is expected that a specific Signage Plan for the area will be prepared when the first development in the area is proposed. That Signage Plan will account for the diverse range of situations and needs that exist throughout the area. Also, that Signage Plan must conform to Salem City's signage regulations and the objectives outlined in this Master Plan. As a great distinction can be made between signage that is necessary to accommodate businesses in the Regional Commercial District and the other districts in the Area, the objectives provided are classified in two categories, Regional Commercial District and Other Districts.

7.1 Regional Commercial

7.1.1 Signage shall be limited to monument signs, wall-mounted signs and pole signs that are placed within 600 feet of I-15.
7.1.2 Wall-mounted signs shall include blade signs, pendant signs and signage located on awnings.
7.1.3 Earth tones shall be the predominate colors used on signage.
7.1.4 Monument signs shall not exceed 60 square feet and shall be multi-tenant signs.
7.1.5 Monument signs on the same side of an uninterrupted street shall not be located closer than 200 feet to one another.
7.1.6 Monument signs shall not exceed six feet above the top back of curb.
7.1.7 Wall-mounted signs shall be limited to 10 percent of the wall area on which the sign is mounted or 75 square feet, whichever is less.
7.1.8 Signage on canopies, awnings or similar architectural features may be permitted upon Site Plan review if it can be shown that it will not detract from the architectural theme.
7.1.9 Blade signs shall be consistent with the architectural theme of the overall development.
7.1.10 Pendant signs shall be consistent with the architectural theme of the overall development.
7.1.11 Signage on awnings shall only be located on the valance of the awning. Awnings must be consistent with the architectural theme of the overall development and shall only be located above doors and windows. Awnings must be kept in good repair at all times.
7.1.12 Backlit signs are discouraged and should only be permitted if they are not cabinet signs. Functional awnings shall not be considered backlit signs. Roof signs shall not be permitted.
7.1.13 Statuary signs bearing the likeness of any product or logo shall not be permitted. Wind signs shall not be permitted.
7.1.14 Temporary signs shall not be permitted.
7.1.15 Handbills and painting or otherwise marking any tress, sidewalks, walls, poles or other surfaces is prohibited.
7.1.16 Spotlights projecting into the sky shall not be permitted.
7.1.17 Vehicles and trailers shall at no time be used as signage.

7.1.18 Flashing, moving or audible signs shall not be permitted.

Address pole sign issue.

7.2 Other Districts

7.2.1 Signage shall be limited to monument signs and wall-mounted signs.
7.2.2 Wall-mounted signs shall include blade signs, pendant signs and signage located on awnings.
7.2.3 Earth tones shall be the predominate colors used on signage.
7.2.4 Monument signs shall not exceed 60 square feet and shall be multi-tenant signs. Monument
7.2.5 signs on the same side of an uninterrupted street shall not be located closer than 200 feet to o2e another.
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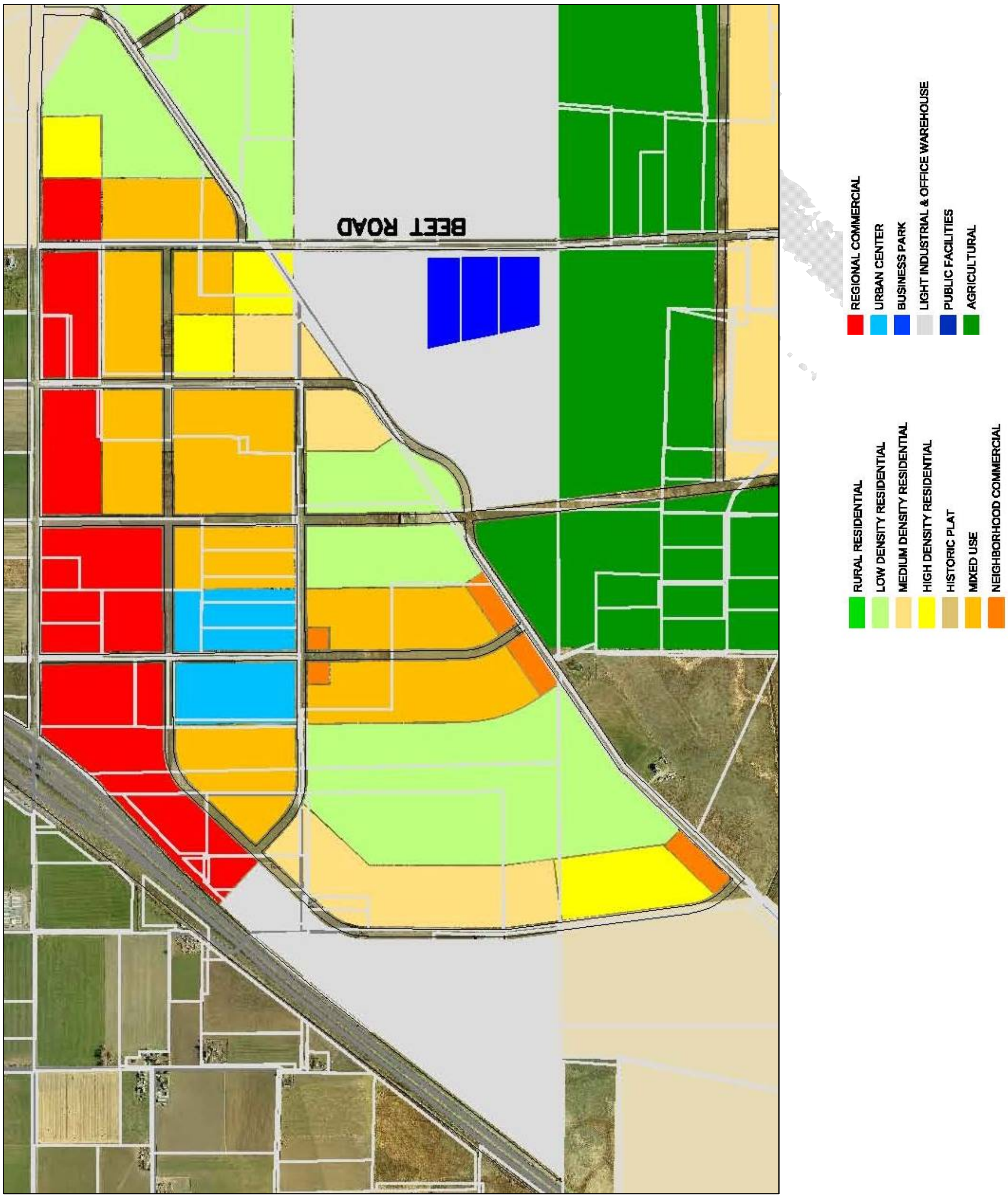
7.2.16 Spotlights projecting into the sky shall not be permitted.
7.2.17 Vehicles and trailers shall at no time be used as signage.
7.2.18 Flashing, moving or audible signs shall not be permitted.

SECTION VIII: RECOMMENDATIONS

SECTION IX:
MAPS



NATURAL SITUATION

Salem is located in the south central portion of Utah County approximately 60 minutes from Salt Lake City. The City is situated east of Interstate 1-15 between Spanish Fork and Payson.

CLIMATE AND VEGETATION

The climate in Salem is semi-arid, characterized by high summer temperatures, low humidity, wide temperature ranges, and low seasonal precipitation. The mean maximum high and low temperatures for January and July are shown in Table 1.

TABLE 1 - Mean and Maximum Temperatures

	January	July
HIGH	36° F	91° F
LOW	19° F	63° F
DIURNAL RANGE	17° F	28° F

Days are generally sunny, except during periods of winter storms or afternoon thunderstorms in the summer. Since the area normally has very little cloud cover, the temperature falls rapidly at night, resulting in a high daily temperature range.

Precipitation is mostly orthographic in origin. The amount averages 12-16 inches in the valley and increases to 25 inches in the surrounding mountains. Most of the precipitation falls as snow during winter months and melts in spring and summer, providing water for the valley.

The high temperatures and high amount of solar radiation cause low humidity and high evaporation rates.

NATURAL HAZARDS

Although no significant earthquakes have occurred in the general area of Salem in recent times; earthquakes and related aftershocks have the greatest potential for destruction of property within the City. The second most likely hazard to cause concern for the City is flooding. Flooding may occur from either snow-melt or a significant rain-fall event. The Federal Emergency Management Agency (FEMA) determines areas that would be covered by water from an event that has a one percent (1%) chance of occurring every year. The City should restrict development that may cause disruption of existing floodways.

