

3.0 Affected Environment

This chapter describes the environment of the Federal Center site to be potentially affected by implementation of the Master Site Plan. It details the existing conditions on the site for each of the technical resource issues that were identified during project scoping and that are evaluated in Chapter 4, Environmental Consequences.

3.1 Land Use

For purposes of this land use analysis, the study area includes the Federal Center site itself, as well as the surrounding areas of the City of Lakewood and Jefferson County. The study area is generally bounded by the alignment of Tenth Avenue in the north, South Hoyt Street in the east, West Virginia Avenue in the south, and Wright Street and West Alameda Drive in the west. Land uses within the Federal Center site, as well as the surrounding study area, were inventoried to characterize the setting for the proposed development of the Federal Center. Inventories were conducted through field inspection in fall 2006. Description of land uses on and surrounding the Federal Center are described below.

The Federal Center site is a 640-acre federal facility located adjacent to the City of Lakewood, Colorado, just west of Denver. The Federal Center is bordered to the north by 6th Street, to the east by Kipling Street, to the south by Alameda Avenue, and to the west by commercial development that fronts on Union Boulevard. The site is accessed by five security gates, two located on the western and eastern sides of the site, and one on the southern side. The site is also bounded by a high chain link fence around its perimeter.

The Federal Center site currently contains ~~65~~ approximately 50 active buildings (approximate 4.1 million square feet) set within an open grassy landscape. The majority of the buildings consist of federal space for office and related uses such as laboratory, research, and storage for over 25 agencies and bureaus. These include the Department of the Interior (U.S. Geological Survey, Bureau of Land Management, Bureau of Reclamation, Minerals Management Services, Office of Surface Mining), U.S. Department of Agriculture, U.S. Department of Health and Human Services (Food and Drug Administration), National Archives and Records Administration, U.S. Environmental Protection Agency, Government Printing Office, U.S. Department of Homeland Security, and GSA. Bureau of Land Management, the Minerals Management Service; Office of Surface Mining; U.S. Geological Survey, the Bureau of Reclamation; U.S. Department of Agriculture (USDA); U.S. Forest Service; Food and Drug Administration; National Archives and Records Administration; U.S. Environmental Protection Agency (EPA); Government Printing Office; Federal Highway Administration (FHWA); Federal Emergency Management Agency (FEMA); U.S. Department of Homeland Security; and GSA. Most of the buildings on the site are controlled by GSA.

The Federal Center's central core was constructed in the 1940s as the Denver Ordnance Plant. At its peak, the Denver Ordnance Plant occupied 3.25 square miles and extended further to the east and west of the current site boundaries. Development within the core is relatively dense, with low, converted warehouses serving as office space. Surface parking is provided alongside many of the buildings. Because of the railroad spur lines that originally

served the site, the streets run diagonally on a shifted grid within the central core. Outside the core, near the periphery of the site, the streets curve gently so that they reconnect with the north-south grid that is present outside of the Federal Center (GSA 2005a).

A handful of buildings and associated surface parking areas are located outside the central core, irregularly placed within open grassy landscapes. Most of these buildings were constructed after 1950, and many of them are taller than the buildings within the central core. In addition, there are several government facilities that are not controlled by GSA. These include a U.S. post office located at the southern edge of the site, near the intersection of Alameda Avenue and 7th Street; an RTD park-n-Ride facility located near the northwestern corner of the Federal Center; and a U.S. Army Reserve facility located at the site's northeastern corner. There is a natural buffer of open space along the northern edge of the site and at the southeastern corner.

3.1.1 Study Area

The roadways that border the Federal Center sharply divide the site from the surrounding area. The study area is generally a mixture of commercial office space, retail and restaurant establishments, and residential uses. North of the site, along 6th Avenue, there is a combination of commercial, industrial, and office uses. Northwest of the site are the Daniels Gardens and Mountain View neighborhoods, which are primarily single-family residences, although a few denser townhouse developments occur. The Eiber neighborhood is located northeast of the site, east of Oak Street (City of Lakewood 2001b). This neighborhood is primarily single-family residential, but it also includes a park and several schools. The Lakewood Industrial Park, located north of the Federal Center, lies between the established residential areas to the northwest and northeast.

East of the Federal Center, along Kipling Street, are the Jefferson County Stadium in the north, several schools, and a park in the south near the intersection with Alameda Avenue. East of Kipling Street is the Green Mountain neighborhood. Primarily a single-family residential neighborhood, the majority of the houses were built between 1950 and 1960.

A large residential area is located south of the site. The Alameda neighborhood is directly south of Alameda Avenue, while Glennon Heights is located southeast of the Federal Center site. Several small retail establishments are located near the intersection of 7th Street/ Oak Street and Alameda Avenue.

West of the Federal Center, uses along Union Boulevard primarily consist of office space, with scattered neighborhood retail and restaurants. GSA leases office space in this area for federal agencies. West of Union Boulevard is a dense residential area, the Union Square neighborhood.

3.1.2 Open Space

Natural open space areas are generally undeveloped lands that provide natural buffers to development, are deliberately conserved to prohibit development, or border natural features such as streams. Conversely, passive/active open space areas include landscaped and

manicured grassy areas, generally located near or around development. The natural and passive/active open spaces that currently help define the Federal Center site are discussed in the following paragraphs. Exhibit 3-1 shows the open space delineations.

The Federal Center includes approximately 350 acres of natural open space (just over half of the total area of the site). The natural open space is primarily located along the outer edges of the site, forming a perimeter around the more developed areas of the Federal Center. On the northern edge of the Federal Center, the natural open space provides a significant green buffer between the Federal Center's central core and 6th Avenue.

Passive open spaces are generally located within the central core of the Federal Center site. These spaces consist primarily of green, manicured foundation plantings, green medians, and small parcels of open space. Active on-site open spaces include two ball fields located south of the central core and just north of the U.S. Post Office. There are recreation paths along the Agricultural Ditch and McIntyre Gulch as well. Most of the trees lining the streets of the Federal Center were planted during the 1940s, not only to enhance the appearance of the Denver Ordnance Plant, but also to help reduce dust that might infiltrate and compromise the ammunition-manufacturing equipment (GSA 1997a).

3.2 Socioeconomics

Socioeconomic resources include a variety of disciplines and topics related to the human environment. This section provides numerical data and narrative discussions of the existing demographic and employment characteristics, including population and households, income, education, and ethnicity.

The Federal Center is located within a metropolitan setting including numerous interdependent neighborhoods, employment centers, and commercial and institutional nodes. Because of these complex existing interrelationships, the socioeconomic impact of changes to even a major land use such as the Federal Center is unlikely to extend far beyond its immediate geographic vicinity. For the purposes of this analysis, therefore, the socioeconomics study area includes the area within a 1.5-mile radius of the center of the Federal Center, extending as far as Colfax Avenue on the north to Mississippi Avenue on the south, nearing Carr Street on the east and just crossing Alkire Street on the west (see Exhibit 3-2).

The most recent estimate for any given socioeconomic indicator was used where available. ESRI, a leading Census-based demographic data provider, uses baselines to generate estimates of most indicators for 2006 (with projections to 2011 in some cases). The Denver Regional Council of Governments (DRCOG) has estimates available for 2005 with projections to 2015 and 2030. ESRI does not show educational attainment beyond the Census 2000 figures.

3.2.1 *Demographic Characteristics*

The Federal Center site is located near the center of the City of Lakewood, within Jefferson County and the overall Denver metropolitan area. Census-based demographic indicators

gathered from ESRI show that the study area is quite similar to the City of Lakewood in terms of its current demographic profile.

3.2.1.1 Population and Households

The study area has an estimated 2006 population of 23,946, accounting for 16.6 percent of the overall Lakewood population of 144,478, and just 4.5 percent of the Jefferson County population. Currently, there are no residents of the Federal Center itself.

Average household sizes in the study area (2.25 persons per household) are slightly smaller than in the City of Lakewood (2.32 persons per household), reflecting a somewhat higher percentage of renter households in the study area compared to Lakewood (43.6 percent versus 34.5 percent in Lakewood overall). Because of the slightly smaller household sizes, the study area's share of Lakewood households (17.2 percent) is slightly higher than its share of population (16.6 percent).

DRCOG provides demographic data and projections for the Denver metropolitan area for small regions known as Traffic Analysis Zones (TAZs). There are 23 TAZs whose centers intersect the study area and account for a combined estimated 2005¹ population of 26,982². The DRCOG forecasts a growth in population within the study area TAZs by 4,595 residents between 2005 and 2015. This represents an annual compounded growth rate of 1.6 percent. The DRCOG forecasts take into account potential development catalysts (such as transit-oriented infill and, in this case, future redevelopment of the Federal Center site); therefore, the DRCOG forecasts are not comparable to a "do nothing" scenario. A more appropriate indicator of the future background population (the future population without redevelopment of the Federal Center) is ESRI's Census-based statistical projections, which do not take into consideration local infill plans and potential catalysts.

Because the City of Lakewood is largely built-out, its population growth has slowed significantly in recent years. In its Census-based statistical estimates, ESRI projected a virtually flat population growth from 2000 to 2006, with a 0.0 percent annual increase estimated over the period from 2000 to 2006. During that timeframe, the population of the Federal Center study area actually declined slightly, losing an estimated 0.5 percent of its population annually. From 2006 to 2011, ESRI projects a population loss of 71 residents within the Federal Center study area, or 0.1 percent annual rate of loss. County-wide population growth is similarly flat. Household and population data for the study area, the City of Lakewood, and Jefferson County are summarized in Table 3-1.

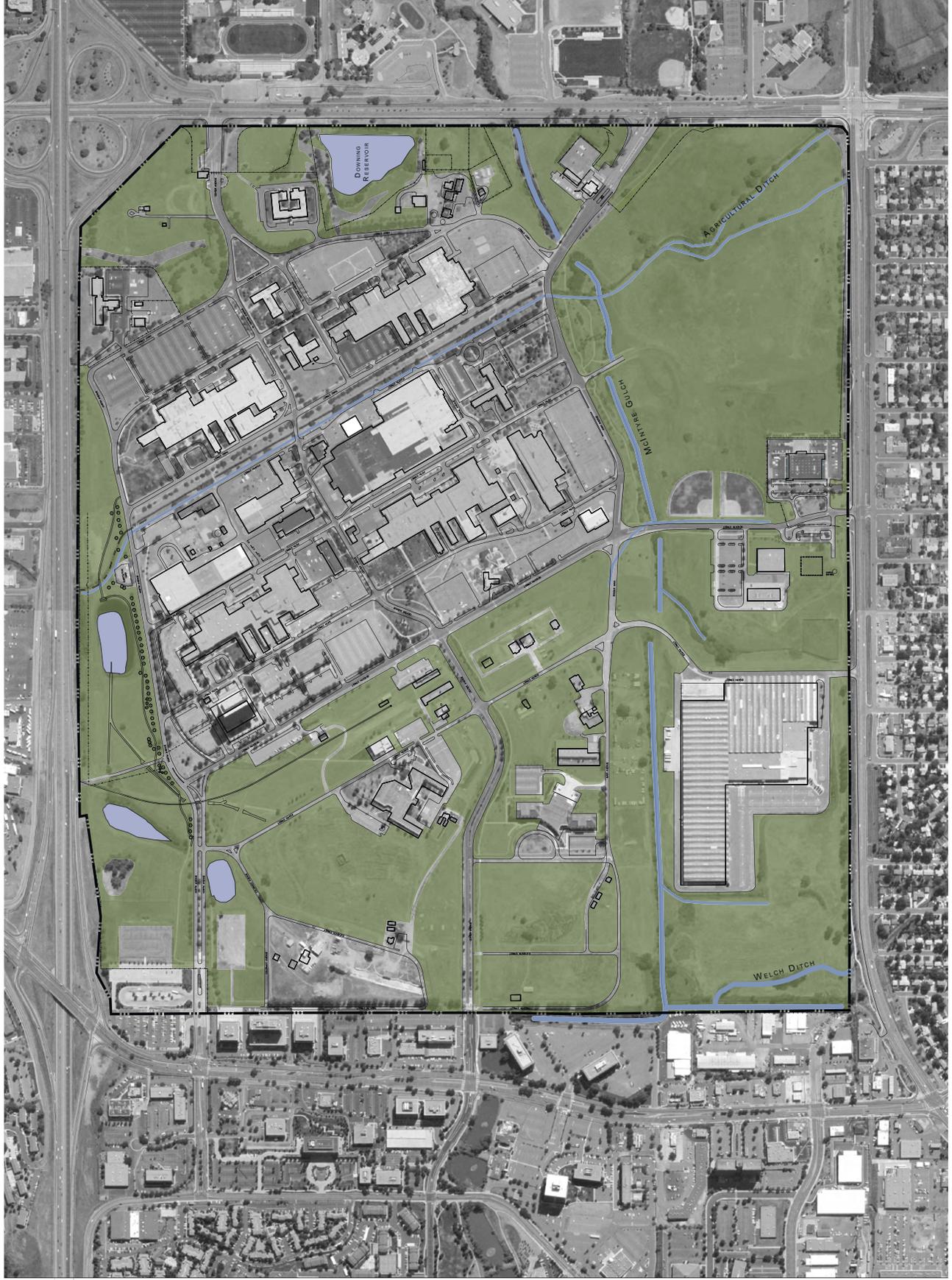
Residents of the Federal Center study area are somewhat younger than Lakewood residents overall, with population skewing somewhat higher in the age 15–24 and the age 25–34 groups. Median age in the Federal Center study area is 35.3, versus 38.1 in the City of Lakewood.

¹ DRCOG TAZ level population estimates are not available for 2006.

² Note that because TAZ boundary shapes overlap the 1.5 mile radius and often differ in shape from U.S. Census block groups, DRCOG estimates differ somewhat from ESRI's Census-based estimates shown in Table 3-1.



Denver Federal Center SITE PLAN STUDY



LEGEND

- Streams and Ditches
- Pond or Reservoir
- Open Space
- DFC Boundary

Sources:
General Services Administration 1997
ERO Resources 2005
Aerial Map: (USDA-NAIP 2005)



Exhibit 3-2: Study Area for Socioeconomics



Source: U.S. Census 2000, ESRI, and Leland Consulting Group

TABLE 3-1:
 Population and Household Characteristics

Characteristic	Federal Center Study Area (1.5 mile radius)	City of Lakewood*	Jefferson County*
Population 2000	24,654	144,126	525,330
Population 2006 (ESRI estimate)	23,946	144,478	536,512
Population 2011 (ESRI projection)	23,875	144,500	537,643
Annual Growth Rate (2006–2011)	-0.1%	0.0%	0.0%
Households 2000	10,714	60,531	205,424
Households 2006 (ESRI estimate)	10,570	61,630	212,896
Households 2011 (ESRI projection)	10,600	62,020	214,646
Annual Growth Rate (2006– 2011)	0.1%	0.1%	0.2%
Average Household Size (2006)	2.25	2.32	2.48

Exhibit: Population and Household Characteristics
 Source: U.S. Census, ESRI, and Leland Consulting Group
 *Figures are inclusive of any smaller areas.

3.2.1.2 Income

Residents of the Federal Center study area have slightly lower incomes than Lakewood residents overall, with an estimated 2006 median household income of \$57,192 versus \$58,834 respectively (Table 3-2). Per capita incomes in the study area are estimated at \$29,644 versus \$31,904 in Lakewood overall. Jefferson County as a whole has higher median household incomes and per capita incomes (\$68,839 and \$35,357) than Lakewood or the Federal Center study area, driven by more affluent western suburb households. Approximately 6.8 percent of households in the Federal Center study area were below the poverty level in 2000, versus 6.3 percent in the City of Lakewood overall.

TABLE 3-2:
Income Characteristics

2006 Household Income	Federal Center Study Area (1.5 mile radius)	City of Lakewood	Jefferson County
\$0—25K	15%	14%	12%
\$25—35K	11%	10%	8%
\$35—50K	17%	17%	13%
\$50—75K	27%	24%	22%
\$75—100K	14%	14%	16%
\$100—150K	14%	15%	19%
\$150K+	3%	7%	11%
Med. Household income	\$57,192	\$58,834	\$68,839
Per Capita Income	\$29,644	\$31,904	\$35,357

Exhibit: 2000 Census Income Characteristics
Source: U.S. Census and ESRI

3.2.1.3 Education

Residents of the Federal Center study area have levels of educational attainment on par with Lakewood residents overall (Table 3-3). In 2000, 32.1 percent of Federal Center study area residents held a bachelor's degree or higher versus 32.8 percent in Lakewood overall. Both are slightly below overall Jefferson County's educational attainment levels, with 36.6 percent holding bachelor's degrees or higher.

TABLE 3-3:
Educational Attainment

Educational Attainment (age 25+)	Federal Center Study Area (1.5 mile radius)	City of Lakewood	Jefferson County
Graduate Degree	10%	11%	12%
Bachelor's	22%	22%	25%
Some College	34%	32%	33%
High School Grad.	25%	25%	23%
No H.S. diploma	10%	11%	8%

Exhibit: 2000 Census Educational Attainment, Population Age 25+
Source: U.S. Census and ESRI

3.2.1.4 Ethnicity

The ethnic profile of residents within the Federal Center study area is predominantly white. Hispanics constitute the largest ethnic minority, with 12.3 percent of the total population (Table 3-4). The next largest ethnic group is Asian (2.8 percent) followed by Black (1.5 percent). This profile is somewhat less diverse than that for Lakewood overall, which is 17.1 percent Hispanic, 3.4 percent Asian, and 1.6 percent Black.

TABLE 3-4:
 Ethnicity Characteristics

Group	Federal Center Study Area (1.5 mile radius)	City of Lakewood	Jefferson County
White Alone	87.6%	85.4%	89.3%
Black Alone	1.5%	1.6%	1.0%
Asian/Pacific Alone	2.8%	3.4%	2.9%
Other/Multiple	8.0%	9.6%	6.9%
Hispanic Origin	12.3%	17.1%	11.7%

NOTE: Totals do not add up to 100% because Hispanic Origin may account for multiple races
 Exhibit: 2006 Census Race/Ethnicity Characteristics
 Source: U.S. Census and ESRI

3.2.2 Employment

The Federal Center site houses more than 6,000 employees and 26 government agencies in approximately ~~65~~ approximately 50 active buildings. As a result, the Federal Center is considered a large regional employment center. Although the majority of the Federal Center is for federal government use and is operated by the federal government, outleases and public uses such as the U.S. Army Reserve, a U.S. post office, and an RTD facility provide services to non-federal employees on site.