Salem's efforts to minimize soil and geologic hazards to people and properties include:

1. Special review procedures and ordinances for building on hillsides or in other environmentally sensitive areas.
2. Requiring developers to identify and assess soils and geologic hazards prior to development.
3. Preparing construction guidelines for roads and other improvements on sensitive hillsides.
4. Regulations that limit development densities on lands that contain severe hazards or constraints.
5. Citizens can avoid soil and geologic hazards by selecting construction sites that have been carefully evaluated by professional geologists or engineers.

TOPOGRAPHY

Salem City has very significant change in elevation with only a very gentle slope progressing downward towards the northwest. The average elevation of the Salem City is approximately 4,650 feet above sea level.

CLIMATE

Rainfall and temperature data for Salem City are provided is the table below:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
average high	36°	44°	50°	58°	70°	81°	90°	87°	77°	64°	48°	38°
average low	15°	20°	27°	34°	44°	51°	58°	57°	46°	36°	26°	17°
mean	26°	32°	38°	47°	57°	67°	75°	72°	62°	51°	38°	28°
average precipitation	1.4"	1.4"	2.0"	2.1"	1.8"	1.0:	.9"	1.3"	1.4"	1.9"	1.8"	1.6"

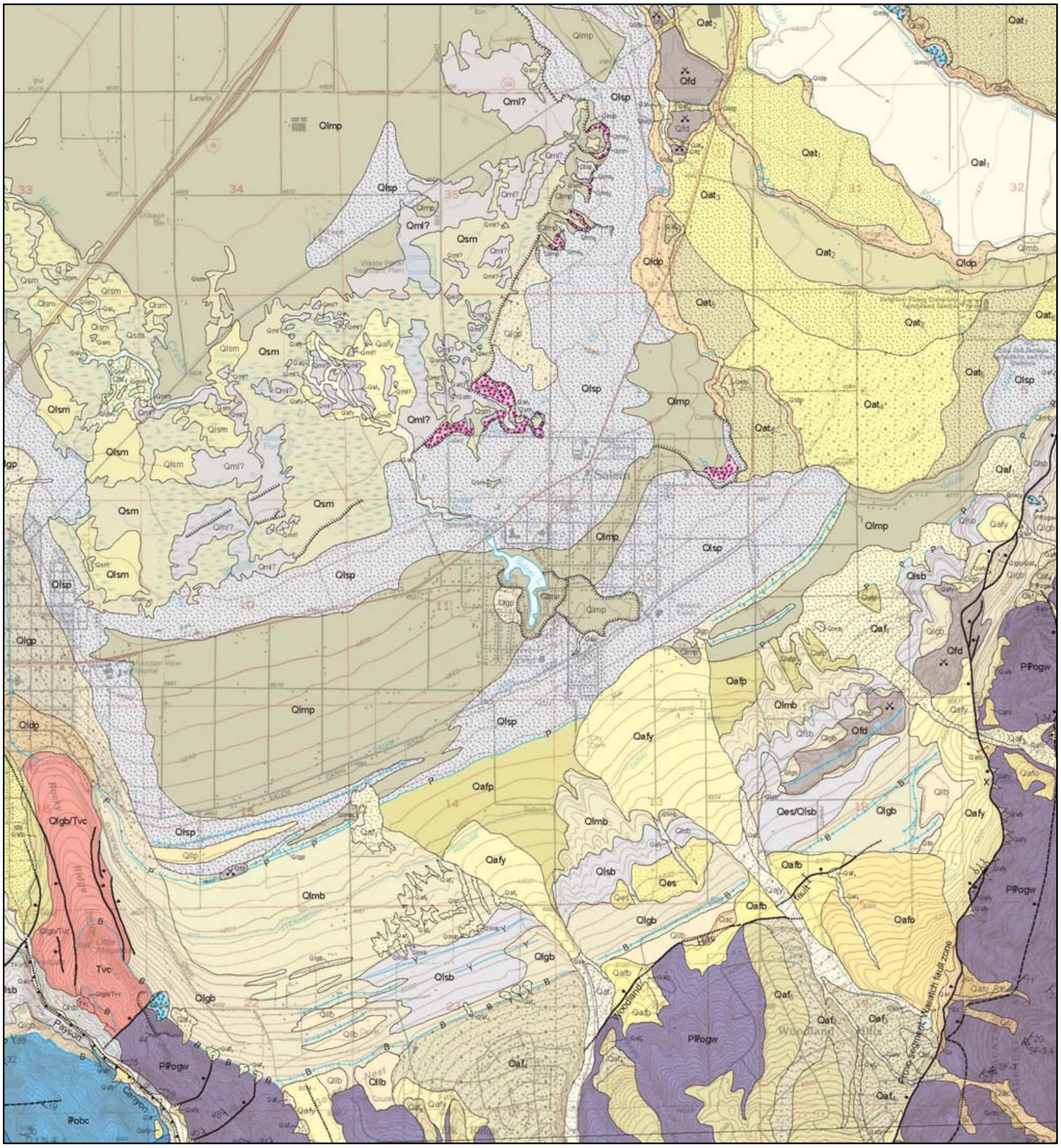
Source: Country Studies

BUILDING REQUIREMENTS

The snow load for Salem City is 30 pounds per square foot roof load, 43 pounds per square foot snow load. The wind factor for the study area is 90 miles per hour.

No specific Geotechnical Studies or Soils Reports were prepared in connection with the development of the Land Use Element. It is understood that geologic hazards are present in the Salem City. These threats include liquefaction and the likely presence of fault in isolated areas of the City.

The following map and excerpts are taken from the GEOLOGIC MAP OF THE SPANISH FORK QUADRANGLE, UTAH COUNTY, UTAH produced by Barry J. Solomon, Donald L. Clark, and Michael N. Machette of the Utah Geological Survey in 2007:



SOIL DESCRIPTIONS

Alluvial deposits

Qal1 Level-1 stream deposits (upper Holocene) – Moderately sorted pebble and cobble gravel in a matrix of sand, silt, and minor clay; contains thin discontinuous sand lenses; subangular to rounded clasts; thin to medium bedded. Deposited by perennial streams such as Peteetneet Creek and Spanish Fork, and by smaller streams draining areas of shallow ground water and marshes from Spring Lake to near Spanish Fork city; includes deposits on active flood plains and minor terraces less than 5 feet (1.5 meters) above stream level; locally includes small colluvial deposits along steep stream embankments; deposits in Peteetneet Creek grade downslope into Holocene to upper Pleistocene alluvial-fan deposits (Qafy); equivalent to the younger part of young alluvial deposits (Qaly), but differentiated where modern deposits with active channels and bar-and-swale topography can be mapped separately. Exposed thickness less than 15 feet (5 meters).

Level-2 stream deposits (middle Holocene to upper Pleistocene) – Moderately sorted pebble and cobble gravel in a matrix of sand, silt, and minor clay; contains thin discontinuous sand lenses; subangular to rounded clasts; thin to medium bedded. Deposited east of Spanish Fork city and south of Spring Lake; equivalent to the older part of Qaly, but differentiated where deposits in abandoned channels and associated flood plains characterized by subdued bar-and-swale topography can be mapped separately. Exposed thickness less than 15 feet (5 meters).

Young alluvial deposits, undivided (Holocene to upper Pleistocene) – Moderately sorted pebble and cobble gravel in a matrix of sand and minor silt and clay. Deposited by perennial streams in mountain canyons and ephemeral streams on the valley floor; locally includes small alluvial-fan and colluvial deposits; includes level-2 stream deposits (Qal2) incised by active stream channels and partly overlain by level-1 stream deposits (Qal1) that cannot be differentiated because of map scale or in areas where the specific age of Holocene deposits cannot be determined; postdates regression of Lake Bonneville from the Provo shoreline and lower levels. Thickness variable, probably less than 15 feet (5 meters).

Old alluvial deposits (upper to middle Pleistocene) – Slightly indurated sand and well-rounded gravel with red-brown, oxidized clay film on clasts; mapped on the southern edge of the quadrangle south of Tithing Mountain and extending southward into the Payson Lakes quadrangle on the saddle between Peteetneet Creek (Payson Canyon) and the piedmont north of Loafer Mountain where the unit intertongues with or is overlain by middle Pleistocene fan alluvium (Qaf5) (Machette, 1992). Machette (1992) stated that the deposits are probably equivalent to, and older than, the latest middle Pleistocene Little Valley lake cycle of Scott and others (1983). The old alluvial deposits are apparently related to headward erosion of Peteetneet Creek and subsequent capture of an ancient stream tributary of Payson Canyon east of Tithing Mountain (discussed in further detail by Machette, 1992). Thickness probably less than 20 feet (6 meters) in the Spanish Fork quadrangle, but may be as much as 30 feet (10 meters) thick to the south (Machette, 1992).

Stream-terrace deposits (middle Holocene to upper Pleistocene) – Poorly to moderately sorted pebble and cobble gravel in a matrix of sand, silt, and minor clay; contains thin sand lenses; subangular to rounded clasts; thin to medium bedded. Deposited on several levels of gently sloping terraces, with subscripts denoting relative height above modern stream channels, 1 being the lowest level; level 1 deposits (Qat1) lie 5 to 15 feet (1.5-5 meters) above modern streams and are incised by them; levels 2 through 8 lie at increasing relative heights of 30 to 40 feet (9-12 meters) (Qat2), 40 to 50 feet (12-15 meters) (Qat3), 50 to 60 feet (15-18 meters) (Qat4), 60 to 75 feet (18-23 meters) (Qat5), 75 to 90 feet (23-27 meters) (Qat6), 90 to 100 feet (27-30 meters) (Qat7), and 100 to 120 feet (30-37 meters) (Qat8) above modern streams; where subscripts are absent, closely spaced terrace levels cannot be differentiated at map scale. Small undifferentiated terrace remnants lie adjacent to Peteetneet Creek and drainages in Loafer and Maple Canyons, but the most extensive deposits lie on regressive Lake Bonneville deltaic deposits at the mouth of Spanish Fork Canyon where Machette (1992) mapped them as regressive-phase stream alluvium. Numbered subscripts do not indicate a specific age and only Qat7 appears to be equivalent to a particular regressive shoreline. The oldest and highest terrace levels (Qat7 and Qat8) are northeast of Spanish Fork and grade to the steep front of a regressive (Provo phase) delta (Qldp) at elevations of 4700 to 4710 feet (1430-1435 meters), whereas younger terraces lie south of the river and grade to delta fronts at lower elevations of from 4600 to 4660 feet (1400-1420 meters). This indicates a shift of the river to the south of its current course as the level of Lake Bonneville fell from the Provo shoreline, and the river occupied its current channel after northward migration from level 6 to level 1 as the lake receded farther. Thicknesses typically 5 to 15 feet (1.5-5 meters).

Level-1 alluvial-fan deposits (upper Holocene) – Poorly to moderately sorted, weakly to non-stratified, pebble to cobble gravel, with boulders near bedrock sources, in a matrix of sand, silt, and minor clay; clasts angular to subrounded, with sparse well-rounded clasts derived from Lake Bonneville gravel; medium to very thick bedded. Coarser-grained material deposited principally by debris flows at the mouths of small, intermittent stream channels that drain bedrock (PPl ogw) on the east side of Tithing Mountain and coarse-grained alluvial-fan deposits (Qaf4) near Elk Ridge, and at the mouth of the perennial stream that drains similar bedrock in Flat and Water Canyons on the east edge of the Spanish Fork quadrangle; finer grained material deposited by debris floods from small drainages in finer grained Lake Bonneville deposits (Qlmb and Qlsb); equivalent to the younger part of young alluvial-fan deposits (Qafy) but differentiated where modern deposits of small, discrete fans, not incised by younger channels, overlie lacustrine deposits and can be mapped separately. Exposed thickness less than 10 feet (3 meters).

Level-2 alluvial-fan deposits (middle Holocene to upper Pleistocene) – Poorly sorted pebble and cobble gravel, locally bouldery, in a matrix of sand, silt, and minor clay; clasts angular to subrounded, with sparse well-rounded clasts derived from Lake Bonneville gravel; medium to very thick bedded. Deposited by debris flows and debris floods in Water Canyon, at the mouths of two drainages to the north of Water Canyon, and in the city of Spanish Fork; equivalent to the older part of Qafy, but differentiated where deposits are graded slightly above modern stream level or are at the mouth of an abandoned stream channel, and can be mapped separately. Exposed thickness less than 15 feet (5 meters).

Young alluvial-fan deposits, undivided (Holocene to upper Pleistocene) – Poorly to moderately sorted, pebble to cobble gravel with boulders near bedrock sources, in a matrix of sand, silt, and clay. Deposited by debris flows and debris floods at the mouths of large and small mountain canyons and streams locally incising Lake Bonneville deposits, and from the stream on the valley floor draining Salem Lake. Includes level-1 and -2 alluvial-fan deposits (Qaf1 and Qaf2) that postdate the regression of Lake Bonneville from the Provo shoreline and lower levels that cannot be differentiated because of map scale or are in areas where the specific age of Holocene deposits cannot be determined; no shorelines are found on these alluvial fans. Thickness variable, probably less than 40 feet (12 meters).

Alluvial-fan deposits, regressive (Provo) phase of Lake Bonneville (upper Pleistocene) – Poorly to moderately sorted, pebble to cobble gravel, locally bouldery, in a matrix of sand, silt, and minor clay; clasts angular but well rounded where derived from Lake Bonneville gravel; medium to very thick bedded. Deposited by debris flows and debris floods near the Provo shoreline at the mouth of Payson Canyon, on the piedmont between Payson and Water Canyons, and on the west flank of Mollies Nipple; locally extends below the Provo shoreline; incised by Holocene streams (Qal1 and Qaly) and covered by young alluvial fans (Qafy); equivalent to the younger part of level-3 alluvial-fan deposits (Qaf3) but differentiated where deposits related to the regressive phase of Lake Bonneville, typically below the Bonneville shoreline, can be separated from deposits related to the transgressive phase of the lake (Qafb), typically above the Bonneville shoreline. Exposed thickness less than 30 feet (10 meters).

Alluvial-fan deposits, transgressive (Bonneville) phase of Lake Bonneville (upper Pleistocene) – Poorly sorted, pebble and cobble gravel, locally bouldery, in a matrix of sand, silt, and minor clay; clasts angular to subangular; medium to very thick bedded. Deposited by debris flows near the Bonneville shoreline between Loafer and Maple Canyons and in Payson Canyon; locally extends below the Bonneville shoreline; incised by Holocene streams; equivalent to the older part of level-3 alluvial-fan deposits (Qaf3) but differentiated where deposits related to the transgressive phase of Lake Bonneville are near the Bonneville shoreline. Exposed thickness less than 15 feet (5 meters).

Level-3 alluvial-fan deposits, Bonneville lake cycle, undivided (upper Pleistocene) – Poorly to moderately sorted, pebble to cobble gravel, locally bouldery, in a matrix of sand, silt, and minor clay. Mapped near the mouth of Maple Canyon above the Bonneville shoreline and related alluvial-fan deposits (Qafb). Level-3 alluvial-fan deposits are incised into, and overlie, alluvial-fan deposits that predate Lake Bonneville (Qaf4, Qaf5, and Qafo); may include alluvial-fan deposits of both the transgressive and regressive phases of Lake Bonneville that are undifferentiated because correlation with a specific lake phase cannot be established. Thickness probably less than 40 feet (12 meters).

Alluvial-fan deposits, pre-Bonneville lake cycle to Little Valley lake cycle (upper to middle Pleistocene) – Poorly sorted, clast-supported pebble to cobble gravel, with matrix-supported interbeds in the upper part; locally bouldery in a matrix of sand, silt, and clay; clasts angular to subrounded; medium to very thick bedded. Fan remnants are mainly on the piedmont between Payson and Maple Canyons, are above and cut by the Bonneville shoreline, and are incised into still older alluvial-fan deposits (Qaf5). Machette (1992) stated that correlative deposits likely underlie Lake Bonneville deposits, forming the piedmont slopes within Utah Valley, and probably grade laterally to lacustrine sediment of the Little Valley lake cycle below an elevation of about 4900 feet (1490 meters) (Scott and others, 1983). Equivalent to the younger part of older alluvial-fan deposits (Qafo) but differentiated where pre-Bonneville deposits can be divided into Qaf4 and Qaf5 based on fan morphology, degree of dissection, and incision of younger into older deposits. Exposed thickness less than 15 feet (5 meters).