The *Lakewood Comprehensive Plan* (City of Lakewood 2003b) has identified Union Center, located along Union Boulevard to the west of the Federal Center, as a major urban center. Major urban centers provide a wide range of community and regional retail uses, in addition to offices, business and personal services, and residential uses. Union Center provides approximately 6,000 jobs. Many businesses have located there to take advantage of Union Boulevard's proximity to the Federal Center.

DRCOG is the only source of "small area" employment estimates and forecasts for the Denver metropolitan area and is the source for this analysis. DRCOG prepares estimates of existing TAZs throughout the Denver Front Range as well as forecasts of employment levels for 2015 and 2030. There are 21 TAZs found within the study area. In 2005, the study area was estimated to have 27,786 employees, of which 7,365 were estimated to work on the Federal Center site.

3.3 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations) requires that federal agencies consider and address disproportionately high and adverse environmental effects on human health or the human environment of minority and/or low-income populations resulting from federal programs, policies, and activities, and identify alternatives that may mitigate these impacts.

The Order states that each federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities because of their race, color, or national origin (subsection 202).

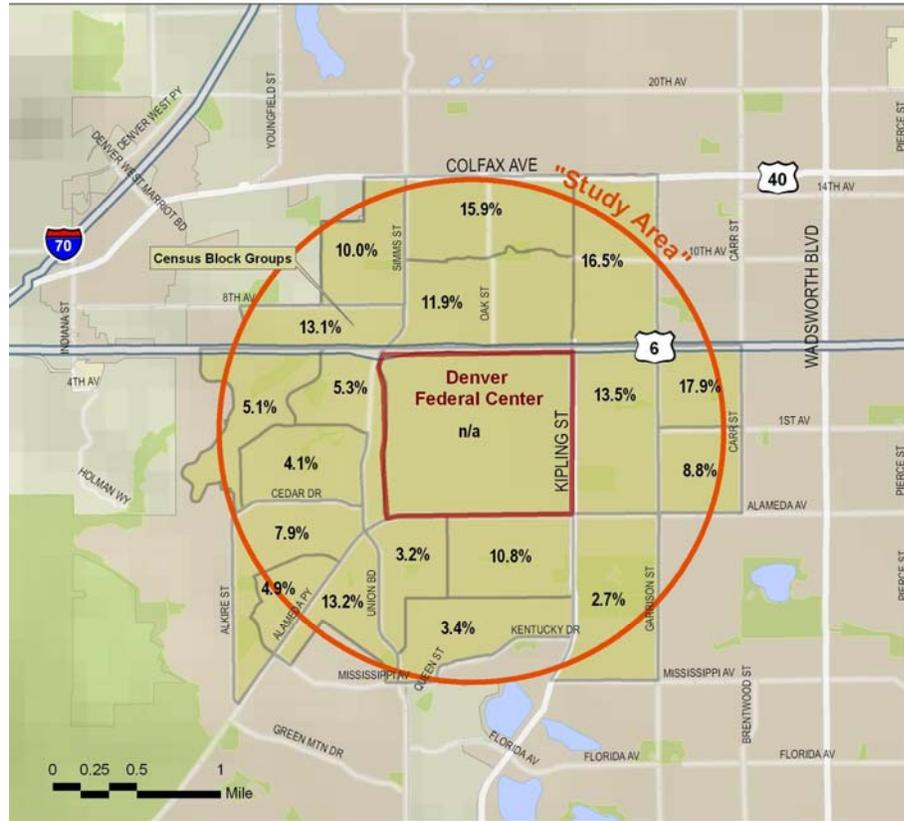
3.3.1 *Low-Income Populations*

“Low income” is defined as a household income at or below the U.S. Department of Health and Human Services poverty guideline (FHWA 1998). One determinant of whether a particular area includes a substantial low-income population is the proportion of residents living below the poverty level. A study area would be considered disproportionately low-income if at least one-quarter of its residents are identified as living below the poverty level, or if its poverty rate is more than double the rates of the surrounding population. According to year 2000 U.S. Census block-group level sample estimates for the study area, 7.3 percent of the resident population lives in a household below the poverty level. This is moderately higher than the 5.2 percent of Jefferson County residents below the poverty level, but only slightly higher than the 6.6 percent of City of Lakewood residents living below the poverty level.

To determine whether this overall rate was concealing an uneven distribution of poverty within the study area, an additional analysis was conducted for the Census block groups. As shown in Exhibit 3-3, poverty rates in the 19 affected block groups include just three groups with poverty rates above 15 percent, with the highest poverty rate among all affected block groups at 17.9 percent. No one block group within the study area has a poverty rate above 25 percent. Thus, no substantial (25 percent or higher) concentrations of poverty are located within the study area.

A related measure of economic disadvantage is per capita income. The 2000 per capita income of the study area was \$24,413, slightly lower than \$25,575 in the City of Lakewood and moderately lower than the \$28,076 in Jefferson County overall (the Denver-Aurora Metropolitan Area’s 2000 per capita income was \$26,212). As with poverty rates, no one block group was found to have a per capita income low enough to suggest a major concentration of low-income residents. The lowest per capita income among block groups within the study area was \$16,841 (or 66 percent of the Lakewood per capita income). Just four of the 19 block groups had per capita incomes below \$20,000.

Exhibit 3-3: Percent of Population below Poverty, Census Block Groups within Study Area



Source: U.S. Census 2000, ESRI, and Leland Consulting Group

3.3.2 Minority Populations

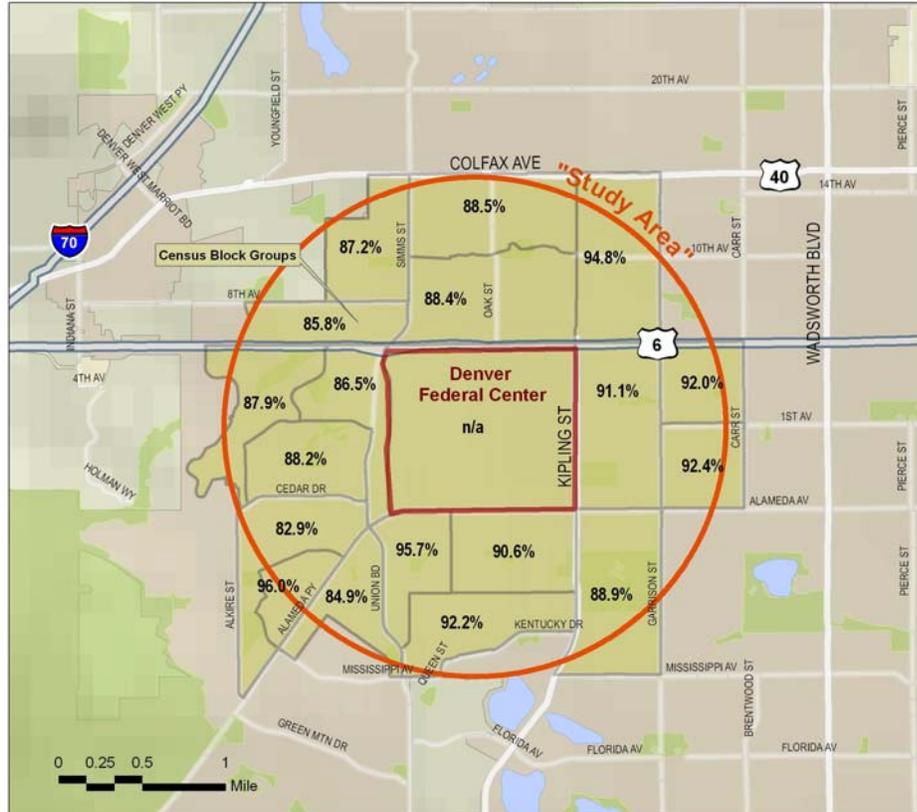
A “minority” is defined as a person who is Black, Hispanic (regardless of race), Asian American, American Indian, or Alaskan Native. The CEQ guidance states that “minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent, or (b) the population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis” (FHWA 1998). Minority populations in the study area, based on Census data, were compared to the population characteristics of the City of Lakewood and Jefferson County.

Based on the 2006 ESRI Census data for the study area, the largest minority representation is among Hispanics (12.3 percent), moderately lower than in the City of Lakewood overall (17.1 percent), followed by Asian/Pacific Islander (2.8 percent of the study area and 3.4 percent for Lakewood overall). Both Black and American Indian populations in the study area are below 2.0 percent, while 8.0 percent of residents report being from some “other” ethnic group or more than one ethnic group. Given the minimal overall populations of minority groups other than Hispanics, only that ethnicity was examined on a block-group by block-group basis. Within the study area block groups, Hispanic residents ranged from

5 percent to 16 percent of the population, suggesting no substantial or disproportionate representation of that (or any) minority group.

Exhibit 3-4 illustrates the high percentage of white population in each of the block groups within the study area, suggesting a lack of substantial concentration of minority populations.

Exhibit 3-4: Percent White Population, Study Area Block Groups



Source: Leland Consulting Group

3.3.3 Community Outreach

An extensive community outreach and notification process was conducted to encourage participation in the public meetings by local and regional residents, elected officials, and government agency representatives. Various outreach and notification efforts included: advertisements in the *Rocky Mountain News*, *The Denver Post*, and *Lakewood Sentinel*; an invitation postcard to approximately 2,200 individuals who had expressed interest in the project or who lived within one-half mile of the project boundary; meeting announcements to local HOAs for inclusion in traditional and e-newsletters; postings to the City of Lakewood and Jefferson County websites; inclusion in Lakewood Chamber of Commerce e-mail distributions; communication through the Channel 8 public access TV community calendar; letters of notification to elected officials and municipal staffs in Lakewood, Jefferson County, and Denver; and invitations to federal agencies.

Although low-income and minority populations were not found to constitute a substantial proportion of the study area, efforts were made to reach these stakeholder groups. A press release announcing the May 17, 2006, EIS public scoping meeting was translated into Spanish and distributed to Spanish-language media. Advertisements, meeting notification mailing pieces, and flyers distributed throughout the Federal Center study area advised that translation services or other special needs could be accommodated upon request; however, no such requests were received.

3.4 Community Services

The study area for public services includes areas within commuting distance of the Federal Center: Jefferson, Adams, Arapahoe, Boulder, Clear Creek, Denver, Douglas, and Gilpin counties. A profile of local public services demands was developed using secondary resources, including annual reports of various agencies and departments, local government budgets, and applicable publications and reports. The community services described in this section include medical facilities, fire protection, police protection, and transit service.

3.4.1 Medical Facilities

While there are no hospitals located within the City of Lakewood, adequate medical facilities and hospital services exist to serve the populations within and near the city. Lutheran Hospital in Wheat Ridge and St. Anthony Hospital in Denver are the closest hospitals to the Federal Center, both of which are located more than 4 miles away. The planned relocation of St. Anthony Central hospital will provide a full service hospital to the residents of Lakewood and the surrounding area. Numerous medical offices and healthcare providers are located within the city limits of Lakewood.

3.4.2 Fire Protection

Fire protection and emergency response services are adequate for existing facilities at the Federal Center. The Federal Center contracts with the West Metro Fire Protection District (WMFPD) for firefighting and emergency response services. All emergency calls from the Federal Center are serviced by Station Number 3, located at 1st Street and Garrison Street in Lakewood. A separate water supply system serves all major buildings throughout the Federal Center site. A separate fire alarm system is located within the underground conduits.

3.4.3 Police Protection

Police protection within the Federal Center is provided by the Federal Protective Service (FPS), under the Department of Homeland Security. FPS provides 24-hour security and controlled access to the Federal Center. Neither the Lakewood Police Department nor the Denver Police Department patrols the Federal Center. The areas neighboring the Federal Center are policed by the Lakewood Police Department, though the RTD park-n-Ride is patrolled by both FPS and the Lakewood Police Department.

3.4.4 Transit Service

Transit services (see Chapter 3, Subsection 3.5.2 ~~3.6.2~~, for a full description) include local, express, and regional buses provided by the RTD and associated park-n-Ride facilities. Although transit service improvements are not proposed as part of the Federal Center improvements, the West Corridor Light Rail Transit Line, currently in progress, is scheduled to open in 2013, connecting the proposed West Corridor from downtown Denver to the Jefferson County Government Center in Golden. As part of the RTD project, the new Federal Center station would replace the Cold Springs park-n-Ride at Union Boulevard and 6th Avenue. As part of the West Corridor project, the RTD and the St. Anthony Hospital projects would include the rebuilding of Routt Street from Alameda Avenue to the station. These improvements also include the signalized intersection of Routt Street at Alameda Avenue.

3.4.5 Public Utilities

The study area for public utilities includes the Federal Center site and the City of Lakewood. The profile of utility services and infrastructure at the Federal Center and the surrounding areas was developed using primary and secondary data sources. Primary data sources include information gathered and confirmed during on-site reconnaissance, information confirmed through interviews with Federal Center employees and representatives of utility service providers, a Utility Feasibility Study (CH2M Hill, Inc. 2002) performed on the Federal Center site, and the Program Development Study (CH2M Hill, Inc. 2006). Secondary data include applicable federal and local government publications and reports and information obtained about ongoing and proposed projects in the area.

It should be noted that, contingent upon funding, GSA's planned infrastructure projects will upgrade the utility service within the central core area of the Federal Center and accommodate a planned expansion across the site (from the existing utility lines) beginning in 2007. As current disposition discussions continue, the parties are also in discussions with the Green Mountain Water and Sanitation District (GMWSD) to improve infrastructure capacity to support the uses identified for the 65 acres ~~being~~ sold to the City of Lakewood through the federal land disposal process.

3.4.6 Water Supply System

Two separate water distribution systems serve the Federal Center site, both of which are operated and maintained by GSA. One system is used to provide drinking water to the facilities, and the second system provides water to the fire sprinkler systems and hydrants throughout the site. Although the systems operate independently, cross-connections between the two systems are known to exist; many more are thought to exist, but they have not been verified.

The water supply is provided to the Federal Center site from the Denver Water Board (Denver Water) through a single 16-inch line connection near Kipling Street and 6th Avenue. Having only a single water supply connection may become problematic in the future as

Denver Water upgrades its system, which could require shutting down the line serving the Federal Center site. A secondary emergency feed from GMWSD exists; however, the connection is not in service. Use of this connection would require an agreement for service between the Federal Center and the GMWSD.

Separate from the proposed Federal Center improvements, extensive improvements to the water supply system are currently underway. The design and construction of two new 16-inch water service mains from the eastern boundary of the Federal Center site is currently underway. Improvements include a new storage tank and pump station, the replacement of fire and domestic service lines, and new valves and backflow preventers as needed. The existing domestic and fire water distribution system will be abandoned (CH2M Hill, Inc. 2006).

3.4.7 Sanitary Sewer System

The Federal Center site's sanitary sewer collection system is owned and operated by GSA, and connects to the City of Lakewood's outfall at Kipling Street. The City of Lakewood's system connects to the Metropolitan Wastewater Reclamation District (MWRD) interceptor, and MWRD provides wastewater treatment at the regional facility adjacent to the South Platte River.

The sanitary sewer system has had blockages in some of its lines in recent years, causing overflows and contamination of a local stream. The Utility Feasibility Study identified the locations of sewer blockages and provided a detailed report of the video inspection performed on the sewer system (CH2M Hill, Inc. 2002). A majority of the system is in working order; however, many of the lines are too small for present sanitary design criteria, and some of the lines need rehabilitation due to cracking and root growth in the system.

Separate from the proposed Federal Center improvements, extensive improvements to the sanitary sewer system are currently underway. All 4-inch sanitary service lines are currently being replaced with new 6-inch lines. Where required, pipe sizes are also being increased using pipe-bursting technology, and degraded lines will be rehabilitated using cured-in-place liners. Additional improvements will include removing inactive flow monitoring stations, replacing the existing outfall, and replacing or rehabilitating existing manholes. An evaluation of the capacity of the outfall within the City of Lakewood at Kipling Street is also underway (CH2M Hill, Inc. 2006).

3.4.8 Stormwater System

The storm sewer system of the Federal Center site is owned and operated by GSA. A series of stormwater ponds along the northern boundary of the site, adjacent to 6th Avenue, drain to the Agricultural Ditch. A majority of the site's storm sewers drain to McIntyre Gulch. McIntyre Gulch enters the southwest corner of the Federal Center site, runs north to the middle of the site, and then runs east before exiting at Kipling Street, approximately halfway between Alameda Avenue and 6th Avenue. No easements exist for McIntyre Gulch, it is not up to date per Urban Drainage and Flood Control District (UDFCD) design criteria, and it is

not currently available to receive maintenance funding from UDFCD. Previous improvement work on McIntyre Gulch was performed jointly by GSA and UDFCD.

Separate from the proposed Federal Center improvements, improvements to the stormwater system and drainage are currently underway. A new storm drainage system is under design and will be constructed along North Avenue. Improvements include adding curbs and gutters, installing curb inlets, installing underground conveyance piping and associated manholes, and installing new drainage system outlets. A new stormwater inlet is also being placed at the intersection of Center Avenue and Fifth Street (CH2M Hill, Inc. 2006).

3.4.9 Electrical Power System

Electrical service is provided to the Federal Center site by Xcel Energy via an overhead feed between North Avenue and 6th Avenue. The Federal Center is a federal enclave, and no franchise agreement exists for service to the site. A master meter monitors service for the entire Federal Center, and direct billing from Xcel Energy to individual buildings does not occur at this time. Sturgeon Electric currently provides maintenance support for the electrical system through a contract with GSA.

In 2005, an additional lighting arrester and grounding grid were added to the main substation, overhead secondaries were converted to underground in 25 buildings, and the underground lead-shielded conductor feeding Building 67 was replaced. A number of load break switches, boxes, junctions, and switchgear packages have also been replaced or repaired (CH2M Hill, Inc. 2006).

Separate from the proposed Federal Center improvements, electrical power system upgrades currently underway include completing the 15-kilovolt electrical loop, replacing a number of oil switches, providing a “Y” feeder to Building 95, and replacing transformer bushings at the main substation (CH2M Hill, Inc. 2006). Improvements also include installing a grid-tied, ground-mounted, net-metered 1-megawatt photovoltaic solar array on a 6.25-acre site just north of Building 25.