Alluvial-fan deposits, pre-Little Valley lake cycle (middle Pleistocene) – Poorly sorted, clast-supported pebble to cobble gravel, with matrix-supported interbeds in the upper part; locally bouldery, in a matrix of sand, silt, and clay; deposits are deeply dissected, lack fan morphology, and are typically preserved remnants of high surfaces on bedrock. On the piedmont between Payson and Maple Canyons; appear incised by level-4 alluvial-fan deposits (Qaf4). Machette (1992) reported that level 5 alluvial fan-deposits are exposed in a stream gully on the divide east of Peteetneet Creek in the adjacent Payson Lakes quadrangle, and contain isolated pods of 0.62 Ma Lava Creek B volcanic ash (Izett and Wilcox, 1982, Utah locality 9). Correlative alluvial deposits likely underlie Lake Bonneville deposits and probably grade laterally to lacustrine sediment of the Pokes Point and other lake cycles older than the Little Valley lake cycle (Scott and others, 1983; Machette and Scott, 1988), although not observed in Utah Valley (Machette, 1992). Equivalent to the older part of older alluvial-fan deposits (Qafo) but differentiated where Little Valley and pre-Little Valley deposits can be separated based on fan morphology, degree of dissection, and incision of younger into older deposits. Exposed thickness less than 60 feet (20 meters).

Older alluvial-fan deposits, pre-Bonneville lake cycle, undivided (upper to middle Pleistocene) – Poorly sorted, pebble to cobble gravel, locally bouldery, in a matrix of sand, silt, and clay. Mapped between Maple and Water Canyons where pre-Bonneville lake cycle alluvial-fan deposits (Qaf4 and Qaf5) are undifferentiated because they are poorly exposed or lack distinct geomorphic expression. Thickness probably less than 60 feet (20 meters).

Artificial fill (Historical) – Engineered fill used as a debris-basin dam and an irrigation-water pond in Payson Canyon; unmapped fill is locally present in developed areas like Payson, Salem, and Spanish Fork.

Disturbed land (Historical) – Land disturbed by sand, gravel, and aggregate operations; only the larger operations are mapped and their outlines are based on aerial photographs taken in 1998; faults and barrier-beach deposits mapped within disturbed land are based on 1965 aerial photographs taken before disturbance. Land within these areas contains a complex, rapidly changing mix of cuts and fills; most operations are extracting material from upper Pleistocene deltaic deposits of the regressive phase of the Bonneville lake cycle (Qldp) beneath a thin cover of middle Holocene to upper Pleistocene stream-terrace deposits (Qat), and from upper Pleistocene lacustrine gravel of the transgressive phase of the Bonneville lake cycle (Qlgb). Faults mapped or exposed in Qfd on the east margin of the quadrangle are based on 1965 aerial photographs that show fault scarps in probable Qlgb prior to disturbance; these faults do not cut the human disturbances.

Colluvial deposits (Holocene to upper Pleistocene) – Pebble, cobble, and boulder gravel, commonly clast supported, in a matrix of sand, silt, and clay; angular to subangular clasts, poorly sorted, poorly stratified, locally derived sediment deposited by slopewash, and soil creep in steep-sided stream canyons; includes landslides, rock falls, and debris flows too small to map separately; most bedrock is covered by at least a thin veneer of colluvium, and only the larger, thicker deposits are mapped. Maximum thickness about 15 feet (5 meters).

Lacustrine deposits

Sediments deposited by Pleistocene Lake Bonneville dominate the surficial geology of the Spanish Fork quadrangle. Lake Bonneville was a large ice-age lake that covered much of northwestern Utah between about 32,500 and 11,600 calendar years ago. Four regionally extensive shorelines of Lake Bonneville are found in the Bonneville Basin, but only two (the Bonneville and Provo shorelines) are found in the Spanish Fork quadrangle (table 1). The earliest of the regional shorelines is the Stansbury shoreline, which resulted from a climatically induced oscillation from about 24,400 to 23,200 years ago during expansion of Lake Bonneville. The Stansbury shoreline formed at elevations below those in the Spanish Fork quadrangle. The lake continued to rise, entering the northwest corner of the Spanish Fork quadrangle at an elevation of about 4500 feet (1370 meters) about 23,000 years ago. In the Bonneville Basin, the lake reached its highest level of about 5093 feet (1552 meters) about 18,000 years ago; this level was controlled by overflow at a threshold near Zenda in southern Idaho. This highstand created the Bonneville regional shoreline. On the south margin of the Spanish Fork quadrangle, the Bonneville shoreline forms a bench at the mountain front and along the piedmont.

About 16,800 years ago, rapid erosion at the Zenda threshold resulted in catastrophic lowering of the lake by 340 feet (100 meters) in less than one year (Jarrett and Malde, 1987; O'Conner, 1993). Lake Bonneville then stabilized at a new lower threshold near Red Rock Pass, Idaho, and the Provo regional shoreline was formed on the piedmont slope in this quadrangle.

The lake oscillated at or near the Provo level until about 13,500 years ago (Godsey and others, 2005), when climatic factors induced further lowering of the lake level within the Bonneville basin. Lake Bonneville later fell below the altitude of the natural threshold of Utah Valley, which thereby isolated Utah Lake from the main body of Lake Bonneville (Machette, 1992). The level of

Lake Bonneville eventually fell below the elevation of present Great Salt Lake, but a subsequent expansion of Lake Bonneville due to climatic variations from about 12,800 to 11,600 years ago formed the Gilbert regional shoreline. During the expansion of Lake Bonneville, flow from Utah Lake over the threshold in Utah Valley increased, preventing the lake level from rising (Machette, 1992). Lake Bonneville fell to near present levels about 10,000 years ago, leaving Great Salt Lake and Utah Lake as two of its prominent remnants.
Isostatic rebound following reduction in the volume of water in Lake Bonneville, as well as displacement along the Wasatch fault zone, have uplifted regional shorelines in the Bonneville basin (Crittenden, 1963). The amount of isostatic uplift increases toward the center of the basin where the weight of removed water was greatest, and Crittenden (1963) estimated a maximum isostatic uplift of 210 feet (64 meters). Machette (1992) reported combined isostatic and fault uplift of the Bonneville and Provo shorelines as much as 110 feet (34 meters) and 65 feet (20 meters), respectively, in eastern Utah Valley. In the Spanish Fork quadrangle near the basin margin, isostatic uplift of both shorelines on the hanging wall of the fault is only about 15 feet (5 meters) and shoreline elevations are closer to threshold elevations in Idaho.

Deposits younger than the Bonneville lake cycle

Young lacustrine deposits (Holocene) – Silt, clay, and minor sand deposited in ponds along Beer Creek (W1/2 section 33, T. 8 S., R. 2 E., SLBMETERS). Maximum thickness about 5 feet (1.5 meters).

Deposits of the Provo (regressive) phase of the Bonneville lake cycle
Only mapped below the Provo shoreline. The Provo shoreline is at elevations from about 4735 to 4750 feet (1445-1450 meters) in the Spanish Fork quadrangle (table 1). Currey (1982) estimated an elevation of 4744 feet (1446 meters) for the Provo shoreline on a north-facing beach ridge east of Rocky Ridge (SW1/4 section 15, T. 9 S., R.2 E., SLBMETERS).

Deltaic deposits (upper Pleistocene) – Moderately to well-sorted, clast-supported, pebble and cobble gravel in a matrix of sand and silt; interbedded with thin pebbly sand beds; clasts subround to round; locally weakly cemented with calcium carbonate. Deposited as foreset beds having original dips of 30 to 35 degrees and bottomset beds having original dips of 1 to 5 degrees; deposited in deltas below the Provo shoreline at the mouth of the Spanish Fork; commonly capped by a thin veneer of stream-terrace deposits (Qat) and exposed along terrace escarpments. Exposed thickness about 75 feet (25 meters).

Lacustrine gravel and sand (upper Pleistocene) – Moderately to well-sorted, subrounded to rounded, clast-supported, pebble to cobble gravel and pebbly sand with minor silt. Gastropods locally common in sandy lenses; gravel commonly cemented with calcium carbonate. Thin to thick bedded; bedding ranges from horizontal to dips of 10 to 15 degrees on steeper piedmont slopes or in bars, barrier beaches, and beach ridges; commonly interbedded with or laterally gradational to lacustrine sand and silt of the regressive phase (Qlsp). Exposed thickness less than 30 feet (10 meters).