3.4.10 Natural Gas Service

The original natural gas system was installed by the federal government and then dedicated in 1990 to Xcel Energy. Xcel Energy continues to own, operate, and maintain the natural gas distribution system at the Federal Center site. Natural gas is provided via underground service lines that generally run adjacent to major streets. There are individual meters at each of the facilities/buildings; GSA is billed by Xcel Energy at the metered point.

3.4.11 Telecommunications System

The main telecommunication system at the Federal Center site is owned and operated by Qwest Communications. Multiple telecommunication systems exist, and some of the agencies at the Federal Center have separate cable and communication systems. According to the Utility Feasibility Study, the majority of the wiring, cable, and fiber optic systems are contained within an underground conduit (CH2M Hill, Inc. 2002).

Separate from the proposed Federal Center improvements, the telecommunications systems in the area are currently being upgraded. A new ductbank is currently being installed for the entire 2,145 feet of existing overhead communications with two 4-inch PVC conduits that are concrete-encased with hand holes (CH2M Hill, Inc. 2006).

3.4.12 Easements and Rights of Way

The Federal Center currently owns three out of its six utility systems. No easements currently exist for the private utilities, and ownership of these private utilities is under separate agreements with Xcel Energy and Qwest. Because GSA is not looking to transfer utility services within the central core area, easement for the central core area will not be required in the future. Easements or rights of way may be required for the provision of utility services and associated maintenance by outside providers.

3.5 Transportation

Transportation in the context of the affected environment includes surface streets, transit facilities/services, and bicycle facilities. Each transportation component is described below. The study area for transportation includes the Federal Center site and roadways and transit services that connect the site to the greater Denver metropolitan area.

3.5.1 Roadway Network

Exhibit 3-5 illustrates the roadway system that serves the Federal Center. As shown, the Federal Center is bounded by four major roadways (6th Avenue on the north, Kipling Street on the east, Alameda Avenue on the south, and Union Boulevard on the west). Sixth Avenue (U.S. 6) is a six-lane controlled-access freeway. Kipling Street is a four-lane arterial with a posted speed limit of 45 miles per hour (mph) and has a partial cloverleaf interchange with 6th Avenue. It also is designated as State Highway 391 and is classified as a non-rural principal highway (NR-A). Alameda Avenue also is a four-lane arterial with a posted speed limit of 45 mph. Union Boulevard is a six-lane arterial with a posted speed limit of 40 mph and has a diamond interchange with 6th Avenue.

The majority of the street system within the Federal Center is two lanes with two-way traffic; however, portions of Main, Center, and North avenues and all of 7th Street have four lanes with two-way traffic.

The Federal Center site has five functional access points. Two gates (1 and 2) are off Kipling Street, one gate (7) is off Alameda Avenue, and two gates (4 and 5) are off Union Boulevard. All gates are secured entrances.

Once traffic enters the Federal Center site, it is distributed via a network of collector and local streets. The collector streets include North Avenue, Center Avenue, Main Avenue, Quail Street, and 7th Street. All collector streets provide four travel lanes (two lanes in each direction). All other streets will be classified as local streets. These are two lanes wide (one lane in each direction).

A traffic study was conducted as part of the master site planning process and is included in Appendix E. Exhibit 3-6 shows the existing traffic volumes on both the perimeter streets and at each gated entrance to the Federal Center. To determine how efficiently and effectively the existing traffic volumes operate on the existing roadway network, all of the signalized intersections in the vicinity of the Federal Center were analyzed. The results are shown as Levels of Service (LOS). LOS is a qualitative measure used to describe the condition of traffic flow and delay, ranging from excellent conditions with very low delay at LOS-A to over saturation and extensive queuing at LOS-F. LOS-D is the minimum desired performance and LOS-E is the minimum acceptable level of service at signalized intersections.

Table 3-5 shows the results of the intersection operations analysis. As shown, all of the intersections operate at acceptable service levels in both peak periods, with one notable exception. The intersection of Union Boulevard and Alameda Avenue operates at LOS-F in the PM peak hour.

TABLE 3-5:
Existing Levels of Service

Intersection	AM	PM
Simms Rd. and 6th Ave.	B	B
Union Blvd. and 6th Ave. Westbound Ramps	B	E
Union Blvd. and 6th Ave. Eastbound Ramps	A	B
Union Blvd. and 4th Ave. (Gate 4)	C	C
Union Blvd. and 2nd Ave. (Gate 5)	B	B
Union Blvd. and 1st Ave.	A	A
Union Blvd. and Cedar Dr.	A	B
Union Blvd. and Alameda Ave.	C	F
Alameda Ave. and Urban Ave.	A	B
Alameda Ave. and Oak St. (Gate 7)	C	D
Alameda Ave. and Kipling St.	C	<u>E-D</u>
Kipling St. and Gate 1	A	A
Kipling St. and Gate 2	A	B
Kipling St. and 6th Ave. Frontage Rd.	B	B

Source: Matrix Design Group (2006)

3.5.2 Transit Service

As shown in Exhibit 3-7, the Federal Center is directly served by two RTD routes. These include one local and one regional service route. Service from the east is provided by Route 14 (Florida). Regional Route G5 is available from Boulder and Golden. An additional 15 routes serve the Cold Springs park-n-Ride, which is located at Union Boulevard and



Denver Federal Center SITE PLAN STUDY

GS



Legend

Route 14

Regional Route GS

Source:
Regional Transportation District
Routes Maps, 2006

FIGURE 3-7: EXISTING TRANSIT ROUTES

6th Avenue. This facility has 646 parking spaces and offers service to all major destinations throughout the Denver metropolitan area.

The West Corridor Light Rail Transit Line is scheduled to open in 2013. The proposed West Corridor is 12.1 miles in length and extends from downtown Denver to the Jefferson County Government Center in Golden. Exhibit 3-8 illustrates the alignment through the Federal Center site. As shown, the current configuration crosses over 6th Avenue from the north into the Federal Center. It then crosses North Avenue at-grade and proceeds south to the new Federal Center station. At the station, the line then loops back to the north and crosses under North Avenue and Union Boulevard as it proceeds to the west along the south side of 6th Avenue.

Currently, there is an RTD-operated bus transfer and park-n-Ride station located near the intersection of Union Boulevard and West 4th Avenue on land leased from GSA. The Federal Center station will replace the Cold Springs park-n-Ride. The station will have 1,000 parking spaces (354 net new spaces) and 18 bus bays. Twenty-three percent of the riders are forecast to access the station by automobile, 58 percent by bus, and 19 percent by walking.

Fifteen bus routes will serve the station (a maximum of 95 buses per hour). These routes will consist of local, express, regional, and new feeder services. As shown in Exhibit 3-8, none of these routes will enter the Federal Center site per the current practice. Access to the station will be from both Union Boulevard and Alameda Avenue via the new Routt Street connection. As part of the West Corridor project, the RTD and the hospital projects will build Routt Street from Alameda Avenue to the station. These improvements also include the signalized intersection of Routt Street at Alameda Avenue.

3.5.3 Bicycle Facilities

Currently, bicycle paths are located along three of the Federal Center's perimeter streets (Kipling Street, Alameda Avenue, and Union Boulevard). The City of Lakewood has plans to improve connections between the Federal Center and the rest of Lakewood through a number of bike lane and path extensions. Exhibit 3-9 shows the proposed improvements that are contained in the Lakewood Bicycle System Master Plan (City of Lakewood 2005). Key investments include:

- Underpass of Alameda Avenue at Simms Street
- Overpass of 6th Avenue as part of the future Routt Street extension
- A bike path along McIntyre Gulch with an underpass of future Routt Street

3.6 Geology and Soils

3.6.1 Geology

As described in the *Environmental Assessment, Potential Development of the Western Portion of the Denver Federal Center* (GSA 2005a), the Federal Center lies in the Denver Basin. The Federal Center site is located within the Denver Basin, which encompasses an area of

approximately 6,700 square miles. This geologic feature extends from Colorado Springs to the vicinity of the northern border of Colorado, and from the foothills west of Denver to the western edge of the northern high-plains to the east (GSA 1997a). The study area for geology includes the Federal Center itself.

The surficial geologic materials found at the Federal Center site include alluvial deposits known as the Piney Creek, Broadway, and Lower Verdos Terrace. These alluvial deposits are composed of unconsolidated, stratified, poorly to well-sorted gravel, sand, and silt materials eroded from the Rocky Mountain Front Range. The Denver and Arapahoe Formations underlie the alluvial material and consist of consolidated, interbedded sandstone, siltstone, claystone, shale, and conglomerate. The depth to bedrock at the Federal Center site varies from zero to several tens of feet (GSA 2005a).

The topography of the Federal Center site is primarily flat, sloping gradually from the west to east at a 2 to 3 percent grade. The slope is greater than 8 percent along McIntyre Gulch, near Building 710 A, and along the east side of Building 810. The northwest corner is the highest point of the site and is 5,716 above sea level, while the low point is 5,548 feet in elevation at the eastern extent of McIntyre Gulch.

3.6.2 Soils

As described in the *Environmental Assessment, Potential Development of the Western Portion of the Denver Federal Center* (GSA 2005a), two soil types have been identified within the project area: Denver-Urban land complex, 2 to 5 percent slopes and Denver-Urban land complex, 5 to 9 percent slopes. Where these soil complexes occur, Denver soils make up approximately 65 percent of the area, and Urban land makes up about 20 percent of the area (or more). The remaining 15 percent of the soil complex comprise numerous soil types as well as small areas that are less than 20 percent Urban land, such as parks, playgrounds, vacant lots, and small fields and pastures. This soil complex is not considered prime or other important farmland by the NRCS. It is also important to note that these soils have been disturbed in the past at the Federal Center as a result of construction/demolition activities and remediation projects.

Typically, the surface layer of Denver soils is a mildly alkaline, grayish-brown clay loam about 6 inches thick. The upper part of the subsoil is mildly to moderately alkaline, grayish-brown clay about 14 inches thick. Below this is a layer of moderately alkaline, light yellowish-brown clay that is 9 inches thick. The lower part of the subsoil is moderately alkaline, light yellowish-brown clay to a depth of 60 inches. Permeability of Denver soils is slow, and as a result, runoff rates are considered medium. Water erosion is a moderate hazard, while the shrink-swell potential of these soils is high.

Streets, parking lots, sidewalks, buildings, and other impervious man-made structures generally characterize the Urban land soil type. Because Urban land is very slowly permeable or is impermeable, runoff is rapid.



Denver Federal Center SITE PLAN STUDY

LEGEND

- LIGHT RAIL LINE
- FEEDER BUS ROUTES
- REGIONAL BUS ROUTES
- LOCAL BUS ROUTES

Source:
West Corridor Final Environmental
Impact Statement, 2003



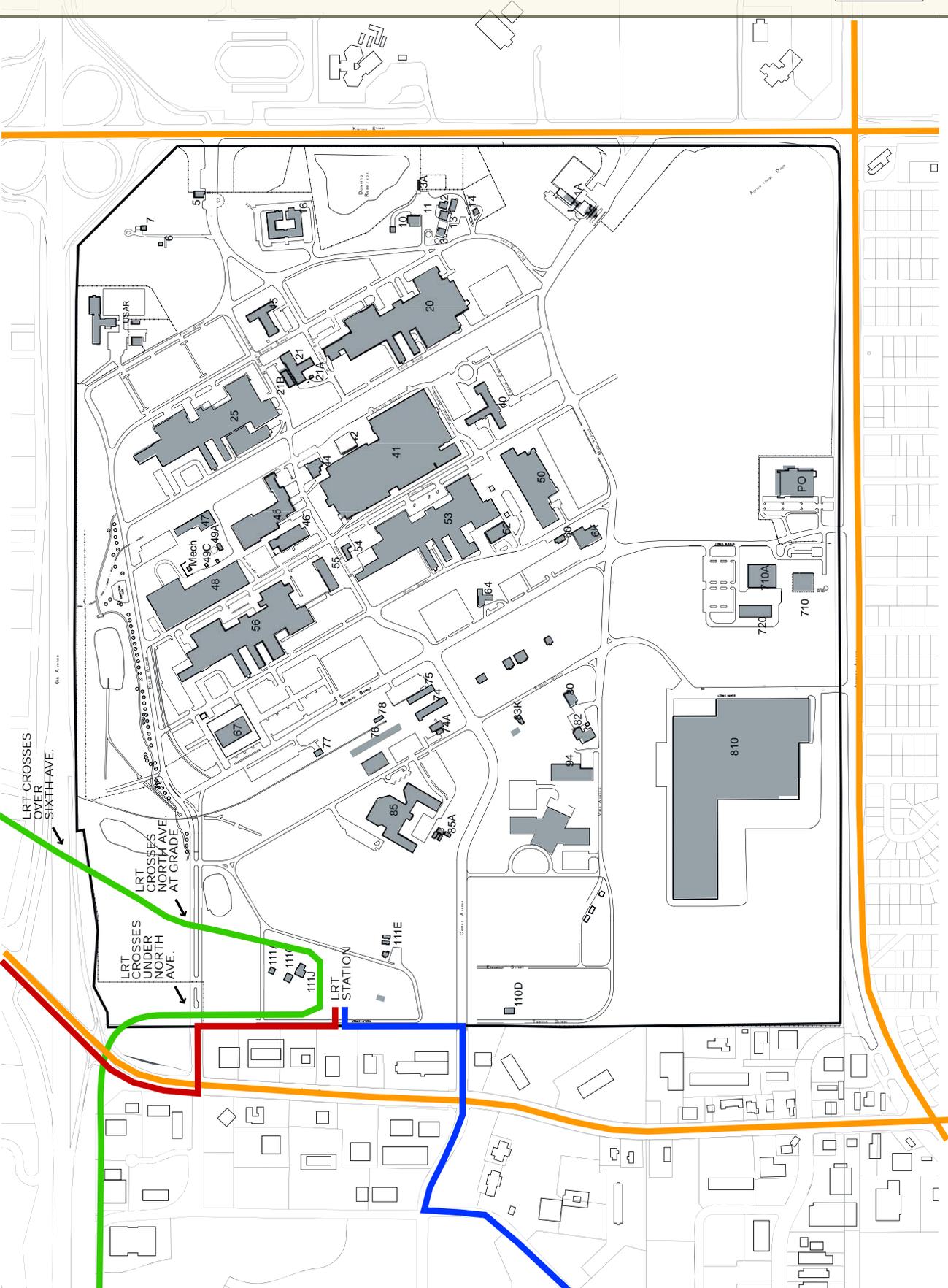
0 150' 300' 600'

April 11, 2007

Master Plan and Environmental Impact Statement

EXHIBIT 3-8: PROPOSED TRANSIT SERVICES

GSA- ROCKY MOUNTAIN REGION, LAKEWOOD, COLORADO



LRT CROSSES OVER SIXTH AVE.

LRT CROSSES UNDER NORTH AVE. AT GRADE.

LRT CROSSES UNDER NORTH AVE.

LRT STATION

6th Avenue

Katella Street

North Avenue

Center Avenue

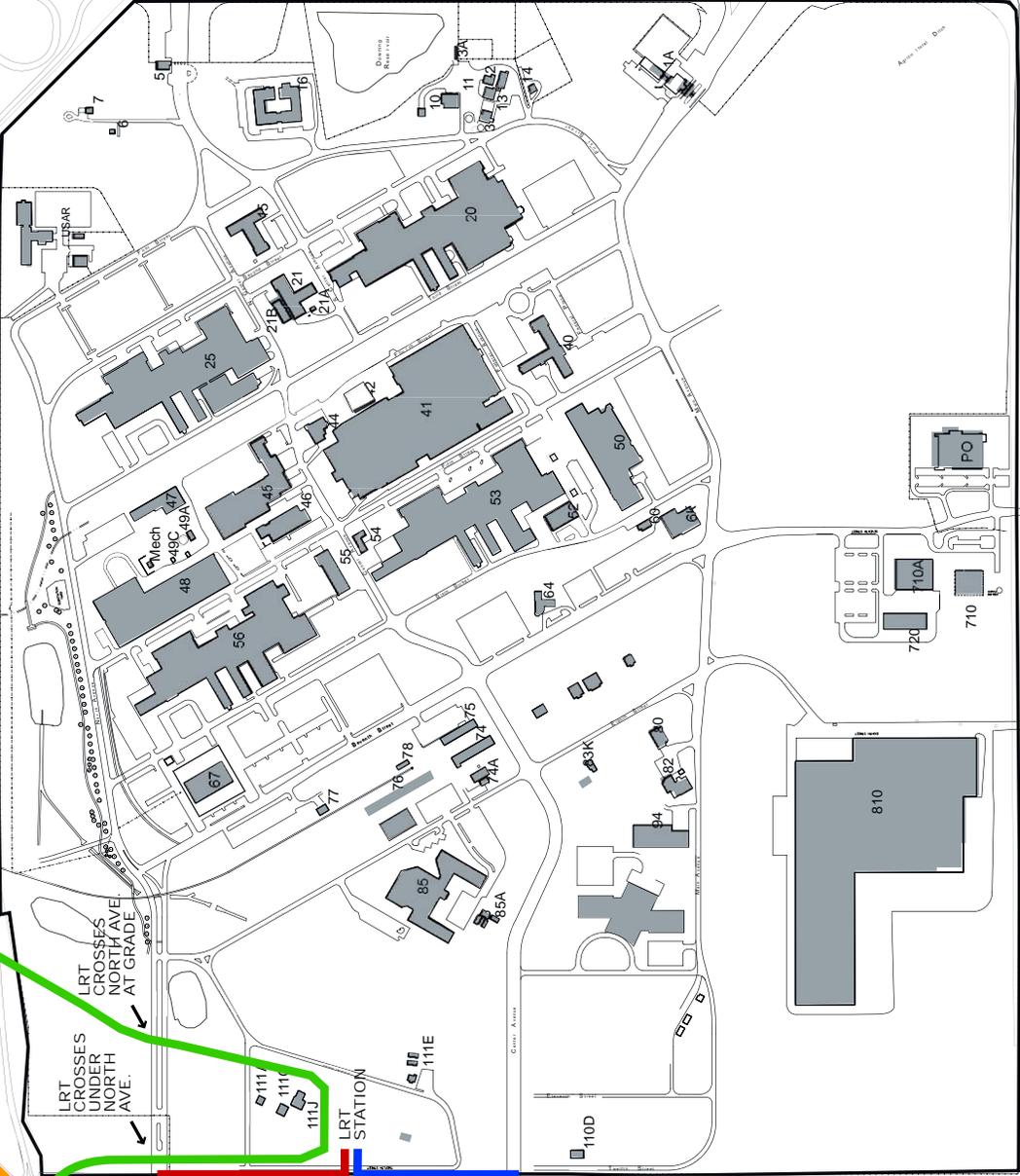
6th Street

7th Street

8th Street

9th Street

10th Street



LRT CROSSES OVER SIXTH AVE.