Lacustrine sand and silt (upper Pleistocene) – Moderately to well-sorted, subrounded to rounded, fine to coarse sand and silt with minor pebbly gravel. Thick to very thick bedded; commonly has ripple marks and scour features; gastropods locally common. Deposited at and below the Provo shoreline in relatively shallow water near shore; overlies and grades downslope into lacustrine silt and clay of the regressive phase (Qlmp) and laterally to sandy deltaic deposits (Qldp). Exposed thickness less than 30 feet (10 meters).

Lacustrine silt and clay (upper Pleistocene) – Calcareous silt (marl) and clay with minor fine sand; typically laminated or thin bedded but appears unstratified at a distance; ostracodes locally common. Deposited in quiet water below the Provo shoreline in moderately deep basins and sheltered bays; overlies lacustrine silt and clay of the transgressive phase (Qlmb). Likely includes or may be entirely lagoon-fill deposits (Qllp) in the flat area south of Payson between beach ridges (Qlgp) along U.S. Highway 6 on the west and the Provo shoreline on the east. Machette (1992) reported that silt and clay of the regressive phase can be differentiated from silt and clay of the transgressive phase by the presence of conchoidal fractures in blocks of transgressive deposits and their absence in regressive deposits, but Qlmp may include some undifferentiated transgressive deposits. Exposed thickness less than 15 feet (5 meters).

Lagoon-fill deposits (upper Pleistocene) – Silt and clay, with minor fine-grained sand and pebbles. One small lagoon-fill deposit is mapped below the Provo shoreline, underlying level, grass-covered ground in a closed depression behind a Lake Bonneville barrier beach about one mile (1.6 kilometers) southwest of Spanish Fork city (NW1/4 section 25, T. 8 S., R.2 E., SLBMETERS). Elsewhere in the Bonneville Basin, similar deposits commonly contain wood that has been used to establish Lake Bonneville chronology (Machette, 1992). Maximum thickness about 10 feet (3 meters).

Deposits of the Bonneville (transgressive) phase of the Bonneville lake cycle
Mapped between the Bonneville and Provo shorelines. The Bonneville shoreline is at elevations from about 5085 to 5100 feet (1550-1555 meters) in the Spanish Fork quadrangle; Currey (1982) estimated an elevation of 5095 feet (1553 meters) for the Bonneville shoreline on a northwest-facing beach ridge south of Salem (SW1/4 section 18, T. 9 S., R.3 E., SLBMETERS).

Lacustrine gravel and sand related to the transgressive (Bonneville) phase of the Bonneville lake cycle (upper Pleistocene) – Moderately to well-sorted, clast-supported pebble to cobble gravel in a matrix of sand and silt; interbedded with pebbly sand. Clasts commonly subround to round, but some deposits consist of poorly sorted, angular gravel derived from nearby bedrock outcrops. Gastropods locally common in sandy lenses; gravel locally cemented with calcium carbonate. Thin to thick bedded; bedding ranges from horizontal to primary dips of 10 to 15 degrees on steeper piedmont slopes or in bars, barrier beaches, and beach ridges; commonly interbedded with or laterally gradational to lacustrine sand and silt of the transgressive phase (Qlsb); commonly covered by a thin veneer of colluvium. Forms wave-cut benches at the highest (Bonneville) shoreline in bedrock on the southwest and southeast margins of the quadrangle and in pre-Bonneville alluvial-fan deposits (Qaf4) on the piedmont near Elk Ridge, and forms constructional bars and barrier beaches on the piedmont at the highest shoreline between Tithing Mountain and Water Canyon, bounding extensive lagoon-fill deposits upslope. Exposed thickness less than 30 feet (10 meters).

Lacustrine sand and silt (upper Pleistocene) – Moderately to well-sorted, subrounded to rounded, fine to coarse sand and silt with minor pebbly gravel. Thick to very thick bedded; commonly has ripple marks and scour features; gastropods locally common. Deposited in relatively shallow water near shore; overlies coarse-grained beach gravel (Qlgb), implying deposition in increasingly deeper water of a transgressing lake; grades downslope into lacustrine silt and clay of the transgressive phase (Qlmb). Exposed thickness less than 15 feet (5 meters).

Lacustrine silt and clay (upper Pleistocene) – Calcareous silt (marl) and clay with minor fine sand; typically thick bedded or massive; ostracodes locally common. Deposited in quiet water, either in sheltered bays between headlands or offshore in deeper water; overlies lacustrine gravel, sand, and silt of the transgressive phase (Qlgb and Qlsb). A small outcrop of the unit is also present beneath regressive deposits at the base of the slope near Grimes Pond, northwest of Salem, but the outcrop is too small to map; Machette (1992) reported that silt and clay of the transgressive phase is characterized by the presence of conchoidal fractures in dense (compact) blocks. Exposed thickness less than 15 feet (5 meters).

Lagoon-fill deposits (upper Pleistocene) – Silt and clay with minor fine sand and pebbles; lies in closed depressions behind Lake Bonneville bars and barrier beaches between the Bonneville and Provo shorelines; the three largest lagoonfill deposits lie upslope of constructional bars at the Bonneville shoreline level, near the base of Elk Ridge and Woodland Hills, including the lagoon-fill deposit at Goose Nest which is partly overlain by young alluvial-fan deposits (Qafy); two smaller lagoons were just north of Goose Nest behind barrier beaches. Locally contains wood that has been used to establish Lake Bonneville chronology. Maximum thickness about 10 feet (3 meters).

Eolian deposits

Eolian sand (Holocene) – Moderately to well sorted, very fine to medium sand, with minor silt and clay. Calcareous, loose to moderately firm where cemented by secondary calcium carbonate; forms small dunes locally; derived from transgressive Bonneville beach sand (Qlsb) between alluvial fans at the mouths of Loafer and Water Canyons. The sand dunes are from 3 to 10 feet (1-3 meters) tall. Unmapped eolian silt (loess), with minor sand and clay, forms a thin mantle on stable geomorphic surfaces throughout the quadrangle; the silt is friable to moderately firm, homogenous, nonstratified, porous, and forms steep to vertical faces where exposed in stream cuts; most argillic B horizons of late Pleistocene age soils are derived from this silt (Machette, 1992). The silt is from 3 to 5 feet (1-1.5 meters) thick.

Mass-movement deposits

Lateral-spread deposits (middle Holocene to upper Pleistocene) – Pebbly sand, sand, and silt below (post-dating) the Provo shoreline, typically with scarps upslope and hummocky terrain with swampy swales where the deposits are mapped. Although interpretations other than lateral spreading are possible, two features are mapped here as possible lateral-spread deposits because they are in an area having high liquefaction potential (Anderson and others, 1986). Miller (1982), Machette (1992), and Harty and Lowe (2003) previously mapped these lateral-spread landslides with different extents than those shown on this map. Machette (1992) removed the query Miller (1982) put on these features, while Harty and Lowe (2003) were unsure of their origin. The one northwest of Salem was named the Beer Creek feature by Harty and Lowe (2003). The other, northeast of Spanish Fork city and extending into the adjacent Provo and Springville quadrangles, was named the Springville/Spanish Fork feature by Harty and Lowe (2003). Thickness of the deposits is unknown but probably less than 50 feet (15 meters).
The Beer Creek feature is characterized by a linear main scarp up to 6 feet (2 meters) high upslope extending for about 3 miles (5 kilometers), a large amphitheater about 1.5 miles (2.5 kilometers) across on the northeastern end of the main scarp, small alcoves about 1000 feet (300 meters) in diameter upslope from the main scarp, minor linear internal scarps up to 3 feet (1 meter) high in the upper part of the deposit, and several small hummocks and swampy swales less than 3 feet (1 meter) deep in the lower part of the deposit. Harty and Lowe (2003) excavated a trench along the main scarp of the Beer Creek feature (NE1/4 section 2, T. 9 S., R.2 E., SLBMETERS) and found evidence of rotational landsliding. Hummocks within small alcoves along the main scarp are evidence of localized rotational landsliding or flow failure. Stream-cut exposures show that the main scarp commonly marks the boundary between fine-grained and coarse-grained lacustrine deposits (Qlmp

and Qlgp), and the main scarp curves to the northwest at its northern end, forming a large amphitheater. Harty and Lowe (2003) concluded that landsliding is only one of several possible modes of origin; another possible mechanism they suggested for the Bear Creek feature is headward erosion due to spring sapping which ceased when relatively resistant gravels were encountered along a lacustrine shoreline.
The Springville/Spanish Fork feature includes a few isolated hummocks and small depressions, and also includes two lineaments interpreted by Harty and Lowe (2003) as regressive shorelines of Lake Bonneville. Although most of the Springville/Spanish Fork feature and included lineaments are in adjacent quadrangles, the southwest part of the southern lineament extends onto the northeast corner of the Spanish Fork quadrangle. Harty and Lowe (2003) excavated three trenches on the feature in adjacent quadrangles and concluded the feature is either the result of liquefaction and ground oscillation, minor sliding unrelated to earthquake-induced liquefaction, or spring sapping along the margin of the delta at the mouth of Spanish Fork Canyon (Qldp).
Spring sapping downslope from Lake Bonneville gravels (Qlgp, Qldp) has undoubtedly occurred in both features, but until definitive evidence eliminates earthquake-induced liquefaction as their cause, it is prudent to err on the side of safety and consider these features to be lateral-spread deposits. The presence of shallow ground water and granular soils near the margin of Utah Valley, with high levels of seismicity on the Wasatch fault zone, suggests that large-scale liquefaction may have occurred during past large earthquakes along the Wasatch fault zone and liquefaction poses a significant hazard to existing and future development.