LRT CROSSES UNDER NORTH AVE. AT GRADE.

LRT CROSSES UNDER NORTH AVE.

LRT STATION

6th Avenue

Katella Street

North Avenue

Center Avenue

6th Street

7th Street

8th Street

9th Street

10th Street



Denver Federal Center SITE PLAN STUDY

LEGEND

- EXISTING BIKE PATH
- PROPOSED BIKE PATH
- PROPOSED BIKE LANE
- PROPOSED GRADE SEPARATION

Source:
City of Lakewood Bicycle System
Master Plan, 2005



0 150' 300' 600'

April 11, 2007

Master Plan and Environmental Impact Statement

GSA- ROCKY MOUNTAIN REGION, LAKEWOOD, COLORADO

EXHIBIT 3-9: BICYCLE FACILITIES



Soil-disturbing activities related to improvements of the Federal Center would be contained within the Federal Center site; therefore, the study area for this resource is limited to within the Federal Center boundaries. The assessment of existing soil resources at the Federal Center is based on secondary data sources, including the Natural Resources Conservation Service (NRCS) (which was formerly the USDA-Soil Conservation Services) 1980 Soil Survey of Golden Area, Colorado, and other existing documents and reports.

Soil properties such as permeability and shrink/swell potential provide a basis for identifying potential development constraints. Permeability refers to the ability of a soil to transmit water or air. It indicates the rate of movement of water through the soil when the soil is saturated. Permeability is mainly considered in the design of soil drainage systems and septic tank absorption fields (NRCS 2006). Shrink-swell potential refers to volume change because of the interaction of clay minerals with water, and varies with the amount and type of clay minerals in the soil. When the shrink-swell potential is rated moderate to very high, shrinking and swelling can potentially cause damage to buildings, roads, and other structures. Special design may be necessary for these soils (NRCS 2006).

The Soil Survey identified six detailed soil map units that occur within the Federal Center boundaries, as depicted on Exhibit 3-10. The Soil Survey provides the following description for each of these soil types:

Denver-Kutch-Urban land complex—5 to 9 percent slopes. This soil unit is described as occurring on hill slopes and shoulders. Denver soils comprise approximately 40 percent of this soil complex, while the Kutch soil makes up approximately 25 percent and Urban lands account for roughly 20 percent. The Denver soil is a deep, well-drained soil. Permeability of the Denver soil is slow, and the available water capacity is high. Runoff is described as medium and water erosion and soil erosion are considered moderate hazards. The shrink-swell potential is described as moderate to high. The Kutch soil is described as moderately deep and well drained. Permeability of the Kutch soil is described as slow, and the available water capacity is low. Runoff is medium, and water erosion is a moderate hazard. Soil blowing is considered a slight hazard, and the shrink-swell potential is moderate to high. Urban land is mainly covered by streets, parking lots, sidewalks, buildings, and other artificial impervious structures. Because Urban land is very slowly permeable or is impermeable, runoff is described as rapid (USDA 1980).

The establishment and maintenance of vegetation in this soil unit is restricted by the clay loam surface layer and clayey subsoil. The main limitations for use of this soil type for homesite development are the shrink-swell potential, depth to rock, low strength, and slow permeability (USDA 1980).

Denver-Urban land complex—0 to 2 percent slopes. This soil complex is described as occurring on high terraces, tablelands, and fans. Denver soil makes up approximately 65 percent of this complex and Urban lands comprise roughly 20 percent. In most places, the areas of this complex are used for community development. In a few places, the Denver soil is used as pasture and for grazing. The establishment and maintenance of vegetation in this soil unit is restricted by the clay loam surface layer and clayey subsoil. The main limitations

for use of this soil type for homesite development are the shrink-swell potential, low strength, and slow permeability (USDA 1980).

In addition, this soil complex may contain inclusions of Nunn Typic Haplaquails, which are designated as hydric soils in the Golden area by the NRCS in the Comprehensive Hydric Soils List. The local landforms in which these hydric soil inclusions occur are low terraces and they are listed as satisfying the saturation and ponding criteria for hydric soils. Specifically, these inclusions have a water table at less than or equal to 1.0 foot from the surface during the growing season if permeability is less than 6.0 inches per hour in any layer within 20 inches and/or they are frequently ponded for long or very long durations during the growing season (NRCS 1995).

Denver-Urban land complex—2 to 5 percent slopes. This soil complex is described similarly to the Denver-Urban land (0 to 2 percent slopes) complex described above (USDA 1980). In addition, this soil complex contains inclusions of Aquic Haplustolls, which are designated as hydric soils in the Golden area by the NRCS in the Comprehensive Hydric Soils List. The local landforms in which these hydric soil inclusions occur are swales, and are listed as satisfying the saturation and ponding criteria for hydric soils. Specifically, these inclusions have a water table at less than or equal to 1.0 foot from the surface during the growing season if permeability is less than 6.0 inches per hour in any layer within 20 inches and/or they are frequently ponded for long or very long durations during the growing season (NRCS 1995).

Denver-Urban land complex—5 to 9 percent slopes. This soil complex is described similarly to the Denver-Urban land (0 to 2 percent slopes) complex described above (USDA 1980).

Englewood-Urban land complex—0 to 2 percent slopes. This soil complex is described as occurring on alluvial fans and in drainageways. This complex is approximately 65 percent Englewood soil and 20 percent Urban land. The Englewood soil is deep and well drained. Permeability of the Englewood soil is described as slow, and the available water capacity is high. Runoff is described as slow, water erosion is a slight hazard, soil blowing is a moderate hazard, and the shrink-swell potential is high. Most areas of this complex are used for community development. In some areas, Englewood soil is used as pasture and for grazing. The establishment and maintenance of vegetation in this soil unit is restricted by the clay loam surface layer and clay subsoil. The main limitations for use of this soil type for homesite development are the shrink-swell potential, low strength, and slow permeability (USDA 1980).

In addition, this soil complex contains inclusions of Typic Haplaquails, which are designated as hydric soils in the Golden area by the NRCS in the Comprehensive Hydric Soils List. The local landforms in which these hydric soil inclusions occur are low terraces, and they are listed as satisfying the saturation criteria for hydric soils. Specifically, these inclusions have a water table at less than or equal to 1.0 foot from the surface during the growing season if permeability is less than 6.0 inches per hour in any layer within 20 inches (NRCS 1995).



Denver Federal Center SITE PLAN STUDY



FIGURE 3-10: SOIL TYPES

Ustic Torriothents—Loamy—15 to 50 percent slopes. This soil complex is described as shallow to deep, well-drained soils on eroded, active hill slopes adjacent to drainageways. The soils formed in loamy material that eroded from interbedded sandstone and shale. This complex is highly variable in depth to bedrock, color, and thickness of soil layers. This complex is commonly found as a clay loam, loam, or sandy clay loam. Permeability of Ustic Torriothents, loamy is described as moderate to slow, and the available water capacity is low to high. Runoff is rapid, and water erosion is a severe hazard. Soil blowing is a moderate to severe hazard, and the shrink-swell potential is moderate to high. In most places, these soils are used for grazing and as habitat for wildlife. The establishment and maintenance of vegetation in this soil unit is difficult due to the slope, and in some areas, because of the clayey texture and depth to rock. The main limitations for use of this soil type for homesite development are the slope, depth to rock, and slippage (USDA 1980).

Further soil analysis was based on linear extensibility percent (LEP) soil testing, which is used by NRCS to estimate the shrink/swell potential of soil. LEP is the linear expression of the volume difference of a natural soil fabric when dried. An LEP greater than 6 percent is high; between 3 percent and 6 percent is moderate, and less than 3 percent is low. The six soils identified on the Federal Center site are generally clay or clay loams with an LEP swell potential rating between 1.5 percent and 4.5 percent. Shrink/swell potential for soils within Federal Center boundaries are shown in Exhibit 3-11.

3.7 Hazardous Materials

This review of existing hazardous materials and contamination at the Federal Center is based on environmental analytical data and reports provided by GSA. Additional information on known underground storage tanks; landfills; hazardous waste generation or treatment, storage, and disposal facilities; and subsurface contamination for an area within 1 mile of the Federal Center boundaries was obtained from an Environmental Data Resources, Inc. Area Study (EDR 2006).

The findings and conclusions presented herein are statements of professional opinion and are based on the documents identified in Table F-1 of Appendix F and the database provided by GSA, which contain information provided by and produced by others. Although a considerable amount of investigative data are available for the Federal Center, detailed investigation data are generally not available for the central portion and the southern third of the Federal Center site. The lack of information about environmental conditions and/or contaminants does not indicate the absence of such materials. As such, there may be unreported and unknown environmental issues associated with the Federal Center or surrounding areas.

Historical activities at the Federal Center over an approximate 50-year-long ~~a 65-year~~ operating period have resulted in the contamination of soil, sediment, surface water, and groundwater within and around the Federal Center. The following sections provide a summary of potential contaminants of concern (PCOCs) that may affect redevelopment of the site.

GSA is actively working to identify and remediate known and potential environmental contamination on the site. Investigation and remediation work is being conducted under three

Consent Orders issued by the Colorado Department of Public Health and Environment. Specific Consent Orders that have been issued for the Federal Center include:

1. Resource Conservation and Recovery Act (RCRA) Consent Order 91-01-24-03a, issued in 1995, requires that GSA investigate and remediate the suspected on-site source of a groundwater contaminant plume in the vicinity of Building 52, of which FHWA is the tenant. Groundwater contaminants of concern include 1,1-dichloroethene (DCE) and 1,1,1-trichloroethane (TCA).
2. RCRA Consent Order 96-04-11-01, issued in 1996, establishes schedules and requirements for the implementation of a groundwater containment system at the eastern boundary of the Federal Center to prevent further off-site migration of groundwater contaminated with hazardous waste or hazardous constituents in excess of established state groundwater standards. This consent order specifically requires that GSA remediate an off-site groundwater plume associated with the Building 52 plume addressed in Consent Order 91-01-24-03a.
3. RCRA Consent Order 97-07-18-01, issued in 1997, requires that GSA identify and investigate the nature and extent of sitewide environmental contamination from current and past releases of hazardous substances on the Federal Center and remediate those releases.

A 1998 study (known as the Pre-RFI Addendum) identified approximately 600 potentially contaminated sites within the Federal Center, many of which have since been eliminated (GSA 1998). The remaining sites have been grouped into “Investigation Areas” as shown in Exhibit 3-12.

3.7.1 Groundwater Contamination

Groundwater in the vicinity of the Federal Center occurs at approximately 10–20 feet below ground surface (bgs) (TTEC 2005). Groundwater depths across the site are illustrated in Exhibit 3-12.

Groundwater at the Federal Center generally flows toward the east, but it shifts slightly to the north in the northern portions of the site. While groundwater at the Federal Center is not currently used for drinking water or irrigation, groundwater to the west of the site is used as a source of irrigation water (TTEC 2005).

Groundwater monitoring began at the Federal Center in 1995 and continues today. Solvents have been identified in groundwater at the Federal Center at concentrations in excess of either regulatory or risk-based screening level criteria identified in the Consent Orders for the site. There are multiple sources of these solvents, the most significant of which is an underground storage tank associated with the FHWA operations at Building 52. The tank leaked a waste solvent into groundwater. Groundwater contaminant plumes present at the Federal Center consist of five specific volatile organic compounds (VOCs): 1,1-DCE, 1,1,1-TCA, cis-1,2-DCE, TCE, and PCE (see Exhibit 3-13) (TTEC 2005).



Denver Federal Center SITE PLAN STUDY



LEGEND
Linear Extensibility Percent (LEP)

- 1.5%
- 4.5%
- 7.5%
- Water

Sources:
USDA NRCS 2004



EXHIBIT 3-11: SOIL SHRINK-SWELL



Denver Federal Center
SITE PLAN STUDY

Legend

- Property Boundary
- Boundary
- Railroad
- Stream
- Pond

Depth To Groundwater

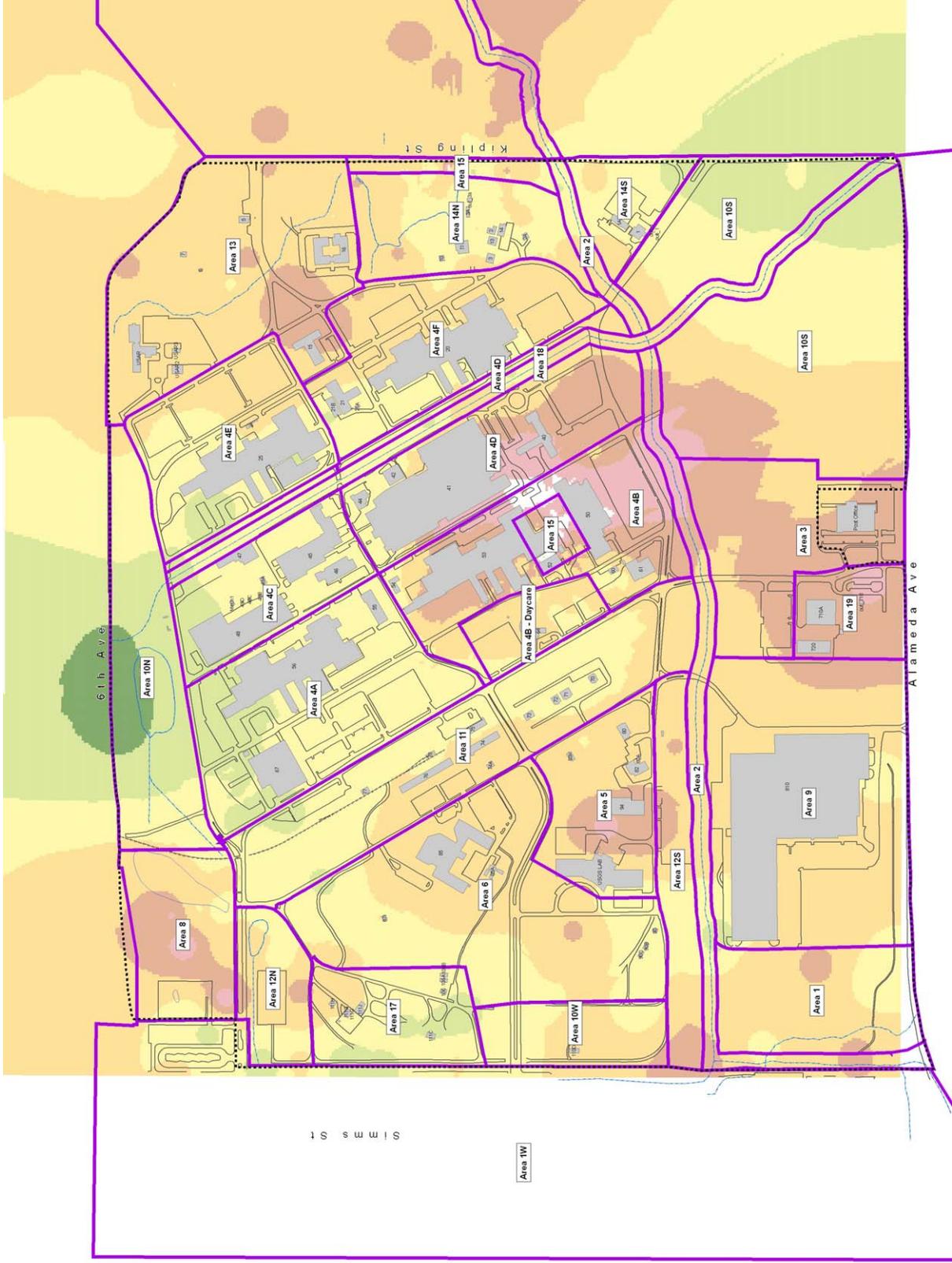
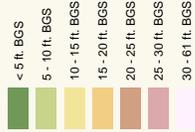


EXHIBIT 3-12: INVESTIGATION AREAS AND DEPTH TO GROUNDWATER



Denver Federal Center SITE PLAN STUDY

- Legend**
- Water Sample Location**
- △ Piezometer
 - Surface Water
 - ◇ Monitoring Well
 - ▲ Property Boundary
 - Investigation Area Boundary
 - ⋯ Railroad
 - Stream
 - ▭ Pond
 - ▭ Solvents in Groundwater above DFC Standards*
- * Source: Tetra Tech, 2005.
Plume boundaries are approximate.