Landslide deposits, unit 1 (Historical to upper Pleistocene) – Poorly sorted, fine to medium sand, sandy silt, and pebble and cobble gravel; composition reflects local sources of material; mapped along bluffs on the southwest and, more commonly, on the northeast side of the Spanish Fork flood plain, and in similar deposits east of Salem, on the east side of Little Mountain, and in Loafer Canyon; characterized by moderately fresh scarps and hummocky topography, with freshest scarps in areas of historical movement. Maximum thickness about 20 feet (6 meters).
Landslides on the northeast side of Spanish Fork originate in Lake Bonneville deltaic deposits (Qldp), and may be a combination of rotational, translational, and flow failures, although only flow failures have been documented historically. Historic flow failures occurred in Spanish Fork city near 440 South Scenic Drive in 1994 (Black, 1996) and 830 South Scenic Drive in 1996 (Ashland, 1997), and Black (1996) reported a verbal communication of a similar landslide in the mid-1970s that damaged a home along Bottoms Road at the base of the bluffs.
Three other landslides may be a combination of rotational, translational, and flow failures. The landslide on the southwest side of the river, underlain by lacustrine silt and clay (Qlmp) with a cap of gravel and sand (Qlgp), lies just beyond the toe of the deltaic deposits. The landslide east of Salem is derived from lacustrine gravel, sand, and silt (Qlgb and Qlsb) and the Little Mountain landslide is derived from lacustrine gravel and sand (Qlgb).
The Loafer Canyon landslides are debris slides derived from Pleistocene alluvial-fan deposits (Qaf4 and Qaf5) and highly weathered Oquirrh Formation (PPl ogw).

Landslide deposits, unit 2 (middle Holocene to upper Pleistocene) – Poorly sorted, fine to medium sand, silt, and clay with minor pebble and cobble gravel; form hummocky rims of alcoves along linear scarp of the Beer Creek feature north of Salem and alcove northeast of Salem, and possibly occurs as unmapped landslide deposits near scarps adjacent to Salem Lake, although landscaping and development obscure the possible exposure; deformed and tilted lake beds were exposed in a trench on the Beer Creek feature (Harty and Lowe, 2003), and were found in a small excavation in the alcove surrounding Grimes Pond during mapping for this project. The surface of unit 2 landslide deposits is typically subdued, suggesting that they are older than unit 1 landslide deposits, but this may be due to flow failure accompanying rotational sliding of deformed and tilted beds, rather than age. Thickness of the deposits is unknown but probably less than 30 feet (10 meters).

Spring and marsh deposits

Marsh deposits (Holocene) – Fine, organic-rich sediment associated with springs, ponds, seeps, and wetlands; commonly wet, but seasonally dry where drained by canals northwest of Payson; may locally contain peat deposits as thick as 3 feet (1 meter); overlies and grades into fine-grained regressive (Provo phase) deposits of Lake Bonneville (Qlmp); present where water table is high such as near Salem (Beer Creek feature), Spanish Fork city (Springville/Spanish Fork feature), Spring Lake, and north of Payson. Thickness commonly less than 10 feet (3 meters). Most marsh deposits in the Spanish Fork quadrangle occupy the center of a shallow, sinuous trough extending from north of Salem, westward along Beer Creek to the Benjamin fault, and farther west into the adjacent West Mountain quadrangle. Although the origin of the trough is unknown, possibilities include: (1) it is the result of its position in a shallow depression between the northsloping piedmont and buried transgressive Lake Bonneville deltaic deposits that underlie the large, fan-shaped regressive delta at the mouth of Spanish Fork Canyon; or (2) it is a relict channel of Spanish Fork, formed before or during the transgression of Lake Bonneville, and covered and partially filled by later lacustrine deposits. Water in the trough accumulates from discharge in springs and seeps where unconfined granular deposits upslope meet less permeable fine-grained lake beds and from upward flow of ground water under artesian pressure through leaky confining lake beds from underlying aquifers (Brooks and Stolp, 1995)

Mixed-environment deposits

Alluvial and colluvial deposits, undivided (Holocene to upper Pleistocene) – Poor to moderately sorted, generally poorly stratified, clay- to boulder-size, locally derived sediment mapped at the base of Woodland Hills, in Maple Canyon and the drainage to the north, and likely in most small drainages; deposits of alluvial, slopewash, and creep processes grade imperceptibly into one another. Thickness less than 20 feet (6 meters).

Lacustrine and marsh deposits, undivided (Holocene to upper Pleistocene) – Sand, silt, and clay in areas of mixed marsh and lacustrine deposits that are undifferentiated because the units are similar. Thickness less than 10 feet (3 meters).

Talus and colluvium, undivided (Holocene to upper Pleistocene) – Very poorly sorted, angular to subangular cobbles and boulders and finer-grained interstitial sediment, deposited principally by rock fall on steep bedrock slopes, that grades downslope into colluvial deposits; only thicker and larger deposits in Picayune Canyon mapped. Generally less than 20 feet (6 meters) thick.

Stacked-unit deposits

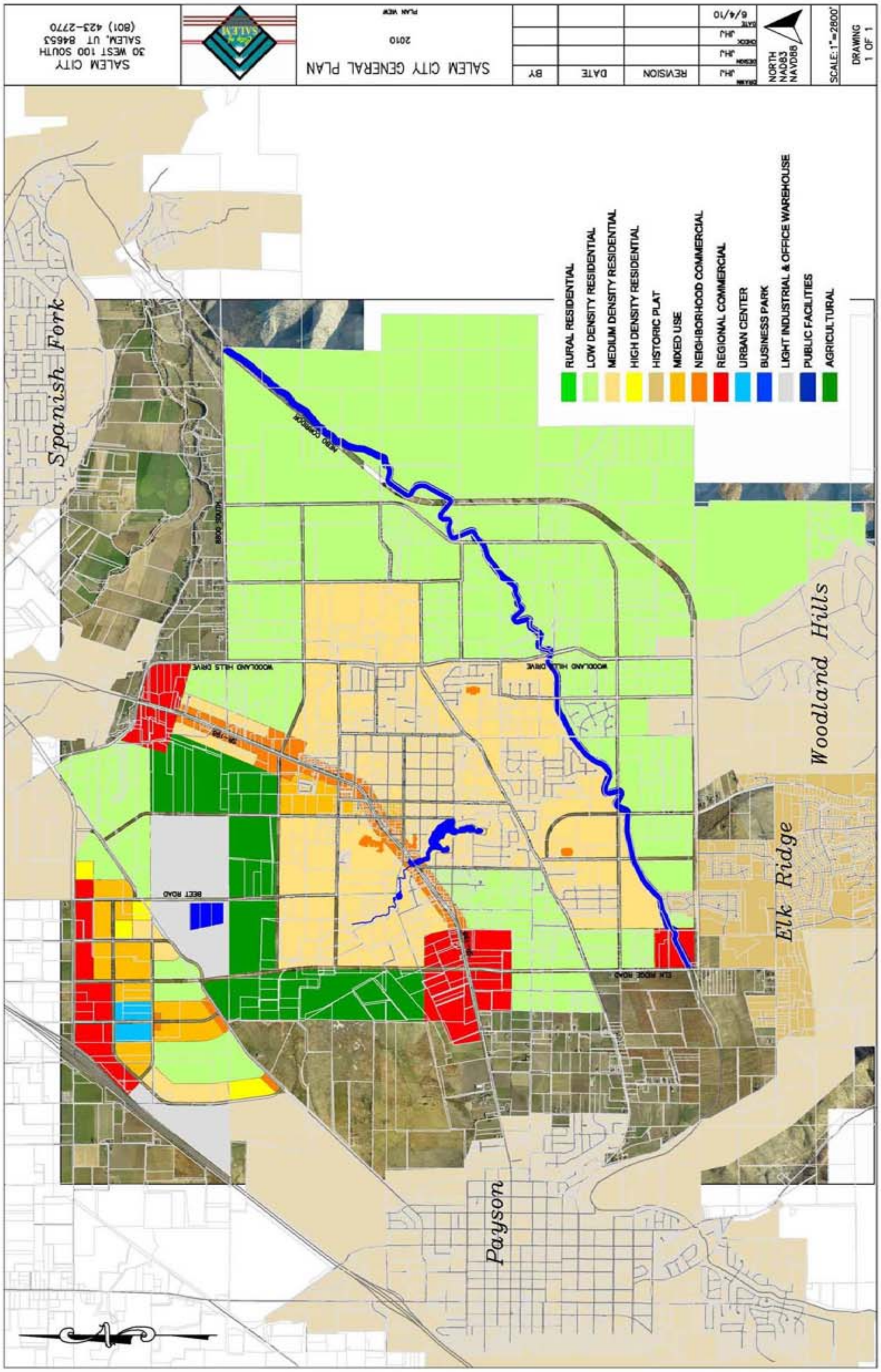
Eolian sand over lacustrine sand and silt (Holocene to upper Pleistocene) – Lacustrine sand and silt related to the transgressive (Bonneville) phase of Lake Bonneville is partly concealed by a discontinuous veneer of sand reworked by wind; mapped north of Woodland Hills, east of eolian sand (Qes). Eolian deposits are generally less than 3 feet (1 meter) thick.

Lacustrine sand and silt over tuffaceous sandstone (upper Pleistocene/Pliocene to Miocene) – A thin veneer of lacustrine sand and silt related to the regressive (Provo) phase of Lake Bonneville is reworked from underlying Tertiary tuffaceous sandstone on a small ridge south of Benjamin. Lacustrine deposits are generally less than 3 feet (1 meter) thick.

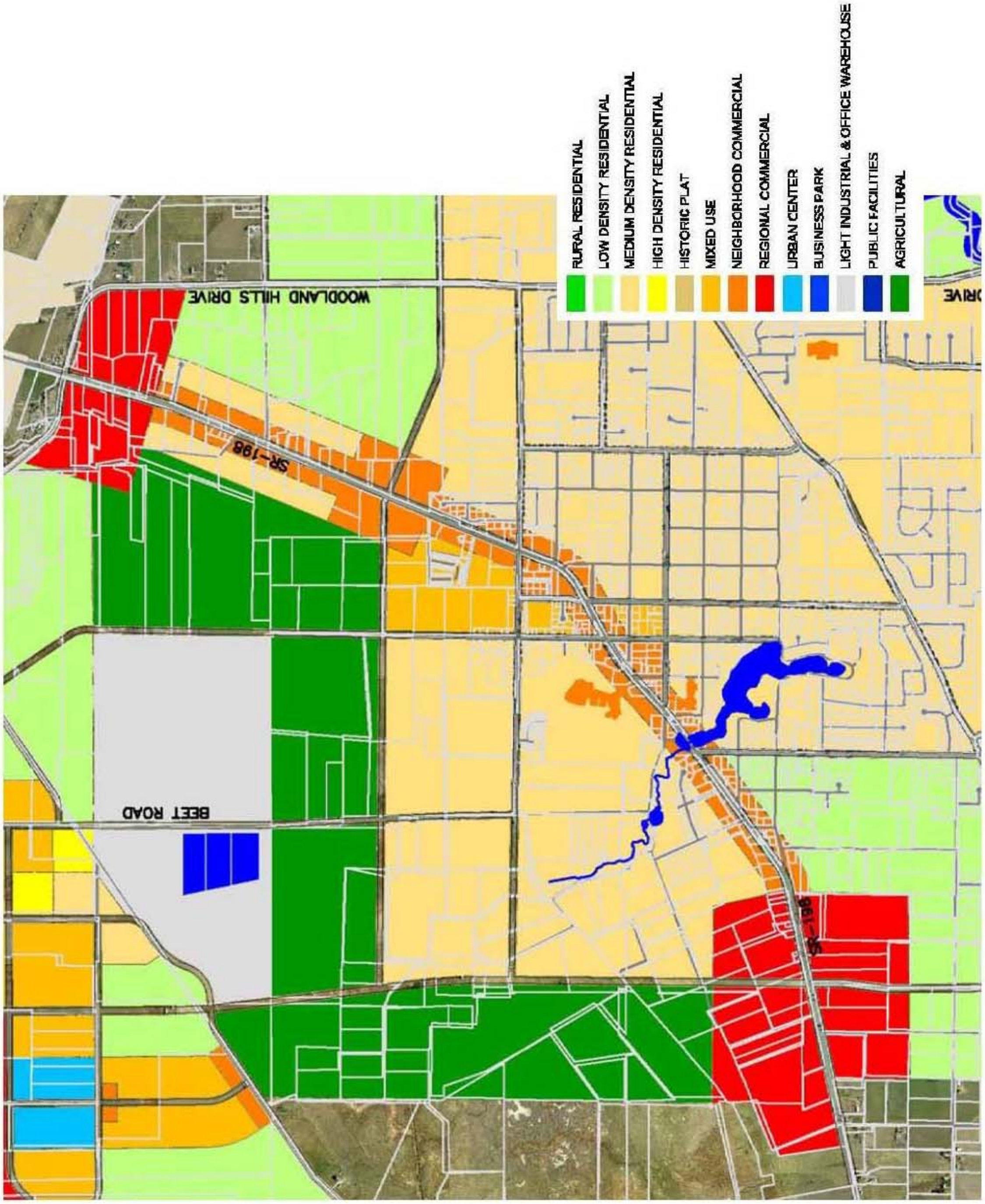
Lacustrine gravel and sand over pre-Bonneville alluvial-fan deposits (upper Pleistocene/upper to middle Pleistocene) – A thin veneer of lacustrine gravel and sand related to the transgressive (Bonneville) phase of Lake Bonneville is reworked from underlying alluvial-fan deposits older than Lake Bonneville but not older than the Little Valley lake cycle; the unit is downslope from pre-Bonneville alluvial-fan deposits (Qaf4) above the Bonneville shoreline at the mouth of a small canyon on the east-central edge of the quadrangle. Lacustrine deposits are generally less than 3 feet (1 meter) thick.

Lacustrine gravel and sand over volcanic conglomerate (upper Pleistocene/ Oligocene and/or upper to middle Eocene) – Volcanic conglomerate partly concealed by a discontinuous veneer of lacustrine gravel and sand related to the transgressive (Bonneville) phase of Lake Bonneville reworked by Lake Bonneville wave action between the Provo and Bonneville shorelines on Rocky Ridge; closely spaced, well-preserved shorelines are common. Lacustrine deposits are generally less than 10 feet (3 meters) thick.