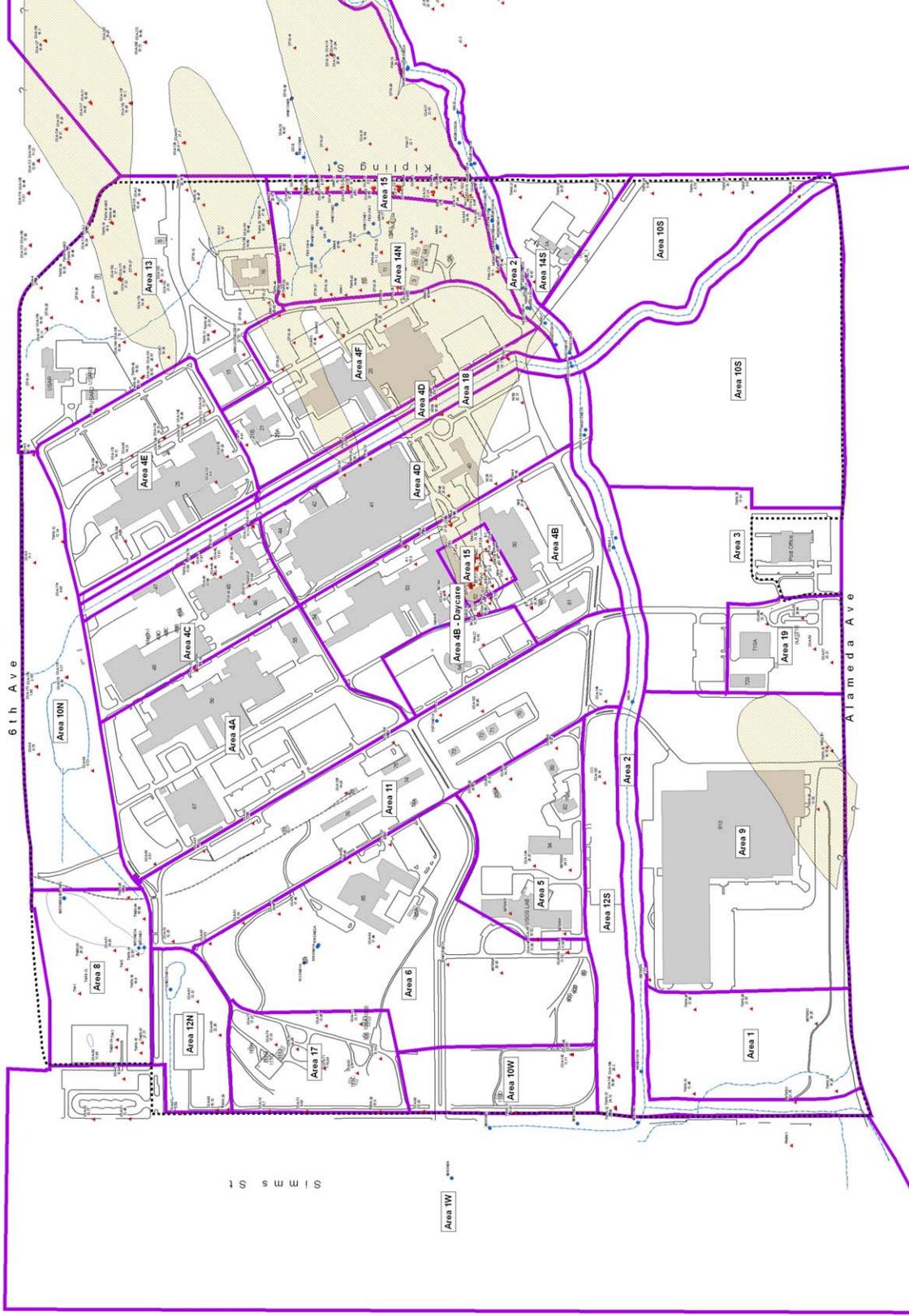


EXHIBIT 3-13: SOLVENTS IN GROUNDWATER



Other analytes (including anions, metals, polynuclear aromatic hydrocarbons, pesticides, semivolatile organic hydrocarbons, and VOCs) have been detected in groundwater in concentrations exceeding their respective criteria (see Table 3-6). However, these analytes have not been detected with a frequency suitable for plume mapping. The sources of these contaminants are described in the source documents cited in Table F-1 of Appendix F.

3.7.2 Soil Contamination

GSA began soil conditions investigations at the Federal Center in 1997 and these continue today. Chemical and site-specific risk-based screening level criteria have been developed for a variety of human and ecological receptors, including but not limited to, on-site grounds workers and resident fauna, which could be exposed to contaminated soil at the Federal Center.

Inorganic and organic PCOCs, including explosive contaminants and radionuclides, have been identified in soils at the Federal Center at concentrations in excess of conservative screening level criteria. The sample locations at which constituents were detected at concentrations exceeding the most conservative Human Health criteria (i.e., residential reuse) and ecological criteria developed for the Federal Center are presented in Figures F-1 through F-9 in Appendix F. The sources of these contaminants are described in the source documents cited in Table F-1 of Appendix F. A detailed list of PCOCs exceeding the screening level criteria in soil is identified in Table F-2 of Appendix F.

3.7.3 Sediment and Surface Water Contamination

The GSA began investigations of sediment and surface water conditions at the Federal Center in 1997 that continue today. Chemical and site-specific risk-based screening level criteria have been developed for sediment and surface water.

Inorganic and organic PCOCs, including explosive contaminants and radionuclides, have been identified in sediment and/or surface water in concentrations in excess of the screening level criteria. The sample locations at which constituents were detected at concentrations exceeding regulatory criteria or the most conservative Human Health criteria and the most conservative ecological criteria developed for the Federal Center are presented in Figures F-10 through F-15 in Appendix F. The sources of these contaminants are described in the source documents cited in Table F-1 of Appendix F. Specific constituents that exceed the criteria in sediment and/or surface water are identified in Tables F-3 and F-4 of Appendix F, respectively.

3.7.4 Other Existing Environmental Concerns

There are a number of additional areas at the Federal Center that could be of potential environmental concern relative to a proposed master plan alternative. Further work is currently planned or is being undertaken by GSA to investigate some, but not all, of these potential areas of concern. The most significant issues of potential environmental concern that could affect or constrain redevelopment include:

TABLE 3-6:
Analytes Detected in Groundwater in Concentrations Exceeding Screening Level Criteria, August 2005

Group	Analyte	Number of MCL Exceedances	
Anions	Nitrate	1	
	Nitrate+Nitrite	1	
Metals	Barium	7	
	Beryllium	34	
	Cadmium	10	
	Chromium	21	
	Lead	75	
	Thallium	22	
	Uranium (total)	45	
	Uranium (dissolved)	26	
	PAHs	Benzo(a)anthracene	2
		Benzo(a)pyrene	8
Benzo(b)fluoranthene		5	
Benzo(k)fluoranthene		1	
Chrysene		4	
Dibenz(a,h)anthracene		1	
Pesticides		Heptachlor Epoxide ¹	4
		Toxaphene ¹	1
SVOCs	1,4-dioxane	16	
	Bis(2-ethylhexyl)phthalate	1	
VOCs	1,1,1-TCA	5	
	1,1-DCA ²	3	
	1,1-DCE	45	
	1,2-DCA	6	
	1,2-DCE	3	
	1,2-dibromoethane ²	3	
	Bromodichloromethane ²	6	
	Carbon Tetrachloride ²	21	
	Chloroform	9	
	Chloromethane ³	2	
	Cis-1,2-DCE	1	
	PCE	6	
	TCE	69	
	Vinyl Chloride ²	20	

Source: TTEC (2005)

MCL Maximum Contaminant Level

PAH Polynuclear Aromatic Hydrocarbon

SVOC Semivolatile Organic Compound

¹ The screening level criteria exceedance for this analyte is for a non-detect result where the reporting limit exceeded screening level criteria.

² Three screening level criteria exceedances for this analyte are for a non-detect result where the reporting limit exceeded screening level criteria.

³ Two screening level criteria exceedances for this analyte are for a non-detect result where the reporting limit exceeded screening level criteria.

- *The EDR Area Study* (2006) of regulatory databases documented known underground storage tanks; landfills; hazardous waste generation or treatment, storage and disposal facilities; and subsurface contamination for the area within 1 mile of the Federal Center site boundaries. Tables F-5 through F-7 display this information and are found in Appendix F. Table F-6 identifies properties located within the site, and Table F-7 identifies properties located in an upgradient groundwater flow direction from the Federal Center. Table F-5 defines the databases listed in Tables F-6 and F-7.
- *Landfills and debris burial areas* are known or suspected to exist in Investigation Area 1, the western portion of Investigation Area 8, and Investigation Area 13.
- *Areas of possible soil disturbance and fill of unknown origin* exist in the northern and central portions of Investigation Area 5. Soil mounds of unknown origin exist in Investigation Area 10N, Investigation Area 10S, and Investigation Area 10W. Soil in these areas may contain construction and demolition debris including concrete, asphalt, and building materials containing asbestos.
- *Underground storage tanks and associated piping* are known or suspected to exist in the vicinity of former Building 14 and Building 44 in Investigation Area 4D.
- *Transformers* were operated or were stored in Investigation Area 06 and in the western portion of Investigation Area 17. If a spill or leak of electrolytic oil containing polychlorinated biphenyls (PCBs) from the transformers occurred, PCB contamination may be present in surrounding soils.
- *Cyanide waste lines, sumps, and pits* exist in Investigation Area 04D. Approximately 1,000 feet of the cyanide waste pipeline and two access manholes exist in Investigation Area 04D. Numerous sumps and/or pits also have been identified surrounding former Buildings 14 and 41.
- *Water, sanitary sewer, and storm lines and steam tunnels* exist throughout the Federal Center. Environmental contaminants may have been released to media surrounding these lines and tunnels through breaks in the lines or through disposal of insulation trimmings containing asbestos in the pipe bed runs.
- *A fire-fighting training area* was formerly located east of Building 44 in Investigation Area 4D. Environmental contaminants from fire suppression materials and incomplete combustion products may exist in environmental media in this area.
- *Railroad tracks* exist in Investigation Area 08, Investigation Area 11, and in the northern portion of Investigation Area 12N. Railroad tracks are of significant potential environmental concern because of spills that often occurred in the rights of way.
- *Buildings* throughout the Federal Center are, or have been, occupied by facilities that could potentially have an adverse effect on the environment. Such uses include laboratories, maintenance and repair shops, and nuclear equipment. Additionally, buildings may contain asbestos materials and lead-based paints.

3.8 Hydrology and Water Quality

McIntyre Gulch is a natural drainage that flows from west to east across the southern portion of the Federal Center site and drains the entire site. Two tributaries flow north into McIntyre Gulch, one to the west of Building 810, and the other to the east of Building 810 and 8th Street (GSA 1997a). McIntyre Gulch then flows into Lakewood Gulch, approximately 2 miles east of the Federal Center site. Lakewood Gulch flows into the South Platte River. McIntyre Gulch maintains much of its natural condition and supports riparian vegetation communities that are described further in Subsection 3.9 ~~Section 3.10~~, *Vegetation*. The study area includes drainage on site and also where it continues off site.

Two constructed irrigation canals are located within the Federal Center site: Agricultural Ditch and Welch Ditch. Agricultural Ditch diverts water from Clear Creek in Golden. It enters the northern boundary of the Federal Center site approximately halfway between Kipling Street and Union Boulevard. It then flows southeast and exits the southeastern corner of the site before continuing approximately 8 miles to Wolcott Lake, located just east of Sheridan Boulevard and Evans Avenue (GSA 1997a). Welch Ditch flows into McIntyre Gulch in what will be part of the St. Anthony Hospital site.

Three detention ponds and one reservoir are located within the Federal Center site. The detention ponds are all located on the northern portion of the site and were designed to divert stormwater runoff originating from the west of the site through each basin from west to east and, if necessary, into Agricultural Ditch (GSA 1997a).

Downing Reservoir is the single permanent surface water impoundment on the Federal Center site. It is located adjacent to Kipling Street on the eastern portion of the site. The approximately 4.25-acre reservoir is, on average, 6 feet deep and is supplied by cooling water, spring water, and stormwater (GSA 1997a). The surface water resources within the Federal Center site are illustrated on Exhibit 3-14.

3.9 Vegetation

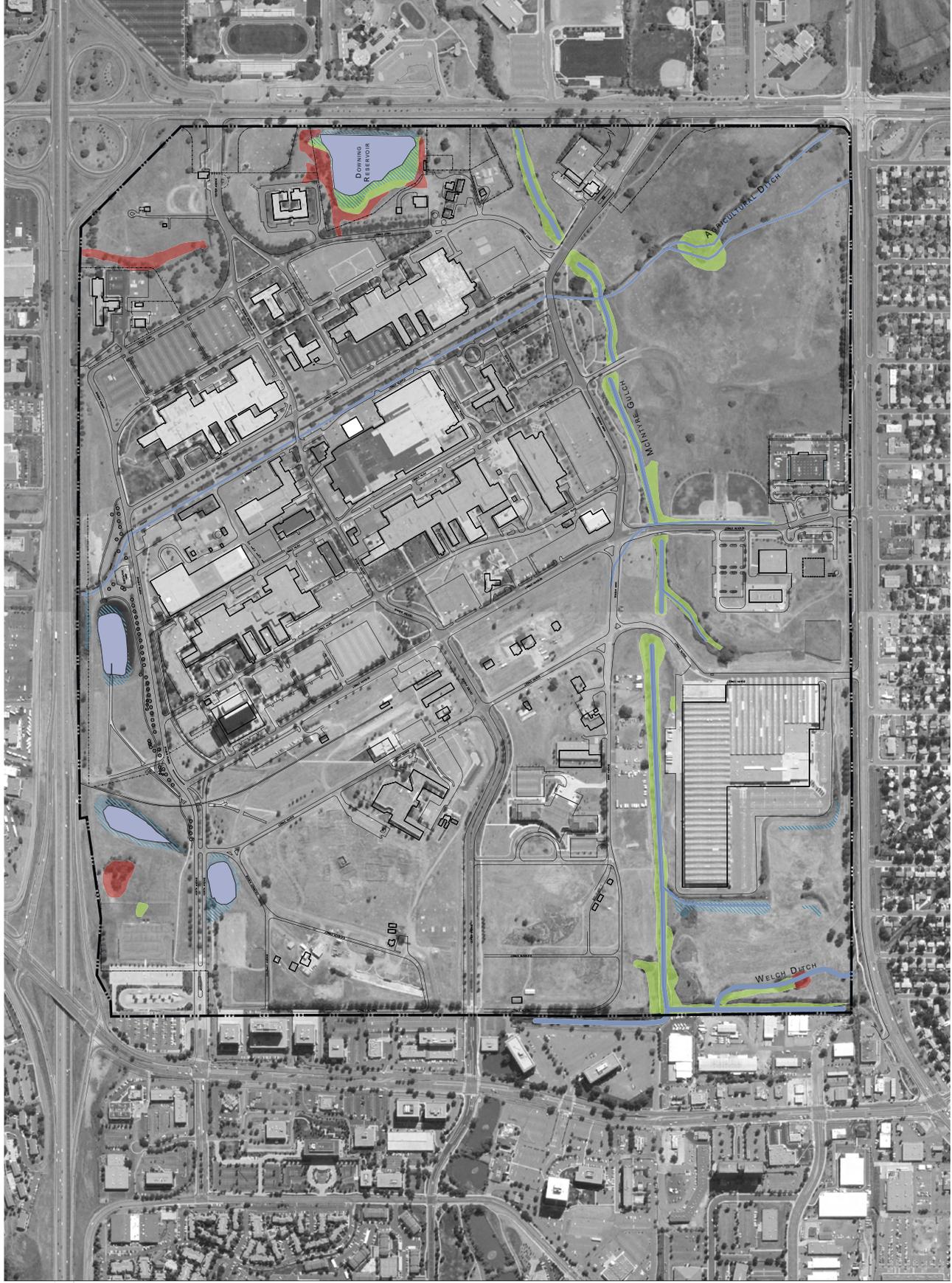
The study area for vegetation resources is confined to the area within the boundaries of the Federal Center site. Primary sources of information regarding the vegetation on the Federal Center site include the 1997 Federal Center Master Site Plan and EIS (GSA2005a); and the 2005 Wildlife Management Plan (GSA 2005b). In addition, observations during site visits confirmed the existing conditions described below.

Plants provide a basic foundation and energy source for natural communities. Plant species diversity directly supports wildlife diversity by providing food and shelter. Significant areas of the Federal Center that were formerly shortgrass prairie are now either woody or disturbed grasslands.

An important habitat found on the Federal Center includes the stands of tall trees and underlying shrubs that border McIntyre Gulch and the Agricultural Ditch, a community commonly called “plains riparian habitat.” This vegetative habitat is composed of large deciduous trees, such as cottonwood, with an understory of shrubs including sandbar willow and crack willow.



Denver Federal Center SITE PLAN STUDY



LEGEND

- Streams and Ditches
- Pond or Reservoir
- Wetlands
- Wetlands/Riparian
- Riparian
- DFC Boundary

Sources:
General Services Administration 1997
ERO Resources 2005
Aerial Map: (USDA-NAIP 2005)

The Federal Center site is located within the Great Plains-Palouse Dry Steppe Province (Bailey 1995). Developed portions of the Federal Center site are surrounded by landscaped vegetation. Undeveloped open space areas are categorized as either open mixed grasslands or open disturbed areas. Open grasslands consist of naturally occurring, but largely non-native vegetation such as smooth brome (*Bromus inermis*) and crested wheatgrass (*Agropyron cristatum*). Patches of native grasses such as buffalo grass (*Buchloe dactyloides*), western wheatgrass (*Agropyron smithii*), and blue grama (*Bouteloua gracilis*) with scattered yucca (*Yucca glauca*) exist in some areas. Open disturbed areas have little or no vegetation as a result of human-related disturbances. In some disturbed areas, invasive exotic plant species are prevalent (GSA 1997a, GSA 2005b). Vegetation communities are mapped in Exhibit 3-15 and include riparian and wetland communities as well as urban landscapes, disturbed areas, and grasslands. Table 3-7 lists plant species that are known to occur on the Federal Center site based on vegetation communities shown in Exhibit 3-15.

3.9.1 Riparian Communities

The riparian community found along the detention ponds on the northern side of the Federal Center, Downing Reservoir, the Agricultural Ditch, and McIntyre Gulch retain valuable native vegetation properties. This community is composed of deciduous trees and shrubs, such as cottonwood (*Populus deltoides*) and various willow species (*Salix* spp.). “Riparian areas are defined by the USACE as . . . lands adjacent to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects water bodies with their adjacent uplands” (Carey 2007).

Riparian communities are considered some of the most threatened habitats in Colorado (because of development and recreation) and are highly productive ecosystems that provide important habitats and corridors for wildlife (GSA 2005b).

3.9.2 Wetlands

A wetland survey was conducted in 1997 to delineate wetland resources within the northwest portion of the Federal Center site. Wetland communities were delineated around detention ponds in the northwest portion of the site and Downing Reservoir along the eastern site boundary (GSA 1997a). In 2004, the U.S. Army Corps of Engineers (USACE) determined that these wetlands are not jurisdictional “waters of the U.S.” and therefore are not regulated by Section 404 of the Clean Water Act (CWA) (GSA 2005b). Named agricultural ditches within the project area have been determined not to be waters of the U.S.

Additional wetlands are associated with riparian communities along McIntyre Gulch and its tributaries. McIntyre Gulch itself is a water of the U.S. regulated by the Clean Water Act (GSA 2005a). Disturbance to McIntyre Gulch, associated tributaries, or wetlands/riparian communities will need to be coordinated with USACE for Clean Water Act Section 404 review. ~~Agricultural ditches are not considered waters of the U.S.~~

TABLE 3-7:
Plant Species Known to Occur on the Federal Center Site

Scientific Name	Common Name	Native/Introduced Location
Deciduous Trees		
<i>Acer negundo</i>	Box elder	Developed/Landscaped
<i>Acer rubrum</i>	Red maple	Developed/Landscaped
<i>Acer sacharinum</i>	Silver maple	Developed/Landscaped
<i>Acer sacharum</i>	Sugar maple	Developed/Landscaped
<i>Cercis canadensis</i>	Redbud	Developed/Landscaped
<i>Elaeagnus angustifolia</i>	Russian olive	Riparian
<i>Fraxinus pennsylvanica</i>	Green ash	Developed/Landscaped
<i>Gleditsia sp</i>	Thornless honeylocust	Developed/Landscaped
<i>Juglans nigra</i>	Black walnut	Developed/Landscaped
<i>Koelreuteria paniculata</i>	Golden rain tree	Developed/Landscaped
<i>Malus pumila var.</i>	Apple	Developed/Landscaped
<i>Malus sp</i>	Flowering crabapple	Developed/Landscaped
<i>Populus deltoides</i>	Plains cottonwood	Riparian
<i>Populus sp.</i>	Cottonless cottonwood	Riparian
<i>Populus tremuloides</i>	Quaking aspen	Developed/Landscaped
<i>Prunus persica var.</i>	Peach	Developed/Landscaped
<i>Prunus sp</i>	Purple plum	Developed/Landscaped
<i>Quercus marcocarpa</i>	Bur oak	Developed/Landscaped
<i>Quercus rubra</i>	Northern red oak	Developed/Landscaped
<i>Robinia pseudoacacia</i>	Black locust	Developed/Landscaped
<i>Salix exigua</i>	Sandbar willow	Wetland/Riparian
<i>Salix fragilis</i>	Crack willow	Wetland/Riparian
<i>Tamarix chinensis</i>	Tamarisk salt cedar	Riparian
<i>Tilia sp.</i>	Linden/basswood	Developed/Landscaped
<i>Ulmus pumila</i>	Siberian elm	Riparian
Evergreen Trees		
<i>Abies concolor</i>	White fir	Developed/Landscaped
<i>Juniperus chinensis var. Pfizers</i>		Developed/Landscaped
<i>Picea pungens</i>	Blue spruce	Developed/Landscaped
<i>Pinus nigra</i>	Austrian pine	Developed/Landscaped

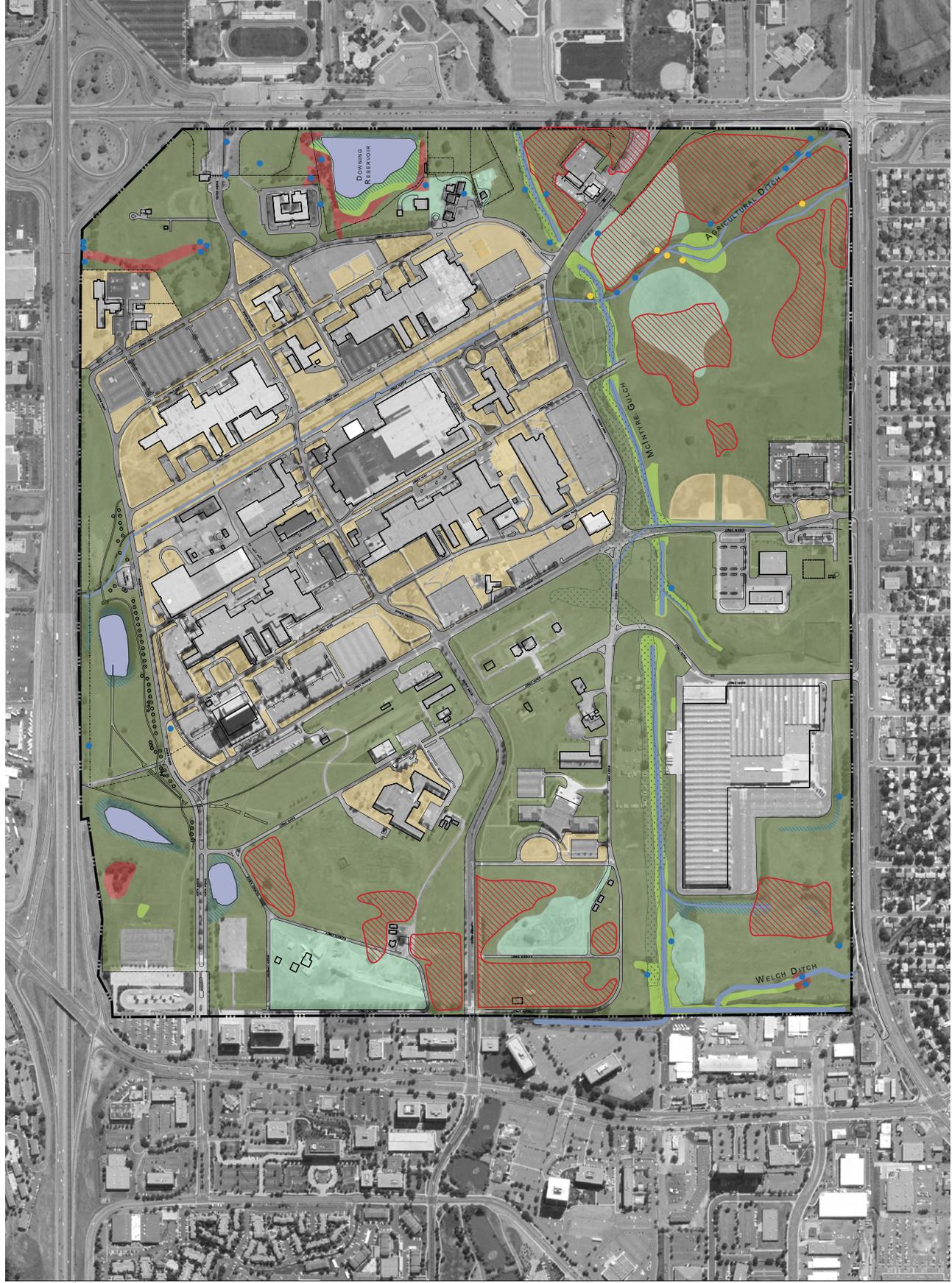
Scientific Name	Common Name	Native/Introduced Location
<i>Pinus ponderosa</i>	Ponderosa pine	Developed/Landscaped
Shrubs		
<i>Chrysothamnus nauseosus</i>	Gray rabbitbrush	Mixed Grassland
<i>Cornus sp.</i>	Dogwood	Developed/Landscaped
<i>Forsythia sp.</i>	Forsythia	Developed/Landscaped
<i>Gutierrezia sarothrae</i>	Snakeweed	Mixed Grassland
<i>Hydrangea sp</i>	Snowball	Developed/Landscaped
<i>Parthenocissus inserta</i>	Virginia creeper	Developed/Landscaped
<i>Prunus virginiana</i>	Chokecherry	Riparian
<i>Rhus typhina</i>	Staghorn sumac	Riparian
<i>Ribes aureum</i>	Golden current	Riparian
<i>Rosa woodsii</i>	Woods rose	Riparian
<i>Rosa sp</i>	Rose	Developed/Landscaped
<i>Syringa sp.</i>	Lilac	Developed/Landscaped
Herbaceous Vegetation		
<i>Asclepias speciosa</i>	Showy milkweed	Riparian
<i>Amaranthus retroflexus</i>	Rough pigweed	Mixed Grassland
<i>Ambrosia psilostachya</i>	Western ragweed	Mixed Grassland
<i>Argemone polyanthemus</i>	Prickly poppy	Mixed Grassland
<i>Artemisia ludoviciana</i>	Prairie sage	Mixed Grassland
<i>Carduus nutans</i>	Musk Thistle	Mixed Grassland
<i>Chenopium incanum</i>	Goosefoot	Mixed Grassland
<i>Cirsium arvense</i>	Canada Thistle	Wetlands/Riparian
<i>Conium maculatum</i>	Poison hemlock	Wetlands/Riparian
<i>Convolvulus arvensis</i>	Field bindweed	Mixed Grassland
<i>Dipsacus sylvestris</i>	Teasel	Wetlands/Riparian
<i>Eriogonum effusum</i>	Bushy buckwheat	Mixed Grassland
<i>Glycyrrhiza lepidota</i>	Wild licorice	Mixed Grassland
<i>Grindelia squarrosa</i>	Gumweed	Mixed Grassland
<i>Gaura parviflora</i>	Velvety gaura	Mixed Grassland
<i>Lactuca serriola</i>	Prickly lettuce	Mixed Grassland
<i>Liatris punctata</i>	Blazing star	Mixed Grassland

Scientific Name	Common Name	Native/Introduced Location
<i>Linaria vulgaris</i>	Butter and eggs	Mixed Grassland
<i>Medicago sativa</i>	Alfalfa	Mixed Grassland
<i>Melilotus officinale</i>	Sweet clover	Mixed Grassland
<i>Oenothera strigosa</i>	Evening primrose	Mixed Grassland
<i>Onopordum acanthium</i>	Scotch thistle	Mixed Grassland
<i>Opuntia compressa</i>	Prickly pear	Mixed Grassland
<i>Psoralea tenuiflora</i>	Scurf pea	Mixed Grassland
<i>Salsola collina</i>	Russian thistle	Mixed Grassland
<i>Sisymbrium altissimum</i>	Tumbling mustard	Mixed Grassland
<i>Solidago sparsiflorum</i>	Few-flowered goldenrod	Mixed Grassland
<i>Tragopogon dubius</i>	Salsify	Mixed Grassland
<i>Trifolium hybridum</i>	Clover	Mixed Grassland
<i>Typha latifolia</i>	Cattail	Wetlands/Riparian
<i>Verbascum thapsus</i>	Common mullein	Mixed Grassland
<i>Yucca glauca</i>	Yucca	Mixed Grassland
Grasses, Sedges, and Rushes		
<i>Agropyron cristatum</i>	Crested wheatgrass	Mixed Grassland
<i>Agropyron repens</i>	Quack-grass	Mixed Grassland
<i>Agropyron smithii</i>	Western wheatgrass	Mixed Grassland
<i>Bouteloua gracilis</i>	Blue grama	Mixed Grassland
<i>Bromus inermis</i>	Smooth brome	Mixed Grassland
<i>Bromus tectorum</i>	Cheatgrass	Mixed Grassland
<i>Buchloe dactyloides</i>	Buffalo grass	Mixed Grassland
<i>Dactylis glomeratus</i>	Orchard grass	Mixed Grassland
<i>Eleocharis macrostachya</i>	Large-spiked spike-rush	Wetlands
<i>Elymus canadensis</i>	Canada wild-rye	Wetlands
<i>Phalaris arundinacea</i>	Reed canary-grass	Wetlands
<i>Poa pratensis</i>	Kentucky bluegrass	Developed/Landscaped
<i>Scirpus sp.</i>	Bulrush	Wetlands
<i>Sporobolus cryptandrus</i>	Sand dropseed	Mixed Grassland
<i>Stipa viridula</i>	Green needle-grass	Mixed Grassland

Source: GSA (2005b)



Denver Federal Center SITE PLAN STUDY



LEGEND

- Streams and Ditches
- Pond or Reservoir
- Wetlands
- Wetlands/Riparian
- Riparian
- Urban Landscape
- Disturbed Areas
- Grasslands
- 100 Yr. Floodplain
- Prairie Dog Colony
- Nest (Raptor, Songbird)
- Coyote Den
- DFC Boundary

Sources:
General Services Administration 1997
ERO Resources 2005
Aerial Map: (USDA-NAIP 2005)



EXHIBIT 3-15: VEGETATION AND WILDLIFE HABITATS

Wetland communities within the Federal Center site are dominated by cattail (*Typha latifolia*), willow, and mixed wetland species. In addition, riparian/wetland communities along McIntyre Gulch and its tributaries are composed of a mix of woody riparian vegetation and a fringe of herbaceous wetland vegetation along the banks, such as cattail, sedges (*Carex* spp.), and rushes (*Juncus* spp.) (GSA 2005b).

3.10 Wildlife

The study area for wildlife resources is confined to the Federal Center site itself. Primary sources of information regarding wildlife resources on the Federal Center site include the 1997 *Federal Center Master Site Plan and EIS* (GSA 1997b); *Environmental Assessment, Potential Development of the Western Portion of the Federal Center* (GSA 2005a); and the ~~Draft~~ *Wildlife Management Plan* (GSA 2005b). The general prescriptions developed in the ~~Draft~~ *Wildlife Management Plan* for reptiles and amphibians, birds, mammals, and injured wildlife incorporates an overall management program that can address broad-based issues and could be implemented across the Federal Center site. Site-specific management prescriptions would be developed in follow-on planning when and where appropriate (e.g., specific threatened and endangered species). In addition, observations during site visits confirmed the existing conditions described below. Wildlife species likely to occur on the Federal Center site are listed in Table 3-8.

3.10.1 Mammals

The open grassland habitats within the Federal Center site support the potential occurrence of more than 40 species of mammals. Mule deer (*Odocoileus hemionus*), various rodents, and several carnivore species are known to occur, or are likely to occur, within the site. The drainage corridors on site, especially the riparian community-lined McIntyre Gulch provide an important wildlife corridor as well a source of water and cover for many species.

Generally, the wildlife population at the Federal Center site is regarded as a positive component of the environment. However, some conflicts between wildlife and humans do occur. For example, some rodent species have the potential to invade buildings. Two non-native species, the Norway rat (*Rattus norvegicus*) and the house mouse (*Mus musculus*), are most likely to enter buildings. Other mammals which may cause concern because of their attraction to trash or their ability to den under and around buildings include striped skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*), coyotes (*Canis latrans*), and red fox (*Vulpes vulpes*) (GSA 2005b).

Black-tailed prairie dogs (*Cynomys ludovicianus*) are prevalent in several colonies throughout the southeast and western portions of the Federal Center site (see Exhibit 3-15). Prairie dogs are considered a species of concern by the Colorado Division of Wildlife. The species of concern designation is not a statutory category and does not provide regulatory protection. ~~Prairie dogs represent the primary wildlife management issue for the Federal Center~~ (GSA 2005b).

TABLE 3-8:
Wildlife Species Likely to Occur on the Federal Center Site

Scientific Name	Common Name	Habitat
Mammals		
<i>Canis latrans</i>	Coyote	Mixed Grassland
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	Mixed Grassland
<i>Lepus californicus</i>	Black-tailed jackrabbit	Mixed Grassland/Developed/Landscaped
<i>Mephitis mephitis</i>	Striped skunk	Mixed Grassland/Developed/Landscaped
<i>Microtus pennsylvanicus</i>	Meadow vole	Mixed Grassland/Riparian/Wetland
<i>Mus musculus</i>	House mouse	Mixed Grassland/Developed/Landscaped
<i>Odocoileus hemionus</i>	Mule deer	Mixed Grassland/Developed/Landscaped
<i>Odocoileus virginianus</i>	White-tailed deer	Riparian/Wetlands
<i>Ondatra zibethicus</i>	Muskrat	Riparian/Wetlands
<i>Pemoyscus maniculatus</i>	Deer mouse	Mixed Grassland/Developed/Landscaped
<i>Procyon lotor</i>	Raccoon	All (except Open Water)
<i>Rattus norvegicus</i>	Norway rat	Riparian/Developed/Landscaped
<i>Sciurus niger</i>	Fox squirrel	Riparian/Developed/Landscaped
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined ground squirrel	Mixed Grassland
<i>Sylvilagus audubonii</i>	Desert cottontail	Mixed Grassland/Developed/Landscaped
<i>Sylvilagus floridanus</i>	Eastern cottontail	Mixed Grassland/Developed/Landscaped
<i>Vulpes vulpes</i>	Red fox	All (except Open Water)
Birds		
<i>Accipiter striatus</i>	Sharp-shinned hawk	Riparian/Developed/Landscaped
<i>Actitis macularia</i>	Spotted sandpiper	Mixed Wetland
<i>Aegolius acadicus</i>	Saw-whet owl	Riparian
<i>Agelaius phoeniceus</i>	Red-winged blackbird	Cattail and Cattail/Willow Wetlands
<i>Aux sponsa</i>	Wood duck	Open Water/Mixed Wetland/Riparian
<i>Anas acuta</i>	Pintail	Open Water
<i>Anas clypeata</i>	Northern shoveler	Open Water

Scientific Name	Common Name	Habitat
<i>Anas crecca</i>	Green-winged teal	Open Water
<i>Anas cyanoptera</i>	Cinnamon teal	Open Water
<i>Anas discors</i>	Blue-winged teal	Open Water
<i>Anas platyrhynchos</i>	Mallard	Open Water
<i>Anas strepera</i>	Godwall	Open Water
<i>Anser albifrons</i>	White-fronted goose	Open Water
<i>Aquila chrysaetos</i>	Golden eagle	Mixed Grasslands
<i>Ardea herodias</i>	Great blue heron	Mixed Wetland/Open Water
<i>Aythya affinis</i>	Lesser-scaup	Open Water
<i>Aythya collaris</i>	Ring-necked duck	Open Water
<i>Aythya marila</i>	Greater-scaup	Open Water
<i>Troglodytes aedon</i>	House wren	Riparian/Developed/Landscaped
<i>Turdus migratoris</i>	American robin	All except Open Water
<i>Tyrannus tyrannus</i>	Eastern kingbird	Mixed Grassland
<i>Tyrannus verticalis</i>	Western kingbird	Mixed Grassland
<i>Vermivora celata</i>	Orange-crowned warbler	Cattail Willow Wetlands
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed blackbird	Cattail and Cattail Willow Wetlands
<i>Zenaidura macroura</i>	Mourning dove	All except Open Water
Reptiles		
<i>Coluber constrictor flaviventris</i>	Eastern yellow-bellied racer	Mixed Grassland
<i>Coluber constrictor mormon</i>	Western yellow-bellied racer	Mixed Grassland
<i>Pituophis mealnoleucus sayi</i>	Bullsnake	Mixed Grassland
<i>Thamnophis radix hayeni</i>	Western plains garter snake	Mixed Grassland
<i>Thamnophis sirtalis</i>	Common garter snake	Mixed Grassland
Amphibians		
<i>Ambystoma tigrinum</i>	Tiger salamander	Riparian/Open Water
<i>Rana catesbiana</i>	Bullfrog	Riparian/Open Water
<i>Rana pipiens</i>	Northern leopard frog	Riparian/Open Water

Source: GSA, 2005b

3.10.2 Avian Species

Many raptors, including red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*Accipiter striatus*), great horned owl (*Bubo virginianus*), barn owl (*Tyto alba*), and the eastern screech owl (*Otus asio*) likely nest within the Federal Center site or nearby areas. In addition, non-nesting raptors may forage in the vicinity of the Federal Center site. Prairie dogs and other rodents, as well as smaller bird species such as pigeons, provide an adequate prey base for raptor species. Raptors are considered ecologically beneficial and assist with population control for prey species.