MAPS


SALEM CITY
30 WEST 100 SOUTH
SALEM, UT 84653
(801) 423-2770
SALEM CITY GENERAL PLAN
2010
REVISION
DATE
BY
NORTH
NAD83
NAVD88
SCALE:1"=2800'
DRAWING
1 OF 1
RURAL RESIDENTIAL
LOW DENSITY RESIDENTIAL
MEDIUM DENSITY RESIDENTIAL
HIGH DENSITY RESIDENTIAL
HISTORIC PLAT
MIXED USE
NEIGHBORHOOD COMMERCIAL
REGIONAL COMMERCIAL
URBAN CENTER
BUSINESS PARK
LIGHT INDUSTRIAL & OFFICE WAREHOUSE
PUBLIC FACILITIES
AGRICULTURAL
Spanish Fork
Woodland Hills
Elk Ridge
Payson
WOODLAND HILLS DRIVE
BEET ROAD
ELK RIDGE ROAD

AREA 1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HIGH DENSITY RESIDENTIAL
HISTORIC PLAT
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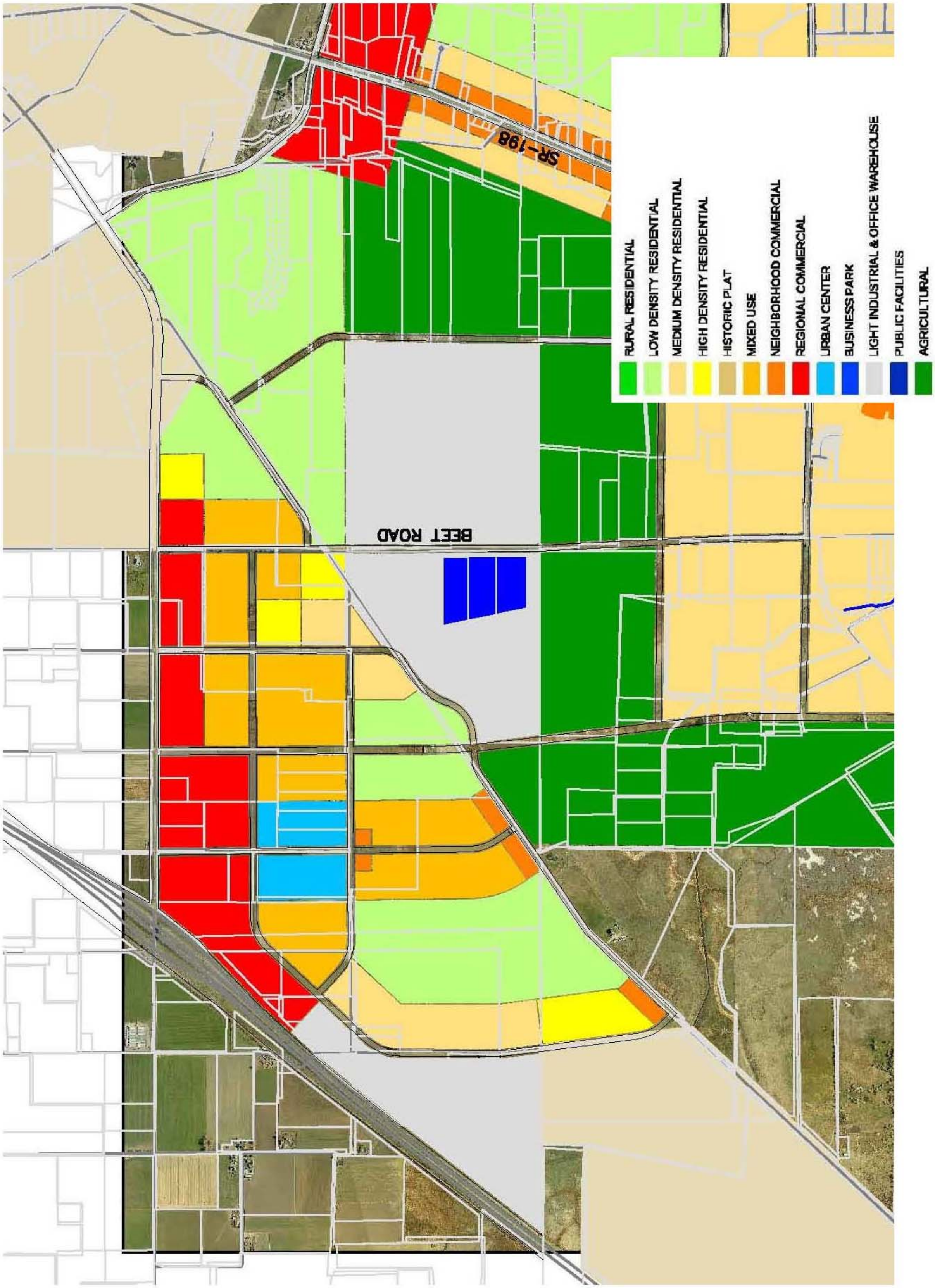
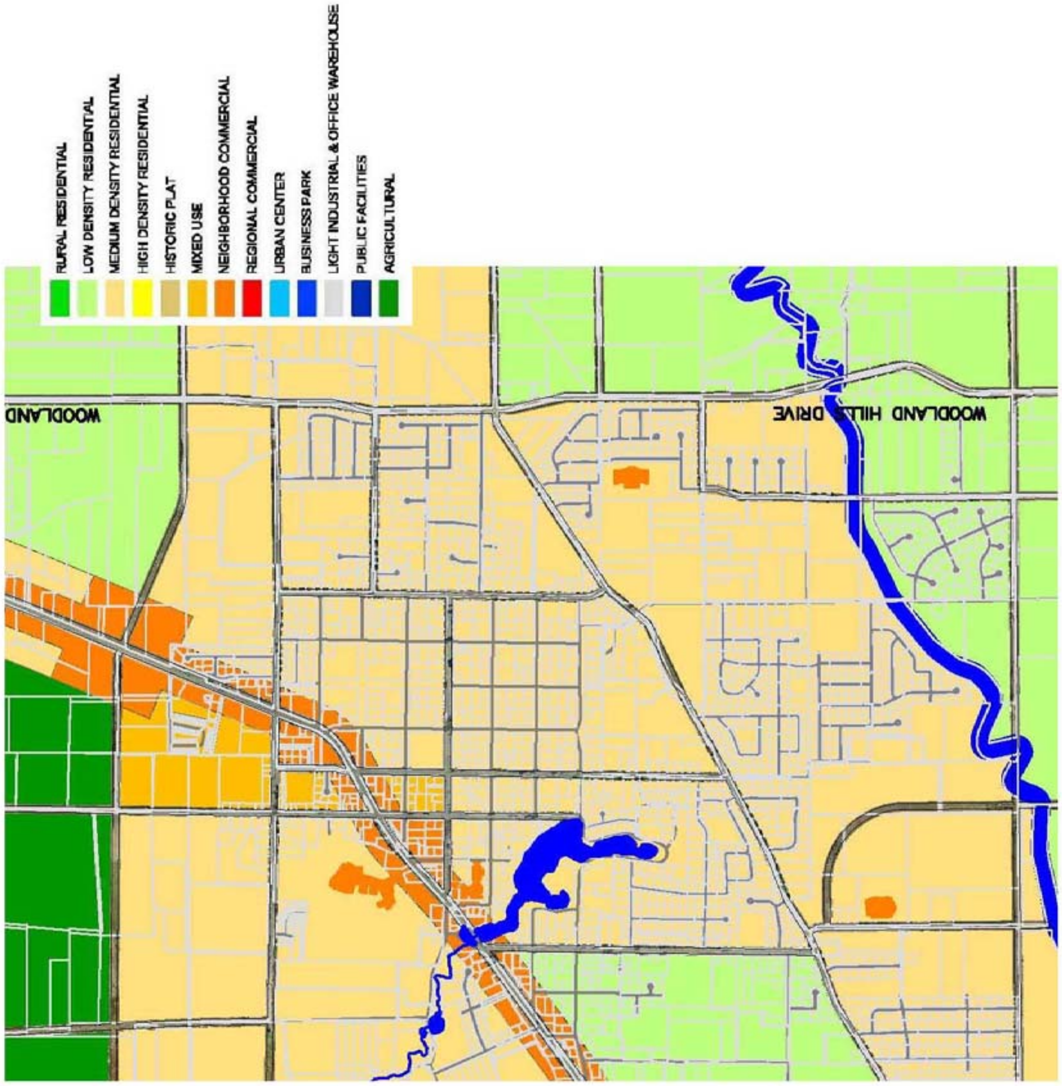
NEIGHBORHOOD COMMERCIAL
REGIONAL COMMERCIAL
URBAN CENTER
BUSINESS PARK
LIGHT INDUSTRIAL & OFFICE WAREHOUSE
PUBLIC FACILITIES
AGRICULTURAL
WOODLAND HILLS DRIVE
SR-198
BEET ROAD

AREA 2



SR-198
BEET ROAD
RURAL RESIDENTIAL
LOW DENSITY RESIDENTIAL
MEDIUM DENSITY RESIDENTIAL
HIGH DENSITY RESIDENTIAL
HISTORIC PLAT
MIXED USE
NEIGHBORHOOD COMMERCIAL
REGIONAL COMMERCIAL
URBAN CENTER
BUSINESS PARK
LIGHT INDUSTRIAL & OFFICE WAREHOUSE
PUBLIC FACILITIES
AGRICULTURAL

AREA 3


RURAL RESIDENTIAL
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WOODLAND
WOODLAND
DRIVE