Other birds likely to be found at the Federal Center site include waterfowl and wading birds, which are attracted to riparian areas and wetlands in the vicinity of McIntyre Gulch, detention ponds, and Downing Reservoir. Smaller birds likely to occur at the Federal Center site include red-winged blackbird (*Agelaius phoeniceus*), American goldfinch (*Carduelis tristis*), yellow warbler (*Dendroica petechia*), western meadowlark (*Sturnella neglecta*), American robin (*Turdus migratoris*), kingbirds (*Tyrannus* spp.), and common crow (*Corvus brachyrhynchos*) (GSA 2005a).

Management issues with bird species at the Federal Center site include non-native species such as the European starling (*Sturnus vulgaris*) and the rock dove or pigeon (*Columba livia*). Nesting and roosting by these species on buildings and in large numbers creates unsanitary and unsightly conditions. The house sparrow (*Passer domesticus*) is a third non-native species prevalent within the Federal Center site (GSA 2005b). All other bird species that occur on the Federal Center site are protected by the Migratory Bird Treaty Act (MBTA), which prohibits possession, sale, purchase, barter, transport, import, export, and take of active nests of protected species. In addition, the capture, pursuit, hunting, and killing of MBTA species is prohibited. Known raptor and other avian species nests are displayed in Exhibit 3-15.

3.10.3 Reptiles and Amphibians

Reptiles and amphibians known or likely to occur on the Federal Center site include the wandering garter snake (*Thamnophis elegans*), the western plains garter snake (*Thamnophis radix*), western rattlesnake (*Crotalus viridis*), bullsnake (*Pituophis melanoleucus*), northern leopard frog (*Rana pipiens*), and bullfrog (*Rana catesbeiana*) (GSA 2005b). Most of the snakes likely to be present on the site, particularly the bullsnake, help control rodent populations, which are often a sanitation concern. The rattlesnake could pose a safety hazard if it occurs in areas where humans may come into contact with it. All snakes need cool, damp shelters and may reside within debris piles under and inside of buildings.

The bullfrog poses an ecological concern as a large, non-native species that preys on many native species, including other frogs, fish, and even ducklings (GSA 2005b).

3.11 Threatened, Endangered, and Sensitive Species

Existing documents and reports were consulted in conjunction with information from the U.S. Fish and Wildlife Service (USFWS) and Colorado Natural Heritage Program for information on threatened, endangered, and sensitive species. The USFWS list of federal endangered, threatened, proposed, and candidate species in Jefferson County includes those in Table 3-9. Consultation with USFWS will continue as the Master Site Plan project progresses. The study area identified for analysis of threatened and endangered species includes the Federal Center site itself.

TABLE 3-9:
 Federally Listed and Candidate Species, Jefferson County

Common Name	Scientific Name	Federal Status	Potential to Occur Within Study Area	Occurs within Study Area
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Y	N
Canada Lynx	<i>Lynx canadensis</i>	Threatened	N	N
Colorado Butterfly Plant	<i>Gaura neomexicana ssp. coloradensis</i>	Threatened	Y	N
Interior Least Tern*	<i>Sterna antillarum athalassos</i>	Endangered	*	N
Mexican Spotted Owl	<i>Strix occidentalis</i>	Threatened	N	N
Pallid Sturgeon*	<i>Scaphirhynchus albus</i>	Endangered	*	N
Pawnee Montane Skipper	<i>Hesperia leonardus montana</i>	Threatened	N	N
Piping Plover*	<i>Charadrius melodus</i>	Threatened	*	N
Preble's Meadow Jumping Mouse	<i>Zapus hudsonius preblei</i>	Threatened	Y	N
Ute Ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened	Y	N
Whooping Crane*	<i>Grus Americana</i>	Endangered	*	N

Source: USFWS Ecological Services, Colorado Field Office
 *Water depletions to the Platte River system may affect these species.

Initial investigation indicated that the species with potential to occur on the Federal Center include bald eagle, Preble's meadow jumping mouse, Ute ladies'-tresses orchid, and the Colorado butterfly plant. Further research and site investigation determined that none of these species are expected to occur within the Federal Center site due to lack of habitat as described below.

3.11.1 *Bald Eagle*

Breeding habitat for bald eagles (*Haliaeetus leucocephalus*) most commonly includes areas close to (within 2.5 miles) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, and seabirds (NatureServe 2005). Bald eagles usually nest in tall trees or on cliffs near water. Nest trees include pines, spruce, firs, cottonwoods, oaks, poplars, and beech.

Bald eagles preferentially roost in conifers or other sheltered sites in winter and typically select larger more accessible trees. Communal roost sites used by two or more eagles are common, and 100 or more eagles may use one site during periods of high use. Winter roost sites vary in their proximity to food resources (up to 20.5 miles) and may be determined to some extent by a preference for a warmer microclimate at these sites. Wintering areas are commonly associated with open water though in some areas, eagles use habitats with little or no open water if other food sources (e.g., rabbit or deer carrion) are readily available. Bald eagles may also occur locally in semideserts and grasslands (Enderson et al. 1970), especially near prairie dog towns. Bald eagles may associate with waterfowl concentrations or congregate in areas with abundant dead fish and often roost communally at night in trees that are used in successive years. Winter roosts avoid areas with nearby human activity and development (NatureServe 2005).

In the last several years, there have been 10 or more breeding pairs in Moffat, Rio Blanco, Mesa, Montezuma, La Plata, Archuleta, Adams, and Weld counties (Craig 1991). In 1991, there were 13 territorial pairs, and nine pairs fledged 19 young (Craig 1991).

There are no known bald eagle nests or roosting colonies located within the Federal Center boundaries; however, the site contains riparian/cottonwood communities that may provide potential foraging habitat for the bald eagle. There are several black-tailed prairie dogs located on the Federal Center site that provide a year-round prey source for bald and golden eagles and other raptors. Although they could be observed at the Federal Center, the site does not contain habitat that would be regularly used by bald eagle.

3.11.2 *Preble's Meadow Jumping Mouse*

The Preble's meadow jumping mouse (PMJM) (*Zapus hudsonius preblei*) is a nocturnal species that lives primarily in heavily vegetated, shrub-dominated riparian (streamside) habitats and immediately adjacent upland habitats along the foothills of southeastern Wyoming, south to Colorado Springs along the eastern edge of the Front Range of Colorado (USFWS 2006). The PMJM range includes Adams, Arapahoe, Boulder, Denver, Douglas, El Paso, Elbert, Jefferson, Larimer, and Weld counties in Colorado; and Albany, Laramie, Platte Goshen, and Converse counties in Wyoming. This area has undergone rapid residential, commercial, agricultural, and industrial development that has affected the PMJM habitat. On February 2, 2005, the USFWS issued a 12-Month Finding on a petition to delist the PMJM and proposed to remove the mouse from the federal list of threatened and endangered species.

Only one occurrence of the PMJM species at the Federal Center has been documented. This occurred in 1911. A habitat assessment for the mouse was conducted in October 1998, to complete an Ecological Risk Assessment and Plan as requested by EPA (GSA 1997a). Several areas were found which represented potential but marginal quality habitat for this species, including the northern and southern portion of the Agricultural Ditch, a tributary to McIntyre Gulch, and riparian habitat along the southwestern boundary of the Federal Center. These areas have perennial or intermittent water, well-developed shrub overstories, and tall grasses and forbs. Other areas examined were unsuitable because of steep banks, lack of adequate shrub cover, sparse or weedy herbaceous cover, disturbance, and/or isolation. The Federal Center does not contain critical habitat for this species as designated by USFWS or occupied habitat for this species as documented by the Colorado Division of Wildlife. There are no known populations of the PMJM near the Federal Center, which is largely surrounded by urbanized areas.

3.11.3 Ute Ladies-Tresses Orchid

According to NatureServe (2006), the Ute ladies-tresses orchid is known from sporadic occurrences in lower-elevation wet meadow habitats in the interior western United States. The species was federally listed as threatened in 1992 when it was only known to occur in Colorado, Utah, and Nevada. Since that time, it has been found in Wyoming, Montana, Nebraska, and Idaho. Currently, the largest documented population, with about 5,500 plants, is in Colorado. The riparian habitat on which this species depends has been drastically modified by urbanization and stream channelization for agriculture and development. Most surviving populations are small and appear to be relict in nature. This plant blooms mainly from late July through August. The orchid is found in moist to very wet meadows along streams or in abandoned stream meanders that still retain ample groundwater as well as near springs, seeps, and lakeshores from 1,300- to 1,600-meter elevations. Ute ladies-tresses are threatened because of many forms of water development, intense domestic livestock grazing, haying, exotic species invasion, fragmentation, and, in particular, urbanization. This species is considered vulnerable in parts of its range due to loss of pollinators, and control of rodent predators.

The Ute ladies-tresses orchid is known to occur in western Jefferson County. There are no known current or historic occurrences of the Ute ladies-tresses orchid within the Federal Center or immediate vicinity. The Federal Center site lacks suitable habitat for this species, as the topography adjacent to on-site drainages does not support the subsurface hydrology that is likely to support the orchid (GSA 2005a).

3.11.4 Colorado Butterfly Plant

The Colorado butterfly plant occurs in subirrigated, alluvial (stream deposited) soils on level or slightly sloping floodplains and drainage bottoms at elevations of 1,524 to 1,951 meters. Colonies are often found in low depressions along bends in wide, active, meandering stream channels a short distance upslope of actual channel. This species requires early-to-mid succession riparian (riverbank) habitat. Critical habitat as designated by USFWS for this species is located entirely in Wyoming with the exception of one site in Weld County just

east of Interstate 25. Critical habitat has been designated for this 707-acre site within a meadow supported by groundwater within the Meadow Springs Ranch in northern Colorado. The property is owned by the City of Fort Collins. This geographically and reproductively isolated population represents the only known naturally occurring population in the state of Colorado.

There are no known or historical occurrences of the butterfly plant within Jefferson County or the Federal Center. Because of a lack of meandering streams and the urban nature of the site, habitat for the Colorado butterfly plant on the Federal Center site is lacking and the species is not likely to occur (GSA 2005a).

3.12 Cultural Resources

This section documents the historical and archaeological resources that are present on the Federal Center site and within the surrounding area. The study area for historic resources has been determined by GSA to be the Federal Center site. In defining the study area for archaeological resources, it was determined that the only effects on archaeological resources would occur as a result of ground-disturbing activities and would also be limited to the site itself.

3.12.1 *Archeological Resources*

The most recent archaeological study of the Federal Center was conducted in 1997 (Tate and Associates 1997). The 1997 study looked at the potential for surviving undisturbed archaeological resources on the site. Specifically, it looked at segments of the Welch, Agricultural Irrigation, and Agricultural Return ditches that cross the site. It also examined a ranch that was located on the eastern side of the Federal Center site. The survey concluded that the potential for surviving undisturbed prehistoric archeological resources was low since the property had undergone extensive landscape transformation since 1941. A survey, completed in 1978, identified eight prehistoric artifacts within the Federal Center site. Artifacts identified were located on the ground surface and consisted of six flakes and two hammer stones and were considered to be “isolated finds.” The surveys concluded that the potential for surviving undisturbed prehistoric archeological resources was low since the property had undergone extensive landscape transformation since 1941 (GSA 1997a).

Some areas of the Federal Center have experienced less development than others and thus the existence of intact prehistoric archeological resources is possible at such locations. McIntyre Gulch and Downing Reservoir (formerly know as Allen’s Spring), as permanent water sources, would have been attractive to animals and hunters. These areas may have been used during prehistoric times and could contain evidence of prehistoric activity.

3.12.2 *Historic Resources*

Prior to 1940, the land currently occupied by the Federal Center site was used for agriculture and ranching purposes and was known as Downing Ranch. Irrigation ditches were introduced in the rural areas surrounding Denver to provide water for farming. The Welch Ditch, the

Agricultural Ditch, and the ancillary Return Ditch were installed in the area that currently comprises the Federal Center.

In January 1941, the U.S. Government purchased 1,422 acres of land including what is now considered the Federal Center site for the purpose of the production of small arms ammunition (GSA 1997a). The site was purchased by the federal government and run by the Remington Company. At its peak, the Denver Ordnance Plant occupied a site 3.25 square miles in area, had over 200 buildings with more than 2.4 million square feet of floor space, 11 miles of rail spur, 15 miles of fencing, 17 miles of roads, six restaurants serving 20,000 meals a day, complete modern police and fire departments, and a fully equipped hospital (DPL 2006).

After World War II, the ammunition plant closed and the buildings were used for office, research, and administrative purposes by a number of federal agencies. These buildings continue to serve these functions today.

Extensive architectural and general cultural resources inventories of the Federal Center site have been previously conducted, most recently in conjunction with the Federal Center's 1997 Master Site Plan (GSA 1997b). Two buildings at the site, the Office of Civil Defense Emergency Operations Center and Building 710, are listed in the National Register of Historic Places.

The Office of Civil Defense Emergency Operations Center (5JF.1048.13), a Quonset hut immediately west of Building 50, is a circa 1960, bunker-like building associated with Cold War Era military history. Designed for temporary use during an emergency, the building is believed to be one of the first of eight first-generation nuclear fallout shelters operated by the Office of Civil Defense. In service as the Region 6 Operations Center until 1969, the partially buried Quonset hut appears as an elongated rectangular earthen mound (CHS 2007).

Building 710 (5JF.1048.14) was constructed in 1969 and is significant for its association with Cold War Era military history. Designed to withstand a nuclear attack, the two-story underground building of reinforced concrete served as the Defense Civil Preparedness Agency's Region 6 Operations Center. Since 1979, it has been utilized by FEMA as its Region 8 Operations Center (CHS 2007).

The Agricultural Ditch and ancillary Return Ditch were recommended eligible for listing in the National Register of Historic Places, though both features exhibited compromised integrity due to alteration (Tate and Associates 1997). The Welch Agricultural Ditch segment has been determined to be a non-contributing element to a site that, on the whole, is considered eligible for listing in the National Register (GSA 2005a).

The Federal Center as a whole was determined not eligible for the National Register of Historic Places given the extensive amount of changes that have occurred to the buildings since they were first constructed. An on-site museum, housed in Building 41, captures the history of the site since 1941; several hundred artifacts are cataloged.

3.13 Visual Resources

This section documents the existing visual character of the Federal Center site and its surroundings. The study area for visual resources was determined by estimating the visibility of the existing improvements to the Federal Center to viewers from surrounding locations. Considering the setting of the Federal Center within an already developed area, the busy thoroughfares that border the site, and the development proposed, it was determined that there would be little chance of substantial visual effect beyond one-quarter mile. Accordingly, the study area for visual resources was generally defined as within approximately one-quarter mile of the site perimeter.

The existing visual characteristics of the Federal Center site, as well as the areas that surround it, were determined through field reconnaissance. The character of the site and the surrounding area are discussed below.

3.13.1 *The Site*

The Federal Center is a 640-acre federal site located at the foothills of the Rocky Mountains, just west of Denver. The topography of the site rises gently from east to west. Views of the Denver skyline are available from vantage points across the Federal Center site.

The Federal Center site is bounded on three sides by major roadways: 6th Avenue, an east-west six-lane highway, defines the northern edge of the site; Kipling Street and Alameda Avenue, both busy four-lane roadways, define the eastern and southern sides of the site, respectively. The site is bordered on the west by a commercial and office strip that fronts on Union Boulevard. A high chain-link fence encircles the Federal Center site. Prominent security gates are located on the western, southern, and eastern sides of the site.

The Federal Center site contains ~~65~~ approximately 50 active buildings. The majority of these are located in the core area of the site (Exhibit 3-16). The core area was constructed in the early 1940s, primarily for munitions production. Development within the core follows a regular grid, although the grid is aligned such that the streets run diagonally across the Federal Center site rather than in a north-south or east-west orientation. The result is that vistas established within the core area are not continued outside of the Federal Center gates. The core area primarily consists of large one- and two-story converted warehouse buildings, constructed of brick with flat roofs, as well as associated surface parking. Building entrances are often difficult to discern and street edges are frequently poorly defined. At the northwest corner of the core, Building 67, a modern 16-story structure, dominates the landscape.

On the northern side of the core area, North Avenue divides the low brick buildings of the core from a natural area to the north. North Avenue itself is a two-lane tree-lined street. North of this street, and south of the Federal Center boundary, is a narrow grassy strip containing two small wetland areas. These are lined with shrubs and small trees, slightly screening views of 6th Avenue from the Federal Center (Exhibit 3-17).

In the western portion of the site, development is somewhat haphazard, with small industrial buildings sited within an open grassy landscape dotted with small trees (Exhibit 3-18). The streets in this area diverge from the diagonally oriented grid within the central core area, to connect with the major east-west roads that cross Union Boulevard. A transit rail line and

Exhibit 3-16: View of the Federal Center Core Area



December 1, 2005

Exhibit 3-17: Wetlands Area on the Northern Side of the Site



December 1, 2005

Exhibit 3-18: The Western Side of the Federal Center with Union Boulevard in the Distance



December 1, 2005

station are proposed for the area located between Center and North Avenues. Panoramic views toward the west from the central core area include the commercial development along Union Boulevard in the foreground and the foothills of the Rocky Mountains in the distance. To the northwest, Table Mountain, in Golden, is visible.

The southern portion of the Federal Center is primarily an open landscape. Building 810, a large, low brick structure, and its associated parking are located in the southwestern corner of the site. On a clear day, Pikes Peak appears in the distance more than 50 miles to the south, and Hayden Green Mountain is visible to the southwest. From the eastern side of the site, there are views of the Denver skyline (Exhibit 3-19).

3.13.2 Study Area Views

On the western side of the Federal Center is Union Boulevard, a wide, six-lane boulevard, runs north-south just west of the Federal Center gate and fence. The majority of Union Boulevard is lined with five- to ten-story office buildings surrounded by surface parking lots. Lower profile retail and restaurant uses are scattered between the office buildings. Views of the Federal Center from Union Boulevard are dominated by the 16-story Building 67 to the east. West of Union Boulevard is the Union Square neighborhood, a lower scale (lower profile) residential area. Views of the Federal Center to the east from this residential area are obscured by the development along the Union Boulevard corridor (Exhibit 3-20).

Sixth Avenue forms the northern boundary of the Federal Center. A wide six-lane highway, the avenue is lined on the north primarily with mid-rise commercial and office structures. These buildings largely obscure views from the residential neighborhoods located further north of the Federal Center.

Kipling Street, a four-lane thoroughfare, forms the eastern boundary of the Federal Center. The eastern side of the street has a series of large, low buildings set back substantially from the street, as well as a park near Alameda Avenue. A low-scale residential area is located to the east of Kipling Street. Because of the gentle slope of the topography and the mass of the buildings along Kipling Street, views of the Federal Center from the residential areas to the east are limited.

Alameda Avenue defines the southern boundary of the Federal Center. A series of low-scale (low-profile) commercial buildings line Alameda Avenue near its intersection with 7th Street/Oak Street. Alameda Avenue forms the northern border of the Alameda neighborhood, a low-scale residential area constructed between 1960 and 1980. Views into the Federal Center from Alameda Avenue include Building 810 and the Post Office. Building 67 is also visible in the distance (Exhibit 3-21).

Exhibit 3-19: The Eastern Side of the Site with the Denver Skyline in the Distance



December 1, 2005

Exhibit 3-20: Looking North on Union Boulevard



December 1, 2005

Exhibit 3-21: Looking East on Alameda Avenue



December 1, 2005

3.14 Air Quality

Because air quality is a regional issue, the study area for this resource includes the entire seven-county Denver metropolitan area and the northern Front Range counties of Weld and Larimer.

3.14.1 Meteorology and Climate

The Denver metropolitan area is generally characterized by a broad valley following the South Platte River basin. The terrain to the east is dominated by gently rolling plains, and the Front Range foothills of the Rocky Mountains are to the west. The Denver metropolitan area has a climate similar to much of the central Rocky Mountain region, with daily temperature extremes ranging from lows of below zero degrees Fahrenheit during winter months to summer highs periodically exceeding 100 degrees Fahrenheit. Extremely hot or cold weather is typically of short duration with low relative humidity, light precipitation, and abundant sunshine. Average monthly temperatures range from 28 degrees Fahrenheit in January to 72 degrees Fahrenheit in July. Annual rainfall is approximately 16 inches, with 0.01 inch or greater occurring over 89 days per year. Annual snowfall is approximately 60 inches, with 1 or more inches of snow falling on an average of 18 days per year.

3.14.2 Regulatory Environment

The Regional Air Quality Council (RAQC) is the lead air quality planning agency for the Denver metropolitan area. The RAQC's mission is to develop effective and cost-efficient air quality planning initiatives with input from local governments, the private sector, stakeholder groups, and citizens of the Denver metropolitan region. Its primary task is to prepare state implementation plans for compliance with the National Ambient Air Quality Standards (NAAQS) established by EPA.

EPA has established NAAQS for the following air pollutants (termed "criteria" pollutants): carbon monoxide (CO), ozone (O₃), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter less than 10 micrometers in diameter (PM₁₀), particulate matter less than 2.5 microns in diameter (PM_{2.5}), and lead. In 1997, EPA promulgated new 8-hour O₃, PM_{2.5}, and regional haze standards; however, due to litigation, implementation of these standards was delayed, and EPA did not issue final 8-hour ozone designations until 2004.

Colorado has adopted the NAAQS, as well as state-specific standards including a 3-hour SO₂ standard (700 micrograms per cubic meter) and a visibility standard. The NAAQS are summarized in Table 3-10.

3.14.3 Attainment Status

EPA classifies air quality in an air quality control region (AQCR) according to whether the concentration of criteria pollutants in ambient air exceeds the primary or secondary NAAQS. All areas within each AQCR are designated as either "attainment," "nonattainment," or "unclassified" for each of the criteria pollutants. Attainment means that the air quality is better than the NAAQS for a criteria pollutant. Conversely, nonattainment indicates that air quality exceeds or is worse than the NAAQS. An unclassified air quality designation means there is not enough information to appropriately classify an AQCR. Areas designated by EPA as nonattainment for one or more of the seven NAAQS may petition EPA for redesignation as a maintenance area if it can be demonstrated that the area has met the national standard for the previous three years.

Under the Federal Clean Air Act, the RAQC is responsible for developing specific plans for implementation, maintenance, and enforcement of NAAQS within the Denver metropolitan area. After years of violating federal health standards for CO, fine particulate matter (PM₁₀), and ozone, the Denver metropolitan area is ~~now in~~ currently designated attainment for all of the NAAQS. However, ~~the~~ principal air quality concern in the Denver metropolitan area continues to be ozone, which is discussed in more detail in the following section.

3.14.4 Ozone

EPA recently replaced the 1-hour ozone standard with the new 8-hour ozone standard to better protect public health. Based on monitoring data collected over a 3-year period (from 2001 to 2003), the Denver metropolitan area was close to exceeding the 8-hour standard. Rather than designating Denver as an area of nonattainment, EPA allowed the region to enter into an Early Action Compact (EAC) for ozone. The EAC allowed the region to submit an

TABLE 3-10:
National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards	
		Primary	Secondary
Carbon Monoxide	1 hour	35 ppm	—
	8 hour ⁽¹⁾	9 ppm	—
Lead	Calendar Quarter	1.5 µg/m ³	—
Nitrogen Dioxide	Annual Average	100 µg/m ³	Same as primary
Particulate (PM ₁₀)	Annual Arithmetic Mean ⁽²⁾	Revoked ⁽³⁾	—
	24 hour ⁽³⁾	150 µg/m ³	—
Particulate (PM _{2.5})	Annual Arithmetic Mean ⁽⁴⁾	15 µg/m ³	—
	24 hour ⁽⁵⁾	35 µg/m ³	—
Ozone	8 hour ⁽⁶⁾	0.08 ppm	Same as primary
	1 hour ⁽⁷⁾	0.12 ppm (applies only in limited areas)	Same as primary
Sulfur Dioxide	Annual Average	80 µg/m ³	—
	24 hour ⁽¹⁾	365 µg/m ³	—
	3 hour ⁽¹⁾	700 µg/m ³ (Colo. Std)	1,300 µg/m ³

Source: <http://www.epa.gov/air/criteria.html>

Notes:

- (1) Not to be exceeded more than once per calendar year.
 (2) Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM₁₀ standard in 2006 (effective December 17, 2006).
 (3) Not to be exceeded more than once per year on average over 3 years.
 (4) To attain this standard, the 3-year average of the weighed annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³.
 (5) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006).
 (6) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor over each year must not exceed 0.08 ppm.
 (7) As of June 15, 2005, EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) areas. The standard is attained when the expected number of days per calendar year with maximum hourly average ozone concentrations above 0.12 ppm is less than one.

Definitions:

µg/m³ micrograms per cubic meter
 NO₂ nitrogen dioxide
 PM₁₀ particulate matter less than 10 microns in diameter
 PM_{2.5} particulate matter less than 2.5 microns in diameter
 ppm parts per million
 SO₂ sulfur dioxide

enforceable State Implementation Plan outlining steps the region will take to maintain compliance with the ozone standard. In return, EPA will defer any nonattainment designation and will give the area until 2007 to demonstrate attainment of the standard.

Elevated ozone concentrations were recorded in the Denver metropolitan area during the summers of 2006 and 2007. Preliminary data collected at the Rocky Flats North air quality monitoring station indicate an 8-hour rolling average ozone concentration of 0.088 parts per million was recorded on July 20, 2007. If validated, that reading—when considered along with other 2005–2007 summer readings—will result in a violation of the federal health-based standard, and EPA will likely designate the nine-county region (Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer, and Weld counties) as “out of compliance with the existing eight-hour ozone standard and the area will be considered to be a ‘nonattainment’ area.” (CDPHE 2007).

The CDPHE Air Pollution Control Division, along with the RAQC and the North Front Range Metropolitan Planning Organization, will work to develop a plan to further reduce ozone concentrations to attain the standard. The plan is scheduled to be submitted to the Colorado Air Quality Control Commission for approval by the end of 2008, with legislative and gubernatorial approval expected to follow. Once all state approval processes have been completed, the plan ultimately will be submitted to EPA for approval by April 2009 (CDPHE 2007).

~~Elevated ozone concentrations were recorded in the Denver metropolitan area during summer 2003. Because the 8-hour ozone standard is defined as a 3-year average of the annual fourth maximum 8-hour concentration, however, the region has not violated the standard. Several monitoring stations recorded elevated 8-hour ozone concentrations in June 2006. The RAQC continues to monitor ozone concentrations and has undertaken an extensive public education campaign to alert the public to steps they can take to reduce ozone.~~

3.14.5 Visibility

The visibility standard index (VSI) is a measure of the visual air quality in the seven-county Denver-Boulder metropolitan area. The standard for visual air quality is 0.076 per kilometer of atmospheric extinction, which means that 7.6 percent of a light source’s intensity is extinguished over a 1-kilometer path. A violation occurs when the 4-hour average extinction exceeds the 0.076 standard.

The visibility standard is in effect during the core daylight hours from 8 a.m. to 4 p.m. throughout the winter high pollution season. On the VSI scale, a value of 101 equals the 0.076/kilometer standard. Values between 0–50 are good, 51–100 moderate, 101–200 poor and 201–plus extremely poor. Meteorologists at the Air Pollution Control Division use weather information and the expected effect of air pollution emissions from a variety of sources to forecast air quality through a daily color-coded advisory system. Mandatory wood-burning restrictions and requests to limit driving are issued during the winter high pollution season when air quality conditions are poor or are expected to deteriorate.

Although Colorado has a visibility standard, this standard does not have the same regulatory authority as the NAAQS. The Denver metropolitan area continues to violate the state visibility standard; however, the RAQC has not adopted additional control measures beyond those necessary to attain the NAAQS. On average, the standard is violated 62 days each winter season (November through March) and approximately 150 days each year. The study area for visibility covers the seven-county Denver metropolitan area.

3.15 Noise and Vibration

3.15.1 Noise

Sound is defined as any pressure variation detected by the human ear. Sound pressure levels (L_p) can vary over a large range of amplitude, from barely perceptible to sound levels that can cause hearing damage. When sounds are unpleasant, unwanted, or disturbingly loud, they tend to be classified as noise.

Sound pressure level describes the level of noise measured at a receptor at any moment in time and is read directly from a sound level meter. The decibel (dB) is the accepted standard unit for measuring the amplitude of sound. When describing sound and its effect on a human population, A-weighted (dBA) sound pressure levels are typically used to account for the response of the human ear. The term “A-weighted” refers to a filtering of the noise signal in a manner corresponding to the way the human ear perceives sound. The A-weighted noise level has been found to correlate well with personal judgments of the noisiness of different sounds and has been used for many years as a measure of community noise. Typical sound levels experienced by people range from approximately 40 dBA in a quiet living room to approximately 85 dBA on a sidewalk adjacent to heavy traffic. Table 3-11 identifies typical A-weighted sound pressure levels for various noise sources.

Community noise levels usually change continuously during the day. The equivalent continuous A-weighted sound pressure level (L_{eq}) is normally used to describe community noise. The L_{eq} is the equivalent steady-state A-weighted sound pressure level that would contain the same acoustical energy as the time-varying A-weighted sound pressure level during the same time interval. The maximum sound pressure level (L_{max}) is the greatest instantaneous sound pressure level observed during a single noise measurement interval.

Another descriptor, the day-night average sound pressure level (L_{dn}), was developed to evaluate the total daily community noise environment. The L_{dn} is a 24-hour average sound pressure level with a 10 dB time-of-day weighting added to sound pressure levels in the nine nighttime hours from 10:00 p.m. to 7:00 a.m. This nighttime 10 dB adjustment is an effort to account for the increased sensitivity to nighttime noise events. The Federal Transit Administration (FTA) uses L_{dn} and L_{eq} to evaluate train noise impacts at the surrounding communities.

TABLE 3-11:
Typical Noise Levels

Noise Level (dBA)	Noise Source
140	Jet Engine
130	Threshold of Pain
115–120	Amplified Rock Band
105–115	Commercial Jet Takeoff at 200 feet
100	Ambulance siren at 100 feet
95–105	Community Warning Siren at 100 feet
85–95	Busy Urban Street
75–85	Rail Transit at 50 feet; Construction Equipment at 50 feet
65–75	Freeway Traffic at 50 feet
55–65	Normal Conversation at 6 feet
45–55	Typical Office Interior
35–45	Soft Radio Music
25–35	Typical Residential Interior
15–25	Typical Whisper at 6 feet
5–15	Human Breathing
0–5	Threshold of Hearing

Source: GSA (2005a)

The smallest noise level change that can be detected by the human ear is approximately 3 dB. A doubling of the static air pressure amounts to a change of 6 dB, and an increase of 10 dB is roughly equivalent to a doubling of the perceived sound level. Under free-field conditions, where there are no reflections or additional attenuation, noise generally decreases at a rate of 6 dB for each doubling of distance. For example, a sound level of 70 dB at a distance of 100 feet would decrease to 64 dB at 200 feet, or 58 dB at 400 feet.

The Federal Center and nearby area is subject to the City of Lakewood's Noise Control Ordinance (Lakewood City Code, Title 9, Chapter 9.52), as well as the Jefferson County Noise Abatement Regulation (Jefferson County Regulatory Policy, Chapter 5.90).

Noise sources in vicinity of the Federal Center include traffic on internal and nearby roadways, ongoing construction, demolition, and remediation activities and various noise sources associated with existing buildings and activities. The Federal Center is surrounded by four major roadways (6th Avenue to the north, Kipling Street to the east, Alameda Avenue to the south, and Union Boulevard to the west). These roadways constitute the boundaries of the study area for noise. Ambient noise levels in the vicinity of the site, measured as part of the Final West Corridor EIS (RTD 2003), ranged from 52 to 71 dBA.

3.15.2 *Vibration*

Vibration is an oscillatory motion, which can be described in terms of displacement, velocity, or acceleration. Displacement, in the case of a vibrating floor, is simply the distance that a point on the floor moves away from its static position. The velocity represents the instantaneous speed of the floor movement, and acceleration is the rate of change of the speed. The response of humans, buildings, and equipment to vibration is normally described using velocity or acceleration. In this section, velocity will be used in describing ground-borne vibration. The boundaries of the Federal Center constitute the study area for vibration.

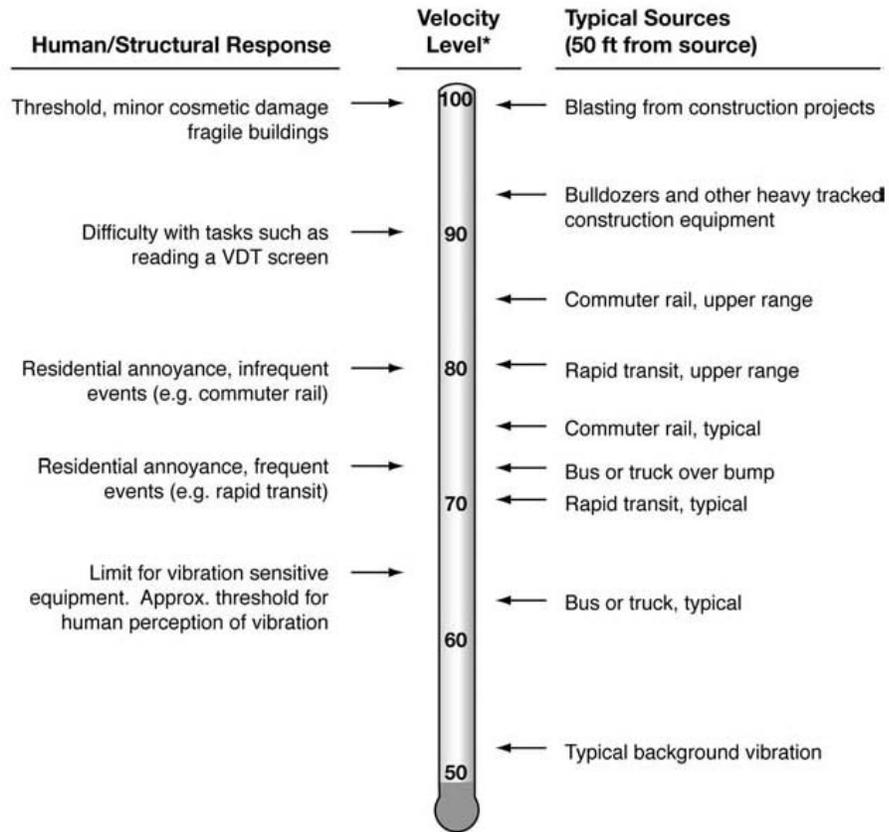
Vibration amplitudes are usually expressed as either peak particle velocity (PPV) or the root mean square (RMS) velocity. The PPV is defined as the maximum instantaneous peak of the vibration signal. The RMS of a signal is the average of the squared amplitude of the signal. Because it takes some time for the human body to respond to vibration signals, RMS amplitude is more appropriate to evaluate human response to vibration than PPV. FTA uses the abbreviation “VdB” for vibration decibels to reduce the potential for confusion with sound decibel.

Vibration above certain levels can damage buildings, disrupt sensitive operations, and cause discomfort to humans within buildings. Exhibit 3-22 illustrates typical groundborne vibration levels for common sources, and the human and structural response to groundborne vibration. The threshold of perception for human response is approximately 65 VdB; however, human response to vibration is not usually significant unless the vibration exceeds 70 VdB. Effects on fragile buildings are observed at vibration levels of 100 VdB.

Similar to the noise descriptors, L_{eq} and L_{max} can be used to describe the average vibration and the maximum vibration level observed during a single vibration measurement interval. Vibration propagates through the ground to the sensitive receptors. Soil conditions have an influence on the levels of groundborne vibration. Stiff soils, such as some clay and rock, transmit vibration over substantial distances, whereas sandy soils tend to absorb movement and thus effectively reduce vibration transmission.

Airborne sound waves can also cause vibrations to structures. Studies have shown sound levels reaching a home or other structure must be greater than 137 decibels to cause damage (GSA 2005a). Some of the buildings in the Federal Center have either been demolished or are scheduled for demolition. There are also ongoing remediation efforts to remove asbestos-containing soils as well as buried steam lines. The operation of heavy equipment associated with these activities, including vehicles hauling debris from the site for off-site disposal, contributes to existing vibrations in the area near the Federal Center.

Exhibit 3-22: Vibration Velocity Levels



* RMS Vibration Velocity Level in VdB relative to 10⁻⁶ inches/second

Source: Federal Transit Administration (2006)